# INTEGRATION, GROWTH AND COHESION IN AN ENLARGED EUROPEAN UNION

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# INTEGRATION, GROWTH AND COHESION IN AN ENLARGED EUROPEAN UNION

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# PREFACE

This book contributes fresh theoretical and empirical evidence on patterns of regional production structures, specialization, regional disparities, convergence and divergence processes and evaluation of cohesion policies in both current and future European Union (EU) member states in the context of increased integration. These subjects are addressed in both individual and cross-country analyses using innovative methodologies. The book is an essential reading for a large audience including researchers and policy makers working in the fields of economic integration, transition economics and regional development.

The thirteen contributions brought together in this book are the result of recent research undertaken in the framework of a larger project initiated and coordinated by the Center for European Integration Studies (ZEI) of the University of Bonn on determinants of regional specialization, growth and convergence in the context of European integration. A number of these papers were presented to a conference on "European integration, regional convergence, location of industrial activity and labour market adjustment" initiated by the Center for European Integration Studies of the University of Bonn and organized jointly with the Center for European Studies of the University "Alexandru Ioan Cuza" of Iasi, Romania. We gratefully acknowledge the financial support from the European Commission **5th** Framework Programme and the Center for European Integration Studies of the University of Bonn. This conference brought together established and young researchers as well as policy makers who discussed issues of great importance in both current and future EU Members States such as: regional disparities and patterns of regional convergence/divergence, regional specialization and concentration of industrial activity, regional development and foreign and direct investments, regional growth, regional monetary integration and fiscal transfers, local culture and the labour markets, SMEs and territorial networks, promoting cohesion in an enlarged European Union, regional policy experiences.

The focus of this book is on uncovering structural changes and economic performance differentials across regions and countries in an enlarged European Union as well as on evaluating existing policies aiming at reducing economic imbalances. The novelty of this book consists in empirical analyses using unique data sets in particular from the EU accession countries. In addition, this book presents for the first time in a unified framework theoretical foundations and empirical results of models used in the evaluation of cohesion policies. The evaluation of cohesion policies in Ireland is used as a benchmark to compare recent evaluation experiences with these models in Estonia, Hungary and Poland.

We wish to thank the contributing authors for their efforts in following our editorial guidelines. We are also grateful for stimulating discussions we had with many colleagues with the occasion of seminars, workshops, conferences, and informal meetings. In particular we thank Jürgen von Hagen for inspiring discussions and constant encouragement for this book project. Finally, we wish to thank Hadya Eisfeld for her excellent editorial assistance.

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# INTEGRATION, GROWTH AND COHESION IN AN ENLARGED EUROPEAN UNION: AN OVERVIEW


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## INTRODUCTION

Achieving better economic and social cohesion is one of the European Union's priorities. Although regional diversity is nothing new in Europe, during the past two decades there has been growing concern about the uneven impact economic integration has had on regions. The experiences of the Single Market Programme (SMP) and Economic and Monetary Union (EMU) suggest that some regions do better in the process than others and that the deepening of economic integration has resulted in relative winners and losers among the different regions. The continuing economic pressure from globalisation, increasing competition and restructuring within particular sectors have also asymmetric effects on regions. In cases where sectors tend to be concentrated in particular regions, industry specific shocks become region specific, posing a challenge to both regional and social cohesion. The upcoming European Union (EU) enlargement to Central and East European countries (CEECs) will further increase regional disparities and makes necessary a rethinking of cohesion policy at European, national and local levels.

Despite the progress of the international economy during the post World War II period, the problem of unequal distribution of income, economic opportunities and activities at a regional, national and international level continues, even today, to be an important theoretical and practical issue, Although the average level of development has increased in this period at a particularly rapid rate, a number of countries (at an international level) or regions (at a national level) have apparently failed to keep up. This observation has been a major challenge to economic theory and policymaking and has generated long discussions and debates.

## THEORIES OF CONVERGENCE AND DIVERGENCE

The relationship between growth and regional inequality is still a matter of controversy among economists. Although a significant part of the theoretical and empirical literature links economic growth with regional convergence, another important part considers growth to be a major determinant of regional inequality. As a result, a debate has been taking place for several decades around this issue, with important contributions from both sides. This discussion started in the late 1950s with the work of Solow (1956) and Myrdal (1957) and has recently gained increasing attention by interacting with the theoretical and empirical work in the fields of economic integration, economic geography, endogenous growth and development.

Following Solow (1956), proponents of the neoclassical (NC) paradigm argue that disparities are bound to diminish with growth, because of diminishing returns to capital. In a competitive environment, regional labor and capital mobility as well as regional trade will also work in favor of factor price convergence, reinforcing the negative relation between growth and regional inequality. If persistent inequalities in income per capita and labor productivity are observed between countries or regions, this should be blamed on externally imposed rigidities and state intervention, which affects the determination of prices and the mobility of the production factors.

Until the revival of research into growth and convergence in the late 1980s and 1990s, the debate on regional inequality was mainly influenced by the work of Williamson (1965). He essentially claimed that the NC model was valid in relatively advanced countries, which are characterized by a negative relation between the level of regional inequality and the level of development. More recent work, however, has shifted attention to empirical models that test directly for the validity of the Neoclassical (NC) convergence hypothesis.

Contrary to neoclassical theory, other schools of thought tend to agree with the basic claim of Myrdal (1957) that growth is a spatially cumulative process, which is likely to increase inequalities. Despite significant differences, whether one examines older theories of development (Rosenstein-Rodan 1943, Fleming 1955, Hirschman 1958, Perroux 1970), theories of urban growth (Segal 1976, Henderson 1983, 1986, 1988, 1999), the new economic geography school (Krugman 1991, 1993a, 1993b, Fujita, Krugman and Venables 1999, Thisse 2000), or the endogenous growth school (Romer 1986, 1990, Lucas, 1988, Grossman and Helpman, 1991, Aghion and Howitt, 1992, 1998), a similar argument arises: economic growth has a tendency to be associated with some sort of agglomeration and requires a minimum threshold of resources and activities in order to take place. Once it starts however, it is likely, depending on the strands of research, to be self-sustained, spatially selective and cumulative in nature.

If a definition of capital is extended to encompass not only physical capital, but also human capital (Lucas, 1988), public capital (Barro, 1990) and technology capital (Grossman and Helpman, 1991), the returns are not necessarily diminishing, but may be increasing. The endogenous growth models show how positive externalities associated with public good characteristics of investments can generate additional unintended benefits to the productive capacity of the economy[1]. In particular, these ideas were incorporated into models as the accumulation of knowledge (e.g. Romer, 1986, 1990), or improvements in the quality of intermediate inputs (e.g. Aghion and Howitt, 1992, 1998). In those cases, the externalities arise when innovations that were generated in one firm are adopted elsewhere. Another line of research is

[1] For extensive reviews of the theoretical literature on endogenous growth see Hammond and Rodriguez-Clare (1993), Barro and Sala-i-Martin (1995), Jones (1998), Aghion and Howitt (1998).

concerned with the level of social capital, defined as the institutions, government policies and interpersonal relationships that exist in a country (Zak and Knack, 2001, Hall and Jones, 1999). In this literature social capital affects the development of other types of capital. But the most important conclusion from this literature is that, in contrast to neo-classical growth theory, the endogenous growth models do not predict automatic convergence.

## EMPIRICAL EVIDENCE IN THE EUROPEAN UNION

Barro and Sala–i–Martin (1991, 1992) (BS from now on) found an annual convergence rate of 2% in GDP per capita and labor productivity for 73 regions of 7 European countries using a non – linear least squares estimation[2]. Mankiw, Romer and Weil (1992) reached the same conclusion assuming a stable rate of population growth and capital accumulation. Also, Ben–David (1993, 1996) supports the convergence hypothesis, claiming that convergence is stronger among countries that have strong trading relationships. Rivera–Batiz and Xie (1993) argue that when countries have different sizes and diverging resource endowments, economic integration will lower the growth rate of the country with a high growth rate, while raising the growth rate of the country with a low growth rate.

On the other hand, Armstrong (1995) suggested that the findings of BS (1992) have to be revised downwards because they exclude the European South (lagging regions). He found an annual _–convergence rate of 1% for 83 NUTS I regions in 12 countries for the period 1960–1990. Furthermore, other authors such as Baccheta (1994), De La Fuente (1994), Abraham and Van Rompuy (1995), Molle and Boeckhout (1995) found a very small convergence factor. Especially after the two oil crises of the 70s, convergence stops and, in some cases, divergence phenomena are observed as many authors point out (Pagano 1993, Suarez–Villa and Cuadrado–Roura 1993, Dunford 1994, Neven and Gouyette 1994, Button and

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[2] They have estimated a basic neoclassical **β-convergence** model for the evaluation of convergence or divergence trends across countries or regions of the form:

$$\frac{1}{T}\ln\left(\frac{y_{i,t}}{y_{i,t-T}}\right) = \alpha + \ln y_{i,t-T}\left(\frac{1-e^{\beta t}}{T}\right) + \varepsilon_{i,t-T}$$

where $Y_{it}$ represents GDP per capita of the country or region *i*; T is the period of analysis; β is the coefficient and ε is the error term. However, other authors estimate the **β–convergence** coefficient from a linear version of the above model given by the regression:

$$Y_{t+T}/Y_t = \alpha + \beta Y_t + \varepsilon,$$

where Y is the per capita GDP value, α is the constant term, β is the convergence coefficient and ε is the disturbance term. The $Y_{t+T}/Y_t$ ratio indicates the growth of regional GDP per capita in the period t–t+T. In the linear model, positive prices of β imply that regions with higher initial value of GDP per capita tend to experience higher growth. Negative prices of β imply that regions with lower initial value of GDP per capita tend to experience a better growth performance. As a result, positive values of β are associated with tendencies of regional divergence, while negative values are associated with tendencies of regional convergence.

Pentecost 1995, Champion et al 1996, Fagerberg and Verspagen 1996, Armstrong and De Kervenoael 1997, Cappelen et al 1999, Lopez–Bazo et al 1999, Pontes 2000, Cuadrado – Roura 2001, Petrakos and Rodriguez – Pose 2003).

Comparing the EU to the US, Esteban (1994) claims that interregional inequality in Europe (140 regions) is more than twice as much as the interstate inequality in the US (48 states). According to Andaluz et al (2002), who studied 75 EU regions and 50 US states for the period 1980 – 1995 and for 6 different sectors, the economic landscape of the EU regions is changing more rapidly than that of the US and the future evolution will lead to an increase in concentration in Europe and a decrease in the US. However, even though the EU has higher levels of interregional disparities in terms of per capita GDP, it has a lower level of concentration of population and activities (Puga 1999, Midelfart–Knarvik et al 2000).

Many authors (Neven and Gouyette 1994, Abraham and Van Rompuy 1995, Esteban 2000, Puga 2001, Petrakos and Rodriguez–Pose 2003, Straubhaar et al 2002) detect a dualistic (north–south or core–periphery) phenomenon in the European space, described by various authors and reports as a "banana", "blue star", "green grape", or "house with seven apartments" pattern development (Nijkamp 1993). The core regions tend to specialize and export high-tech manufacturing and producer services to the periphery, while the periphery tends to export low-tech manufacturing or extracting activity products to the core regions (Mack and Jacobson 1996).

The analysis of both GDP per capita and per worker points to substantial differences in their convergence processes (Lopez–Bazo et al 1999). Some authors propose the classification of European regions into different development groups (clusters) that have their own developmental dynamic and potential. EU regions are dividing themselves up into four clusters, each one with its own asymptotically stable per capita income level (Canova and Marcet 1995, Durlauf and Johnson 1995, Quah 1996a, 1996b, 1997, Gallor 1996, Canova 1998, Desdoights 1998, Durlauf and Quah 1999). In the same direction, Rodriguez–Pose (1999) and Petrakos and Rodriguez–Pose (2002) found five convergence clusters while Heidenreich (1998) discerned eight convergence clusters in the EU space.

All this theoretical and empirical discussion, with all the conflicting results, may simply indicate that in reality trends of convergence and divergence coexist. Petrakos et al (2003) with the use of SURE models and time–series data for 8 EU countries, test directly the validity of the neoclassical and the cumulative causation hypotheses and indicate that both short–term divergence and long–term convergence dynamics coexist. While convergence is observed more clearly among EU countries (with some disagreement about the rate of convergence), divergence is more often observed within countries. This is because convergence between countries has been, in many cases, enforced by the dynamism of the national metropolitan centers causing dualistic phenomena inside the countries (Abraham and Van Rompuy 1995, Esteban 2000, Puga 2001, Petrakos and Rodriguez–Pose 2003). EU (1999) in the 6th Periodic Report stresses the fact that between 1986 and 1996 regional disparities in per capita GDP within countries have decreased only in Portugal and the UK. It was estimated that about half of the income inequality between the EU regions is accounted for by domestic inequalities between regions within individual countries (De La Fuente and Vives 1995).

These results are attributed either to the negative correlation between equality and efficiency, for developing countries (Williamson 1965, Terrasi 1999, Davies and Hallet 2002) or to the impact of economic cycles on regional inequality (Berry 1988, Thisse 2000, Petrakos et al 2003). According to the first approach, the diagram of regional inequalities takes the form of an inverted U because all countries choose efficiency over equality, in the first stages of their development. Davies and Hallet (2002) found evidence of a trade–off between national growth and regional dispersion in the Cohesion countries and especially Spain and Ireland. An empirical study in Spain revealed that regional inequalities could have been reduced by 13,54% for the period 1981–1991, if the Spanish government had "accepted" the reduction of the country GDP by 1,62% (De La Fuente 1996).

According to the second approach, the rise (fall) of a country's economic cycle causes a rise (fall) of interregional inequalities. Petrakos and Saratsis (2000) and Fotopoulos et al (2002) found evidence of this relationship in Greece and Chatterji and Dewhurst (1996) in Great Britain. Petrakos et al (2003) claim that growth performance at the EU level has affected inequality among EU members in the period 1960-2000. Compared to the 1960s and 1970s, convergence in the 1980s and 1990s has been, among other things, also influenced by lower growth rates of the European economy during the last two decades. A similar argument is made for regional inequalities within countries: they increase in periods of higher growth and decrease in periods of lower growth. However, not all authors agree with this view. The official report of the European Commission (EU 1999) and some authors, such as Dunford (1994) and Amin and Tomaney (1995), consider economic growth to be linked with higher rates of convergence, not the opposite.

Another major factor of regional inequality is the structure of production. Studies conducted for the 6th Periodic Report (EU 1999) found that an unfavorable sectoral structure with a lack of innovative capacity seems to be among the most important factors underlying lagging competitiveness. Empirical evidence suggests that the aggregate trends towards convergence and / or divergence hide, at the micro level, a complex pattern of regional change: a pattern to a large extent shaped by the structural type of each region as highlighted by Rodriguez–Pose (1999). De La Fuente (2000) showed that regions with a large agricultural sector have lower average labor productivity. A move out of agriculture spurs thus growth and almost every region has lost employment in the agrarian sector between 1985 and 1995. This trend will continue as less developed regions have agriculture sectors with very low average productivities (Iglesias et al 1998). The fact is that during the 80s there has been significant regional convergence in productivity per worker in the EU in industry and services but not in agriculture (Paci 1997).

## EMPIRICAL EVIDENCE IN SELECTED EU COUNTRIES

The discussion on regional inequalities and convergence has expanded to include a number of EU countries. In Greece, the literature provides contradictory evidence.

Siriopoulos and Asteriou (1997), Siriopoulos et al (1997) and Fotopoulos et al (2002) found divergence between Greek regions whereas Giannias et al (1997) and Papanikos (1997) support the opposite. Lyberaki (1996) and Petrakos and Pitelis (2000) found that Greece was converging towards the EU until the mid–70s, then it started diverging in the 80s and remained so until the mid–90s. Tsionas (2002) found signs of polarization in Greece for the period 1971–1993 using Markov chains, in NUTS III level. Petrakos and Saratsis (2000) found that regional inequalities in NUTS III level, decreased during the 70s and the 80s, partly due to the poor adjustment of the economy in the new international environment and the EU and the decline of the large industrial regions. Petrakos and Rodriguez–Pose (2003) show that regional inequalities increased in the 1990s, which is exactly the period that the Greek economy exhibits a strong growth performance and converges towards the EU average.

In Spain, the main findings point to a convergence trend until the late 70s and a divergence trend afterwards (Alcaide 1988, Suarez–Villa and Cuadrado–Roura 1993, Mas et al 1995, De La Fuente 1996, Cuadrado–Roura et al 1999, Villaverde 1999). The case of Portugal is regarded as an atypical one, since the country has converged as a whole to the European average and experienced at the same time declining inequality among its regions. This has been attributed mainly to the rise of the unemployment rate (Pontes 2000).

Ireland provides a good illustration of growth pole effects as the strong national growth rate in the 1990s was driven by the particularly rapid growth of the eastern and southern regions. Although the higher growth rates of these regions had led to a widening of regional disparities within Ireland, all regions converged towards the EU in the period 1991 – 99 (Davies and Hallet 2002).

The same results about the Cohesion countries were found by Quah (1999) who analyzed regional and national convergence in 1980–89 using models of explicit distribution dynamics to examine the evolution of the per capita income. Mauro and Podrecca (1994) found $\beta$–divergence among Italian regions and a high level of polarization. Terrasi (1999) analyzed the GDP per capita in Italy for the period 1953–1993 using the Theil index and she found that after a period of strong convergence, which was limited to the years, 1960–1975, a long–term tendency towards divergence has been verified.

Perrson (1994) for the period 1906–1990 found convergence across Swedish counties in terms of per capita income while Bergstrom (1998) found convergence across Swedish counties from 1945 in terms of real per capita income. Funke and Strulik (1999) found that regions in West Germany do not share a common steady–state.

## EMPIRICAL EVIDENCE IN TRANSITION COUNTRIES

A growing literature is now concerned with the regional aspects of the transition process and the type and evolution of regional disparities in Central and Eastern Europe. A number of earlier studies argue that the process of transition in Central and Eastern Europe is associated with increasing regional disparities. Petrakos

(1996a) has attempted a theoretical inquiry concerning the interaction of the various processes of transition and space. He claims that transition will have a serious impact on the regional structure of Central and East European countries, because the processes of internationalization and structural change tend to favor metropolitan and western regions, as well as regions with a strong industrial base. In addition he claims that at the macro-geographical level the process of transition will increase disparities at the European level, by favoring countries near the East-West frontier (Petrakos 2000, Petrakos and Totev 2000).

At the same time, a number of empirical papers have appeared. Evidence from Estonia shows that core-periphery differences have increased, with Talin and Western coastal regions benefiting the most from the new orientation of the country (Raagmaa 1996). Evidence from East Germany already indicates that development is highly selective and depends on the behaviour of foreign capital. Berlin emerges as a development pole with strong links with the West German and the international economy but weak local linkages and low spread effects (Haussermann 1993).

Similar trends have been detected in the Slovak Republic, where Bratislava, with 9% of the national population, generates 30% of the country's GDP (Balaz 1996). In Hungary, disparities increased during the early years of transition (Fazekas 1996), although regional unemployment patterns have remained stable (Fazekas 2000). FDI and domestic capital prefer metropolitan and western regions (Lorentzen 1996, 1999), turning an already unbalanced pre-1989 situation of the regions into a serious core-periphery and east-west disparity (Nemes - Nagy 2000).

Additional evidence comes from Poland (Gorzelak 2000), indicating that different regions adjust in a different way to the new economic environment. Another study (Ingham et al 1996) shows that the regional pattern of unemployment is relatively stable in the 1990-1994 period, indicating that initial best performing regions are also final best performing regions and initial losers are final losers also. This basic picture is also supported by reports for Albania (Petrakos 1996b), Bulgaria (Minassian and Totev 1996, Petrakos 1996b) and Romania (Ramboll 1996). A comparative regional analysis of Poland, Hungary, Romania and Bulgaria by Petrakos (2001) has suggested that the level of disparities is affected by national characteristics (such as institutional factors), economic factors (such as the level of development), the success of restructuring and catching up, as well as by size and the geographic co-ordinates of each country in the European space.

A comparative analysis of the spatial structure of South-Eastern Europe by Petrakos and Economou (2002) has found increasing regional disparities in all countries, an increasingly superior performance of the metropolitan regions, serious discontinuities at the borders which have, generated over-time border regions with below average performance and finally, an urban system with serious deficiencies in medium sized cities. Although the process of spatial adjustment to the forces of transition is very complex, the available evidence seems to reveal some general patterns. It shows that in countries sharing common borders with the EU and being at a short distance from the European core, spatial adjustments have been favouring metropolitan and western regions. However, disparities have increased at various rates and degrees in all transition countries to levels that are higher than those in most of the EU countries.

## INTEGRATION, GROWTH AND INEQUALITY FROM A PAN-EUROPEAN PERSPECTIVE

Recent research provides evidence that in terms of economic structure and performance, an East-West and a North-South divide is present in Europe (Jackson and Petrakos 2001, Mertzanis and Petrakos 1998, Petrakos and Totev 2000). Moreover, in certain aspects, this divide is more evident now than it was 10 or 20 years ago. Within the EU, Northern and Western European countries have a more sustainable economic structure than Southern European ones. Within transition countries, the Central European countries have a better performance and a better economic structure than the Baltic countries and the Balkans.

Although not explicitly stated, it is beyond any doubt that in this pattern of changes that is shaping the new Europe, the worst performing place in all accounts is the Balkan region. With existing trends, the new economic divide in Europe may take a Northwest-Southeast character, where the Southwest, the Central and the Northeast will take the intermediate positions. With respect to convergence and divergence trends in the new European space, Petrakos et al (2000) provide some evidence that transition has increased disparities with respect to development levels. They show that disparities in GDP per capita measured by the coefficient of variation and the max/min ratio were greater in the late 1990s than in late 1980s. Petrakos (2000) has estimated the _-convergence coefficient at the European level in the same period and verified the divergence hypothesis. The coefficient of the regression was found positive and statistically significant at the 1 percent confidence interval, indicating that relatively more developed countries had a higher growth rate than relatively less developed ones in the 1989–1997 period.

## METHODOLOGICAL QUESTIONS

Regional inequalities have been examined having as a base the NUTS classification. However, the term “region” is totally subjective as its size is determined by exogenous criteria (Thisse 2000). This type of the European territorial classification has evoked significant disagreements by a part of academics (Boldrin and Canova 2000, Thisse 2000, Davies and Hallet 2002, Straubhaar et al 2002), which support the view that the NUTS classification is not able to illustrate regional imbalances regardless of its statistical simplicity. NUTS II and NUTS III are very small units to include the sum of economic linkages (as few economic activities are spatially integrated within them) so the notion of convergence has no concrete value (Davies and Hallet 2002). The fact that inequality increases with the level of territorial disaggregation is not unexpected (Dunford 1994). First, economic activities tend to agglomerate and are highly clustered. There are also strong forces of selection that concentrate key economic functions in core areas and force out those activities which are associated with lower levels of value added per head and are not required to service core metropolitan functions. Second, at high levels of aggregation workplaces, places of residence and rural zones are combined and the differences between them are often averaged out. So, the extension of regional inequalities is a function of the delimitation of the regional units and the selection of the spatial level (Thisse 2000).

Another point of criticism to the scientific methodology is that most studies treat regions as "isolated islands" without taking into consideration the interactions between them (Anselin 1988, Larch 1994, Mankiw 1995, Quah 1996a, 1996b, Fingleton 1999, Vaya et al 2000, Johansson 2001, Le Gallo et al 2002, Niebuhr 2002). However, a structural element in both the endogenous growth theory and the new economic geography theory is the significant influence of interregional interaction (in terms of trade, migration and technology) on relative economic performance. The exclusion of spatial interaction and the assumption that all regions of the European territory belong to one national growth cluster cannot serve as an adequate framework to analyze convergence among European regions. Rodriguez–Pose (1999) found for 110 regions and for the period 1977–1993 that the convergence trend is affected by spatial autocorrelation, which means that the growth levels of adjacent regions tend to be correlated. Le Gallo et al (2002) found that the average growth rate of per capita GDP of a given region is positively affected by the average growth rate of neighboring regions. A poor (rich) region surrounded by poor (rich) regions will stay in this state of economic development whereas a poor region surrounded by richer regions has a greater probability of reaching a higher state of economic development. Le Gallo (2001) using Markov chains approach for the study of 138 EU regions and for the period 1980–1995, reached to the conclusion that in Southern Europe there is a cluster of poor regions creating a poverty trap. Thus, the exclusion of spatial interaction and the assumption that all regions of the European territory belong to one national growth cluster cannot serve as an adequate framework to analyze convergence among European regions.

One more point of serious criticism against the scientific methodology is the omission of the influence of cyclical effects on the countries' and regions' figures, especially for short time periods (Lall and Yilmaz 2001, Petrakos et al 2003). However, many authors (Frankel and Rose 1997, Angeloni and Dedola 1999, Rees 2001, Trichet 2001) argue that an increasing correlation between the countries' business cycles is observed due to the forces of economic integration.

Although the evidence is mixed, it should be a relatively safe prediction to argue that at the European scale both forces of convergence and divergence are in motion with different intensities and balances in different spatial levels of aggregation. The debate is still on and it is very likely to be a heated and lasting one. Who converges to whom, at what rate (a very important question, particularly when viewed in the light of Keynes' famous saying that "in the long run we are dead"), and for what reasons will be important questions that will hold the attention of an expanding literature for some time. Celebrated cases of success, such as Ireland, and dramatic cases of failure, such as the Balkan region, will become more often the subject of detailed case study examination. In a similar manner, the investigation and understanding of the conditions, dynamics and policies that lead to success and failure at the micro level will be necessary in order to provide more convincing answers to the questions related to cohesion and development policies in the new EU-25.

## AIMS AND OUTLINE OF THIS BOOK

This book contributes fresh theoretical and empirical evidence to the research agenda discussed above. It brings together a selection of recent research papers investigating the impact of increased integration on regional production structures, patterns of disparities, convergence and divergence processes and evaluations of cohesion policies in both current and future EU countries. The contributions include both individual and cross-country comparative analyses.

Part I includes six chapters analyzing integration effects on production structures, growth and inequalities in current and future EU member states. They address important and policy relevant questions such as the dynamics of regional inequalities, the relationship between economic freedom and total factor productivity, patterns of regional production and investment specialization, and the consequences of technological progress on the spatial distribution of activities among integrating countries.

In Chapter 2, Petrakos, Pose and Anagnostou, investigate the evolution of regional inequalities among EU countries as well as within countries and uncover that, despite the mobility that has been observed at various spatial levels, the geography of inequalities in the EU has been maintained to a significant extent during the last 10-20 years. The authors point out that tendencies of convergence and divergence coexist in European Union and depend on the initial conditions, the economic and structural characteristics of the regions, their geographic position and the policies that were employed at the regional, national and European level. Despite a continuous increase of financial resources spent on cohesion policies, the trend of convergence of countries to the EU average was mirrored by a tendency to divergence of regions from the national as well as from the European average. The authors underline that the EU will be confronted with even increased regional inequalities following its enlargement to the East while increased public deficit and objections of net contributors will constrain the EU budget for cohesion policies.

The upcoming enlargement of the European Union to twelve more countries including ten Central and Eastern European countries will pose new challenges to the EU economic cohesion. As shown in European Commission (2001) the disparities will double in magnitude and the need for assistance will concentrate in the new member states.

This challenge is clearly illustrated in Chapter 3 by Petrakos, Psycharis and Kallioras. They examine regional characteristics of the EU accession countries for the period 1995 – 2000, and reveal a number of inequalities and divides. At a cross-country level they show that there is a “north-south” divide similar to the one found within the EU-15 consisting in the relative dynamism of the Central Europe and the difficulties of the Balkan region. Within these countries, there is a divide between the fast growing metropolitan centers, led by agglomeration economies, and western border regions, led by adjacency and proximity to the EU–15 on the one hand and the rest of the regions on the other. Their empirical analysis shows that over time these inequalities have increased in almost all accession countries to levels comparable (or even higher) to that of EU–15.

These findings have significant implications for the future of European regional policies. The EU–27 will be faced with far more serious economic divisions and problems of structural weakness and underdevelopment, than those encountered with previous enlargements to the West and South. The growing regional inequalities in the EU accession countries are a critical test of the ability of the EU to adjust its policies to the new conditions in order to maintain cohesion its highest priority.

In Chapter 4, Moomaw and Seok focus on the relationship between the level of economic freedom and total factor productivity (TFP) and its growth for a selection of OECD countries. After describing economic freedom variations over time and over countries, the chapter tests for TFP convergence among the selected OECD countries. Using standard approaches from the literature, the authors find evidence supporting beta and sigma convergence. Specifically, the authors find that TFP growth is inversely related to the initial level of TFP and that the standard deviation of TFP falls over time, both for the manufacturing sector and for industries within the manufacturing sector disaggregated to the two- and three-digit level. The authors then relate TFP levels and growth to economic freedom. Their results show that economic freedom differentials among OECD countries have a statistically and quantitatively significant effect on TFP in manufacturing and its growth.

The debate preceding the EMU, pointed to potential negative effects of increasing specialization and core-periphery tendencies. Economic regions having a specialized industrial structure could find themselves vulnerable to asymmetric shocks that are difficult to smooth intra-regionally. Potential contrasting specialization tendencies between central and peripheral regions would thus lead to the need of improved and flexible shock absorbing mechanisms at the regional level.

In Chapter 5, Stirböck investigates the spatial patterns and driving forces of relative sectoral investment specialization of EU regions in specific sectors. The exploratory spatial analysis uncovers investment clusters in a number of regions within countries reflecting the geographical proximity of regions with similar specialization. The econometric analysis finds that investments in manufacturing sectors are attracted by central regions. On the other hand, investments in service sectors are located in administrative centers as well as regions located at long distances from their national capital cities. A higher local level of sectoral economies of scale and productivity strongly increases investments in manufacturing sectors. No evidence is found for the relevance of sector-specific labor cost differentials between regions, but sectoral productivity differentials between regions generally contribute to the explanation of relative investment shares in the nine manufacturing sectors analyzed. Further, the author finds that country-specific characteristics influence the regional investment level in most sectors. However, these country-specific effects differ with respect to each sector. Peripheral regions play a different role in the location of sectoral investments compared to core regions The driving forces of investment specialization in core regions are growth-oriented market services like transport and communication services and credit and insurance services. The service sectors with the highest regional specialization of peripheral regions, however, are repair, trade and lodging services as well as other services – both linked to economic activity in tourism.

Regarding the lower relative specialization in manufacturing sectors of those regions distant from the economic center, the author concludes that promoting or even subsidizing the location of manufacturing sectors in peripheral regions may be a wasteful effort if these sectors are already established in other regions while significantly profiting from increasing returns to scale at sector level.

Rieber and Tran analyze in Chapter 6 the consequences of technological progress on the spatial distribution of activities among integrating countries using a three-country model of economic geography: one developed country – the North, and two Southern catching-up countries. They focus on the internal geography of the Southern country during its catching-up process. Their investigation is conducted under two patterns of regional trade agreements, namely customs union and free trade area. The results of this analysis suggest that the Southern catching-up process has positive consequences on industrialization and welfare. However, a bifurcation point may appear in the case of customs union, due to the tension between centripetal and centrifugal forces at work in the model being used. Economic growth under integration among identical countries can result in catastrophic agglomeration, wherein just one of the countries monopolizes all the benefits of growth, the other staying in a poverty trap. When instead there is a free trade area among the Southern countries, the authors show that trade liberalization with the North yields higher economic performance than import substitution policies. However, the liberalizing country benefits from its free trade policy, provided that its partner remains protectionist.

The next chapter looks at the case of specialization profiles of Italian regions over 40 years in the post-war period. In this chapter, Vertova provides quantitative evidence about the stability of the profiles of specialization of the Italian regions. Despite some degree of incremental change towards diversification, the ability of regions to diversify into new fields of specialization does not cause a strong change in their profiles of specialization. In fact, on average, the Italian regions maintain their specialization in their existing and traditional spheres of expertise. This result is quite discouraging because it shows the typical immobility of the Italian regional specialization. The results show that, on average, regions have been specialized in the same sectors since 1951. The results over the longest period (40-year period) are quite discouraging because, over such a long period of time, significant changes in regional profiles of specialization would have been expected due to the great transformation occurred in the external and national environment and the development of new technological paradigms. Surprisingly, there are no differences among the Northern regions, the Southern ones and the regions of the 'Third Italy'.

The econometric analysis in this chapter shows that regions are likely to undergo incremental change in the distribution of their activities as they adapt to changing economic conditions. The longer the distance in time the stronger the incremental change. This analysis suggests that Italian regions need a long time to change their specialization, thus indicating a tendency of Italian regions to be locked into a traditional path of economic development.

This chapter suggests that policy makers should keep in mind the natural stickiness of regional profiles of specialization when planning policy actions targeting the change of specialization of regions in the short-run. Incremental change towards diversification of economic structures takes time and effort because a complete re-organization and restructuring of the economy is needed. Furthermore, institutions need to learn how to adapt and change according to the new productive structure of the economy and this may cause a mismatch between the institutional set-up of the society and its productive side.

Part II focuses on evaluations of cohesion policies. In Chapter 8, Bradley addresses the question of whether the EU-inspired National Development Planning process, together with its implementation through EU aided Community Support Frameworks (or Structural Funds), have a role to play in promoting convergence. This process started in the late 1980s, when there was a fear that the lagging member states – Greece, Ireland, Portugal and Spain – would lose out as the increasingly competitive Single European Market was launched. The paper first describes the institutional and organisational aspects of the NDP process, and then explores the procedures and policy instruments used – mainly physical infrastructure, human resources and direct aid to the productive sector. One consequence of the NDP process is that it has encouraged a more rigorous and open approach to monitoring and evaluation, and the lagging countries have used this cultural change to good effect. Another consequence has been the incentive to develop appropriate evaluation tools and to make use of the body of empirical research findings that has been generated within the new growth and new economic geography literatures.

The paper then presents a specific case study of the Irish experience, and makes the point that Ireland's dramatic catch-up that took place during the 1990s should not be thought of as being caused purely by Structural Fund aid. Rather, it was driven by a complex set of industrial, economic, social and other policies, which provided ideal conditions for Structural Funds to have maximum impact. The paper concludes by suggesting that the acceding states of CEE will need extensive Structural Fund aid set within well designed National Development Plans, and that the earlier cohesion experiences of the EU lagging countries can provide valuable guidelines.

In Chapter 9, Bradley,Gács, Kangur and Lubenets look back over a period of ten years of international collaborative research on the development of macro modelling frameworks for evaluation of the impacts of National Development Plans (NDPs) and Community Support Frameworks (CSFs). This work started in Ireland in the late 1980s, driven by the evaluation needs of the first CSF, covering the period 1989-93. It was then extended via international collaborative research to the other cohesion countries (Greece, Portugal and Spain) during the first half of the 1990s, and was further extended towards the end of the 1990s to the analysis of the pre-accession investment aid programmes of the newly liberalised economies of Central and Eastern Europe (CEE). The paper discusses some of the lessons of that trans-European collaborative research, drawing in particular on the Irish, Estonian and more recent Hungarian experiences.

The paper describes how the conjunction of international advances in applied macroeconomics, as well as in new trade and growth theories, combined with the influence of the earlier EU HERMES modelling project of the 1980s, served to influence modelling research on the analysis of the impacts of the large-scale investment programmes that were implemented in EU Community Support Frameworks. The structure of the HERMIN model is then described, a brief overview given of how the four EU cohesion country HERMIN models were calibrated, their responses to a series of stylised external and policy shocks, and a summary of what can be learned about lagging EU economies from models like HERMIN.

After the first dramatic stage of CEE market liberalisation in the late 1980s and early 1990s, the economic reforms that had been carried out from the mid-1990s onwards involved the emergence of processes that had many similarities with earlier developments in the EU cohesion countries. The second stage of CEE transition (following the initial severe output decline and early recovery) can be examined by means of adaptations of the HERMIN framework to these economies. In particular, because of the extreme limitations on availability of time-series data, special approaches to calibration of the CEE models are needed. After early modelling experiments in the Czech Republic, Romania, Slovenia and Latvia, the most detailed and systematic modelling application was carried out for Estonia in 2000.

More recently, the HERMIN modelling approach has been applied to Hungary. Drawing on the earlier Irish and Estonian experiences, it is shown how a modelling methodology that stresses standardisation and cross-country comparisons can be implemented quickly and at a relatively low cost, and facilitates the transmission of institutional learning on modelling, medium-term forecasting and policy analysis. In such an exercise, rather than just studying the specific features of the Hungarian economy in depth, the HERMIN model invites comparisons with other CEE and EU economies/models. It is argued that the HERMIN approach is a useful complement to the alternative, detailed, stand-alone and country-specific approaches that have tended to dominate modelling research.

In Chapter 10, Bradley, Kangur and Lubenets describe how macroeconomic modelling techniques were developed in the late 1980s to carry out systematic ex-ante impact evaluations of the Irish CSF 1989-93. This involved adapting the HERMIN model to take account of the re-structuring effects of the EU programmes, and how the role of the Structural Funds can be separated from other influences. They show how the early Irish work was extended in a series of analyses of the CSFs for the four cohesion countries – Greece, Ireland, Portugal and Spain - and resulted in the further evolution of a modelling framework (HERMIN) specifically tailored to facilitate national and cross-national comparative NDP/CSF impact analysis.

The economic reforms that had been carried out from the mid-1990s onwards in the CEE area involved the emergence of processes that had many similarities with earlier developments in the EU cohesion countries. The first systematic impact analyses of pre-accession Structural Funds that were carried out for Estonia in 2000 are described, where revised and improved HERMIN models have recently been used in the analysis of the Estonian NDP 2004-2006. Influenced by the MEANS programme of DG-REGIO, the paper shows how CSF impact analysis in the cohesion countries was combined with analysis of the impact of the Single European Market, in a move away from what the MEANS programme refers to as a restricted CSF "theory of action" towards more holistic "explanatory" and "global" study of cohesion, where a wider range of EU policy initiatives beyond investment aid were additional driving forces of transformation and growth.

The paper concludes with a discussion of some of the administrative and practical challenges that arise when HERMIN models are used to evaluate the impacts of NDPs and CSFs. The complexity of such analysis, combined with the relative sophistication of the modelling tools, gives rise to particular challenges in presenting the impact analysis results in a way that feeds into the institutional learning process for the CSF. Suggestions are made on how CSF impact results should be presented, drawing on the Irish and Estonian experiences. Finally, the HERMIN-based approach to CSF impact analysis is compared with alternative approaches based looser and more eclectic econometric modelling and explanations are offered for why these two approaches can produce radically different impact evaluations.

In Chapter 11, Bradley, Zaleski and Zuber deal specifically with the administrative experience of the most recent Polish National Development Plan. EU development aid was made available to Poland and the other CEE countries from the very start of the period of transition in the late 1980s, but only recently – as Poland moves towards EU membership in June 2004 – has the pace quickened. The design of the Polish National Development Plan 2004-2006 (NDP) represents a step change in the process of preparation for EU membership, and requires that the Polish authorities now participate in the complex procedures of NDP design, ex-ante evaluation, CSF treaty negotiation, implementation, monitoring, mid-term and ex-post evaluations that have been a fact of life in the EU Objective 1 regions since the late 1980s.

The paper examines the recent Polish experience in designing and evaluating its first major EU-supported NDP and this involves a critical review of the recently designed Polish NDP both in terms of process and content. A wide variety of ex-ante evaluation tools is potentially available for use in monitoring, evaluating and optimising National Development Plans (NDPs), ranging from the cost-benefit analysis of individual projects at the one extreme to evaluating aggregate impacts of an NDP on the entire national economy at the other. However, previous EU experience suggests that the NDP/CSF process has tended to evolve in a linear sequence that makes only limited use of feedback and learning derived from formal methodologies and ex-ante evaluation techniques. For the acceding states in Central and Eastern Europe, who are presently engaged with NDP 2004-2006, this presents serious challenges to domestic public administrations as well as to DG-REGIO.

The Community Support Frameworks (CSFs) had exposed the EU cohesion states to a decade of "learning by doing", and they could draw on a wide range of ex-ante, mid-term and ex-post evaluations. However, the context for the CEE states as they approached the design of NDP 2004-2006 was much less advantageous. In CEE states, the concept of a National Development Plan was sometimes embraced with reluctance, since it evoked memories of the central planning experiences of the pre-1989 era that had distorted their economies. The economic background of the CEE area was one of upheaval, change, and uncertainty, and the public finance and balance of payments constraints were often more binding than for the less developed EU states and regions. The learning experience gained from the previous pre-accession structural aid programmes had been limited, particularly as guides towards the preparation for the highly integrated NDP-type exercises. The formal tools of ex-ante evaluation at project, programme and national levels were at best untested in a CEE context, often of questionable reliability, and at worst simply unavailable. Finally, the initial amount of aid – as a proportion of national GDP – was smaller than was the case in the previous EU CSFs.

The paper describes how the main problems and challenges faced by the Polish economic planners were identified as the design of the Polish NDP 2004-2006 moved from inception to completion, and the resulting National Development Plan is briefly reviewed. A nested sequence of increasingly more stringent criteria for the ex-ante evaluation of the NDP design is then examined. First, how the concept of ex-ante *appropriateness* (or suitability) of the NDP can be studied, i.e., how the barriers to cohesion of the Polish economy were identified and the extent to which NDP-based strategies could be designed to address these structural weaknesses. Second, the concept of ex-ante *effectiveness* is reviewed, i.e., what efforts can be made to project the effects envisaged or anticipated from the main NDP strategies. Third, the difficulties faced in addressing the *efficiency* of the NDP ex-ante are described, i.e., the achievement of the cohesion objective with the minimum use of resources.

The paper concludes with a discussion of the steps that are being taken to ensure that the strategic intent of the Polish NDP (i.e., the cohesion objective) is reinforced by learning from the insights obtained from the above aspects of ex-ante evaluations and some of the directions are illustrated in which the national culture of analysis and evaluation in Poland could be further improved.

In Chapter 12, Südekum provides a critical analysis of regional policies in the European Union. He argues that from a theoretical point of view, regional policies lack a convincing economic justification. The modern regional divergence theories explaining the emergence of regional divergence typically do not imply that core-periphery structures are inefficient. There is no rationale that agglomeration should be reduced by public policy. On the contrary, many of these models ask for more instead of less agglomeration, since increasing returns to scale can only be exploited through spatial concentration. In addition to these normative theoretical considerations, there are also problems of regional policy from a positive point of view. Some types of regional policy can actually lead to more agglomeration and more inequities instead of less. This is because of secondary adjustments and hidden trade-offs that play a role both for infrastructure and for education oriented policies.

The author suggests two avenues for improving the EU regional policies. First, the reduction of agglomeration and the elimination of differences in output per head as measured by GDP as regional goals of the EU regional policy should be reconsidered. Second, the funding of large projects should be better motivated against political intentions.

In Chapter 13, Belke and Baumgärtner discuss the suitability and sense of fiscal transfer mechanisms in the euro area to absorb asymmetric shocks such as automatic stabilizers, automatic transfers from the EU budget and an intra-European fiscal transfer. The authors conclude that automatic stabilizers do not mean any hazard for the compliance with the Stability and Growth Pact, but do not evolve enough stabilizing effects because of their small volume. Automatic transfers from the EU budget also cannot combat effectively asymmetric shocks because of their small volume compared to the necessary amount. The authors argue that the often-discussed intra-European fiscal transfer system should aim at regions and not at the level of member countries to be able to confront (regional) asymmetric shocks.

Finally, mainly discretionary adjustment mechanisms to asymmetric shocks are relevant. As long as any asymmetric shocks are only temporary, the stabilizing task is to be taken over from national fiscal policy. Short-term deficits could be financed through the capital market. Hereby, the fiscal rules limit national fiscal policy in a reasonable manner. There is no need for a reform (at all events a strengthening, particularly of the sanction mechanism). A stronger co-ordination of national fiscal policies is also to be rejected because there is no significant influence of fiscal policy on inflation. However, if long running asymmetries occur between European countries, the authors suggest the use of EU budget transfers in individual cases, which are a sort of insurance against regional-specific shocks. In addition, characteristics of a 'stabilizing fund' and its implications are further examined. The authors stress that permanent disparities could however not be financed for good. Equalization by changing real wages or migration may need to take place.

The authors conclude that regional shocks can be absorbed using a different set of instruments, which need to be reinforced accordingly. These are a higher degree of intra-national and international labor mobility, a higher degree of interregional price flexibility and a more carefully tailored use of fiscal policy to correct regional imbalances. But all mechanisms and measures to combat asymmetric shocks in the Euro area (or in the EU) have to some extent considerable negative impacts in spite of their stabilizing aim, e.g. because of a small stabilizing efficiency of the 'fiscal insurance'. Financial transfers to absorb asymmetric shocks should be realized by the regional authority that includes the beneficiaries of the shock absorption. Normally, this applies to the national level and in future probably to an increasing degree also at the European level.

## POLICY IMPLICATIONS

Increasing regional inequality, which can be attributed to the process of integration, is evident in most EU-15 countries. This can be considered as an indication that the costs and benefits of integration are unequally distributed over space. Moreover, no evidence of a core-periphery structural convergence is found, as the structural characteristics of regions seem to be 'path dependent' and follow different trajectories in time and space.

Although there are now a number of success stories in the EU-15 at the national (i.e. Ireland) or the regional level, there is also a significant number of regions that have failed to catch up.

Policy lessons related to these success and failure stories could be drawn, but there is also an understanding that initial conditions, such as geography, size, structure and institutional arrangements may play a significant role in determining the overall effect of integration.

The EU Enlargement countries are characterized by serious and increasing regional inequalities, as metropolitan regions and western regions have performed significantly better in the process of transition and have developed a more sustainable productive structure.

The new EU-27 will be characterized by the highest ever level of disparities among members and will face the most serious challenge to its internal cohesion. A new east-west divide, in addition to the existing north-south one, will require greater attention and effort by EU policy makers.

The policy challenge for the EU-27 is to enhance economic efficiency and growth on the one hand and improve dramatically internal cohesion on the other. Failure to improve existing growth records may be associated with increasing unemployment, while failure to speed up inter-national and intra-national convergence may lead to frustration in the less developed regions and put under question the very essence of the European idea.

On the other hand, the EU has now available the accumulated experience of the last 10-15 years in implementing development programs through the CSFs. This experience, especially the one coming from the lagging regions, will be extremely useful in the EU acceding countries. The 'learning by doing' of the first period of cohesion policies can be transformed to 'learning from others' in the new members.

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# PART I:

# INTEGRATION, GROWTH AND INEQUALITIES

# 2

# REGIONAL INEQUALITIES IN THE EUROPEAN UNION

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## INTRODUCTION

The European Union (EU) constitutes, at the international level, the only effort of economic integration that has the institutional obligation to face inequalities among member states and regions and has allocated during the last two decades significant resources for this purpose. Despite this fact, a series of studies indicate that these inequalities still remain in high levels (EC 1999). At a theoretical level, the relationship between economic integration and regional inequalities or spatial cohesion is still a subject of debate. On the one hand, there is a view that economic integration is a long run process that eventually leads to a reduction of inequalities through the expansion of trade relations, greater labor and capital mobility and technological diffusion. This view is based on neoclassical type of assumptions for the operation of the economy and claims that the market forces released in the process of integration are beneficial for the least developed regions and lead to greater cohesion.

On the other side of the debate, there is the belief that the costs and benefits of economic integration are unlikely to be spread out uniformly in space. On the contrary, more advanced regions are expected to profit more, while lagging regions are more likely to gain less, or even fall further behind. The resulting increase of inequalities is primarily based on internal and external economies of scale, technological progress, structural change and the process of economic integration.

Internal and external economies of scale are associated with lower production costs, product differentiation and RTD activities. They tend to favor areas and regions with a higher density of activities and also tend to have a cumulative and self-reinforcing character. On the other hand, structural change increases the relative importance of the tertiary sector and alters progressively the sectoral composition of industry. This change tends to favor capital and technology-intensive sectors, pressuring at the same time labor and resource-intensive sectors. This change in the prospects of different sectors generates advantages and opportunities or disadvantages and threats in host regions, depending on the sectoral mix of local industry. Finally, the process of economic integration intensifies competition among cities and regions with different initial conditions with respect to productive structure, infrastructure, technological progress, quality of human resources, institutional arrangements and geographical coordinates. Thus, regions with less favorable endowments suffer more intensely the pressures of competition in this new environment (Amin et al 1992, Camagni 1992, Rodriguez-Pose 1999).

Discussing the relationship of European integration and regional inequalities, it is necessary to take into consideration two important facts: First, intra-national regional inequalities in the EU countries predated the new economic environment and the process of economic integration in the EU. The type and the level of inequalities in every country have been influenced – and continue to be influenced – by geography, morphology, history and the specific national pattern and path of development. For this reason, each country has adopted and applied regional policies aiming to deal with the consequences of these factors[3].

Secondly, the European Commission has been providing Structural and Cohesion Funds for the development of the structurally and economically lagging regions. The allocation of these funds implies indirectly that the EU tends to be closer to the view that regional inequalities are likely to increase from the process of economic integration.

In short, the development of inequalities in the EU is the outcome of complex processes that are influenced by: (a) the initial conditions of each country and the factors that are behind them, (b) the (positive or negative) consequences of the process of economic integration and (c) the dimension, duration and effectiveness of the applied European and national policies of regional development.

In the next sections of the paper, we will try to provide a better understanding of the regional problem of the EU, by reviewing the literature and analyzing the available data. Initially, we examine the development of the inequalities among EU members. Then, we investigate the evolution of inequalities within each member state. Finally, we examine regional convergence or divergence trends at the EU level and discuss future prospects, setting some questions for regional policy.

## COMPARING REGIONAL INEQUALITIES IN THE EU AND IN THE USA

One of the interesting questions in the literature is which geographic area has higher regional inequalities: the European Union or the USA? The available evidence shows that inequalities in the EU are higher than in the USA. In 1990 the max/min ratio between the Countries of the EU in terms of GDP per capita (measured at market prices) was 2.4, while in the USA, the same ratio between the States was 1.4 (Suarez-villa and Cuadrado Roura 1993). If the criterion for funding Objective One Regions were applied also in the USA, it would only include 2% of the population and not 25%, which is eligible for aid in the EU (Puga 2001).

The evidence shows also that, even though the EU has higher levels of regional inequalities in terms of GDP per capita than the USA, it has lower levels of concentration of population and productive activities than the USA. This is true not

[3]For a review of regional policies of the member states of the EU, see Yuill *et al.* (1999).

only at an aggregate level, but also at a sector-based level (Puga 1999, Midelfart-Knarvik et al 2000). Without a doubt, an important reason for the long run combination of relatively high concentration of income and relatively low concentration of population in the EU is the limited mobility of labor. Today in Europe, despite the differences in income, people usually remain in 'their place'. A study by Obsteld and Peri (1998) shows that the mobility of labor in Germany, Italy and Great Britain is roughly one third of that in USA. If internal immigration in the EU remains in current low levels, the tendency of enterprises to concentrate in selective places will be lower than that of the USA (Puga 1999).

These facts place an important question about the relationship between inequalities and concentration, which is usually understood as a positive and monotonic one in the context of most 'divergence theories': The existence of income inequalities leads, first, to a concentration of population and activities in the more advanced region, which in turn strengthens agglomeration economies and contributes to a further increases of inequalities.

This view however, does not match the reality of the EU, which is characterized by relatively high inequalities but relatively low concentration. The key factor in understanding the relationship between inequality and concentration is the mobility of labor (Krugman 1991). If labor is relatively immobile, then regional inequalities will not necessarily lead to greater concentration, as the economic expansion in the advanced regions will be restricted by rising labor costs (the EU experience). If labor is relatively mobile, its inflow in the more prosperous regions has two counterbalancing effects: first, it keeps pressure on wages through increasing supply and second it increases the productivity of capital by facilitating its expansion. If the first effect is stronger than the second, then greater concentration is associated with low or decreasing inequality (the case of the USA). If the second effect is stronger, then increasing concentration and increasing inequality may go hand in hand.

## INEQUALITIES AMONG EU MEMBER STATES

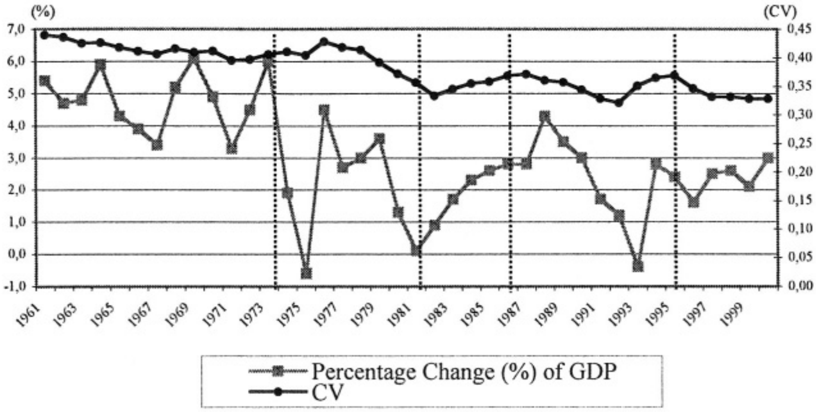
Even though inequalities among EU member states are relatively high compared to those of USA, over time they have decreased. This can be viewed in Figure 1, which presents the weighted coefficient of variation of GDP per capita[4] for the 15 member states of the EU during the period 1960-2000. In the figure we can observe first, that inequalities among the countries of the EU have decreased considerably and second, that the coefficient of variation has a periodic cyclical behavior over time.

[4]The weighted coefficient of variation is estimated from the formula:

$$CV_w = \left[\sum_i (X_i - \bar{x})^2 * (P_i / P)\right]^{1/2} / \bar{x}$$

where $X_i$ is the variable under examination in regional level, $\bar{x}$ is the variable under examination in average country value, $P_i$ is the population in regional level and $P$ is the national population. It is the weighted towards population square standard error divided to the mean value of per capita GDP $(\sigma / \bar{x})$

**Figure 1: The Evolution of the Weighted Coefficient of Variation (CV) of National GDP per capita and the National GDP Growth Rate in the EU-15 (1960-2000)**




These observations raise the question of whether there exists a relationship between the level of inequality and the rate of growth in the European economy. Even though the prevailing view (EU 1999, Dunford 1993, Amin and Tomaney 1995) is that inequalities are higher in periods of recession and lower in periods of expansion, Figure 1 does not support this view. It shows, that in the EU, periods of high growth are characterized by relatively higher inequalities (in the 1960s), while periods of low growth are characterized by relatively low inequalities (in the 1990s). Petrakos et al (2003) have shown that the relationship between the rate of growth and the level of inequalities is positive and statistically significant by estimating a set of equations: $cv_t = \beta_0 + \beta_2 g_{t-1} + \varepsilon_t$, where $cv_t$ is the weighted coefficient of variation of the national GDP per capita and $g_{t-i}$, are the GDP growth rates of the EU with one, two, and three lags.

This evidence indicates that the fluctuations of economic activity influence the level of inequalities among EU member states in such a way that inequalities are increasing in periods of economic expansion and decreasing in periods of recession. This evidence, which is also verified by other studies,[5] is closer to the "cumulative causation" rather than the neoclassical theory of regional inequality.

[5] Petrakos and Saratsis (2000) have found that similar relations between the level of inequalities and the rate of growth of the economy are also in effect in Greece.

## REGIONAL INEQUALITIES IN THE EU

At the EU level, the pattern of regional inequality has been described as a 'Core–Periphery' or a 'North–South' one. The main characteristic of this model is that the most advanced regions are on or near a development axis that includes London, Stockholm and Copenhagen in the north, and leads to the north part of Italy, passing through dynamic industrial and metropolitan regions in The Netherlands, Belgium, Denmark, Luxembourg, Germany and Austria. Away from this axis, one can find the peripheral regions of EU that are characterized by relatively low levels of development. This is shown in Map 1, which depicts the GDP per capita of the EU NUTS II regions in the year 2000.

The map shows that Greece, Portugal and Southern Italy, as well as a large part of Spain include regions with GDP per capita lower than the 75% of the EU average. Similar regions exist also in Eastern Germany, Belgium and Austria. On the other end of the scale, one finds the advanced regions of the development axis, as well as the metropolitan regions of France,[6] with GDP per capita in the scales of 100–125,125–150 and even greater than 150. In general, we would argue that despite some changes, the general picture of Map 1 has remained more or less the same[7] over time.

Although the relative position of certain regions of the South has improved during the last years and certain intermediate regions lost ground, these changes have at best influenced the intensity of inequalities, but not their nature. The 'Core–Periphery' pattern of inequality remains strong, and it is expected to be strengthened even further with the enlargement of the EU to the East, since the EU-25, or the EU-27 includes a large number of new countries and regions with GDP per capita below the 50% of the EU-15 average.

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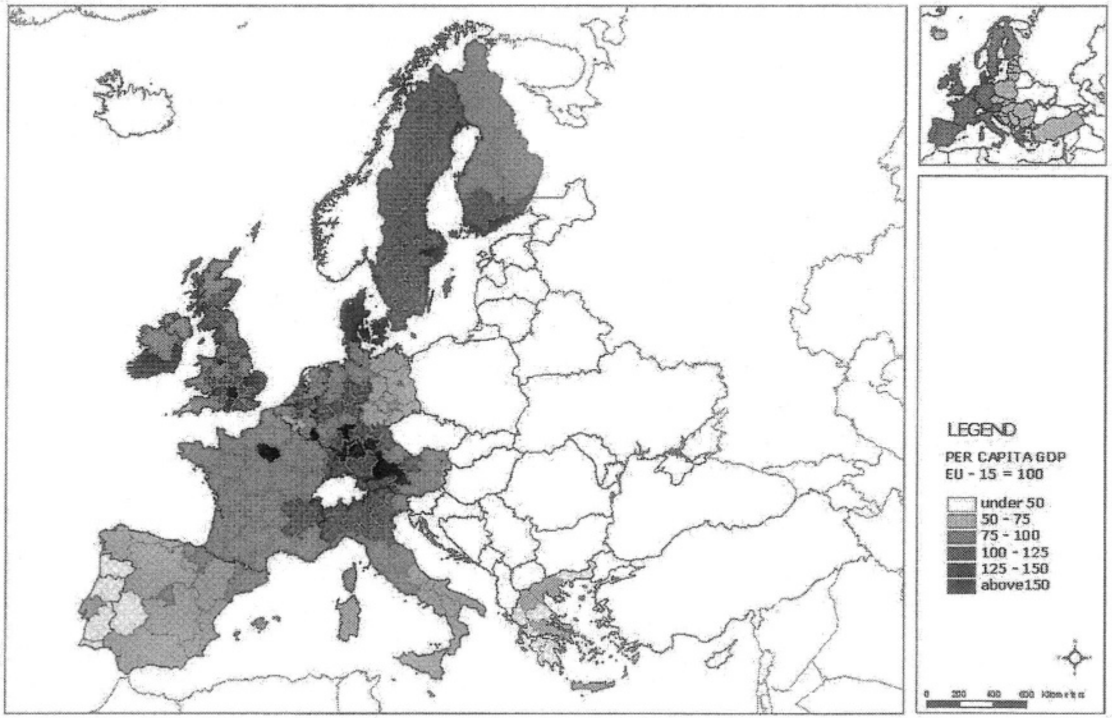
[6] In the relative bibliography, the developed model of Europe has been described as ' banana', ' blue Star,' green grape' and 'house with seven apartments' (Nijkamp 1993).

[7] The only remarkable case of change in the spatial pattern of development in the EU concerns the case of Ireland, which succeeded, in a period of roughly two decades, in surpassing the EU average, starting of about the 65% of the European average in 1980. This convergence was achieved with an annual rate of growth 6-8% and it was due to policies that attracted foreign investments. The result is undeniably impressive, given that Ireland has the lower rates of unemployment in the EU.

**Map1: PC GDP in EU-15 Region, NUTS II Level, Year 2000**



## INTRA-COUNTRY REGIONAL INEQUALITIES IN THE EU STATES

Over the last period, there appear to exist two potential counterbalancing dynamics in the EU economic area. On the one hand inter-national inequalities are decreasing, while on the other hand intra-national inequalities seem to be increasing. This paradox is to a large extent explained by the fact that the convergence of the cohesion countries was achieved mainly through the faster growth of metropolitan centers and other advanced regions, which had a certain dynamism (EC 1999, Puga 2001). In the 1980s and afterwards, regional inequalities in the EU are primarily generated by increasing inequalities within countries and to a lesser degree by inequalities among countries (Esteban 2000).

Tables 1 - 4 present for each EU country the Weighted Coefficient of Variation (CV) and the max/min ratio of regional GDP per capita at the NUTS II and NUTS III levels. Beginning from Table 1, which presents the CV at the NUTS II level, we can make the following observations: Firstly, using 2000 as the year of classification, Belgium, France and the United Kingdom are the countries with the higher level of regional inequalities, while The Netherlands, Greece and Ireland the countries with the lowest. Secondly, during the period 1981-2000, in nine out of the thirteen countries in the table, there has been recorded some increase in the level of inequality.

**Table 1: The Weighted Coefficient of Variation (CV) of Regional GDP per capita, NUTS II Level**

| COUNTRIES | 1981 | 1990 | 2000 |
|---|---|---|---|
| Austria | 0,283[3] | 0,280 | 0,221 |
| Belgium | 0,292 | 0,258 | 0,381 |
| France | 0,338[1] | 0,374 | 0,372 |
| Germany | - | 0,399[4] | 0,272 |
| *East Germany* | - | *0,256*[4] | *0,243* |
| *West Germany* | *0,184* | *0,203* | *0,201* |
| Greece | 0,131 | 0,123 | 0,162 |
| U. K. | 0,322 | 0,319 | 0,357 |
| Spain | 0,181 | 0,201 | 0,223 |
| Ireland | - | 0,180[5] | 0,203 |
| Italy | 0,265 | 0,258 | 0,275 |
| Netherlands | 0,260 | 0,113 | 0,157 |
| Portugal | 0,395 | 0,268 | 0,268 |
| Sweden | 0,087[2] | 0,103 | 0,210 |
| Finland | 0,159[3] | 0,171 | 0,239 |

Notes: 1: 1982, 2: 1985, 3: 1988, 4: 1991, 5: 1995

Table 2 presents a similar picture. It shows the weighted coefficient of variation of regional GDP per capita for all countries at the NUTS III level. As expected in lower levels of aggregation, inequalities, measured by the CV, are higher. Using 2000 as the year of classification, United Kingdom, Belgium and France are the countries with the highest regional inequalities, while Sweden, Spain and The Netherlands are the countries with the lowest. As it is shown in the table, in nine out of thirteen countries, there has been recorded some increase in the level of inequality during the period 1981–2000.

**Table 2: The Weighted Coefficient of Variation (CV) of Regional GDP per capita, NUTS III Level**

| COUNTRIES | 1981 | 1990 | 2000 |
|---|---|---|---|
| Austria | 0,431[3] | 0,425 | 0,357 |
| Belgium | 0,395 | 0,346 | 0,533 |
| France | 0,481[1] | 0,518 | 0,518 |
| Germany | - | 0,590[4] | 0,501 |
| *East Germany* | - | *0,330[4]* | *0,376* |
| *West Germany* | *0,431* | *0,456* | *0,460* |
| Denmark | 0,226[3] | 0,217 | 0,289 |
| Greece | 0,190 | 0,201 | 0,274 |
| U. K. | - | 0,476[5] | 0,536 |
| Spain | 0,204 | 0,231 | 0,251 |
| Ireland | - | 0,289[4] | 0,294 |
| Italy | - | 0,310[6] | 0,310 |
| Netherlands | 0,368[1] | 0,203 | 0,256 |
| Portugal | - | 0,539[4] | 0,516 |
| Sweden | 0,102[2] | 0,118 | 0,249 |
| Finland | 0,175[3] | 0,187 | 0,317 |

Notes: 1: 1982, 2: 1985, 3: 1988, 4: 1991, 5: 1994, 6: 1995

Table 3 presents serious differences among EU countries in the max/min ratio of regional GDP per capita at the NUTS II level. In United Kingdom, the more advanced region has a GDP per capita which is 271,4% greater than that of the poorest; while in Ireland the richer region has a GDP per capita hardly 50,8% higher than that of the poorest. Countries with a high max/min ratio are, apart from the UK, Belgium, France and Germany, while countries with a low max/min ratio are Finland, Sweden, Portugal, The Netherlands and Greece. From the thirteen countries in the table, five present increasing tendencies, while eight present tendencies of reduction.

Finally, Table 4 presents the max/min ratio at the NUTS III level. Inequalities at this level are greater compared to the NUTS II level, as the max/min indicator is higher in all countries. The countries with the highest level of inequalities in 2000 are United Kingdom, Germany and France, while the countries with the lowest max/min indicator are Ireland, Sweden and Finland. Nine countries in the table present over-time increasing ratios, while five countries present decreasing ratios.

**Table 3: The Max / Min Ratio of the Regional GDP per capita, NUTS II Level**

| COUNTRIES | 1981 | 1990 | 2000 |
|---|---|---|---|
| Austria | 2,489[3] | 2,468 | 2,142 |
| Belgium | 2,217 | 2,123 | 3,074 |
| France | 3,181[1] | 3,164 | 3,140 |
| Germany | - | 5,739[3] | 3,031 |
| *East Germany* | - | *2,126*[3] | *2,113* |
| *West Germany* | *2,300* | *2,248* | *2,313* |
| Greece | 1,857 | 1,741 | 1,694 |
| U. K. | 4,383 | 4,000 | 3,714 |
| Spain | 2,071 | 1,987 | 2,076 |
| Ireland | - | 1,438[5] | 1,508 |
| Italy | 2,158 | 2,329 | 2,191 |
| Netherlands | 2,996 | 1,599 | 1,755 |
| Portugal | 4,236 | 1,889 | 1,759 |
| Sweden | 1,263[2] | 1,321 | 1,616 |
| Finland | 1,713[3] | 1,637 | 1,920 |

Notes: 1: 1982, 2: 1985, 3: 1988, 4: 1991, 5: 1995

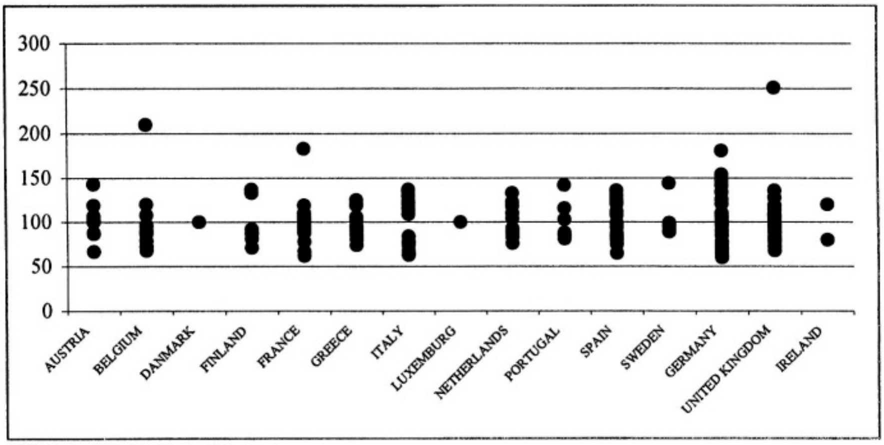
**Table 4: The Max / Min Ratio of Regional GDP per capita, NUTS III Level**

| Countries | 1981 | 1990 | 2000 |
|---|---|---|---|
| Austria | 3,116[3] | 3,106 | 2,534 |
| Belgium | 2,701 | 2,769 | 4,830 |
| France | 5,801[1] | 5,600 | 5,860 |
| Germany | - | 13,971[4] | 6,789 |
| *East Germany* | - | *4,394*[4] | *2,938* |
| *West Germany* | *6,662* | *8,412* | *6,567* |
| Denmark | 1,890[3] | 1,883 | 2,321 |
| Greece | 3,148 | 2,801 | 3,242 |
| U. K. | - | 7,556[5] | 7,559 |
| Spain | 2,744 | 2,779 | 2,274 |
| Ireland | - | 1,955[4] | 1,912 |
| Italy | - | 3,288[6] | 2,942 |
| Netherlands | 4,481[1] | 2,438 | 2,571 |
| Portugal | - | 3,583[4] | 3,590 |
| Sweden | 1,351[2] | 1,399 | 1,755 |
| Finland | 1,779[3] | 1,707 | 2,164 |

Notes: 1: 1982, 2: 1985, 3: 1988, 4: 1991, 5: 1994, 6: 1995

Figure 2 presents for each EU country, the distribution of regional GDP per capita in 2000 around the national average. This figure offers an alternative view of inequalities and allows us to assess their magnitude in a more visual way. We observe that most countries have developed a metropolitan structure, which is characterized by the dominance of the capital city. The main characteristic of the metropolitan structure is that the rest of the regions have GDP per capita values at a considerable distance from the most developed region. The most profound cases of metropolitan structure can be found in Belgium (Brussels), France (Paris) and the United Kingdom (London).

**Figure 2: The Distribution of GDP per capita in NUTS II Level, 2000 (National average = 100)**




## TRENDS OF CONVERGENCE – DIVERGENCE IN THE EU LEVEL

One of the most interesting topics of discussion and debate in the EU is that of cohesion and the tendencies of convergence or divergence that are observed over time. This issue is important because it is often used as a measure of evaluating regional theories and regional policies. Some theorists have understood trends of convergence at the regional or the international level as empirical evidence of the validity of the neoclassical economic theory, which foresees an even distribution of income (and consequently levels of development) among regions or countries without the need for any type of policy[8]. On the other hand, those having the responsibility of regional policies at the national or European level prefer to understand any tendencies of convergence as a sign of the effectiveness of the existing policy mix[9]. In practice, however, it is rather difficult to assess to what extent the dynamics of the market or the applied policies are responsible for the observed trends of convergence or divergence. It is more likely that both markets and policies are to some degree responsible for the level and course of inequalities, although it is not clear whether both factors affect inequalities in the same direction[10].

[8]According to the neoclassical approach there exist at least three automatic mechanisms in the economy that lead to an equalization of factor prices and incomes ensuring that that markets are able to deal with regional imbalances without the help of policies. The first mechanism is based on inter-regional trade, the second in inter-regional migration and the third in based on the law of diminishing marginal productivity of capital.

[9]The Sixth Periodical Report on the conditions of the EU regions links directly convergence with the effectiveness of the structural and cohesion policies (EC 1999).

[10]A large number of experts and the EU share the view that markets and regional policies have the opposite impact on regional inequalities. Market forces usually tend to increase inequalities, while regional policies tend to decrease them. The net result in most cases depends on the relative strength of the forces.

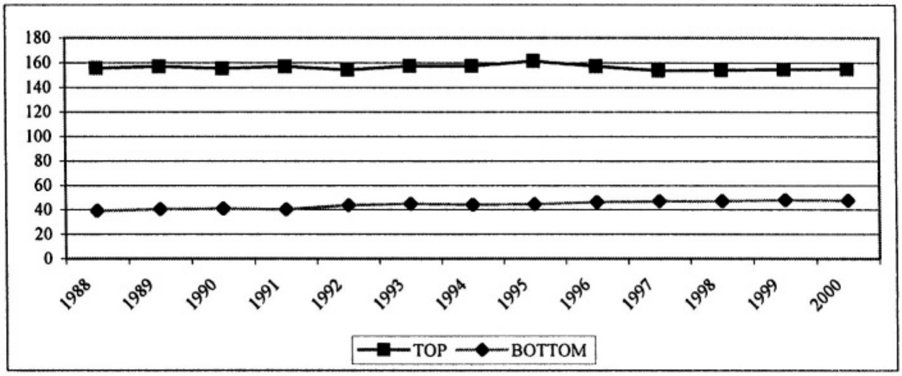
According to the literature, the regions of the EU were converging until the end of 1970s, (Lopez-bazo et al 1999, Neven and Claudine 1995). Tendencies towards increased inequalities were evident in the middle of the 1980s (Abraham and Van Rompuy 1995), as well as in the middle of the 1990s (EU 1999). Barro and Sala-i-Martin (1991,1992) reported that, during the period 1960-1985, the regions of the EU converged at a rate of about 2% annually. Armstrong (1995), however, observes that these estimates need to be revised downwards, since they do not include the South European regions. Using data for 12 countries and 85 regions (NUTS I) for the period 1960-90, Armstrong (1995) finds that the rate of convergence is 1% annually. He further shows that convergence among countries is more significant and lasts longer that intra-national convergence.

Rodriguez-Pose (1999) points out that the weak trend of convergence is not in agreement with the endogenous growth theory and the new economic geography, which suggests that the development of a region depends, to a certain extent, on its initial conditions. In addition, it is not in line with the figures of the European Commission, which reports an increase of regional inequalities during the 1990s. Using data for 110 regions over the period 1977-1993, Rodriguez-Pose (1999) finds that national performance exerts an influence on the trend of regional convergence. When nationally weighted values for GDP growth and GDP per capita are used, the tendency of convergence becomes very weak (Rodriguez-Pose 1999).

Certain studies attempt to investigate convergence or divergence trends on the basis of developments in labor markets. However, the results are not so optimistic, as inequalities with respect to unemployment rates have increased. In the regions with the lowest rates of unemployment, unemployment remained constant at around 4%, while in the regions with highest rates, unemployment increased from 20 to 24 per cent during 1986-96 (EU 1999). Moreover, Overman and Puga (1999) observe that the regions of EU have been differentiated more during the last years with respect to the rates of unemployment. There exist now fewer regions with intermediate levels of unemployment and more regions with very high or very low rates of unemployment, a fact revealing tendencies of regional divergence.

Figure 3 presents the average GDP per capita for the 25 most developed and 25 least developed regions of the EU during the period 1988-2000. It is observed that the 25 most advanced regions maintain a level near the 160% of the EU average, while the 25 most lagging regions are close to 50% of the EU average. This implies that, during the last decade, the most developed regions in the EU had a level of welfare and development that was at least three times greater than that of the least developed regions. Although a small tendency towards improvement can be detected in the poorest EU regions during the last years, this cannot be considered as a deviation from the status quo. Rather, it can be thought of as an indication of insignificant regional convergence.

**Figure 3: GDP per capita of the 25 Most Affluent and 25 Poorer NUTS II Regions of the EU (1988-2000)**




## CONCLUSIONS AND POLICY QUESTIONS

During the recent past, the EU has experienced a mosaic of regional adaptations, where tendencies of convergence and divergence coexist and depend on the initial conditions, the economic and structural characteristics of the regions, their geographic position and the policies that were employed at the regional, national and European level.

It appears that the trends of convergence among EU member states have been influenced partially by European economic cycles, and partially by the internal dynamics of the South. In other words, the convergence of the last two decades would have been less significant if the developed countries of the EU had maintained during this period the rates of growth that they experienced in the 1960s and early 1970s. On the other hand, the convergence of the southern countries was due to the dynamism of their metropolitan and tourist regions, a fact that led to the increase of internal disparities.

Thus, trends of convergence and divergence at various geographical levels of the EU go hand in hand, as it is possible for a country to converge towards the EU average, while at the same time a number of its regions diverge from the national as well as from the European average.

Even though there are many important unanswered questions, we may claim that the geography of inequalities in the EU has been maintained to a significant extent during the last 10-20 years, despite the mobility that has been observed at various spatial levels.

What lessons can be drawn for regional policy? Hurst *et at* (2000) have claimed that fifty years of regional policy in Europe have not managed to change the *status quo* of the territorial distribution of activities and welfare. It is interesting to note that this inability to change the *status quo* of regional inequalities has coincided with a continuous increase in available policy resources. For example, the EU during the period 2000-6, allocated €195 billions to Structural Funds and €18 billions to Cohesion Funds (in 1999 prices). These funds take a significant share of the EU budget and are more than double the funds allocated in 1988 (Puga 2001). This apparent inability of regional or structural policy to reduce disparities in the light of increased resources may have been the outcome of two possible situations: Either the allocated resources were insufficient to offset the strength of the market forces released by the process of economic integration, or the resources were not utilized in the best possible way, being allocated to projects or activities that did not have a proven effect in the reduction of inequalities.

The available evidence seems to indicate that both explanations may be valid. On the one hand, the process of integration exerts increasing pressure on structurally weak and lagging regions (Petrakos 2000). On the other hand, there is evidence that Structural Funds have not been always utilized in an effective way in all of the Objective One Regions (see Economou 1997, and Georgiou 1994 for the Greek case). Too often, the funds of the First and Second Greek CSF were spent in many, small, partly unfinished and largely unrelated projects serving political agendas that could hardly make a contribution to regional growth. In addition, the literature has now some evidence that the policy priorities were not always the right ones and in some cases had results opposite to those expected.

Faini (1983), for example, reports that the construction of national highways and the resulting reduction of transportation cost between North and South Italy during the 1950s, deprived the Mezzogiorno enterprises of the protection that they had enjoyed in the past and led to accelerated deindustrialization. Also, Martin and Rogers (1995) claim that inter-regional transportation projects can possibly affect negatively the peripheral regions. Similar views come from Vickerman *et al.* (1999) and Gutierrezs and Urbano (1996) for the Trans-European networks (TEN), which polarize the economic space and increase in relative terms the distance between central and peripheral regions. Everyone, of course, understands the usefulness of transportation infrastructures at the national or the European level. What is questioned in the relevant literature is whether these projects should be considered to be part of the national or the European regional policy and whether they can help reduce regional inequalities.

Although it still unclear to what extent market dynamics and policy failures are responsible for the status quo in regional inequalities, it is very likely that the EU will be shortly confronted with a serious policy dilemma and that it will be forced to deal more systematically with the investigation of the real nature of the problem.

The EU today has a serious problem to solve: On the one hand, enlargement of the Union adds in relative terms significant populations with income much lower than the European average and much lower than that of the Cohesion countries. Dealing with the new levels of inequality requires significantly greater resources, which at the moment do not appear to be secured. On the other hand, the inevitable reduction of the GDP per capita of the EU-27, will lead to a redistribution of resources from the South to East, during a period where the regional problems of the countries are increasing rather than decreasing. Thus, the EU will be faced with a serious dilemma: Either it will increase considerably its budget for the confrontation of the new challenges in the East and the old challenges in the South, or it will stick with a conservative policy, where with the same funds it will try to face increasingly serious problems. In the first case, it may face problems of competitiveness stemming from increased public deficits, as well as the objections of the developed countries, that have been net contributors to the budget. In the second case, the EU will have to deal with the problems of a larger economic space with greater and probably increasing inequalities and the consequences of these problems for economic and social cohesion.

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# 3

# REGIONAL INEQUALITIES IN THE EU ACCESSION COUNTRIES: EVOLUTION AND CHALLENGES

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## INTRODUCTION

The Treaty of the European Union (EU) Enlargement, signed in the Athens European Summit (16/04/03), constitutes a nodal point in the integration of the Central and East European (CEE) countries into the EU economic and institutional structures.[11] Although the EU eastward enlargement is expected to benefit Transition Countries, a number of questions are raised when the discussion takes a regional perspective. Would the process of EU integration of CEE countries affect their spatial structures and balances and in which way? What is the recent experience of Transition? What does that imply for EU policies?

There are two important reasons that legitimize such type of questions. The first reason has to do with the experience of the EU-15, which is not very encouraging. Although a reduction of inequalities between member states has been recorded, the "core-periphery" pattern of regional inequalities has remained largely inalterable at the EU level (Puga 2001, Straubhaar et al 2002), despite serious and well-funded interventions at the structural and regional level (Hurst et al 2000). At the same time, tendencies of regional divergence are recorded in many EU-15 countries, in the recent period (Petrakos and Rodriguez – Pose 2002), that can, at least partially be attributed to the process of integration (Armstrong and De Kervenoael 1997).

The second reason is related to the recent experience of the New Member States, as a number of studies have shown that the process of transition has been associated with increasing inequalities (Petrakos 1996a, 2000). As a result, the regional problems of the enlarged EU are expected to be more pronounced, since intra-national disparities will be closely coupled with greater national level differences at the EU–27 level, producing a highly heterogeneous economic landscape compared to that of the EU-15 in the previous periods (Eichengreen and Kohl 1997).

[11] These countries are: Czech Republic, Cyprus, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia, which are going to be acceded on May 2004, and Bulgaria and Romania, which are going to be acceded in 2007. Unsettled and directly connected with the Cypriot issue resolution is the accession process of Turkey. Concerning the present analysis, the notion "Transition Countries" comprises the eight Central and East European countries (accession on 2004) and the two Balkan countries (accession on 2007). Cyprus and Malta are not included in the analysis due to their small size and the lack of statistical information at the regional level.

The goal of this paper is to examine the regional characteristics of the EU Accession countries for the period 1995 – 2000, employing static and dynamic analysis at the NUTS II and NUTS III spatial levels. The period of investigation, although small in duration, is extremely important. By including recent trends, independent from the shocks of the first period of transition, the analysis provides the potential picture of the EU Accession Countries' regional patterns of development and inequalities and their prospects for converging with the EU–15 countries, in the EU–27 framework.

The following section presents a review of the literature concerning the spatial adjustment of the CEE countries to the processes of integration and transition. We then analyse the regional structure of the EU Accession Countries, and move on to take a more dynamic approach in order to detect general trends. The last section summarizes the findings of the paper and presents the conclusions.

## REGIONAL INEQUALITIES UNDER TRANSITION: A LITERATURE REVIEW

What type of spatial adjustments has taken place in CEE countries in the post-1989 period, as a result of the processes of integration and transition? Have openness and structural change affected the spatial organization of these economies and in which way? The general answer to this question is that CEE countries have experienced significant spatial changes in all levels.

At the macro-geographical level, it is evident that the South-east European countries in transition have fared worse compared to those of Central and East Europe, not only in terms of economic activity (lower GDP per capita and lower GDP growth rates) but also in terms of structural change and sectoral specialization (Petrakos 2000, Petrakos and Totev 2001). At the micro-geographical level, the processes of internationalization and structural change tend to favor metropolitan regions in all CEE countries and western regions in those countries bordering with the advanced EU-15 countries (Downes 1996, Petrakos 1996a, Resmini 2002 and 2003).

A number of empirical studies support this basic picture regarding the Transition Countries' regional patterns of development. Evidence from Estonia shows that core-periphery differences have increased, with Tallinn and Western coastal regions benefiting the most from the new orientation of the country (Raagmaa 1996). Similar trends have been detected in the Slovak Republic, where Bratislava, with 9% of the national population, generates 30% of the country's GDP (Balaz 1996). In Hungary, disparities increased during the early years of transition (Fazekas 1996). FDI and domestic capital preferred metropolitan and western regions (Lorentzen 1996,1999), turning an already unbalanced pre-1989 situation of the regions into a serious core-periphery and east-west disparity (Nemes - Nagy 2000). Additional evidence comes from Poland (Gorzelak 2000), indicating that different regions adjust in a different way to the new economic environment. Another study in Poland (Ingham *et al* 1996) shows that the regional pattern of unemployment is relatively stable during the 1990-1994 period, indicating that initial best performing regions are also final best performing regions and initial losers are also final losers. The same evidence is also supported for Bulgaria (Minassian & Totev 1996, Petrakos 1996b), Romania (Ramboll 1996, Constantin 1997) and the Balkan Peninsula (Petrakos and Economou 2003). Further, a comparative regional analysis of Poland, Hungary, Romania and Bulgaria by Petrakos (2001) has suggested that the level of disparities is affected by national characteristics (such as institutional factors), economic factors (such as the level of development), the success of restructuring and catching up, as well as by the size and the geographic co-ordinates of each country in the European space[12].

Given these findings of the literature in the early years of transition, an important question arises concerning the evolution of disparities in the more recent years. Have disparities continued to increase in the second half of the 1990s in all or most countries? If disparities increase, transition countries will be forced, sooner or later, to somewhat shift the focus of public policy and design more effective regional policies. Also, a large number of transition countries have been already accepted to become the new members of the EU. It is already known that the new EU-27 will be characterized by a higher level of inter-state disparities, as the new members are characterized by a lower or significantly lower GDP per capita compared to the EU-15 average. Will, however, the new members be characterized by higher intra-country disparities? The answer to this question is crucial for the design of effective structural and cohesion policies on behalf of the EU.

## THE REGIONAL STRUCTURE OF THE EU ACCESSION COUNTRIES

The economic space of the EU new member–states is characterized by a high degree of heterogeneity, including countries and regions with different development levels and different geographic, economic and demographic characteristics (Table 1). In terms of size and population, there are two relatively large countries (Poland and Romania), three relatively medium-sized countries (Czech Rep., Hungary and Bulgaria) and five small or very small countries (Slovakia, Lithuania, Latvia, Slovenia and Estonia). In terms of population density, a "core-periphery" pattern exists, as the population densities' of the Central Europe countries are higher than those of the Baltic and the Balkans.

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[12] Another factor that may have affected the evolution of inequalities is the possibility that Transition Countries in their effort to converge with the EU–15 have neglected regional policies (Hallet 2002).

**Table 1: Basic Demographic and Economic Characteristics of the EU Enlargement Countries**

| Country | Size ($km^2$) | Population (thousand of inhabitants) (2000) | Population Density (inhabitants/$km^2$) (2000) | GDP (thousands of euros) (2001) | GDP per capita (euros/inhabitant) (2001) |
|---|---|---|---|---|---|
| Bulgaria | 110.909,7 | 8.170 | 73,7 | 15.202.875 | 1.910 |
| Estonia | 45.227,6 | 1.370 | 30,3 | 6.171.993 | 4.520 |
| Latvia | 64.589,0 | 2.373 | 36,7 | 8.593.001 | 3.650 |
| Lithuania | 65.300,0 | 3.696 | 56,6 | 13.259.038 | 3.810 |
| Hungary | 93.029,0 | 10.024 | 107,8 | 57.772.611 | 5.670 |
| Poland | 312.685,0 | 38.646 | 123,6 | 204.052.950 | 5.280 |
| Romania | 238.390,7 | 22.443 | 94,1 | 44.382.649 | 1.980 |
| Slovakia | 49.035,0 | 5.401 | 110,1 | 22.847.453 | 4.250 |
| Slovenia | 20.273,0 | 1.990 | 98,2 | 21.749.679 | 10.920 |
| Czech Rep. | 78.859,9 | 10.273 | 130,3 | 63.848.951 | 6.220 |

Source: Eurostat REGIO database

In terms of GDP, the classification is quite different from the previous ones. Poland has the largest economy among the Transition Countries with GDP exceeding 40% of the total. The economies of the Czech Republic and Hungary have a GDP which is higher than that of Romania, even though they are smaller in size and population, whereas small countries such as Slovenia and Slovakia have GDP levels that are higher than that of Bulgaria. Important differences among Accession Countries are also found concerning their levels of development. In the upper part of the range is Slovenia, with a GDP per capita which is greater than €10,000[13], almost as much as the average of the EU–15 Objective 1 Regions. The Czech Republic, Hungary and Poland follow with per capita GDP around €5,000- €6,000. Below are the Baltic countries with per capita GDP around €3,500 - €4,500. In the lower part of the scale are found the two Balkan countries having per capita GDP below €2,000. It is evident that the Accession Countries are characterized by intense inequalities in their levels of development, and a 'core-periphery' pattern similar to that of the EU–15 is reproduced in the new economic space (Petrakos 2003).

Table 2 presents the regional demographic and economic characteristics of the Accession Countries, based on information provided at the NUTS II and NUTS III spatial levels. In particular, it shows the number of NUTS II and NUTS III regions per country, as well as the minimum, average and maximum figures of population and per capita GDP at the different spatial levels of aggregation. We can see that Poland has the greater number of NUTS II regions, while small countries such as Estonia, Latvia, Lithuania and Slovenia have only 1 NUTS II region (the whole country). At the NUTS III spatial level, the picture is quite different. The national particularities prevail and there is no general rule concerning the number of regions. Poland and Romania have the same number of NUTS III regions despite differences in terms of population size, whereas, Bulgaria and Slovenia, although smaller in population, have more NUTS III regions than the Czech Republic, Hungary or Slovakia.

[13] GDP per capita figures in Tables 1 and 2 have been converted in euros using exchange rate parity.

**Table 2: Basic Demographic and Economic Characteristics of the EU Enlargement Countries at the Regional Level, 2000**

| COUNTRY | NUTS | NUMBER | POPULATION (thousands of inhabitants) | | | GDP per capita (euros/inhabitant) | | |
|---|---|---|---|---|---|---|---|---|
| | | | Minimum | Average | Maximum | Minimum | Average | Maximum |
| BULGARIA | II | 6 | 582 | 1.362 | 2.143 | 1.378 | 1.641 | 2.213 |
| | III | 28 | 138 | 292 | 1.217 | 1.061 | 1.481 | 2.777 |
| ESTONIA | II | 1 | 1.370 | 1.370 | 1.370 | 4.064 | 4.064 | 4.064 |
| | III | 5 | 144 | 274 | 526 | 2.326 | 3.401 | 6.322 |
| LATVIA | II | 1 | 2.373 | 2.373 | 2.373 | 3.274 | 3.274 | 3.274 |
| | III | 5 | 321 | 475 | 963 | 1.241 | 2.574 | 5.374 |
| LITHUANIA | II | 1 | 3.696 | 3.696 | 3.696 | 3.477 | 3.477 | 3.477 |
| | III | 10 | 142 | 370 | 896 | 1.987 | 3.082 | 4.832 |
| HUNGARY | II | 7 | 972 | 1.432 | 2.838 | 3.139 | 4.535 | 7.542 |
| | III | 20 | 216 | 501 | 1.797 | 2.687 | 4.269 | 9.664 |
| POLAND | II | 16 | 1.024 | 2.416 | 5.069 | 3.026 | 4.088 | 6.076 |
| | III | 44 | 293 | 878 | 2.112 | 2.529 | 4.208 | 13.119 |
| ROMANIA | II | 8 | 2.041 | 2.805 | 3.826 | 1.249 | 1.869 | 3.703 |
| | III | 42 | 231 | 534 | 2.003 | 858 | 1.587 | 3.703 |
| SLOVAKIA | II | 4 | 617 | 1.350 | 1.876 | 3.048 | 4.612 | 8.422 |
| | III | 8 | 551 | 675 | 786 | 2.416 | 4.031 | 8.422 |
| SLOVENIA | II | 1 | 1.990 | 1.990 | 1.990 | 9.800 | 9.800 | 9.800 |
| | III | 12 | 46 | 166 | 490 | 7.384 | 9.064 | 13.142 |
| CZECH REP. | II | 8 | 1.113 | 1.284 | 1.658 | 4.335 | 5.487 | 11.674 |
| | III | 14 | 305 | 734 | 1.280 | 4.222 | 5.110 | 11.674 |

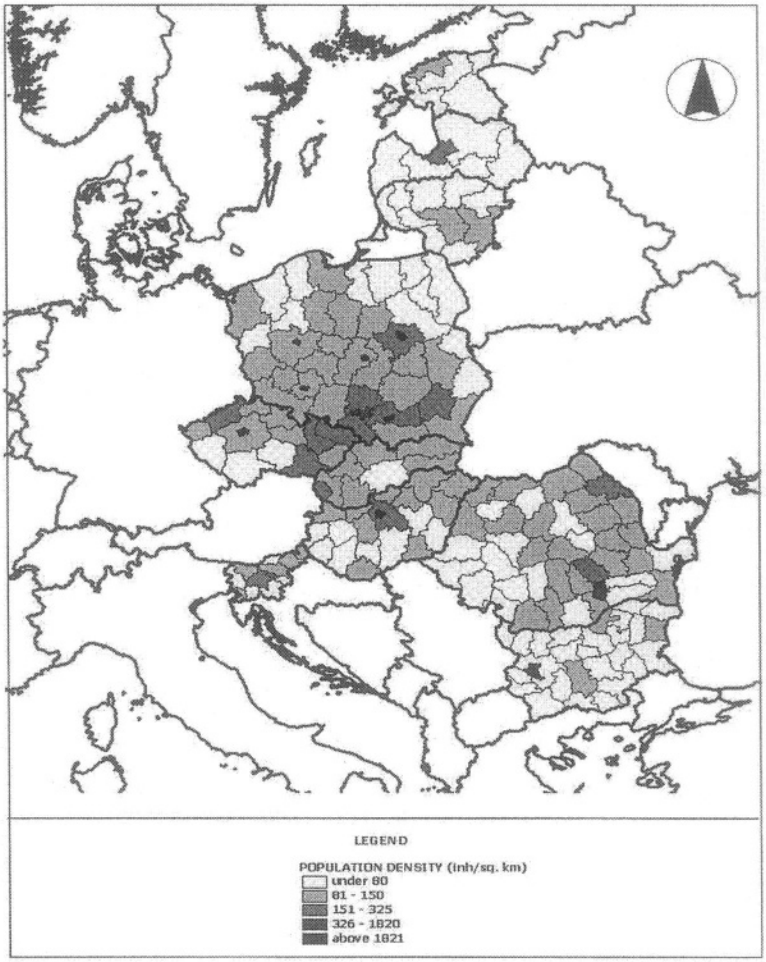
Source: Eurostat REGIO database – Own elaboration

Comparing the average population size of NUTS III regions, Poland (878.000 inhabitants), the Czech Republic (734.000 inhabitants) and Slovakia (675.000 inhabitants) have the largest figures, whereas Slovenia (166.000 inhabitants), Estonia (274.000 inhabitants) and Bulgaria (292.000 inhabitants) have the smallest. Internal differences between the largest and smallest region in each country depend to a great extent, on the size of the region hosting the capital city (which in most cases is the largest region). Significant differences between the maximum and the minimum population figures are observed mainly in Bulgaria, Hungary, Romania and Slovenia, whereas the smallest ones are observed in Slovakia, Latvia and Estonia. Generally speaking, the population pattern of the Transition Countries is similar to that of the EU–15 countries.

It is known that the method of disaggregation of each country in smaller spatial entities, which is determined by national factors, may affect regional balances, since different administrative divisions of the economy are likely to produce different results (Boldrin and Canova 2000, Straubhaar *et al* 2002, Thisse 2000).

Nevertheless, as it is presented in Map 1, the pattern of concentration seems to follow the usual pattern, with capital cities having the higher population densities. In most of the countries, regional differences in population density at the NUTS III level are extremely intense, with the exceptions of Lithuania and Slovenia where the population's distribution is relatively smoother. In Map 1, we observe that the population densities of the countries of Central Europe are on the average higher than those of the Baltic and the Balkan countries.

**Map 1: Population Density in NUTS III Level, 2000**




From the evidence presented in Table 2 we observe that significant differences are also evident in the GDP per capita figures of the Accession Countries' regions. The high levels of GDP per capita, especially at the NUTS III spatial level, show the dynamism of each country's metropolitan/capital city. A very interesting observation is that differences between the most developed and the least developed region are greater at the NUTS III than at the NUTS II level. This is due to the simple fact that aggregations taking place at the NUTS II level tend to smooth out regional disparities found at the NUTS III level. In general, the lower the level of aggregation, the higher the level of disparities, as the performance of leading cities is not averaged by that of the surrounding, less successful areas.

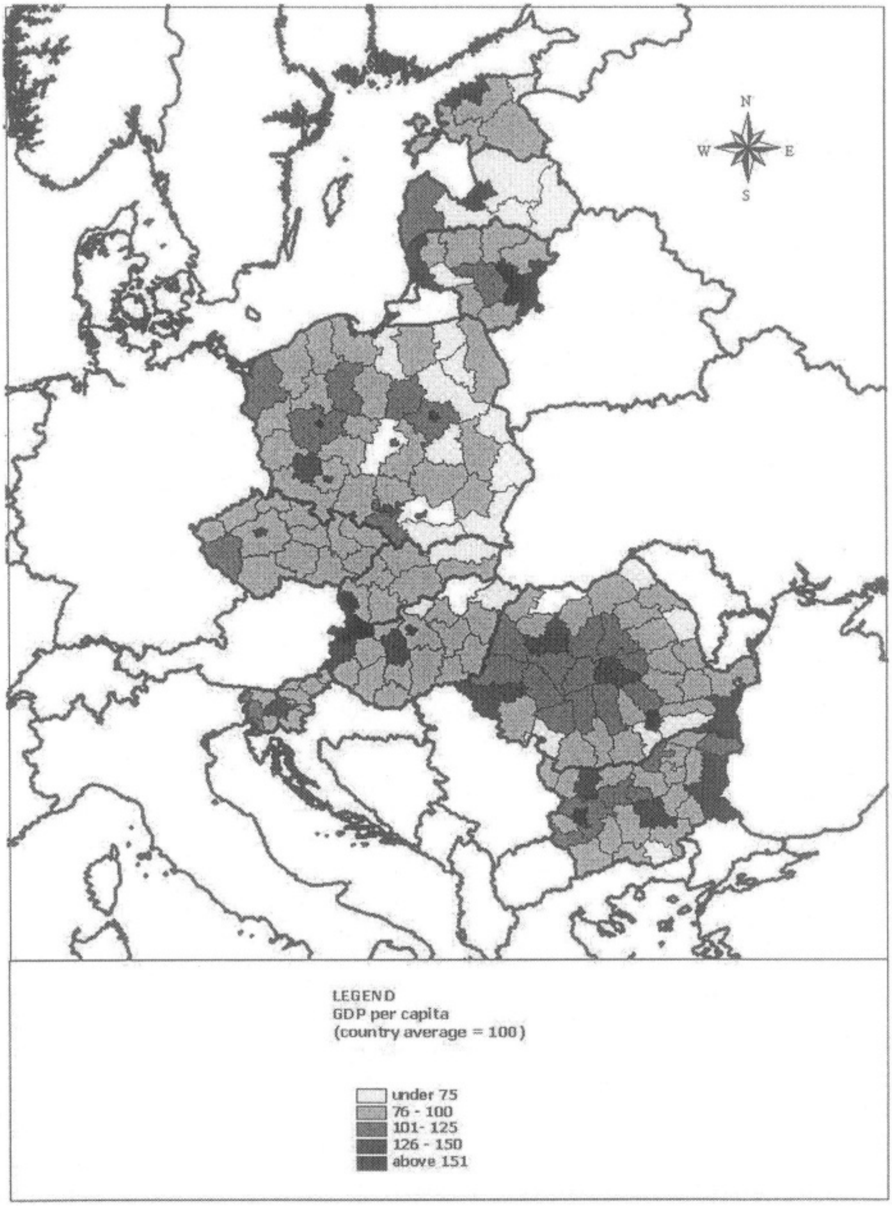
The "geography" of regional disparities in Transition Countries is better understood with the use of Maps 2 and 3. Map 2 provides a macroscopic perspective of regional inequalities, by presenting the figures of GDP per capita at the NUTS III level compared to that of the EU average (EU–15=100). On the other hand, Map 3 presents the same figures compared to the national average of each country (national average=100), providing a microscopic perspective of regional inequalities. It becomes explicit in Map 2 that the most developed regions are found in Central Europe and are either metropolitan centers or western border regions. Moving away from the European core, one can find only a few regions with relatively high levels of development. The worst position in the enlarged EU–27 is observed in the Balkan countries, where the per capita GDP does not exceed 10 percent of the EU–15 average, indicating that the maintained "north-south" pattern of development in Europe has shifted eastwards.

Map 3 presents regional GDP per capita figures compared to each country's national average. The first remark here is that the metropolitan regions reach noticeably higher levels of development compared to the national average in all countries. The second remark is that the regions along the EU–15 borderlines concentrate a relatively large amount of economic activities (domestic and foreign investments), which allows them to reach relatively high levels of development. The evidence tends to confirm the early predictions of the literature according to which in the new economic environment agglomeration economies (favoring metropolitan regions) and geographic factors (favoring western border regions) play an important role in determining the spatial regularities of Transition Countries (Petrakos 1996a, 2000).

The third point is that each country has, to a larger or smaller extent, its own pattern of spatial development. The Baltic countries are characterized by an intense metropolitan structure since the major urban centers have the highest levels of development. Poland seems to preserve (or to reproduce) the historic "east-west" division. The Czech Republic and Hungary have also an intense metropolitan structure but at the same time their western border regions have a higher level of development than the rest of the country. Romania, which maintains a polycentric urban structure, has development problems mainly in its regions bordering with the Ukraine, Moldova and Bulgaria, while, its central and western regions (parts of the former Austro-Hungarian Empire) have attained relatively higher level of development (Petrakos and Economou 2003). Finally, in Bulgaria a horizontal developmental axis connecting Sofia to Varna and Burgas is evident, leaving outside regions bordering with Romania and Greece (Petrakos 1996b).

**Map 2: GDP per capita in NUTS III Level (EU–15 Average = 100), 2000**

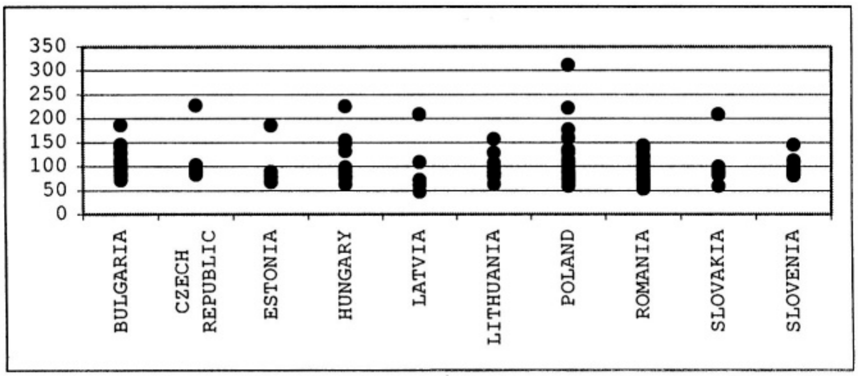
**Map 3: GDP per capita in NUTS III Level (Country Average=100), 2000**



In general, Maps 2 and 3 contribute to the better understanding of the regional patterns of the Accession Countries and demonstrate the role and significance of geography (in fact: proximity to advanced countries and centrality with respect to European markets) in the process of development. The dynamic growth of the western border regions in Central Europe shows that cross-border areas are not lagging behind regions by definition (Nitsch 2002), as the influence of accessibility and centrality at the European and the international level may be equally important with that in the national level. In that sense, the peripheral (at the national level) western regions of Poland, Hungary and the Czech Republic found themselves in the post-1989 period in an extremely central place at the European level. In the long run, the advantages of central place at the European level may be stronger and offset the disadvantages of peripherality at the national level, allowing these regions to grow in a satisfactory way. However, this cannot be the case for the peripheral regions of Bulgaria and Romania, which are also peripheral at the European level.

Figure 1 shows the regional dispersion of GDP per capita at the NUTS III level for the year 2000 around the national average, giving us the opportunity to evaluate regional inequalities under a different perspective. Most of the countries have developed an intense metropolitan structure and some of them, such as the Czech Republic, Hungary, Poland, Latvia and Slovakia, have metropolitan centers with GDP per capita figures which are at least twice the figure of the national average. Based on Figure 1, we could say that the countries with the smaller regional spread of GDP per capita (or a more balanced regional allocation of per capita GDP) are Romania and Slovenia. On the other hand, the countries with the greater regional spread are Poland, Hungary, the Czech Republic and Slovakia.

**Figure 1: The EU Enlargement Countries GDP per capita Dispersion (NUTS III level) 2000 (Country Average = 100)**



## THE EVOLUTION OF REGIONAL INEQUALITIES IN THE NEW MEMBER - STATES

Although the static view of regional inequalities is important, their evolution over time is even more important, as it allows us to raise a number of questions concerning the spatial implications of integration and transition. For instance, are these processes followed by an increase in regional inequalities? If yes, how important is this increase? Is it a general phenomenon or does it apply to a few countries only? What should we expect to see in the near future, after EU membership? What is going to be the impact on the EU regional policy?

In order to answer these questions we estimate four indicators of spatial inequality in order to analyze the evolution of disparities in the 1995-2000 period: the weighted coefficient of variation (CVw)[14], the ratio of maximum to minimum regional GDP per capita (max/min ratio), the convergence coefficient (**$\beta$–convergence**) and the density coefficient (**$\gamma$–density**). The analysis is based on regional data at the NUTS III level and the results are presented in Table 3.

The coefficient of variation is weighted by the population of each region. It basically depicts disparities between the regions of a country, taking into consideration their relative weight. The coefficient of variation takes values between 0 (absolute equality) and 1 (absolute inequality).

The max/min ratio is the ratio of the richest to the poorest region in terms of per capita GDP. The greater its value, the greater is the spread of the observations and the greater the level of disparities.

The **$\beta$–convergence** coefficient is estimated from the regression:

$$Y_{2000}/Y_{1995} = \alpha + \beta Y_{1995} + \varepsilon,$$

where $Y$ is the per capita GDP value, $\alpha$ is the constant term, $\beta$ is the convergence coefficient and $\varepsilon$ is the disturbance term. The $Y_{2000}/Y_{1995}$ ratio indicates the growth of regional GDP per capita in the period 1995 – 2000. Positive values of $\beta$ imply that regions with higher initial value $Y$ tend to have higher growth. Negative values of $\beta$ imply that regions with lower initial value of $Y$ tend to have a better growth performance. This indicates that positive values of the **$\beta$–convergence** coefficient are associated with tendencies of regional divergence, while negative values are associated with tendencies of regional convergence.

The **$\gamma$–density** coefficient is the slope coefficient of the following regression:

$$Y_{2000} = \alpha + \gamma D_{2000} + u,$$

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[14] The weighted coefficient of variation is estimated from the formula:

$$CV_W = [\sum_i (X_i - \bar{x})^2 * (P_i/P)]^{1/2} / \bar{x},$$

where $X_i$ is the variable under examination in regional level, $\bar{x}$ is the variable under examination in average country value, $P_i$ is the population in regional level and P is the national population. It is the weighted towards population square standard error divided to the mean value of per capita GDP $(\sigma/\bar{x})$.

where $D$ is the regional population density, $Y$ is the regional GDP per capita, $\alpha$ is the constant term, $\gamma$ is the population density coefficient and $u$ is the disturbance term. Positive values of $\gamma$ imply that regions with a higher population density enjoy a higher level of per capita GDP. This coefficient is a measure of inequality based on agglomeration economies.

Table 3 allows us to make a number of interesting observations. First, all Accession Countries, with the exception of Bulgaria[15], are characterized by an increase of the coefficient of variation and the max/min ratio in the 1995-2000 period. This general trend indicates that the market-based processes of integration and transition are accompanied by a significant increase of regional inequalities. This trend, which was evident from the early stages of Transition (Petrakos 2001), has continued to prevail in the late 1990s at an undiminished pace.

Secondly, based on the value of the weighted coefficient of variation, the countries with the greatest disparities in the year 2000 are Latvia, Hungary, Estonia and Poland. Romania, the Czech Republic and Slovakia follow, whereas Bulgaria, Lithuania and Slovenia have the smallest inequalities. Based on the max/min ratio the greatest inequalities are found in Poland, Latvia and Romania and the smallest in Slovenia and Lithuania. These figures indicate that country size by itself is not a criterion for the magnitude of regional inequalities. Further, the group of countries with the greatest inequalities includes both large (Poland), medium (Hungary) and small countries (Estonia).

Third, the level of regional inequalities, evaluated by the weighted coefficient of variation of the Transition Countries is comparable (or even higher) to that of the EU–15 countries (Table 4). The Transition countries with the highest inequalities (Latvia, Hungary and Estonia) have indices greater than those of the EU–15 countries with the highest inequalities (UK and Belgium). Comparing the large countries, Poland and Romania have a slightly higher coefficient of variation than France and Spain, respectively. Comparing medium countries, the Czech Republic and Slovakia have a higher coefficient of variation than Austria and the Netherlands, respectively. The countries with the smallest indices in both groups (Slovenia and Sweden) have similar values.

[15] There is a reservation about the validity of Eurostat's regional figures of Bulgaria, as they different from unpublished data collected by other national sources.

**Table 3: Evolution of Regional Inequalities in the EU Enlargement Countries, Based on GDP per capita in NUTS III Level**

| COUNTRY | INDEX | Level of inequalities 1995 | 2000 |
|---|---|---|---|
| BULGARIA | $CV_W$ | 0,394 | 0,391 |
| | max / min | 2,878 | 2,617 |
| | $\gamma$- density (t – student) | 1,332 (7,002) | 1,626 (4,560) |
| | $\beta$ – convergence (t – student) | | -2,462 (-0,970) |
| ESTONIA | $CV_W$ | 0,463 | 0,562 |
| | max / min | 2,164 | 2,718 |
| | $\gamma$- density (t – student) | 12,436 (3,679) | 32,205 (3,223) |
| | $\beta$ – convergence (t – student) | | 2,802 (2,153) |
| LATVIA | $CV_W$ | 0,341 | 0,747 |
| | max / min | 2,041 | 4,327 |
| | $\gamma$- density (t – student) | 2,500 (2,113) | 13,747 (4,664) |
| | $\beta$ – convergence (t – student) | | 18,454 (2,876) |
| LITHUANIA | $CV_W$ | 0,156 | 0,314 |
| | max / min | 1,574 | 2,432 |
| | $\gamma$- density (t – student) | 4,909 (2,943) | 25,849 (3,558) |
| | $\beta$ – convergence (t – student) | | 20,744 (4,122) |
| HUNGARY | $CV_W$ | 0,483 | 0,583 |
| | max / min | 3,054 | 3,597 |
| | $\gamma$- density (t – student) | 0,911 (7,195) | 1,710 (5,130) |
| | $\beta$ – convergence (t – student) | | 1,444 (2,302) |
| POLAND | $CV_W$ | 0,415 | 0,527 |
| | max / min | 4,213 | 5,188 |
| | $\gamma$- density (t – student) | 0,902 (10,773) | 2,020 (11,100) |
| | $\beta$ – convergence (t – student) | | 0,896 (2,136) |
| ROMANIA | $CV_W$ | 0,211 | 0,478 |
| | max / min | 2,140 | 4,316 |
| | $\gamma$- density (t – student) | 0,415 (2,533) | 1,849 (5,964) |
| | $\beta$ – convergence (t – student) | | 6,115 (2,874) |
| SLOVAKIA | $CV_W$ | 0,372 | 0,414 |
| | max / min | 3,080 | 3,486 |
| | $\gamma$- density (t – student) | 15,065 (8,503) | 24,906 (10,286) |
| | $\beta$ – convergence (t – student) | | 0,428 (1,043) |
| SLOVENIA | $CV_W$ | 0,207 | 0,236 |
| | max / min | 1,681 | 1,780 |
| | $\gamma$- density (t – student) | 8,740 (1,577) | 10,703 (1,175) |
| | $\beta$ – convergence (t – student) | | 0,273 (1,078) |
| CZECH REP. | $CV_W$ | 0,328 | 0,448 |
| | max / min | 2,359 | 2,765 |
| | $\gamma$- density (t – student) | 1,571 (15,156) | 3,093 (19,037) |
| | $\beta$ – convergence (t – student) | | 0,934 (2,620) |

Source: Own elaboration

**Table 4: The EU-15 Countries Weighted Coefficient of Variation ($CV_w$) of GDP per capita in NUTS III Level, 2000**

| Countries | 2000 |
|---|---|
| Austria | 0,357 (6) |
| Belgium | 0,533 (2) |
| France | 0,518 (3) |
| Germany | 0,501 (5) |
| *East Germany* | *0,376* |
| *West Germany* | *0,460* |
| Denmark | 0,289 (10) |
| Greece | 0,274 (11) |
| UK | 0,536 (1) |
| Spain | 0,251 (13) |
| Ireland | 0,294 (9) |
| Italy | 0,310 (8) |
| Holland | 0,256 (12) |
| Portugal | 0,516 (4) |
| Sweden | 0,249 (14) |
| Finland | 0,317 (7) |

Source: Petrakos and Rodriguez-Pose (2003)

The interesting point in this comparison is that Accession Countries have, in a short period of 10 years, reached levels of regional inequalities comparable to those of the EU–15 countries. If in the post-1989 period the market mechanism is considered to be the most important factor creating regional inequalities, a question is raised about the future evolution of inequalities (given that markets are relatively young and not fully developed) and the challenges the EU will have to face when these countries become full members.

Fourthly, the $\gamma$–density coefficient is positive and statistically significant in all countries[16] in both time periods. Moreover, its value tends to increase over time. How can this be explained? First of all, the positive and statistically significant value of the coefficient implies that as regional population density increases, regional GDP per capita will increase also due to higher productivity, which is the result of agglomeration economies[17]. Furthermore, the increase of the value of the coefficient implies that this relationship is getting stronger, and therefore, the role of agglomeration economies in the process of spatial development is becoming more important. This means that regions having a critical threshold of activities, allowing the operation of agglomeration economies, will be growing at a faster rate than in the past. On the contrary, regions lacking such critical scale of activities are going to face difficulties in their efforts to maintain significant growth rates. The increased value of the coefficient in the end of the decade may be a sign that the future spatial divides will be more intense than in the past.

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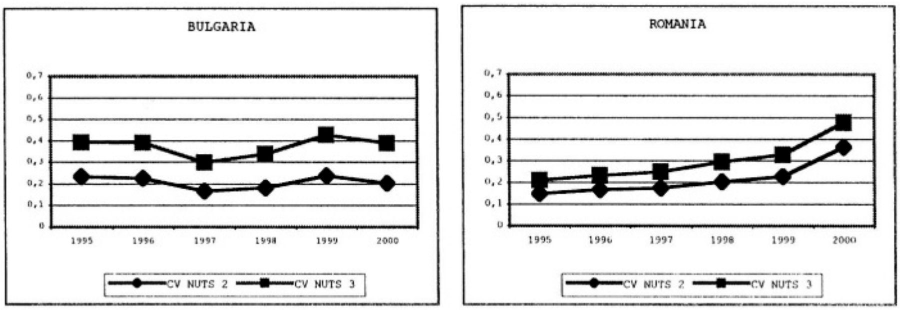
[16] With the exception of Slovenia, which has a positive but statistically insignificant $\gamma$–density coefficient.

[17] A higher population density at the regional level implies that there is a higher concentration of activities. This concentration favors horizontal and vertical interaction among firms, or favors the creation of new services. In either case, it increases productivity.

Fifthly, the value of the $\beta$–convergence coefficient is positive and statistically significant for almost all Transition Countries[18]. This indicates that in the period 1995–2000, the more advanced regions of each country have been growing with higher rates than the less advanced regions. This trend has led to further divergence between the rich and the poor regions in the end of the period. Although the use of the $\beta$–convergence coefficient for the evaluation of regional inequalities has been questioned in the literature (Petrakos et al 2003), the fact that almost all countries present the same trend and the fact that the others indices of inequality provide similar results allow us to conclude safely that Accession Countries have been facing significant and increasing inequalities the last period.

Figures 2 and 3 also verify this finding. Figure 2 presents the evolution of the weighted coefficient of variation at the NUTS II and III spatial levels. We can observe that regional inequalities are higher at the NUTS III level of than those at the NUTS II level. However, both levels are characterized by an over time increasing trend.

**Figure 2: The EU Enlargement Countries Weighted Coefficient of Variation of GDP per capita (NUTS II and NUTS III Levels) 1995-2000**




[18] With the exception of Bulgaria, which has a negative and statistically significant $\beta$ – convergence coefficient.

**Figure 2 (cont.)**

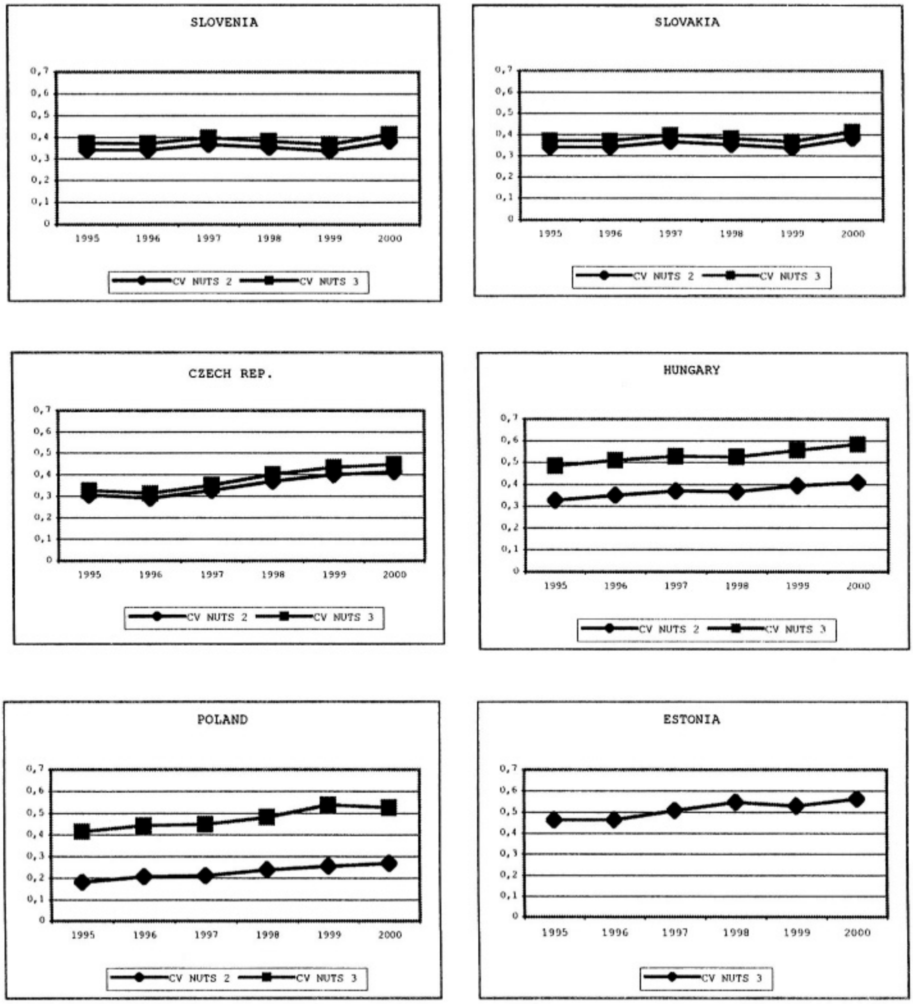
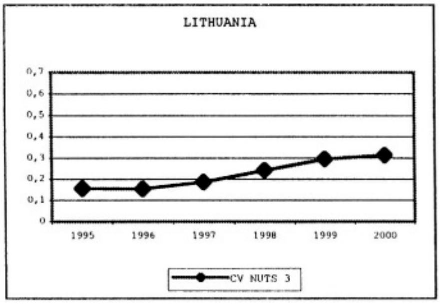


**Figure 2 (cont.)**



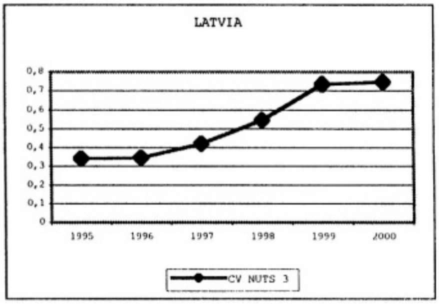
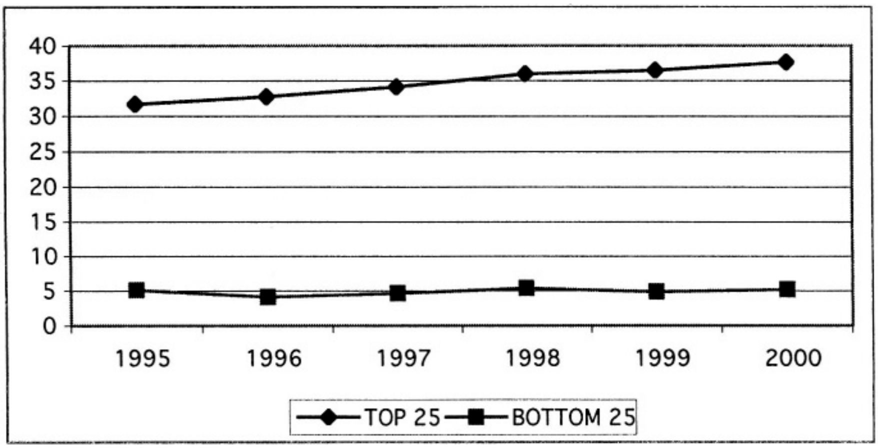




Figure 3 presents the average GDP per capita of the 25 richest and the 25 poorest regions of Accession countries, as a share of the EU–15 average. We can observe that the 25 richest regions have a GDP per capita figure equal to 30-40% of the EU–15 average, whereas, the 25 poorest regions have a GDP per capita figure equal to only 5% of the EU–15 average. We can also observe that the gap has increased at the end of the decade mainly due to the faster growth of the most developed regions group, which comprises mainly of metropolitan centers.

**Figure 3: The Evolution of GDP per capita of the 25 More Developed and the 25 Least Developed Regions of the EU Enlargement Countries (NUTS III Level) 1995 – 2000 (EU – 15 Average = 100)**



## CONCLUSIONS

Our analysis has revealed a number of inequalities and divisions in the geographic space of the EU new member–states, which over time seem to intensify. At a macroscopic level, we have the relative dynamism of the Central Europe and the difficulties of the Balkan region. This "north - south" divide is similar to the one found within the EU–15. At a microscopic level, the dynamic character of the metropolitan centers, led by agglomeration economies, and western border regions, led by adjacency and proximity to the EU–15, is revealed.

The empirical analysis has shown that over time these inequalities have increased in almost all Accession Countries to levels comparable (or even higher) to that of EU–15. Further, it becomes clear on the one hand that the historic task of transition from plan to market has been accompanied by a significant increase in regional inequalities, which may change the economic map in the area. On the other hand, the EU has an equally historic task to integrate a new economic space with unusually severe problems of cohesion and development.

Our findings may have significant implications for the future of European regional policies. The EU–27 will be faced with far more serious economic divisions and problems of structural weakness and underdevelopment than those encountered during previous enlargements to the South. Despite that, this historic task is not accompanied by any substantial increase in the EU budget (Begg 2000), as in the case of previous enlargements. Maintaining the EU budget at the same levels and partially transferring funds from the South to the East is not expected to solve the EU–27 cohesion problem, as the problems and the needs of the South are still significant.

Despite the fact that the political borders in Europe have ceased to exist, in many people's mind they have been replaced by economic divides, which are more complex and equally hard to overcome. In that sense, the growing regional inequalities in the EU Accession countries are a critical test for the EU and its ability to adjust its policies to the new conditions in order to maintain cohesion its highest priority.

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# 4

# TOTAL FACTOR PRODUCTIVITY AND ECONOMIC FREEDOM - IMPLICATIONS FOR EU ENLARGEMENT*

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## INTRODUCTION

The ongoing enlargement of the European Union (EU), expanding from the initial 6 to 15 and now to 25 members with more in the wings, is at the frontier of economic and political integration. Political and economic stumbling blocks have been hurdled, but the larger number of countries and greater economic and political disparities make the process more and more difficult. In this chapter, we consider the existing disparities in economic freedom among the 25 EU countries and the evolution of total factor productivity (TFP) in the manufacturing sectors of a selected group of OECD countries, some of which were members of the EU during the period studied. We are interested both in TFP convergence and in the relationships between TFP and economic freedom.

We first use the methodology of Bernard and Jones (1996) to test for TFP convergence in the manufacturing sector and in nine disaggregated manufacturing industries in 12 OECD countries. TFP convergence at the aggregate level, at least, among countries in the EU is important for the EU's goals related to political and social cohesion. Convergence is necessary for cohesion because it implies that all countries in the union can have strong economies, while outcome diversity diminishes. Although neoclassical economics suggests that convergence is to be expected, increasing returns, in its new economic geography clothes or in its older versions, among other phenomena may yield divergence.

In a recent paper, Freeman (2002) evaluates and uses the Fraser Institute's economic freedom index (Gwartney et al. 2003) to test for differences in economic performance among OECD countries that may result from institutional differences. He concludes that the index is correlated reasonably well in the expected direction with other measures of economic freedom and with more specific measures of labor market flexibility, product market regulation, and barriers to entrepreneurial activity. Thus, the index provides a summary measure of institutional considerations associated with economic freedom. It is particularly valuable for his purposes (and ours) because it is available, starting with 1970, in five-year increments, thus permitting

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construction of a cross-section, time-series panel. Freeman uses panel estimators, controlling for time and country fixed effects, to estimate the association between economic freedom and economic performance. He and others find such an association, without and *with* time and country effects, if the countries sampled have large variations in economic performance and economic freedom. If the country observations consist only of OECD countries, however, Freeman concludes that variation in the Fraser index of economic freedom is not associated with variations in economic performance. He suggests that this result occurs because OECD countries have reached a threshold of basic market freedoms necessary for advanced capitalism. Once reached, he concludes, countries can have a variety of economic institutions that cause differences in the freedom index without associated differences in performance.

The current enlargement of the EU, however, includes countries that are moving toward but may not have reached this threshold of basic market freedoms. If the EU is going to become a single market, these countries can be expected to change their institutions in ways that increase their economic freedom indices. What will be the effect, if any, of these institutional changes on the level and evolution of TFP? We believe that we can provide information pertinent to this question by examining countries that have traveled a similar path. Unlike Freeman, we find that variation in economic freedom among a selection of OECD countries is positively associated with variation in economic performance.

To pursue these arguments, it is first necessary to examine the Fraser index for OECD countries, current EU countries, and the accession countries. We will then describe our data and its construction, followed by a test of TFP convergence. Finally, we will bring the Institute's freedom index into the analysis of TFP.

## ECONOMIC FREEDOM, THE EU, AND THE OECD

According to its developers, the Fraser index (Gwartney et al., 2003) is derived assuming that "the key ingredients of economic freedom are personal choice, voluntary exchange, freedom to compete, and protection of person and property." In addition to what Freeman (2002) calls "a strong tradition of basic market freedoms—protection of property, rule of law, private ownership rights, viability of contracts, etc.—" the Fraser index emphasizes personal choice and voluntary exchange. It considers size of government, freedom to compete, and access to a stable currency of the same level of importance as property rights, individual markets, or international openness in measuring economic freedom. It presumes that a large government sector, for instance, is associated with less economic freedom because it implies collective, rather than individual, choice rules over a larger sector of the economy. This is one the distinctive differences between the "Anglo-American" economic system and the "Social-Market" system of Continental Europe.

Table 1 gives the Fraser index for each of the 12 OECD countries in our data set and for other relevant groups of countries.

**Table 1: Economic Freedom Indices for Selected Countries**

| | Scores | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Countries | 1970 | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2001 |
| **Panel A Countries Considered** | | | | | | | | |
| Austria | 6.1 | 5.8 | 6.2 | 6.3 | 6.9 | 7.0 | 7.4 | 7.5 |
| Belgium | 7.3 | 6.6 | 6.9 | 6.9 | 7.3 | 7.2 | 7.4 | 7.4 |
| Canada | 7.4 | 6.6 | 7.0 | 7.1 | 7.7 | 7.8 | 8.1 | 8.0 |
| Finland | 6.7 | 5.8 | 6.4 | 6.6 | 7.1 | 7.3 | 7.6 | 7.7 |
| France | 6.2 | 5.5 | 5.7 | 5.8 | 6.9 | 6.8 | 7.0 | 6.7 |
| United Kingdom | 5.9 | 5.7 | 6.1 | 6.9 | 7.7 | 8.1 | 8.3 | 8.3 |
| Italy | 5.8 | 5.1 | 5.2 | 5.5 | 6.4 | 6.5 | 7.1 | 7.0 |
| South Korea | 5.1 | 5.1 | 5.4 | 5.5 | 6.0 | 6.5 | 7.0 | 7.1 |
| Netherlands | 7.1 | 6.4 | 6.9 | 7.1 | 7.5 | 7.8 | 8.0 | 7.8 |
| Norway | 5.9 | 5.4 | 5.7 | 6.2 | 6.9 | 7.4 | 7.2 | 7.1 |
| Sweden | 5.6 | 5.2 | 5.6 | 6.2 | 6.7 | 7.2 | 7.4 | 7.2 |
| United States | 7.0 | 7.1 | 7.4 | 7.5 | 8.2 | 8.3 | 8.5 | 8.3 |
| **Average** | **6.3** | **5.9** | **6.2** | **6.5** | **7.1** | **7.3** | **7.6** | **7.6** |
| **Panel B Anglo-American** | | | | | | | | |
| Canada | 7.4 | 6.6 | 7.0 | 7.1 | 7.7 | 7.8 | 8.1 | 8.0 |
| United Kingdom | 5.9 | 5.7 | 6.1 | 6.9 | 7.7 | 8.1 | 8.3 | 8.3 |
| United States | 7.0 | 7.1 | 7.4 | 7.5 | 8.2 | 8.3 | 8.5 | 8.3 |
| **Average** | **6.8** | **6.5** | **6.8** | **7.2** | **7.8** | **8.1** | **8.3** | **8.2** |
| **Panel C Social-Market** | | | | | | | | |
| Belgium | 7.3 | 6.6 | 6.9 | 6.9 | 7.3 | 7.2 | 7.4 | 7.4 |
| France | 6.2 | 5.5 | 5.7 | 5.8 | 6.9 | 6.8 | 7.0 | 6.7 |
| Italy | 5.8 | 5.1 | 5.2 | 5.5 | 6.4 | 6.5 | 7.1 | 7.0 |
| Netherlands | 7.1 | 6.4 | 6.9 | 7.1 | 7.5 | 7.8 | 8.0 | 7.8 |
| **Average** | **6.6** | **5.9** | **6.2** | **6.3** | **7** | **7.1** | **7.4** | **7.2** |
| **Panel D EU-9** | | | | | | | | |
| Belgium | 7.3 | 6.6 | 6.9 | 6.9 | 7.3 | 7.2 | 7.4 | 7.4 |
| Denmark | 6.6 | 5.9 | 6.1 | 6.2 | 7.0 | 7.4 | 7.6 | 7.6 |
| France | 6.2 | 5.5 | 5.7 | 5.8 | 6.9 | 6.8 | 7.0 | 6.7 |
| Germany | 7.3 | 6.8 | 7.1 | 7.2 | 7.5 | 7.5 | 7.6 | 7.3 |
| Ireland | 6.5 | 5.8 | 6.2 | 6.2 | 7.1 | 8.2 | 8.1 | 8.0 |
| Italy | 5.8 | 5.1 | 5.2 | 5.5 | 6.4 | 6.5 | 7.1 | 7.0 |
| Luxembourg | 7.0 | 7.0 | 6.8 | 7.2 | 7.5 | 7.5 | 7.7 | 7.6 |
| Netherlands | 7.1 | 6.4 | 6.9 | 7.1 | 7.5 | 7.8 | 8.0 | 7.8 |
| United Kingdom | 5.9 | 5.7 | 6.1 | 6.9 | 7.7 | 8.1 | 8.3 | 8.3 |
| **Average** | **6.6** | 6.0 | **6.2** | **6.4** | **7.1** | **7.3** | **7.5** | **7.4** |

**Table 1: Economic Freedom Indices for Selected Countries (cont.)**

| | Scores | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Countries | 1970 | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2001 |
| **Panel E Earlier Accession** | | | | | | | | |
| Austria | 6.1 | 5.8 | 6.2 | 6.3 | 6.9 | 7.0 | 7.4 | 7.5 |
| Finland | 6.7 | 5.8 | 6.4 | 6.6 | 7.1 | 7.3 | 7.6 | 7.7 |
| Greece | 6.2 | 5.7 | 5.5 | 5.2 | 5.8 | 6.3 | 6.8 | 6.7 |
| Portugal | 6.0 | 3.8 | 5.6 | 5.4 | 6.1 | 7.3 | 7.3 | 7.2 |
| Spain | 6.2 | 5.5 | 5.7 | 5.9 | 6.3 | 7.0 | 7.3 | 7.0 |
| Sweden | 5.6 | 5.2 | 5.6 | 6.2 | 6.7 | 7.2 | 7.4 | 7.2 |
| **Average** | **6.1** | **5.3** | **5.9** | **5.9** | **6.5** | 7.0 | **7.3** | **7.2** |
| **Panel F Current Accession** | | | | | | | | |
| Bulgaria | | | | 4.5 | 3.5 | 4.2 | 5.3 | 5.2 |
| Cyprus | | 5.4 | 5.3 | 5.3 | 5.9 | 6.1 | 6.1 | 6.3 |
| Czech Rep. | | | | | | 5.8 | 6.8 | 6.8 |
| Estonia | | | | | | 5.4 | 6.9 | 7.4 |
| Hungary | | | 4.2 | 5.0 | 4.9 | 6.3 | 6.6 | 6.9 |
| Latvia | | | | | | 4.6 | 6.5 | 6.6 |
| Lithuania | | | | | | 4.7 | 6.2 | 6.2 |
| Malta | | | 5.1 | 4.9 | 5.3 | 6.6 | 6.4 | 6.4 |
| Poland | | | | 3.8 | 3.6 | 5.3 | 5.8 | 6 |
| Romania | | | | 4.7 | 4.2 | 3.7 | 4.6 | 4.6 |
| Slovak Rep | | | | | | 5.3 | 6.1 | 6.0 |
| Slovenia | | | | | | 4.7 | 5.9 | 5.9 |
| Turkey | 3.5 | 3.8 | 3.5 | 4.7 | 4.8 | 5.7 | 5.8 | 5.3 |
| **Average** | | | | | | **5.3** | **6.1** | **6.1** |

Source: The Fraser Institute indices were taken from Gwartney et al. (2003).

As seen in Panel A, beginning in 1975 the average index for the 12 countries increased steadily until 2001. The increase in the index from 1980 to 1990, however, is substantially greater than the increase from 1990 to 2000. Examining the individual countries, we see the remarkable convergence and steady country by country increase in the index noted by Freeman. Comparing the Anglo countries in Panel B (Canada, the United Kingdom, and the United States) with the Social-Market countries in Panel C that were in the original European trade associations (Belgium, France, Italy, and the Netherlands), we see that both sets of countries experienced increases in economic freedom, beginning in 1975. The Anglo countries, however, had greater average economic freedom in 1975 (6.5 compared to 5.9) and 2001 (8.2 compared to 7.2). Although it is risky to talk about a trend with so few observations, the data hints that both groups of countries have reached a local peak in their indices, with the Anglo countries experiencing greater economic freedom than the Social-Market countries.

The average value for the first nine countries in the EU is also shown in Table 1, Panel D. From 1980 to 1995 it increased from 6.2 to 7.3 with little apparent change from 1995 to 2000 or 2001. Since the early 1970s, six countries have joined the EU. Although we do not know the extent to which their prospective membership in the EU influenced their institutional change, the average index for these countries, as seen in Panel E, increased steadily from 5.3 in 1975 to 7.3 in 2000. The similarity between the average for these earlier accession countries and the current accession countries (the 10 approved countries plus Bulgaria, Romania, and Turkey) in Panel F lagged 20 years is remarkable. The average for the latter countries in 1995 was 5.3 and it had risen to 6.1 by 2000. Twenty years earlier, the average for the original six was 5.3 and it had risen to 5.9 by 1980. These trends may suggest that these new accession countries will continue institutional change that results in larger measured economic freedom, just as happened for the earlier accession group.

## TFP CONVERGENCE IN MANUFACTURING IN SELECTED COUNTRIES: 1980 TO 1998

Productivity comparisons across countries and over time are difficult for many of the same reasons that comparisons of productivity level and growth are difficult within a country. To calculate productivity and productivity growth for industries or industry-regions within a country at a disaggregated level for, say, the manufacturing sector or a branch of the manufacturing sector such as transportation equipment, it is necessary to deflate the value of output in the industry by an appropriate price index. To be appropriate, the index must somehow incorporate quality improvements so that it is an index for a product of constant quality. In addition to accounting for changes in the quality of the product over time, the product mix ideally would also be controlled. It is also necessary to measure input use on the basis of constant input quality. Ideally, the output measure would be gross output and the inputs would consist of various types of capital, labor, and materials.

Changing the research question to comparisons of TFP levels and growth across countries introduces two new fundamental problems. The first is an index number problem that arises because of the cross-country dimension. Pairwise comparisons of a bilateral productivity index are not transitive. This makes the productivity comparisons sensitive to the base country chosen in the comparison. Caves, Christensen and Diewert (1982a and 1982b) tackle this problem by developing a multilateral productivity index that is not sensitive to the choice of base country or base year.

The other fundamental problem that arises in cross-country comparisons arises because different national currencies must be converted to a common currency. Market exchange rates are not appropriate because they typically are influenced by short-term capital movements. Furthermore, there could be huge variations in price ratios even in traded sectors across countries due to different economic conditions, such as degree of monopoly power in a specific industry or a time lag in response to exchange rate movements. A solution is to use purchasing power parity (PPP) exchange rates to bring all values to a common currency

The relative prices of products vary across countries because of different opportunity costs of inputs and because the products themselves are not homogenous across countries, making aggregate PPPs deficient in disaggregated comparison. Otherwise similar products may be of different quality across countries and the mix of products within a certain industry may differ across countries. O'Mahony (1996) and van Ark (1996) discuss these issues in detail. Harrigan (1997) chose to use expenditure category PPPs to convert domestic currencies into a common currency. A shortcoming of this is that it does not take account of intermediate products, which are important part of manufacturing output. The unit value ratio (UVR), which is based on industry of origin rather than final expenditure category, is the conversion factor preferred by van Ark. Unit value ratios (UVRs), however, are not available in secondary data sources, whereas PPPs by expenditure category are so available. Therefore, the pragmatic solution for input and output conversion is to use PPPs by expenditure category. Our primary data is from the new OECD STAN (Structural Analysis) Database. This database has been revised using new industrial classifications. To use this new database we had to limit the number of countries and industries in the analysis. Our data are for 12 countries—Austria, Belgium, Canada, Finland, France, Great Britain, Italy, Korea, Netherlands, Norway, Sweden, and the United States. Fortunately, this list of countries gives a sampling of OECD countries well tailored to our focus. It includes early members of the European Union and members that have joined in the 1990s; in addition it includes four countries that are not in the EU.

The industry list is also diverse. It includes the manufacturing sector and seven two-digit branches and one three-digit branch, namely: Food Products; Textiles; Wood Products; Pulp, Paper Products and Printing; Chemical Products; Non-Metallic Mineral Products; Basic Metals; Machinery and Equipment; and Transportation Equipment.

We have followed Harrigan's (1997) procedures to adjust the data. For instance, the labor input is adjusted to an hours worked measure for all countries. Wage rates for broad occupational categories in the United States are used to adjust the labor hours for labor quality. Our data provide fixed capital formation by industry instead of capital stock. We use Harrigan's parameters in the perpetual inventory approach to converting fixed capital formation flows to capital stock.[19]

Studies by Bernard and Jones (1996) and by Harrigan (1997) concentrate on cross-country comparisons of productivity in sectors of the aggregate economy. Bernard and Jones estimate convergence in broad sectors of the aggregate economy, e.g. agriculture, mining, and manufacturing, using cross-section data. Although they found evidence of convergence for other sectors of the economy, they did not find evidence of convergence in manufacturing. Harrigan's study of 2-digit ISIC

[19] See Yang (2003) for the precise calculation methods used to calculate the multilateral total factor productivity indices used in this paper. We followed Harrigan's (1997) procedures as closely as we could.

manufacturing industries did not test for convergence; he showed, however, that TFP for manufacturing industries differs across OECD countries. In a recent study, Nicoletti and Scarpetta (2003) analyze total factor productivity using annual data for 23 manufacturing and service industries over the period 1984-98. They estimate convergence coefficients for the manufacturing sector and the service sector. In their baseline estimation using this panel data, the convergence coefficient for the service sector is much larger than the one for the manufacturing sector, but both sectors exhibit convergence.

There are two distinct definitions of convergence: $\beta$-convergence and $\sigma$-convergence (Barro and Sala-i-Martin, 1992). Productivity convergence across countries can be analysed based on two questions: (1) Do countries with relatively high initial levels of TFP grow relatively slowly ($\beta$-convergence)? and (2) Is there a reduction over time in the cross-sectional variance of TFP ($\sigma$-convergence)? If the idea of a common technology for an industry across countries—at least in the long run—were to have validity, both types of convergence would seem to be necessary.

### β-Convergence

To examine $\beta$-convergence, assume that productivity (TFP) for a manufacturing branch in country *i*, $A_{i,t}$, is:

$$\ln A_{i,t} = \gamma_i + \lambda \ln G_{i,t} + \ln A_{i,t-1} + \ln \varepsilon_{i,t} \tag{1}$$

where, $\lambda$ is the catch-up parameter, $G_{i,t}$ is the technology gap, and $\varepsilon_{i,t}$ is a manufacturing branch and country specific error term. The technology gap, $G_{i,t}$ is the negative of the previous period's productivity in country *i* relative to that in base country *b*, the country with the highest TFP: $\ln G_{i,t} = -\ln \hat{A}_{i,t-1}$, where the hat over the variable represents the ratio of country *i*'s to country b's variable: $\hat{A}_{i,t} = \frac{A_{i,t}}{A_{b,t}}$.

$\hat{A}_{i,t}$ is the technology gap and can be expressed as a function of its past values (see Barnard and Jones, 1996):

$$\ln \hat{A}_{i,t} = (\gamma_i - \gamma_b) + (1-\lambda) \ln \hat{A}_{i,t-1} + \ln \hat{\varepsilon}_{i,t} \tag{2}$$

This says that the technology gap between country *i* and the base country *b* is a function of the lagged gap ($\ln \hat{A}_{i,t-1}$) in the same productivity measure. If both countries have the same asymptotic rate of TFP growth and if the catch-up parameter $\lambda$ is between zero and one, then productivity differentials result in a higher growth rate for the country with lower productivity.

Following Bernard and Jones (1996), the estimating equation is:

$$\Delta \ln(TFP_i) = \alpha + \beta \ln(TFPGap_i^{1980}) + \varepsilon_i \tag{3}$$

where $\Delta \ln(TFP_i)$ is the growth rate of TFP of country *i* over 1980-1998, which can be expressed as $\ln(TFP_i^{1998}/TFP_i^{1980})^{1/T} = (1/T)(\ln TFP_i^{1998} - \ln TFP_i^{1980})$. The technology gap $(TFPGap_i)$ is the ratio of country *i*'s TFP to the maximum level of TFP in the initial period. The speed of convergence, $\lambda$, is calculated from

$$\beta = -\frac{1-(1-\lambda)^T}{T}. \tag{4}$$

A regression of the long run average growth rate on the initial technology gap tests convergence, with a negative coefficient on the initial gap required for convergence. The intuition for this is straightforward. As the productivity in a low-productivity country increases relative to that of the leader country, the catch-up opportunities available to the low-productivity country decrease.

Table 2 presents the results for $\beta$-Convergence for TFP. For each manufacturing branch, the growth rate of TFP is regressed on its initial level of the TFPGap with a constant, producing an estimate of $\beta$. The implied convergence speed, $\lambda$, is calculated using equation (4). The convergence speed is the rate at which TFP level is converging to the productivity leader's TFP, which may itself be growing over time. As shown in Table 2, all branches of manufacturing and the manufacturing sector exhibit convergence. The estimated negative coefficient of the initial technology gap is significant using a one-tail test at the 10 percent level for Food, Beverages and Tobacco, at 5 percent for Basic Metals and Fabricated Metal Products, and at 1 percent for the remaining seven industries and the manufacturing sector.

**Table 2: TFP Convergence Regressions by Industry**

| | $\beta$ | $t$ | $\lambda$ | $R^2$ |
|---|---|---|---|---|
| Manufacturing Sector | -0.02370$^!$ | -2.42 | 0.0304 | 0.42 |
| Food, Beverages and Tobacco | -0.01427$^*$ | -1.73 | 0.0164 | 0.27 |
| Textiles, Leather and Footwear Products | -0.01968$^!$ | -5.61 | 0.0240 | 0.80 |
| Wood and Products of Wood and Cork | -0.03199$^!$ | -3.22 | 0.0465 | 0.56 |
| Pulp, Paper and Printing & Publishing | -0.04044$^!$ | -2.92 | 0.0698 | 0.52 |
| Chemical, Rubber, Plastics and Fuel Products | -0.01950$^!$ | -2.90 | 0.0237 | 0.51 |
| Other Non-Metallic Mineral Products | -0.02303$^!$ | -4.49 | 0.0293 | 0.72 |
| Basic Metals and Fabricated Metal Products | -0.02094$^\#$ | -2.17 | 0.0259 | 0.37 |
| Machinery and Equipment | -0.03355$^!$ | -8.72 | 0.0501 | 0.90 |
| Transport Equipment | -0.03073$^!$ | -5.04 | 0.0438 | 0.76 |

Notes: 1) This regression is based on TFP indices of 12 OECD countries (11 for wood products) by industry. With 10 degrees of freedom (9 for Wood Products), the critical values for t for a one-tailed test at 0.1, 0.5, and 0.01 are 1.37, 1.81 and 2.23. !, #, and * indicate significance at p=0.01, p=0.05. and p=0.10 with a one-tail test.

The convergence rates for the manufacturing branches vary from 2.37 percent in Chemical, Rubber, Plastics and Fuel Products to 6.98 percent in Pulp, Paper and Printing & Publishing. Just as there is substantial variation in the convergence rates, the $R^2$s for the convergence regressions vary substantially—from 0.27 for Food, Beverages and Tobacco to 0.90 for Machinery and Equipment. Unlike

Bernard and Jones (1996), we find convergence in the manufacturing sector with a 3 percent speed of convergence. They find some evidence for labor-productivity convergence, but not TFP convergence. Their speeds of adjustment for sectors of the economy range from 1.3 to 6.5 percent per year; our adjustment speeds for manufacturing branches range from 1.6 (Food) to 5 percent (Machinery and Equipment).

### $\sigma$- Convergence

One way to examine the data for $\sigma$-convergence is to study the time trend of the standard deviation of the productivity indices. A declining standard deviation indicates that the TFPs for various countries are getting closer. Figure 1 presents the cross-sectional standard deviations of log TFP over time for manufacturing. The manufacturing sector exhibits a reduction in this standard deviation over time. It falls in the early 1980s, is flat until about 1990, when it again resumes its fall. In all the manufacturing branches, the standard deviations are lower at the end than at the beginning of the period.

Several patterns exist, however, within this generalization. Chemicals and Pulp and Paper both have extended periods (about a decade) of a rising standard deviation, and the pattern for Textiles is uneven. The remaining industries have declining trends with some interruption. The pattern appears consistent with the idea that $\sigma$-convergence is relatively strong, but is interrupted by country-industry specific shocks.

**Figure 1: Standard Deviation of (Log) TFP by Manufacturing Branch**

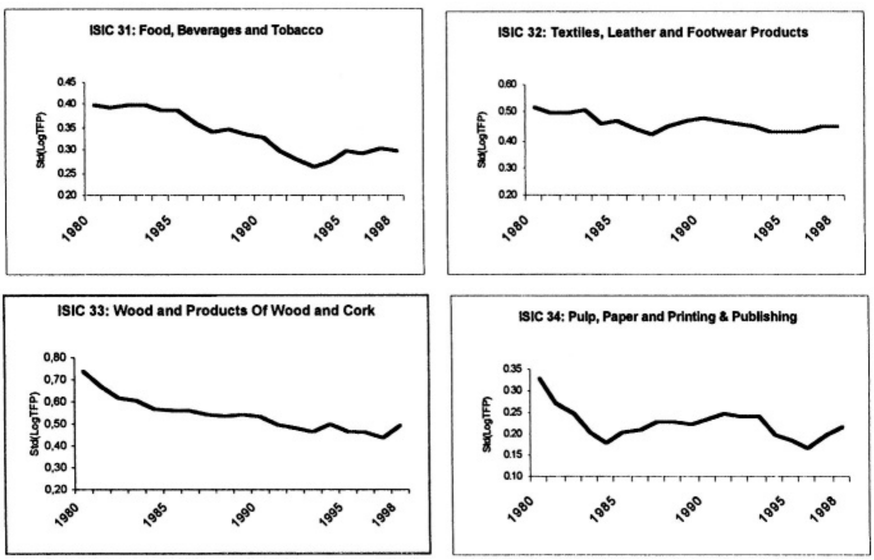
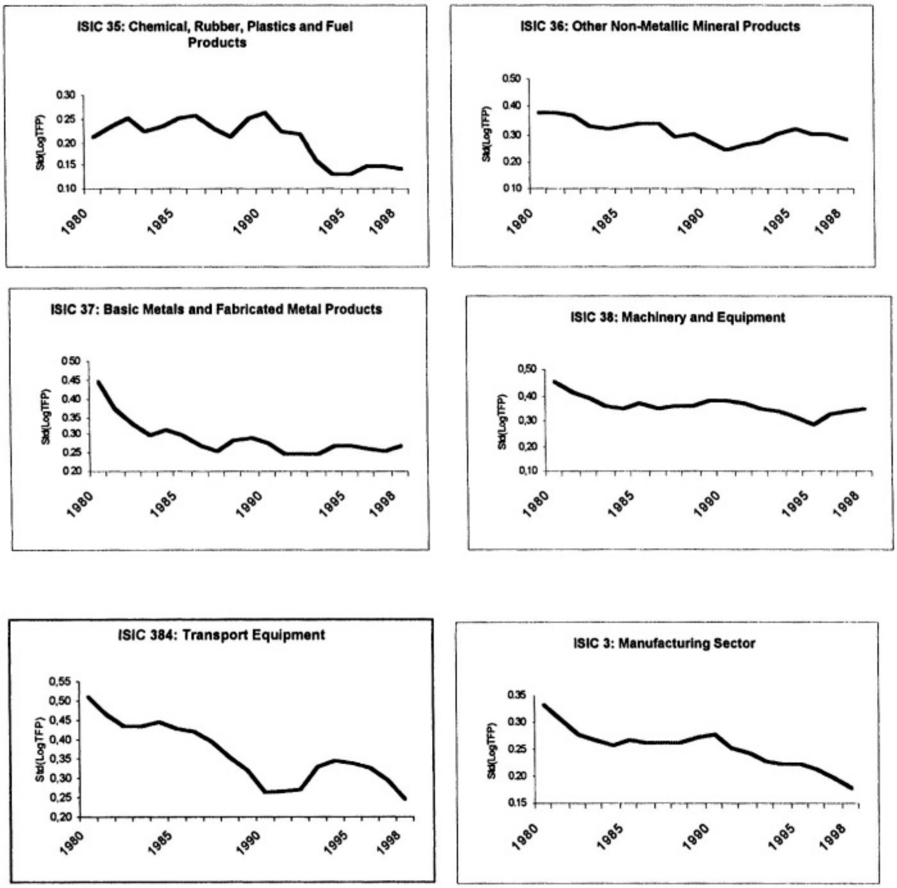


**Figure 1: Standard Deviation of (Log) TFP by Manufacturing Branch (cont.)**




The existence of relatively strong evidence of β–and σ-convergence supports the idea of technology transfers between and among countries. Countries with lower levels of productivity have faster productivity growth, which may be based on adapting frontier technologies to their situation The remainder of this chapter presents some preliminary estimates of the effects of economic freedom on relative productivity levels and growth.

## TOTAL FACTOR PRODUCTIVITY DIFFERENCES AND ECONOMIC FREEDOM

Freeman (2002) regresses levels and growth of various measures of economic performance on the economic freedom index, country dummies, and time dummies.

As mentioned, he finds that economic performance is not associated with economic freedom across a selection of OECD countries when dummy variables are included to control country effects and time effects. He concludes that different sets of institutions, which for instance result in the different freedom rankings for the Anglo-American countries and the Social-Market countries, among advanced countries are equally amenable to good economic performance.

To examine the question of TFP levels and economic freedom, we regress the TFPGap—the technology gap—on the economic freedom index, including dummy variables for countries and time. We have calculated relative TFP levels from 1980 to 1998 for 12 countries and 9 manufacturing industries (See Yang, 2003), and have observed, as did Harrigan (1997), that annual TFP can vary erratically, presumably due to measurement error. Because the freedom index is only available in five-year increments, we make a virtue of necessity by averaging the TFP relative productivity indexes over the three years centered on 1980, 1985, 1990, and 1995.

For each industry, except for ICIS 33 for which data for France are not available, we have 12 countries and 4 cross sections (See the footnote in Table 3 for the list of industries by ICIS code.) This gives 48 observations for each of nine industries and 44 observations for the tenth. Our estimating equation for a particular industry is

$$TFPGap_{it} = \alpha + \beta_1 \cdot EF_{it} + \beta_i \cdot Country_i + \beta_t \cdot Time_t + \varepsilon_i \tag{5}$$

Table 3 gives the results of estimating this equation for each industry. The set of estimates in columns 2 and 3 are for the ordinary least squares estimator, which pools all of the data in the panel. The coefficient of economic freedom is significant and large for nine of the ten industries. To gauge the quantitative impact of the coefficient, note that in 1995, for instance, the economic freedom index ranges from 6.5 for Italy and Korea to 8.3 for the United States. The significant coefficients for economic freedom range from 0.15 to 0.32. Now conduct a thought experiment using plausible values for the relevant parameters. Suppose a country has a freedom index of 7 and a relative productivity index of 0.6. The coefficient range predicts that an otherwise identical country with a freedom index of 8 would have a relative productivity index between 0.75 to 0.92. Such a large effect may not be plausible, but these coefficients may be biased because other factors correlated with economic freedom are not controlled.

**Table 3: The Effects of Economic Freedom on the Relative Productivity in the Manufacturing Sector and Selected Industries**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|
| **Fixed Effects** | **None** | | | **Country** | | | **Time and Country** | |
| Industry | EF | $R^2$ | EF | $R^2$ | F-Statistic | EF | $R^2$ | F-Statistic |
| ISIC 3 | 0.20 | 0.37 | **0.07!** | 0.94 | 2.55 | 0.04 | 0.96 | 1.93 |
| | (5.25) | | **(3.46)** | | | (1.03) | | |
| ISIC31 | 0.18 | 0.17 | **0.06#** | 0.93 | 2.59 | 0.09 | 0.93 | 0.33 |
| | (3.11) | | **(2.07)** | | | (1.54) | | |
| ISIC32 | 0.32 | 0.32 | 0.08 | 0.95 | | **0.08*** | 0.96 | 3.44 |
| | (4.70) | | (2.55) | | | **(1.33)** | | |
| ISIC33 | 0.38 | 0.31 | 0.00 | 0.94 | | **-0.14** | 0.96 | 3.66 |
| | (4.30) | | (-0.03) | | | **(-1.81)** | | |
| ISIC34 | 0.15 | 0.27 | **0.06#** | 0.81 | 2.09 | 0.03 | 0.84 | 2.29 |
| | (4.18) | | **(1.81)** | | | (0.52) | | |
| ISIC35 | 0.01 | 0.00 | 0.04 | 0.62 | | **-0.05** | 0.64 | 8.89 |
| | (0.25) | | (0.90) | | | **(-0.78)** | | |
| ISIC36 | 0.22 | 0.30 | **0.11!** | 0.94 | 2.57 | 0.06 | 0.94 | 1.15 |
| | (4.40) | | **(4.12)** | | | (1.11) | | |
| ISIC37 | 0.23 | 0.30 | 0.15 | 0.88 | | **0.07** | 0.09 | 9.82 |
| | (4.44) | | (3.98) | | | **(1.22)** | | |
| ISIC38 | 0.26 | 0.32 | 0.15 | 0.86 | | **0.04** | 0.93 | 9.40 |
| | (4.64) | | (3.36) | | | **(0.69)** | | |
| ISIC384 | 0.25 | 0.25 | 0.16 | 0.88 | | **0.15#** | 0.91 | 2.93 |
| | (3.96) | | (3.85) | | | **(1.93)** | | |

Note: 1) Bold type indicates the preferred model. 2) The number in parentheses is the t-statistic for the coefficient. 3) The coefficients for ISIC 33 were estimated from an 11-country sample (France excluded); 12 countries were available for the remaining industries. 4) !, #, and * indicate significance at p=0.01, p=0.05. and p=0.10 with a one-tail test. 5) EF is the Fraser Index of Economic Freedom.
6) ISIC coding stands for the following;
ISIC 3: Manufacturing Sector
ISIC31: Food Products, Beverages and Tobacco
ISIC32: Textiles, Textile Products, Leather and Footwear
ISIC33: Wood And Products Of Wood and Cork
ISIC34: Pulp, Paper, Paper Products, Printing and Publishing
ISIC35: Chemical, Rubber, Plastics and Fuel Products
ISIC36: Other Non-Metallic Mineral Products
ISIC37: Basic Metals and Fabricated Metal Products
ISIC38: Machinery and Equipment
ISIC384:Transport Equipment

To examine the possible effects of omitted variables, we add country dummies to the pooled model, obtaining the results given in Columns 4 and 5. In this set of estimates, 8 of the 10 industries have significant coefficients for economic freedom, but all of the coefficients are much smaller than in column 2, suggesting that omitted variables are a problem in the pooled estimate. The significant coefficients range from 0.06 to 0.16. Conducting the same thought experiment as above, we find that a freedom index of 8 rather than 7 would be associated with a productivity relative in the range of 0.66 to 0.76 rather than 0.60.

In columns 7 and 8 are the results for the full model with economic freedom and country and time dummies. The addition of the time dummies results in the freedom coefficients being significant for only two industries, 32 and 384. For these two industries the freedom coefficient is essentially the same as in column 5. Thus, just as Freeman finds, models that include country and time dummies show little association between freedom and performance. An association between economic freedom and performance exists with the models that include country dummies, but almost disappears with the inclusion of the time dummies. Given the positive trends in the freedom index, it is perhaps not surprising that the inclusion of the time dummies reduces the precision of the estimated coefficients. Consequently, the answer to the question of an association between freedom and performance depends upon model selection. If either the time or country dummies are inappropriate for the model, the efficiency of the estimator is reduced. Although the freedom coefficients would not be biased, their standard errors could be overestimated, reducing the coefficients' t statistics. Therefore, we test for the preferred model by comparing the full model to the model with country dummies and economic freedom; i.e., we test for the joint significance of the coefficients of the time dummies.

The results in columns 7 and 8 are for the unrestricted model. In column 9 we present the F-statistic for the hypothesis that the coefficients of the time dummy variables jointly equal zero. The calculated F is 1.93 and, with 4 and 30 degrees of freedom, the critical value for $p = 0.05$ is 2.69. We cannot reject the null hypothesis that the coefficients of the time dummies jointly equal zero in the manufacturing sector. Next, we perform the same test for the country dummies for the manufacturing sector. The critical value for $p = 0.05$ with 12 and 34 degrees of freedom is 2.05. As shown in Column 6, the calculated F is 2.55; we reject that null hypothesis that the coefficients of the country dummies jointly equal zero. For the manufacturing sector, the specification with the country dummies and the economic freedom index is preferred; the bold type indicates that this is the preferred model. For the manufacturing sector as whole, the positive coefficient for economic freedom in the preferred model is highly significant ($p = 0.01$), but has a much smaller coefficient than in the pooled estimate. Comparing otherwise identical countries, a country with a freedom index of 8 rather than 7 is associated with a 0.07 larger productivity relative in the manufacturing sector: 0.67 rather than 0.60.

In Table 3, we report the results obtained by using this same strategy for all of the industries; results for the preferred specification for each industry are in bold type. For the preferred specifications, two of the freedom coefficients are significantly greater than zero at the 0.01 level, three at the 0.05 level, and one at the 0.10 level. We have evidence, particularly strong for the manufacturing sector as a whole, of a positive association between economic freedom and total factor productivity. The positive association between economic freedom and time, however, makes it difficult to determine just how strong the relationship is. This correlation between freedom and time also may account for Freeman's finding of little relationship between economic freedom and economic performance; all of his equations, except for the OLS pooled model, include time dummies. Productivity growth is just as important as the productivity level, so we now turn to the relationship between it and economic freedom.

## TOTAL FACTOR PRODUCTIVITY GROWTH AND ECONOMIC FREEDOM

To continue our analysis of productivity and economic freedom, we turn to testing the relationship between economic freedom and TFP growth. We first specify equation (6), by adding the economic freedom index and the country and time fixed effects to equation (3) to obtain:

$$\begin{aligned}&\Delta \ln TFP_{i(t\ to\ t+1)} = \\ &\alpha + \beta_1 \cdot \ln TFPGap_{it} + \beta_2 \cdot EF_{it} + \beta_i \cdot Country_i + \beta_t \cdot Time_t + \varepsilon_t\end{aligned} \tag{6}$$

We expect TFP growth to be a function of the technology gap (TFPGap) and economic freedom (EF), both measured at the beginning of the period. In this section we again use four cross sections (three at five year intervals and one at a three year interval) for estimation. We calculate TFP growth by first averaging the productivity levels for the three year period for which 1980, 1985, 1990, and 1995 are the midpoints. We then annualize the log difference in the levels for each period to get the growth rate. We use our results for 1998 to create the fourth cross section, by annualizing the log difference between 1998 and 1995. Table 4 presents three sets of estimates, one including the two continuous variables, country dummies, and time dummies, one including the continuous variables and country dummies, and one including only the continuous variables.

Examining Table 4, we again see that the specification that includes time dummies has few—three— industries (ISIC 33, ISIC 36 and ISIC 37) with freedom coefficients significantly greater than zero. In contrast in the specification with country, but not time, dummies six of the freedom coefficients are significant, while in the estimates with no dummies, seven freedom coefficients are significant. Again the strong time trend in the freedom variables may make it difficult to isolate the effects of economic freedom on economic performance in OECD countries. We again test for the preferred model, following the same procedure as before.

**Table 4: The Effects of the Technology Gap and Economic Freedom on TFP Growth in the Manufacturing Sector and Selected Industries**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Fixed Effects** | | **None** | | | **Country** | | | | **Time and Country** | | |
| Industry | TGap | EF | $R^2$ | TGap | EF | $R^2$ | F-Stat | TGap | EF | $R^2$ | F-Stat |
| ISIC 3 | **-0.07!** | **0.01#** | **0.36** | -0.07 | 0.01 | 0.43 | 0.38 | -0.06 | 0.00 | 0.47 | 0.47 |
| | **(-4.90** | **(2.33)** | | (-1.62) | (2.06) | | | (-1.29) | (0.30) | | |
| ISIC31 | -0.02 | 0.00 | 0.20 | **-0.09!** | **0.00** | **0.57** | **2.16** | -0.09 | -0.01 | 0.60 | 1.10 |
| | (-2.92) | (-0.25) | | **(-4.07)** | **(-0.83)** | | | (-3.45) | (-0.91) | | |
| ISIC32 | **-0.09!** | **0.02#** | **0.25** | -0.11 | 0.04 | 0.35 | 0.36 | -0.09 | 0.03 | 0.39 | 0.64 |
| | **(-3.88)** | **(1.75)** | | (-1.21) | (1.90) | | | (-0.89) | (0.76) | | |
| ISIC33 | **-0.09!** | **0.03#** | **0.30** | 0.10 | 0.04 | 0.49 | 0.98 | 0.14 | 0.07 | 0.52 | 0.71 |
| | **(-4.13)** | **(1.88)** | | (1.38) | (2.02) | | | (1.60) | (1.93) | | |
| ISIC34 | **-0.08** | **0.00** | **0.29** | -0.11 | 0.00 | 0.50 | 1.12 | -0.10 | 0.01 | 0.51 | 0.29 |
| | **(-3.87)** | **(0.45)** | | (-2.98) | (0.64) | | | (-2.27) | (0.66) | | |
| ISIC35 | -0.05 | 0.00 | 0.09 | -0.10 | -0.01 | 0.29 | | **-0.24** | **-0.03** | **0.57** | **6.20** |
| | (-2.12) | (-0.20) | | (-2.62) | (-1.03) | | | **(0.04)** | **(-1.62)** | | |
| ISIC36 | **-0.07!** | **0.02!** | **0.33** | -0.21 | 0.04 | 0.56 | 1.48 | -0.22 | 0.03 | 0.58 | 0.33 |
| | **(-4.66)** | **(2.78)** | | (-4.67) | (4.48) | | | (-4.59) | (1.94) | | |
| ISIC37 | **-0.06!** | **0.01#** | **0.38** | -0.14 | 0.02 | 0.56 | 1.10 | -0.19 | 0.02 | 0.63 | 1.74 |
| | **(-5.21)** | **(2.21)** | | (-5.00) | (3.24) | | | (-4.80) | (1.51) | | |
| ISIC38 | **-0.07!** | **0.02!** | **0.26** | -0.10 | 0.05 | 0.48 | 1.15 | -0.12 | 0.01 | 0.56 | 1.81 |
| | **(-3.97)** | **(2.67)** | | (0.00) | (0.00) | | | (-2.23) | (0.65) | | |
| ISIC384 | -0.05 | 0.02 | 0.24 | -0.09 | 0.03 | 0.33 | | **-0.16!** | **0.01** | **0.57** | **5.24** |
| | (-3.80) | (2.22) | | (-2.39) | (2.33) | | | **(-4.28)** | **(0.71)** | | |

Note: 1) Bold type indicates the preferred model. 2) The number in parentheses is the t-statistic for the coefficient. 3) The coefficients for ISIC 33 were estimated from an 11-country sample (France excluded); 12 countries were available for the remaining industries. 4) !, #, and * indicate significance at p=0.01, p=0.05, and p=0.10 with a one-tail test. 5) See Table 3 for industry definitions. 6) TGap is the logarithm of the technology gap, which is defined as a productivity gap of country $i$ from a base country $b$, the country with the highest TFP, s.t $TGap_{i,t} = \ln TFPGap_{i,t}$, where TFPGap is the country's productivity as a proportion of the frontier country's productivity. 7) EF is the Fraser Index of Economic Freedom.

The coefficients of the continuous variables from the unrestricted model are in columns 9 and 10. The F statistic for the null hypothesis that the coefficients of the time dummies jointly equal zero is in column 12. The two industries for which the null cannot be rejected are industries 35 and 384. For the eight remaining industries, the null hypothesis of no country effects is rejected in only one, industry 31 (See columns 5 and 6 for the coefficients and column 7 for the calculated F statistics.) The preferred estimates are again in bold. In six of the preferred estimates the coefficient of economic freedom is significantly greater than zero. The significant coefficients average 0.02. The one unit difference in economic freedom ratings for the Anglo-American countries relative to the Social-Market countries, other things equal, would be associated with a productivity growth rate 0.02 percentage points higher.

The coefficient on the technology gap variable is significant in 9 of the 10 preferred specifications, suggesting productivity convergence. This suggests that the overall performance of the model is reasonable, but the remarkably large effect of economic freedom on TFP growth requires further analysis.

Although it is important to examine the effect of simply adding the economic freedom index to the convergence equation, the mechanism through which economic freedom induces productivity growth can be modeled more usefully by considering a specification with an interaction term. Following Nicoletti and Scarpetta (2003), among others, we first substitute the growth rate of the frontier for the time dummies in equation 6. By this mechanism, the influence of the growth rate of the frontier may be transmitted directly to the follower countries. Greater economic freedom may directly influence the productivity growth rate by providing stronger incentives for innovation. It may also increase the rate at which a follower country absorbs technology because of more flexible markets as well as greater incentives. We investigate the effect of freedom on technology transfer by interacting the technology gap with economic freedom. Adding Frontier Growth and the interaction term to equation (6), we get,

$$\begin{aligned}&\Delta \ln TFP_{i(t\ to\ t+1)} = \\ &\alpha + \beta_1 \cdot \ln TFPGap_{it} + \beta_2 \cdot EF_{it} + \beta_3 \cdot FrontierGrowth_t \\ &+\beta_4 \cdot \ln TFPGap_{it} * EF_{it} + \beta_i \cdot Country_i + \varepsilon_i\end{aligned} \tag{7}$$

This model differs in two ways from the previous model. First, the frontier growth rate enters explicitly. Second, the effects of freedom and the technology gap are no longer linear. The catch-up coefficient is now $\beta_1 + (\beta_4\ EF)$ and the economic freedom coefficient is $\beta_2 + (\beta_4 \ln TFPGap)$. We expect the coefficients of lnTFPGap and economic freedom, $\beta_1$ and $\beta_2$, to be negative and positive. $\beta_1$ is the catch-up coefficient, assuming that the economic freedom index is zero, which eliminates the interaction term. $\beta_2$, on the other hand, is the economic freedom coefficient for the frontier country. (For the frontier country, the TFP gap is one; its logarithm is zero, which eliminates the interaction term. For all other countries, the logarithm of the TFP gap is negative.) We expect economic freedom to be positively associated with the growth of the productivity frontier. In addition, we expect the coefficient of frontier growth to be positive and that of the interactive term to be negative. A negative coefficient for the interaction term means that the catch-up coefficient, $\beta_1 + (\beta_4\ EF)$, is larger in absolute value, the greater the value of the freedom index. Convergence accelerates. A negative coefficient for the interaction term also means that the effect of freedom, $(\beta_2 + \beta \ln TFPGap)$ on productivity growth will be greater the farther the country is from the frontier. A negative interaction term means that freedom makes it easier to catch up and that the importance of freedom in catch up is greater the farther the country is from the frontier.

Columns 2-5 in Table 5, give the estimates of equation 7 with country dummies included. The F statistic for dropping the country dummies is in column 7. It fails to meet the critical value of 2.11 ($p = 0.05$) for the manufacturing sector and for four of the branches. For these five industries, we next test the null hypothesis that the coefficients of the technology gap and economic freedom are jointly equal to zero. This null could not be rejected for three branches, 34, 35, and 384. Again the preferred estimates are in bold type.

**Table 5: The Direct and Indirect Effects of the Technology Gap and Economic Freedom on TFP Growth in the Manufacturing Sector and Selected Industries: The Interaction Model**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Full Model | | | | | | Preferred Model if Full Model is rejected | | | | |
| Industry | TGap | EF | Front | TGap·EF | $R^2$ | F-Stat | TGap | EF | Front | TGap·EF | $R^2$ |
| ISIC 3 | 0.52$^{!}$ | -0.02$^{!}$ | -0.58 | -0.09$^{!}$ | 0.70 | 2.10 | **0.20$^{!}$** | **0.00** | **-0.41** | **-0.04$^{!}$** | **0.48** |
| | (4.44) | (-2.73) | (-1.57) | (-5.33) | | | **(2.35)** | **(-0.74)** | **(-1.02)** | **(-3.13)** | |
| ISIC31 | **0.05** | **-0.02** | **0.17** | **-0.02$^{*}$** | **0.59** | **2.26** | | | | | |
| | **(0.56)** | **(-1.40)** | **(0.61)** | **(-1.65)** | | | | | | | |
| ISIC32 | **1.11$^{!}$** | **-0.08$^{!}$** | **-0.84** | **-0.17$^{!}$** | **0.71** | **3.63** | | | | | |
| | **(5.45)** | **(-3.36)** | **(-0.56)** | **(-6.20)** | | | | | | | |
| ISIC33 | **0.86$^{!}$** | **-0.04$^{*}$** | **0.34$^{*}$** | **-0.14$^{!}$** | **0.72** | **2.76** | | | | | |
| | **(5.15)** | **(-1.72)** | **(1.53)** | **(-4.86)** | | | | | | | |
| ISIC34 | 0.30 | -0.01 | -0.05 | -0.06 | 0.59 | 1.86 | | | **-0.23** | **-0.01$^{!}$** | **0.30** |
| | (1.81) | (-1.00) | (-0.22) | (-2.46) | | | | | **(-1.04)** | **(-3.90)** | |
| ISIC35 | -0.46 | 0.01 | 0.56 | 0.04 | 0.50 | 1.84 | | | **0.29$^{\#}$** | **-0.01$^{!}$** | **0.17** |
| | (-1.45) | (0.76) | (3.69) | (0.82) | | | | | **(2.13)** | **(-2.78)** | |
| ISIC36 | **0.27$^{\#}$** | **0.01** | **0.16** | **-0.07$^{!}$** | **0.70** | **3.12** | | | | | |
| | **(2.10)** | **(1.07)** | **(0.35)** | **(-3.91)** | | | | | | | |
| ISIC37 | **0.13** | **-0.01** | **0.76$^{!}$** | **-0.04$^{!}$** | **0.70** | **2.45** | | | | | |
| | **(1.27)** | **(-0.69)** | **(2.52)** | **(-3.02)** | | | | | | | |
| ISIC38 | 0.38 | 0.01 | 0.15 | -0.07 | 0.60 | 1.47 | **0.25$^{\#}$** | **0.00** | **0.39$^{*}$** | **-0.05$^{!}$** | **0.29** |
| | (2.24) | (0.47) | (0.40) | (-3.02) | | | **(2.02)** | **(-0.39)** | **(1.45)** | **(-2.64)** | |
| ISIC384 | 0.00 | 0.02 | 0.58 | -0.02 | 0.53 | 1.09 | | | **0.34$^{!}$** | **-0.01$^{!}$** | |
| | (0.02) | (1.39) | (3.64) | (-1.07) | | | | | **(2.36)** | **(-3.97)** | |

Note: 1) Bold type indicates the preferred model. 2) The number in parentheses is the t-statistic for the coefficient. 3) The coefficients for ISIC 33 were estimated from an 11-country sample (France excluded); 12 countries were available for the remaining industries. 4) !, #, and * indicate significance at $p=0.01$, $p=0.05$, and $p=0.10$ with a one-tail test. 5) See Table 3 for industry definitions. 6) TGap is the logarithm of the technology gap, which is defined as a productivity gap of country $i$ from a base country $b$, the country with the highest TFP, s.t $TGap_{i,t} = \ln TFPGap_{i,t}$, where TFPGap is the country's productivity as a proportion of the frontier country's productivity. 7) EF is the Fraser Index of

Economic Freedom. 8) Front is Frontier Growth, which is the growth rate of TFP for the leading country. 9) TGap.EF is TGap times EF.

The results for the manufacturing sector require additional consideration, particularly because the test for the joint significance of the country fixed effects at p = 0.05 is right on the margin. The equation without the country fixed effects in columns 8-11 has insignificant coefficients of economic freedom and frontier growth. The coefficient of the technology gap is positive and statistically significant. This result says that if the economic freedom index is zero, TFP grows faster the smaller the technology gap. In this case the effect of the technology gap on growth is the catch-up coefficient times TGap. TGap is the logarithm of the productivity ratio, resulting in its logarithm being zero or negative. As the gap increases—the productivity ratio gets smaller—the variable takes increasingly large negative values, resulting in larger reductions in growth. Recall, however, that this is for an economic freedom index of zero; because no country in the sample has a zero freedom index, the effect of economic freedom on the catch-up coefficient must be considered.

The observed range for the economic freedom index is roughly 5 to 8. To find where the catch-up coefficient switches from divergence to convergence, set $\beta_1 + (\beta_4 . EF)$, equal to zero and solve for EF. The coefficient equals zero when $EF = \beta_{1/}\ \beta_4$. Using the restricted results for the manufacturing sector, this is 5. So the catch-up coefficient is positive with freedom indices less than 5, in which case productivity diverges. Divergence is greater, the greater the technology gap. Convergence occurs for countries with freedom levels greater than 5. For these countries, convergence is faster the greater the technology gap. The size of the catch-up coefficient varies with the level of economic freedom; for freedom indices of 7 and 8, the catch-up coefficients are (0.20 – (-0.04 * 7) -0.08 and –0.12. Thus, the greater the freedom index, the faster the convergence.

The restricted estimate shows that economic freedom has a positive effect on TFP growth even though the coefficient of EF is not significantly different from zero. The freedom coefficient is –0.04 times TGap. For the frontier country, freedom has no effect on growth. For productivity ratios of 0.75 and 0.50, the associated TGaps are –0.29 and –0.69, giving freedom coefficients of 0.0116 (given by (-0.04*-0.29)) and 0.0276.

The unrestricted estimate for the manufacturing gives a similar result for the catch-up coefficient; the breakeven freedom index is 5.8. If it is less than 5.8, growth rates diverge; greater, they converge. As the freedom index goes from 7 to 8, for instance the catch-up coefficient goes from –0.11 to –0.20. The economic freedom coefficient in this estimate, however, is somewhat different; it is -0.02 – 0.09 TGap. Thus, for the frontier country (TGap is zero) economic freedom reduces productivity growth. The coefficient remains negative until the productivity ratio falls to 0.8. The farther the country from the frontier, the greater the freedom coefficient. For productivity ratios of 0.75 and 0.50, the freedom coefficients are 0.006 and 0.042.

The coefficient for the technology gap is positive and significant, as we have seen for the manufacturing sector and for five of the industries (ISIC 32, ISIC 33, ISIC

34, ISIC 36 and ISIC 38). To interpret this, it is necessary to consider the coefficient in conjunction with the interaction coefficient. So, for industry 32, the effect of the gap on productivity growth is 1.11 – 0.17 * EF. If EF is 6.5, which is the lowest value for the index in 1996, the coefficient for catch up is 0.005. There would be no convergence. A freedom index of 8 yields a catch up coefficient of -0.25. Dividing the gap coefficient by the interaction coefficient gives the economic freedom value for which the coefficient is zero. For industries 32 and 33 the coefficients imply that the least free countries in the sample are not converging. For the remaining industries with both of these coefficients significant, the breakeven value of economic freedom is 5 or less, which implies that all of the countries in the sample have a catch-up coefficient that leads to convergence. It is important to note, also, that in all cases the greater the freedom index, the faster the convergence. For the three industries where the gap coefficient is omitted from the equation, catch up occurs regardless of the freedom index, but it is faster the larger the freedom index.

The coefficient of economic freedom is only significant in two of the preferred specifications—for industries 32 and 33—and it takes a negative value. Taken literally, as we have seen, this says that for the frontier—the technology gap is zero—economic freedom reduces productivity growth. At the average value of the technology gap for these two industries, productivity growth is positively associated with economic freedom. But as the gap narrows, eventually the partial effect of freedom on growth is negative. This result is fairly robust for industries 32 and 33, and it is difficult to find an explanation. For the remainder of the industries, except for 35 where it is not significant, the partial effect of freedom on growth is given by the interaction coefficient times the level of the technology gap. The greater the gap, the greater the growth. Perhaps the most significant conclusion from this analysis is that freedom has its effect on productivity growth indirectly through it effect on the size of the catch-up coefficient and through an additional effect that is stronger the farther the country is from the frontier.

Finally, the effect of growth in the productivity frontier, which we expect to positive, is significantly greater than zero in five of the industries. It is significant at 0.01 in one industry, 0.05 in two industries, and 0.10 in two industries.

This section shows a reasonably strong association between economic freedom and productivity growth. Adding the level of economic freedom to a traditional convergence equation, we find that convergence is generally supported. If time effects are omitted, we also find that economic freedom is positively associated with productivity growth. Using F tests, we find that time effects are not significantly different from zero. The preferred model is the one without country and time effects for seven of ten industries. The manufacturing sector and five of the nine disaggregated industries have significant freedom coefficients in the preferred models. Expanding the model to include the interaction between economic freedom and the technology gap provides even stronger support for the role of economic freedom in productivity growth. This interaction term is significant in all industries. Its negative coefficient implies that as economic freedom increases, convergence is enhanced. It also implies that as the technology gap widens economic freedom has a greater effect on productivity growth. In two or three instances, economic freedom has a negative effect on productivity growth for countries at or close to the frontier. For these same industries, countries productivity diverges for countries at the lowest observed freedom levels.

## CONCLUSION

This chapter examines productivity convergence and economic freedom for 12 selected OECD countries, 8 of which are in the EU. These countries experienced rising levels of economic freedom beginning in 1975. Other EU countries and current and potential accession countries have also experienced increased levels of economic freedom.

Three Anglo countries and four Social-Market countries have experienced these increases, but the Anglo countries have freedom levels above the Social-Market ones. Productivity convergence among EU countries is of particular interest because it would ease certain problems associated with deeper integration. We do not have data for current accession countries, but we do for eight EU countries, including three that joined in the 1980s, and four non-EU countries. The observed convergence among these countries suggests that the current accession countries may be experiencing convergence.

We find an association between variations in economic freedom and productivity growth that is counter to Freeman's findings. We believe that our results differ from his because we test for time fixed effects and find that they are often jointly insignificant. We also find that economic freedom and the technology interact, such that economic freedom is more important the farther a country is from the frontier and that convergence is faster the greater the level of economic freedom. If the current accession countries follow the pattern of the earlier accession countries, it can be expected that economic freedom will be increasing in those countries. Our results indicate that increases in economic freedom, in turn, will enhance productivity convergence and productivity growth.

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# 5

## WHAT DETERMINES RELATIVE SECTORAL INVESTMENT PATTERNS IN EU REGIONS?

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### INTRODUCTION

Prior to the inauguration of the EMU, fears of increasing specialization and core-periphery tendencies had risen. Economic regions showing a rather heterogeneous industrial structure could find themselves confronted with the risk of economic shocks being intra-regionally un-smoothable. Potential contrasting specialization tendencies between central and peripheral regions would thus lead to the need of improved and flexible shock absorbing mechanisms at the regional level. To date, we have no clear indication about the determinants of the level of regional specialisation in the EU and specifically not about the specialization tendencies to be expected due to increased factor mobility and market integration.

Since Krugman (1991), the New Economic Geography (NEG) has gained a special focus of attention. According to NEG models, specialization need not – like in the neo-classical world – develop according to the comparative advantage of regions, but can be the result of historical conditions, i.e. path dependency, and random macroeconomic events. Thus, even similar regions can develop differently and the resulting patterns of specialisation are ex ante unpredictable.

In the investigation of sectoral specialization patterns, it is possible either directly to focus on output or trade data[20] or to look at the allocation of the most important factors of production: labour and capital. In a descriptive analysis of the localization patterns of employment in EU countries, Brülhart and Torstensson (1996) as well as Brülhart (1998) confirm that scale-intensive industries are marked by a strong concentration of employment across EU countries, while they are at the same time predominantly located in central EU countries. The process of concentration seems to be already more advanced in the high-technological and scale-intensive sectors than in labour-intensive and science-based sectors - the latter two now showing stronger tendencies of specialization. The result that employment in small-scale

[20] Trade data can be regarded to give insights into the specialization of an economy insofar as the sectoral patterns of trade approximately reflect the structure of national production. Studies on trade patterns focus on the degree and development of inter- and intra-industrial trade of countries. Ireland, Denmark, Portugal, and Greece seem to be highly specialized, but there is no clear evidence of strongly increasing specialization tendencies of EU countries according to e.g. European Commission (1997) and Greenaway and Hine (1991).

industries is still relatively dispersed across EU countries is in contrast to the strong regional clustering in the US found by the seminal study in Krugman (1991).

Since the high mobility of employees across US states contrasts sharply with the low mobility of labour across the EU, we must not neglect the analysis of capital data - especially as inside the EU we face an increasing mobility of capital which is enforced by EMU and financial market integration. In addition, a profound analysis of regional, not only national, specialization is still missing in recent research. This study therefore aims to identify the determinants of sectoral specialization patterns of EU regions with respect to gross fixed capital formation, i.e. what causes a region to have especially strong investments in a particular sector.

Factor cost differentials between regions, due to e.g. productivity differentials, are essential in the explanation of specialization patterns according to traditional trade theory. Market integration increases regional specialization in line with trade expansion. Agglomeration tendencies such as a high density of population, capital or economic activity in only one regional area and a disequilibrium in economic developments are, however, not to be expected. Polarisation theory, instead, stresses possible circular and cumulative agglomeration tendencies in the centre accompanied by “backwash-effects” which are unfavourable for peripheral regions. The NEG also predicts that, due to the existence of economies of scale, the production of each differentiated good is locally concentrated. It locates close to large markets due to forward and backward linkages, i.e. advantages from being close to consumers and (intermediate-) input markets. The core thus specializes in scale-intensive economic activity, the periphery in sectors with constant or decreasing economies of scale. The impact of the centripetal forces of economies of scale are the lower, the stronger centrifugal forces such as transaction costs are. Increased market integration might thus lead to enforced agglomeration tendencies. As soon as transaction costs are sufficiently low, low labour costs in the periphery may act as a dispersion factor. Recent NEG models thus predict an inverse U-shaped curve of sectoral concentration.

The few econometric studies testing the predictions of the NEG mostly focus on the geographic concentration of industries across countries or regions, neglecting the explanation of regional specialisation. The level of sectoral concentration across EU countries is investigated by Amiti (1999) and Haaland et al. (1999), and one across Spanish regions by Paluzie, Pons and Tirado (2001). These studies have identified a higher level of demand concentration, human capital, stronger scale intensity and intermediate-input intensity of a sector to increase its level of concentration while a high labour intensity seems to decrease the sector’s uneven allocation across space[21]. Amiti (1999) additionally finds significant positive time effects and concludes that reductions in trade barriers have possible increasing impacts on sectoral concentration. Middlefart-Knarvik et al. (2001) focus on the determinants of the location of sectors analyzing gross value added. Sectors which are intensive in unskilled labour are located in peripheral, low wage countries while those industries highly dependent on intermediate inputs and subject to increasing returns to scale

[21] The finding of Haaland et al. (1999) of a significant negative impact of economies of scale on sectoral concentration for 1992, one of the two years analyzed, however, is a controversial outcome.

are significantly stronger attracted by central regions. In addition, all industries prefer to locate in big regions, i.e. close to large markets.

Investigating the manufacturing specialization of regions, Kalemli-Ozcan, Sorensen and Yosha (1999) find higher population density, lower per capita gross regional product, lower number of population of a region as well as a higher degree of risk sharing (supposed to represent financial market integration or development) to have a significant increasing impact on regional specialization. In an investigation of the level of relative regional investment specialization of EU regions, Stirböck (2002a, 2002b) detect that the location of a region in either the economic centre or in the periphery increases the uneven relative allocation of investments across sectors within the region. The level of regional investment specialization is also augmented by a region's small size, weak market potential (gross regional product), high population density, high unemployment rate and increasing economic openness or capital market integration. The fact that economically central regions as well as peripheral regions are stronger specialized than other regions is of particular interest when analyzing the regional specialization patterns in specific sectors in the following.

Our analysis is twofold. In the next section we start with an exploratory spatial data analysis of regional specialization patterns in order to identify the spatial structure of relative sectoral investment shares, i.e. where are clusters of regional specialization in the different sectors. The following section contains the econometric analyses of the determinants of strong or weak relative sectoral investments, i.e. what sort of EU regions are specialized in specific sectors. This is intended to give insight into regional characteristics that influence the allocation of economic activity across sectors within a region and thus regional specialization patterns.

## EXPLORATORY SPATIAL DATA ANALYSES OF RELATIVE SECTORAL SPECIALIZATION PATTERNS OF EU REGIONS

EU regional entities are defined by the Eurostat Nomenclature on territorial units (NUTS – Nomenclature des unités territoriales statistiques). We analyze EU regions at the NUTS 2-level for the period 1985 to 1994. The maximum number of regions included is 45. These regions belong to Belgium, Denmark, France, Luxembourg, Ireland as well as Italy[22]. For all other countries and years, the availability of regional data for different sectors is not sufficient for our kind of analysis. The disaggregation of EU countries into NUTS-regions is primarily based on political or administrative entities. Such "normative" regions are regarded for practical reasons of data availability in the REGIO database, but also in accordance with the implementation of regional policies[23]. These regions are not defined on the basis of economic criteria. This is often criticized by economists as this might not give us the actual degree of specialization of economic entities. However, the definition of economic regions might differ for each variable or even sector regarded, i.e. a general

[22] Details and further explanation are given in an appendix.
[23] Since the 1961 Brussels Conference on Regional Economies, regional policies are generally applicated in NUTS 2-regions (Eurostat, 1999).

specification of regional disaggregation is inappropriate. In addition, the analysis of normative regions, disaggregated according to NUTS, allows us to focus on the degree of specialization of a territorial community which is authorized to implement regional policies or is in the focus of regional structural programmes. Since the debate concerning the specialization level of EU regions originates in questioning their regional shock absorbing potential and the need to improve regional policies, the analysis of *administrative* regional entities is one relevant empirical aspect.

Up to 17 differentiated sectors (see Table 1) – consistent to the industrial classification of NACE Rev. 1 – Nomenclature des activités économiques dans les Communautés Européennes – are available in the REGIO database. These refer to agriculture, manufactured products as well as market and non-market services.

In our analysis of the investment patterns in these 17 sectors, we focus on their investment shares in relation to an economy of reference. Thus, relative investment specialization (SPCFEU: **SP**ecialisation of gross fixed **C**apital **F**ormation in relation to **EU** patterns) is measured. This is important as the absolute allocation of production across sectors does not give any information about a region's particularly high level of sectoral engagement, while this is what we focus on: relative allocation and hence, relative specialization in the different sectors. It is the unequal size of regions or sectors that generally causes the difference between the absolute and the relative specialization[24].

**Table 1: Sectors Disaggregated According to NACE Rev. 1**

| Sector | Abbr. |
|---|---|
| **Agricultural, forestry and fishery products** | AGRO |
| **Manufatured products** | |
| Fuel and power products | FUEL |
| Ferrous and non-ferrous ores and metals, other than radioactive | META |
| Non-metallic minerals and mineral products | MINE |
| Chemical products | CHEM |
| Metal products, machinery, equipment, electrical goods | METP |
| Transport equipment | TREQ |
| Food, beverages, tobacco | FOOD |
| Textiles and clothing, leather and footwear | TEXT |
| Paper and printing products | PAPE |
| Products of various industries | VARI |
| Building and construction | BUIL |
| **Services** | |
| Recovery, repair, trade, lodging and catering services | TROL |
| Transport and communication services | TRCO |
| Services of credit and insurance institutions | CRED |
| Other market services | OTHS |
| Non-market services | NMSE |

[24] While measures of absolute allocation are influenced by regional size and sectoral classification, measures of relative allocation are influenced by the sectoral patterns of either the economy of reference or the average pattern of the group of countries included. In case of a very special pattern of the reference economy, the relative specialization pattern of the economic entities analyzed can be biased. See e.g. Stirböck (2001) or Krieger-Boden (1999).

Relative investment indices have therefore been constructed measuring the sectoral investment share of the respective region $s_{ij}$ in relation to the average sectoral share of all EU regions (EU thus being the reference economy $r_i$)[25]:

$$SPCFEU_{ij} = \frac{S_{ij}}{r_i} = \left(x_{ij} / \sum_i x_{ij}\right) / \left(\sum_j x_{ij} / \sum_i \sum_j x_{ij}\right)$$

with i (j) as the sectoral (regional) index. As a result, this adapted „Balassa-index“[26] reflects the relative sectoral investment “performance” of a region. If the region’s investment in one sector is relatively strong (low) compared to the average sectoral share in EU, the index is higher (smaller) than 1[27]. Table A6 presents the average level of SPCFEU for each sector of the 45 NUTS 2-regions analyzed.

The investigation of *regional indices of sectoral specialization* does not give insights into the level of *sectoral concentration* across space. Relative sectoral investment shares simply tell in which regions investments in a sector are particularly strong or weak. A spatial agglomeration of the sector is only evident in case of high Balassa-indices in one or few nearby regions.

Paying attention to possible discrepancies or core-periphery tendencies, we find many regions located far away from the centre to have an allocation of investments particularly different from the EU average, most regions near the centre to have a more or less even relative allocation and the economic centres (proxied by the administrative centres[28]) to have a strongly uneven relative allocation as well (Stirböck, 2002a/2002b). Thus, the level of relative regional specialization of the core as well as the peripheral regions is particularly high. Depending on the specific sectoral specialization, the regional growth potential differs. A region might profit

[25] As sectoral GFCF data are not in all cases as complete as we wish it to be, we had to use adequate but different data representing the economic extent or importance of the different sectors to calculate sectoral specialization indices with respect to GFCF. Therefore we refer to data of gross value added at factor costs as the denominator when calculating the specialization indices in relation to EU average patterns. Eurostat (2000b) similarly uses the regional contributions of national gross value added as distributional weights when the national values of gross domestic product (GDP) need to be divided among the regions.
Sectoral investment shares of each region as well as the average EU sectoral shares of value added at factor costs (VAFC) are given in the appendix in Table A5. For most sectors, average EU sectoral shares of VAFC are comparable to the average sectoral share of total GFCF in Italy or France. Only for OTHS, the sectoral shares of VAFC are much lower than those of GFCF, thus potentially leading to an upward bias, i.e. an increase in the level of SPCFEU. In contrast to OTHS, the average sectoral shares of VAFC are higher than those of GFCF for the sectors BUIL, CRED (however, not for Luxembourg), and TRLO. As a consequence the level of SPCFEU might be biased downwards for these sectors. However, such effects do not disturb the analysis of relative sectoral specialization patterns as long as each sector is analyzed in separate estimates since the bias is symmetric for each region.

[26] This kind of specialisation index has first been introduced by Balassa for the analysis of the relative export “performance” of a country by use of export data and is known as the “revealed comparative advantage” index in international trade theory [see e.g. Balassa (1989:19)].

[27] In some few (four) cases, negative investments were replaced by zero investments in order to avoid problems in the interpretation and calculation of further indicators. Such negative investments are mostly due to realignments and depreciation and are always close to zero investments.

[28] In some countries like Germany, the administrative centre would not adequately represent the economic centre. However, in the countries analyzed, the administrative centre is a good proxy.

from relative specialization, it might also suffer from relative specialization in case of an unbalanced or unfavourable specialization.

We use Moran scatter plots in order to display spatial patterns in sectoral investment structures such as clusters of similar sectoral investment shares or outlying regions. These are one tool of the exploratory spatial data analysis[29]. The Moran scatter plot was introduced by Anselin (1995) and is used to visualize the patterns of spatial association between neighbouring regions. It thus gives a description of the spatial distribution of the variable observed, i.e. the spatial allocation of sectoral investments and the spatial association between nearby regions. For such a spatial analysis, spatial weighting matrices defining the spatial structure of interaction are needed. We use the inverse squared distances between the regional capitals which reflects a decreasing strength of influence of neighbouring locations with increasing distance.

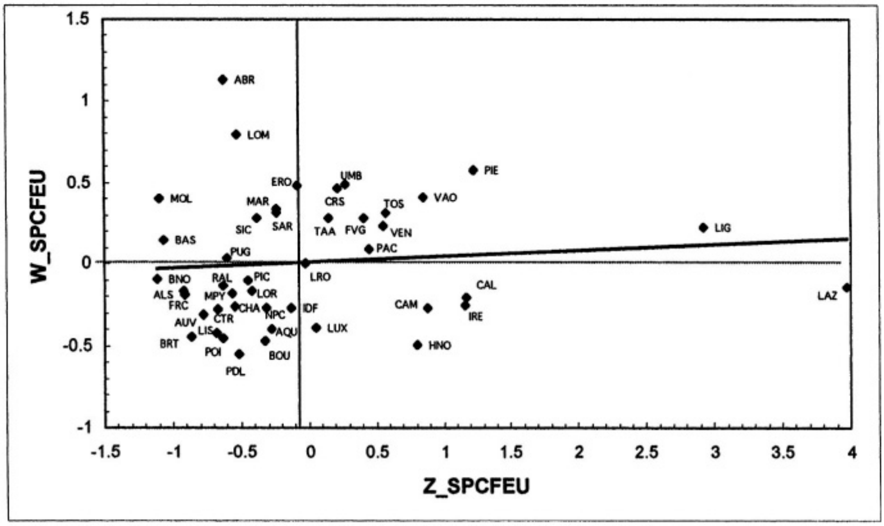
The Moran scatter plot in Figure 1 displays the spatial association between the 45 regions (for details see Anselin, 1996) with respect to their average specialization index in transport and communication services and the spatially weighted average of the neighbouring values (W_SPCFEU). The sectoral specialization indices are taken as deviations from the sectoral mean (Z_SPCFEU). Different scatterplots are thus comparable. In the upper right and the lower left quadrant, those regions are displayed which are surrounded by regions similarly specialized in the respective sector and are thus marked by positive spatial association. Regions with dissimilar neighbours are located in the upper left (regions with low specialization in a sector surrounded by regions highly specialized in this sector) and the lower right quadrants (regions highly specialized in a sector surrounded by regions with a low specialization in this sector). Those points which are more than two units away from the origin are regions that can be characterized as outliers[30]. Figure 1 displays the scatter plot for TRCO, Figure 2 the one for FOOD, and the other sectors' scatter plots are given in the appendix B (see Figure B1 to B15).

It is important to note that Moran scatter plots present spatial distributions, i.e. they tell us which regions are surrounded by similar or dissimilar regions. Due to the standardization of SPCFEU, i.e. its presentation in deviation from the mean, it becomes visible which regions have a higher or lower level of relative investment shares than the average level of the regions regarded. However, the actual (or non-standardized) level of relative specialization in a sector – which is presented in Table A6 – is not given in the plot. We might thus see a cluster of very similar, though not strongly specialized regions in a sector. It is therefore important to pay attention to the non-standardized level of relative specialization (SPCFEU) in a sector as well when drawing economic conclusions.

[29] The exploratory spatial data analysis tools rely on the methods of exploratory data analysis following e.g. Tukey (1977).

[30] Since the values are standardized in the Moran scatter plot, i.e. expressed in deviation from their mean, those values further than two units away from the origin are generally treated as outliers according to the two-sigma rule (Anselin, 1995: 45).

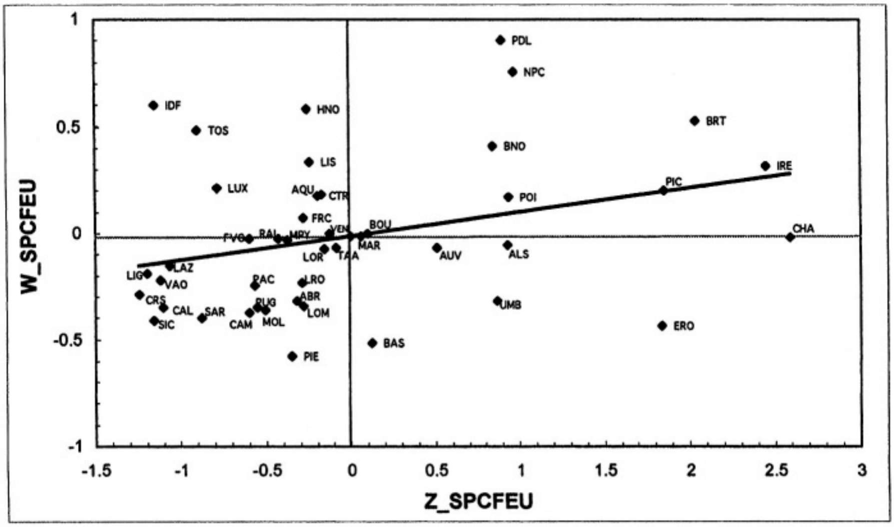
**Figure 1: Moran Scatter Plot: Transport & Communication Services, NUTS 2**




Note: Average pattern for 1985-94; Z_SPCFEU displays the deviation of the different SPCFEU from their mean while W_SPCFEU represents the spatially weighted average of the neighbouring values.

The scatter plot for relative specialization in transport and communication services gives evidence of a very high relative specialization in the regions Liguria and Lazio compared to the other regions. There is no region with an outlying low value of relative specialization in TRCO. The North and North-Western Italian regions Liguria, Piemonte, Valle d'Aosta, Toscana, Venetio, Umbria, Trentino-Alto-Aldige, and Friuli-Venezia Giulia, as well as the French regions Provence-Alpes-Côte d'Azur and Corse, show an above average relative specialization and are surrounded by similar regions, i.e. regions highly specialized in TRCO as well. The level of specialization of Corse, however, is above average, but rather moderate. In addition, Provence-Alpes-Côte d' Azur is somewhat stronger specialized than Corse, but not as high as one would have expected from the existence of e.g. the technological centre Sophia-Antipolis near Nice. The reason for this only moderate relative specialization is the stronger diversification of this Mediterranean region, compared to the Italian regions. Highly specialized in TRCO, though surrounded by regions with a low specialization in TRCO, are Ireland, the Haute-Normandie, Campania as well as Calabria. Of the named regions, only Corse and Trentino-Alto-Aldige show a level of relative specialization slightly below 1.5, all these regions are thus highly specialized in TRCO compared to average EU patterns.

**Figure 2: Moran Scatter Plot: Food, Beverages & Tobacco, NUTS 2**




Note: See Figure 1.

In the FOOD sector, we have three regions with outlying strong relative investments (i.e. Z_SPCFEU > 2): Bretagne, Ireland, and Champagne-Ardenne. The upper right quadrant gives those regions which are highly specialized in FOOD and are surrounded by similarly specialized regions. Most of these are located in France. Regions with a high relative importance of investments in the FOOD sector, thus, appear to be locally concentrated in the North-West of France (Picardie, Nord-Pas de Calais, Pays de la Loire, Bretagne, Basse-Normandie as well as Poitou-Charentes). In Italy, we see three central Italian regions with above average relative investment shares in FOOD: Basilicata, Umbria, and Emilia-Romagna. These are, however, never surrounded by similar regions, but by regions with a below average specialization in the sector "food, beverage & tobacco". Compared to TRCO, relative investment shares in FOOD have a lower level. Only five regions, three of them in France, show regional investment shares which are 50 per cent higher than average EU investment shares in the sector FOOD.

A particularly high specialization in agricultural, forestry & fishery products (AGRO) is obvious for the two Italian regions Basilicata and Molise in contrast to the Île de France which has the lowest relative investment share. While a cluster of regions with a high relative specialization in FOOD was visible for the North-Western French regions, we now have evidence of a spatial cluster in AGRO across Italy as most, i.e. 14 of the 20 Italian regions are highly specialized in AGRO while being surrounded by similar regions. In addition, 17 of the 20 Italian regions and 13 of the 22 French regions have Balassa-indices for AGRO of more than 1.5 which demonstrates the high relative importance of this sector in France and Italy. Italian regions with a relative specialization below the mean (i.e. Z_SPCFEU < 0) in agriculture are e.g. Lazio, Liguria, and Campania, i.e. a number of those regions, we identified to show a high importance of investments in TRCO. Ireland, instead, provides evidence of strong relative investments in AGRO in addition to TRCO. With respect to the French regions, Champagne-Ardenne shows the highest relative investment share– this is not surprising since AGRO also includes investments in wine-growing.

As for AGRO, though not as widespread, we have a clustering of the textiles industries (TEXT) in Italy. Eight Italian regions are highly specialised in the sector TEXT while surrounded by highly specialized regions. In contrast to AGRO, this cluster is concentrated mainly in the central and Northern parts of Italy. Four regions have above average relative investment shares when analyzing the standardised values of relative investment specialization: Marche, Toscana, Lombardia, and Veneto. But only these four as well as Piemonte also show a high non-standardized value of relative specialization of more than 1.5.

Another cluster located in Italy can be found for relative investments in non-metallic minerals and mineral products (MINE) which is especially strong in Umbria, Emilia-Romagna, and Toscana and more moderate in Abruzzo, Veneto, Molise, Sardegna, Sicilia, Puglia, and. Relative investments in fuel & power products (FUEL) are also clustered in Southern Italian regions with especially strong specialization indices in Sardegna followed by Sicilia, Puglia, Calabria as well as Molise, Basilicata, Abruzzo, Umbria, and finally Lazio. High relative investments, though not surrounded by regions with similar patterns, are also to be found in the French regions Provence-Alpes-Côte d'Azur, Haute-Normandie, and Centre (F). Finally, building & construction (BUIL) is clustered in Italy as well. We find regions with above average investments in BUIL which are surrounded by similar regions mostly in Southern Italy: Sicilia, Puglia, Campania, Molise, and outstanding Basilicata and Calabria[31]. While in the before mentioned Italian regions the non-standardized value of the relative specialization indicator is near or above 1.5 for both, MINE and FUEL, this is not the case for BUIL. We can thus identify a geographical proximity of South Italian regions with the highest relative investment specialization indices in BUIL. However, the absolute level of relative specialization in this sector is rather low[32].

There is no clear pattern of clustering neither for CHEM, META, METP, PAPE, TREQ, nor for VARI. We find that Sardegna and Haute-Normandie have outstanding relative investments in the chemicals industries, and the Basse-Normandie in "ferrous & non-ferrous ores & metals" (META). Auvergne is relatively strong in investments in various industries, Molise, Franche-Comté, and Piemonte in transport equipment, Lombardia and Emilia-Romagna in "metal products, machinery, equipment & electrical goods", Haute-Normandie and Limousin in paper & printing products.

[31] Relative investments in BUIL are only slightly above average in Puglia, though it is obviously surrounded by a number of regions with high relative investments in this sectors and is thus clearly part of the identified cluster. In addition, a number of French regions is specialised in BUIL, but not surrounded by similar regions.
[32] To some extent, this is due to the described downward bias in the indicator. However, the indicators' levels are – like for TRLO – consistently rather low.

With respect to credit and insurance services (CRED), we have an outstanding high relative investment share in Luxembourg, dominating the whole spatial patterns of association, followed at a large distance by Ireland and the Île de France. The high credit specialization of Luxembourg even causes the outlier-position of Lorraine (more than two units away from the origin with respect to the spatially weighted average of neighbouring values), its neighbour, which, itself, turns out to show a specialization moderately below average. Relative investments in other services (OTHS) are especially strong in the Île de France and particularly low in Luxembourg. A number of those regions with a high relative specialization in OTHS, we find to be regionally clustered in Southern Italy (Puglia, Sicilia, Campania, Calabria, and Molise)[33]. Relatively high trade, repair & lodging services (TRLO) investments are clustered in the traditional tourist (and mostly also coastal) Italian regions Veneto, Lombardia, Liguria, Toscana, Emilia-Romagna, and Friuli-Venezia Giulia as well as the isle of Corse. Relative investments in TRLO are outstandingly high in Trentino-Alto Adige – a region in the Alpes where some of the most important Italian ski stations are located. However, besides Trentino-Alto Adige, none of these regions shows a particularly high level of relative investment shares[34].

The scatter plot for non-market services (NMSE) provides evidence of outstanding high investment shares of the state sector in two regions being the isle of Corse as well as the small North-Western Italian Valle-d'Aosta sharing borders with Switzerland and France. Both regions, and only these two, indeed show a non-standardized relative specialisation level of more than 1.5. These two as well as Basilicata are surrounded by dissimilar regions, thus being three local points – and not clusters – of relatively high non-market services investments. In addition, we have another 19 of the 45 regions marked by high relative investments in non-market services which are also surrounded by similar regions. Besides Luxembourg, these regions are mostly located in France. Those regions with the highest relative investment shares are located far away from the French capital, e.g. in the South of France. Most of the regions with a relatively low specialization in NMSE are to be found in Italy or Ireland.

The degree of linear association between the vectors Z_SPCFEU and W_SPCFEU is displayed by the linear regression line superimposed in the Figures (see Anselin, 1996: 115ff; Anselin, 1992: 132f). The regression lines in the Moran scatter plots point to significant positive spatial autocorrelation of the relative specialization of most sectors, i.e. regions are more spatially clustered than in the case of random patterns with respect to their sectoral investment specialization. In other words, regions with a high (low) relative specialization in a specific sector are more likely to be surrounded by regions which are also highly (low) specialized in this sector[35].

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[33] Since the relative investment shares of OTHS are supposedly biased upwards as explained above, we need not interpret their absolute levels here.

[34] To some extent, this is due to the described downward bias in the indicator. However, the indicators' levels are consistently comparably low.

[35] However, from this kind of analysis, we only get information about spatial associations or spatial clustering. Evidence on spatial dependencies or even causal interactions have to be derived from spatial regression analyses which is not the focus of this analysis.

The only exception is the spatial pattern of the relative specialization in the credit and insurance services, transport equipment as well as metal production, Regions highly specialized in these sectors are likely to be surrounded by regions with a low specialization.

In addition to the visualisation of the linear association by use of the bivariate regression line in a Moran scatter plot, its degree, i.e. the slope of the bivariate regression line, is also formally indicated by the Moran I statistic. Moran's I test is defined as $I = \sum_j \sum_k w_{jk}(Y_j - \mu)(Y_k - \mu) / \sum_j (Y_j - \mu)^2$ with W as the row-standardized weights matrix and Y as the variable whose spatial distribution is analysed (Anselin, 1992: 138)[36]. Moran's I coefficient is centred around its theoretical expected mean which is [-1/(N-1)]. Values larger than its expected mean, which in case of a high number of observations is approximately zero, display positive spatial autocorrelation.

**Table 2: Moran's I-Tests**

| Sector | Moran I | z-value | |
|---|---|---|---|
| AGRO | 0.256 | 4.412 | *** |
| FUEL | 0.191 | 3.386 | *** |
| META | -0.054 | -0.454 | |
| MINE | 0.315 | 5.234 | *** |
| CHEM | 0.016 | 0.611 | |
| METP | 0.114 | 2.126 | ** |
| TREQ | -0.026 | -0.036 | |
| FOOD | 0.117 | 2.164 | ** |
| TEXT | 0.129 | 2.360 | ** |
| PAPE | 0.085 | 1.675 | * |
| VARI | 0.103 | 1.955 | * |
| BUIL | 0.238 | 4.125 | *** |
| TRLO | 0.225 | 3.757 | *** |
| TRCO | 0.038 | 0.940 | |
| CRED | -0.022 | 0.024 | |
| OTHS | 0.032 | 0.846 | |
| NMSE | 0.237 | 4.115 | *** |

Table 2 displays the Moran I values for all sectors which reflect the slope in the regression line. None of the three negative Moran I values is significant. Eleven sectors show a significant positive Moran I value. These sectors are AGRO, FUEL, MINE, BUIL, TRLO and NMSE at the 1 per cent-level of significance, METP, FOOD, and TEXT at the 5 per cent-level as well as PAPE and VARI at the 10 per cent-level of significance. We thus find a positive spatial association which is significant for many sectors while the negative spatial association is not. In addition, most of the services sectors, besides TRLO which is naturally concentrated in coastal or mountainous areas, are not spatially associated, but randomly distributed. Though TRCO seemed to be spatially clustered in Northern Italy and OTHS in Southern Italy, according to the Moran scatter plot presented above, we do

[36] For further details on the Moran I coefficient see Anselin (1996: 115ff) and Anselin (1992: 132f).

not find a significant positive spatial association between nearby regions for these sectors.

## EXPLAINING SECTORAL INVESTMENT PATTERNS

In order to explain relative investment specialization in the different sectors, a number of important theoretical determinants can be identified within the traditional trade theory as well as regional economics such as polarization theories and the NEG. The location of the region, economies of scale, market integration, comparative advantages such as factor cost or productivity differentials, and the regional market size need, according to the different theoretical approaches, to be taken into consideration when explaining the regional patterns of sectoral specialization.

Value added in relation to employment captures the level of regional productivity in the different sectors. Since productivity differentials are important for the explanation of comparative advantages in *traditional trade theory,* we use the (annual) deviation of the regional productivity in a sector from the mean of all regions (DPROD) in the estimates. The regional level of sectoral wages and salaries per employee reflects average regional labour costs in the sector. Again, we measure particularly high or low regional levels of labour costs by the (annual) deviation from the mean (DLABCOST). A positive deviation of regional labour costs from the mean should lead to decreasing investments according to the theory if labour costs are important. A negative sign of DLABCOST thus explains investments which are in line with comparative advantages. In addition, a significant negative sign of DLABCOST provides evidence for the importance of labour costs as a factor of dispersion in a particular sector and a potentially inverse U-shaped curve of sectoral concentration.

We use an indicator variable reflecting the location of a region in the economic centre (CENTR) – proxied by the administrative centre of each country[37] – and the regional population density (PODEN) in addition to the distance to the economic centre (DIST) of the respective country as an indicator of the peripherality of the region. A positive sign of CENTR and PODEN as well as a negative sign of DIST in the estimates for the important growth-oriented sectors would support the hypothesis of the *polarization theory* of cumulative agglomeration tendencies in the centre and backwash effects for peripheral regions.

The size of the regional market (MAR) is approximated by gross regional product (GRP). The importance of the market size in the explanation of the location of sector provides evidence in favour of the *New Economic Geography* which predicts that scale-intensive sectors concentrate production close to large markets. The regional level of economies of scale (ES) in a sector is measured by dividing sectoral value added at factor costs by the number of firms in the given sector[38]. The

[37] See footnote 9.
[38] Data availability limits us to this simple measure of economies of scale. A more complex proxy of ES is the average value of shipments per firm, considering the 50 per cent largest firms, assuming that the larger firms are likely the efficient size to exploit economies of scale (Saunders, 1982; Caves, 1974).

significance of the regional level of ES indicates the further agglomeration potential of the respective sector.

In order to measure the impact of market integration (INT), we use an indicator of economic openness by Quinn (1997, 2000)[39]. We expect an increasing impact on the level of regional specialization according to both, the traditional trade theory and the NEG. However, adding this variable in the analysis of sectoral specialization indices might tell us which sectors do profit particularly from increasing economic openness.

According to the product life cycle theory, regions with a strong research intensity specialize in innovative or high-tech products. Once these products are standardized, more labour-intensive (and less innovative) regions take over their production. Therefore, the number of regional patent applications in relation to GRP proxying the regional research intensity (RDINT) is included in the estimation as well.

In addition, we add further regional characteristics and economic performance variables which can be assumed to be important in the explanation of investment decisions. These regional control variables included in the estimations are the regional size (AREA) as well as the unemployment rate (UEWP). Since we do not dispose of any variable reflecting sectoral research and development activity in EU regions, we have to refer to the regional research intensity. We also include indicator variables for the different countries (DUM_FRA, DUM_LUX etc.) as further control variables capturing country-specific impacts. These are constructed relative to Italy.

We thus test the following specification for each sector in a pooled regression for the time period 1985 to 1994:

$$
\begin{aligned}
SPCFEU_{ij} = \quad & \beta_0+\beta_1 MAR_j+\beta_2 CENTR_j+\beta_3 UEWP_j+\beta_4 PODEN_j \\
& +\beta_5 AREA_j+\beta_6 DIST_j+\beta_7 INT_j+\beta_8 RDINT_j+\beta_9 ES_{ij} \\
& +\beta_{10} DPROD_{ij}+\beta_{11} DLABCOST_{ij} + \text{country dummies} + \epsilon_{ij}
\end{aligned}
$$

with $i$ ($j$) as the sectoral (regional) index.

In the estimates, we cannot exclude potential interactions or reverse causation between the relative sectoral investments of a region, i.e. its sectoral specialization, and the regional unemployment rate, market size, research intensity as well as the sectoral level of economies of scale, labour costs, and productivity in the specific region. In order to control for these potential endogeneity problems, instrumental variable regressions have to be conducted additionally.

Neither the number of firms in the different sectors, the number of patent applications, nor the sectoral level of wages and salaries are available for all regions and years. Thus, our dataset is restricted when including these variables in the analysis. We include the regional research intensity independent of the sector focussed on. However, when referring to region-specific sectoral economies of scale,

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The average value added per firm, we use, is a common proxy in empirical studies as well and according to Lall/Siddharthan (1982)'s correlation analysis a sufficient proxy.

[39] The construction of this indicator is explained in the appendix.

DLABCOST as well as DPROD, the analysis is unfortunately restricted to only nine manufacturing sectors with available sector-specific data. Separate estimates have therefore been displayed for each of these additional sector-specific explanatory variables. Thus, theoretically very important variables can only be included in additional estimates with less observations.

Table 3 displays the qualitative results for the pooled estimates which include those region-specific characteristics available for all the years for which we have calculated specialization indices. Results are displayed in case of significance only – which has to be at least 10 per cent, though significance is achieved at the 1 per cent-level in most cases. Detailed results are given in the appendix in Table C1. We used generalized least squares instead of ordinary least squares estimates to control for potential heteroscedasticity in the pooled data of 45 regions and 10 years[40]. The number of observations for each sector is given in the last line. In the case of Denmark, data availability is very poor since we only have specialization indices for four sectors. In addition, information on Irish investments in TRLO and OTHS is not available. Controlling for potential endogeneity between the level of specialization and regional market size as well as UEWP, we conducted instrumental-variables estimates. Following a common approach in econometric analysis, lagged values of the unemployment rate as well as of GRP are included as instruments. Results are given in Table C2 which are very similar.

Investments in many manufacturing sectors are attracted by large markets (MAR – proxied by GRP). Relative investment shares in credit and insurance services, other services, transport and communication as well as trade and lodging services are lower in larger markets. Investments in market services seem to be strengthened in smaller markets, in contrast to investments in manufacturing industries. Relative investments in e.g. agriculture as well as most manufacturing sectors (besides FUEL & BUIL) are significantly lower in the administrative centre (CENTR) of the respective country. Market services, instead, have higher relative investment shares in the centre as well as in densely-populated regions (PODEN) – in addition to their relative strength in small markets.

Significantly lower relative investments are to be found in larger regions (AREA) in agriculture, metal production (META), non-market services as well as transport equipment, while the inverse is evident for fuel & power products, metal products & electrical goods (METP), and various industries as well as the services sectors CRED, TRCO, and TRLO. The location far away from the centre (DIST), i.e. in the periphery, leads to significantly lower relative investments in agriculture and most manufacturing sectors, but to stronger relative specialization in the market services sectors (besides CRED), non-market services as well as building & construction.

Results for the level of the regional unemployment rate (UEWP) as well as for regions being located in countries with a higher economic openness (INT) do not provide clear patterns with respect to the nature of sectoral investment strength. We

[40] We thus estimate variance-corrected standard errors to prevent that potential heteroscedasticity influences the coefficients‘ significance.

thus have no evidence that increasing European integration might influence investments in particular (e.g. labour-intensive) sectors.

Summarizing, we find market services sectors to have a significantly stronger relative gross fixed capital formation in small markets, central regions, regions with high population density as well as peripheral regions. Manufacturing sectors are mainly located outside the national administrative centres, however, not too far away from this economic centre. Investments in manufacturing sectors are, thus, stronger in the central parts of each country, but not in the centre itself. Non-market services investment shares are higher in the peripheral and small regions as well as regions with high unemployment and a low population density. Relative investments in agriculture, finally, are located neither in the centre nor the periphery, and are stronger in smaller, not densely populated regions, but also in large markets. The indicator variables are often significant capturing country-specific impacts.

The additional inclusion of the regional research intensity (RDINT) in separate estimates – due to the availability of the number of patents for the restricted time period 1989 to 1994 – provides evidence of the importance of the regional research intensity in 7 of the 17 sectors[41]. Table 4 shows that a high research intensity leads to a regional investment share which is lower than the average sectoral investment share in agriculture, credit services as well as non-market services. Relative investments, instead, are high in mineral products, chemical, various and metal industries in case of high research intensity. The higher importance of investments in agriculture and non-market services in regions with low research intensity is not surprising. However, we expect investments in the manufacturing sectors to be higher in those regions with a higher research activity due to knowledge spillovers etc. – especially for those sectors marked by high research & development activity like e.g. transport equipment and the chemicals industries.

[41] Due to the strongly decreased number of observations, we refrained from instrumental-variable estimates.

**Table 3: Influence of Regional Characteristics on Sectoral Investment Patterns**

| | AGRO | FUEL | META | MINE | CHEM | METP | TREQ | FOOD | TEXT | PAPE | VARI | BUIL | TRLO | TRCO | CRED | OTHS | NMSE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAR | + | | + | + | + | + | | + | + | | | + | - | - | - | - | |
| CENTR | - | + | - | - | - | - | - | - | - | - | - | + | + | + | + | + | |
| UEWP | + | + | | | + | - | | - | - | - | - | + | - | - | - | + | + |
| PODEN | - | - | - | - | | | | - | - | | - | | + | + | + | + | - |
| AREA | - | + | - | | | + | - | | | | + | | + | + | + | | - |
| DIST | - | | | - | - | - | - | - | - | - | - | | + | + | | + | + |
| INT | | + | | | | | + | + | | | | - | | + | - | - | |
| DUM_FRA | - | - | + | - | | | | + | - | - | | - | - | - | + | + | + |
| DUM_IRE | + | - | + | | + | + | | + | + | | | - | n.v. | - | + | n.v. | |
| DUM_LUX | - | - | + | | | + | | | + | | + | - | | - | + | - | + |
| DUM_DEN | - | - | n.v. | n.v. | n.v. | n.v. | n.v. | n.v. | n.v. | n.v. | n.v. | | n.v. | n.v. | n.v. | n.v. | + |
| no. of obs. | 377 | 377 | 353 | 361 | 360 | 361 | 353 | 361 | 360 | 361 | 361 | 377 | 358 | 363 | 363 | 358 | 377 |

Note: Results are displayed in case of statistical significance only. Detailed results are given in the appendix in Table C1.

We found significant effects for four of the eleven manufacturing sectors including the chemical industries, but not transport equipment. In addition, we have a significant positive sign for VARI (including among others wood, rubber & plastic products, music instruments) & MINE, both with a rather low research intensity. The regional research intensity thus seems to be of minor importance in the explanation of investments, not as predicted by the product life cycle theory. Though, it is to be expected that these estimation results can be improved with a better, more complete database as well as sector-specific information on regional research activity. The other explanatory variables' coefficients – given in Table C3 – remain extremely robust in spite of the sharply decreased number of observations. Only in a few cases[42], they loose or gain significance, but never change their sign when remaining significant.

**Table 4: Additional Influence of the Regional Research Intensity**

| | AGRO | MINE | CHEM | METP | VARI | CRED | NMSE |
|---|---|---|---|---|---|---|---|
| RDINT | - | + | + | + | + | - | - |

**Note: Results are displayed in case of significance only. Detailed results are given in the appendix in Table C3.**

Similar to the research intensity variable, we also added the variables described above on the regional deviation from the average level of productivity (DPROD) in the different sectors, on sectoral economies scale (ES), and on the regional deviation from average labour costs per employee (DLABCOST) in the specific sectors in three separate estimates[43] to the regional characteristics displayed in Table 3. The results for these three sectoral variables are given in Table 5. Detailed results, including instrumental-variable estimates (by use of lagged values of MAR, UEWP, DPROD, ES as well as DLABCOST), are displayed in the appendix in Tables C4 to C6. As explained above, we only have the necessary data for nine manufacturing sectors, and not of all the 17 sectors. In addition, the data availability and thus the number of observations differs in each case. Again, the influence of the explanatory variables, we have already discussed above, is mostly robust in spite of the decreased number of observations[44].

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[42] With respect to the estimates for FUEL, three variables become insignificant, in the estimates for TREQ, BUIL, CRED, and NMSE, two variables loose significance – though in any case, RDINT is only significant in the estimates for CRED and NMSE. However, no systematic pattern is obvious in these changes. CENTR is the variable which looses significance most often (in four cases), though RDINT is only significant in one of these cases. This means that the inclusion of RDINT influences the other variables' significance in very few cases, does never change a significant variable's sign while some variables loose significance in the estimates due to the decreased number of observations.

[43] We tried to add all three variables jointly in one regression for each sector. The results do not change much. The number of observations, however, is still further decreased.

[44] Again, we have no change in sign of any significant variable. With respect to the estimates for TREQ, we have an additional significance of three variables in the estimates including DPROD, in the estimates including DLABCOST, however, two explanatory variables loose significance. A number of changes, though, occur for the regressions including ES: regarding FUEL, four variables become insignificant, regarding FOOD, three, and regarding TEXT, two. Most often, i.e. in three cases, the variable PODEN changes its level of significance.

**Table 5: Additional Influence of Sector-Specific Regional Characteristics**

| | FUEL | MINE | CHEM | METP | TREQ | FOOD | TEXT | PAPE | BUIL |
|---|---|---|---|---|---|---|---|---|---|
| DPROD | + | + | + | | + | + | | + | - |
| DLABCOST | | | | - | | | | - | + |
| ES | + | + | + | + | + | + | + | + | |

Note: Results are displayed in case of significance only. Detailed results are given in the appendix in Table C4 to Table C6.

The results do provide evidence of a consistent significant impact of the sector-specific regional level of productivity and the level of economies of scale. Unsurprisingly, those regions with higher economies of scale[45] as well as a higher productivity in the different sectors attract a higher relative share of gross fixed capital formation. These impacts, however, cannot be found for building & construction. In addition, the regional level of sectoral productivity seems to be of no importance in textiles as well as metal & electrical products.

The impact of the region-specific level of sectoral labour costs is not a general one, but is rather mixed. According to traditional trade theory, one would expect all sectors to increase production (and thus investments) in regions with a lower level of labour costs. This impact should be especially strong or obvious in labour-intensive sectors like the textiles industries. In the estimates, however, we only find significant impacts of DLABCOST for investments of three sectors – though the variance of DLABCOST is quite large. For the paper and printing as well as the metal & electrical products industry, a lower regional level of sectoral labour costs seems to attract investments while the opposite is the case for the building & construction sector.

When conducting additional instrumental-variable estimates, most results can be confirmed[46] - except for the three cases with significant DLABCOST. Thus, sector-specific labour cost differentials between the regions regarded do not explain regional specialization patterns[47]. Only sector-specific productivity differentials play a role according to traditional trade theory. However, in contrast to the other manufacturing sectors, building & construction even seems to counteract theoretical assumptions of the traditional trade theory.

[45] This result is consistent with Amiti (1999) who found significant positive effects of economies of scale on sectoral concentration in addition to the intermediate goods intensity.

[46] In some few case, the respective region-specific sectoral variable or one of the other explanatory variables loses significance. However, to some extent this can be explained by the lower number of variables included.

[47] However, sector-specific regional labour costs possibly do not reflect high or low cost regions and might be driven by specific sectoral market developments.

## CONCLUSION

In this paper, we investigate the spatial patterns and driving forces of relative sectoral investment shares and thus the relative specialization of EU regions in specific sectors. Analyzing regional specialization in relation to the average sectoral structure of the EU, we often find a clustering of high relative sectoral investments in a number of regions within countries, reflecting the geographical proximity of similarly specialized regions. This result is especially obvious for agriculture across most Italian regions, textiles industries in North Italian regions and minerals & mineral products in the middle parts of Italy as well as fuel & power products across most Italian regions, but particularly strong in Southern Italy. Relative investments in the services sectors are less clustered, but we find a spatial concentration of trade & lodging services along most Italian coastal regions, of other services in South Italian regions as well as of transport & communication services in Northern Italy and the south of France. But, in contrast to all other clusters described, we find no evidence for the significance of the positive spatial association for the latter two services sectors.

With respect to the French regions, we cannot identify a regional clustering of high relative investments in one sector. But, across French regions, non-market services are consistently stronger, though still moderate, than in the other regions analyzed and are the highest in those regions far away from Paris, e.g. in the south of France. In addition, those regions with the highest levels of specialization in the food sectors are mostly located in North-Western France.

The econometric analyses aim at identifying the regional determinants of high relative sectoral investments. We test a number of determinants from different theoretical approaches and control for heteroscedasticity and potential endogeneity. Regional factor cost or productivity differentials are supposed to matter according to the traditional trade theory. We find no evidence for the relevance of sector-specific labour cost differentials between regions, but sectoral productivity differentials between regions generally contribute to the explanation of relative investment shares in those nine manufacturing sectors analyzed.

Since investments in most manufacturing sectors are attracted by regions close to (or not too far away from) the administrative centre (though not by the administrative centres themselves), we might be confronted with backwash effects predicted by the polarization theory for peripheral regions. In addition, core regions and densely-populated regions provide evidence for stronger relative investment shares in the important and growth-oriented services sectors. But we cannot directly conclude on cumulative agglomeration of services in the core since peripheral regions show higher relative investment share in some services sectors as well.

Using gross regional product as a proxy for the market potential, we find it is significant and positive for many manufacturing sectors. For those sectors, the location close to large markets – predicted by the New Economic Geography – thus seems to matter. In addition, the consistently significant and positive sign of the regional level of sector-specific economies of scale for the manufacturing sectors points to a further agglomeration potential in these sectors. However, market integration, which according to the New Economic Geography is supposed to enforce the agglomerative forces of economies of scale does not play a particular role in any sector.

The prediction of the product life cycle theory that regions with a high research intensity specialize in high tech or innovative sectors can neither be accepted nor rejected by the empirical analyses.

Finally, country-specific dummies are mostly significant as well. This means that country-specific characteristics which are not captured by the regional determinants in our estimates do influence the regional investment level in most sectors. However, these country-specific effects differ with respect to each sector.

The studies of Stirböck (2002a, 2002b) provide evidence for the stronger relative regional specialization of core as well as of peripheral regions. Core regions – in contrast to peripheral regions – are marked by a higher potential of economic performance. The results of our econometric analysis now demonstrate that peripheral regions compared to core regions, indeed, play a different role in the location of sectoral investments. The driving forces of investment specialization are favourable for core regions with respect to growth-oriented market services like transport & communication services and credit & insurance services. The services sectors with the highest regional specialization of peripheral regions, however, are repair, trade & lodging services as well as other services – both linked to economic activity in tourism.

In addition to some of the services sectors, relative investments in non-market services as well as building & construction are stronger in peripheral regions as well. As long as investments in NMSE and BUIL support education or infrastructure measures, a high relative regional specialisation can be beneficial. However, in general, high relative investments in NMSE as well as BUIL do not necessarily represent a specific advantage, but rather a high dependence on non-market economic activities and a poor sectoral diversification. When regarding "absolute" regional investment shares (presented in Table A5), i.e. regional investment shares not given in relation to EU, these only amount to about 2.4 per cent (2.8 per cent) of total investments in France (Italy) in BUIL and to 14.7 per cent (8.3 per cent) in France (Italy) in NMSE. Thus, the respective importance of those sectors in which peripheral regions are more strongly specialised than central regions, is not too high. However, to be precise, sectoral investment shares vary between 5.3 per cent for Lazio and 27.5 per cent for Valle d'Aosta in NMSE. This shows that differences between central and some of the peripheral regions are rather large. In addition, those regions with the highest relative investments shares are clustered in Southern Italy with respect to the sector BUIL, and located in the French regions far away from the French capital, e.g. in Southern France, with respect to NMSE.

Regarding the lower relative specialization in manufacturing sectors of those regions far away from the economic centre, we do not find a strong regional clustering of manufacturing sectors in central or core regions pointing to a disadvantageous situation of peripheral regions. However, it is a waste of resources to promote or even subsidise the location of manufacturing sectors in peripheral regions if these sectors are already established in other regions and are significantly profiting from increasing returns to scale at sector level.

A good sign, however, is the stronger relative importance of some of the services sectors – in addition to NMSE and BUIL – in the regions far away from the centre. Though, there are large differences with respect to the sector's importance across space. These are the most obvious for transport & communication services. Its share is only about 6 to 9 per cent in Southern Italian regions while it amounts to 24 per cent in Lazio. However, for repair, trade & lodging services as well as other services – mostly linked with tourism or a coastal location – the variation of regional investment shares is much less pronounced.

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## APPENDIX

## DATA DESCRIPTION

The regional disaggregation of the data is given according to the Nomenclature of Territorial Units for Statistics (NUTS - Nomenclature des unités territoriales statistiques). The REGIO database disaggregates data for the three aggregation levels NUTS 1, 2 and 3. However, data for GFCF is not available further disaggregated than the NUTS 2-level. In addition, it is not complete (with regard to the regional and/or the sectoral disaggregation – the latter needed for the calculation of the specialization indices).

**Table A1: Regional Data for GFCF from the REGIO Database**

| Country | NUTS level | Respective national disaggregation level | Number of regions NUTS 2 |
|---|---|---|---|
| France | 2 | Régions | 22 |
| Italy | 2 | Regioni | 20 |
| Denmark | 1&2 | - | 1 |
| Ireland | 1&2 | - | 1 |
| Luxembourg | 1&2 | - | 1 |
| Total number of regions | | | 45 |

Note: Version of *NUTS 1995*. French oversea departments (DOM – départements outre-mer) are not counted in total sums for France as well as for the EU.

Data availability at NUTS 2-level is sufficient for the five countries presented in Table A1 and A2. Luxembourg, Denmark as well as Ireland are only regarded as one single region at the NUTS 1- as well as at the NUTS 2-level (=monoregional countries). The maximum number of regions available at the NUTS 2-level is 45.

**Table A2: Overview on NUTS 2-Regions Included**

| France | | Italy | | Monoregional countries | |
|---|---|---|---|---|---|
| Alsace | ALS | Abruzzo | ABR | Denmark | DEN |
| Aquitaine | AQU | Basilicata | BAS | Ireland | IRE |
| Auvergne | AUV | Calabria | CAL | Luxembourg | LUX |
| Basse-Normandie | BNO | Campania | CAM | | |
| Bourgogne | BOU | Emilia-Romagna | ERO | | |
| Bretagne | BRT | Friuli-Venezia Giulia | FVG | | |
| Centre (F) | CTR | Lazio | LAZ | | |
| Champagne-Ardenne | CHA | Liguria | LIG | | |
| Corse | CRS | Lombardia | LOM | | |
| Franche-Comté | FRC | Marche | MAR | | |
| Haute-Normandie | HNO | Molise | MOL | | |
| Île de France | IDF | Piemonte | PIE | | |
| Languedoc-Roussillon | LRO | Puglia | PUG | | |
| Limousin | LIS | Sardegna | SAR | | |
| Lorraine | LOR | Sicilia | SIC | | |
| Midi-Pyrénées | MPY | Toscana | TOS | | |
| Nord-Pas-de-Calais | NPC | Trentino-Alto Adige | TAA | | |
| Pays de la Loire | PDL | Umbria | UMB | | |
| Picardie | PIC | Valle d'Aosta | VAO | | |
| Poitou-Charentes | POI | Veneto | VEN | | |
| Provence-Alpes-Côte d'Azur | PAC | | | | |
| Rhône-Alpes | RAL | | | | |

All data included in the analysis are based on the European System of Accounting established for data since 1979 (ESA79). Data are taken from the Eurostat REGIO Database (yearbooks up to 2000) which – for gross fixed capital formation - comprises data for the years 1985 to 1994. Sectoral wages and salaries as well as local units of enterprises are available in the Structural Business Statistic (SBS) of Eurostat.

**Table A3: List of Explanatory Variables, REGIO and SBS Database**

| Abbreviation | Variable | Unit |
|---|---|---|
| GFCF | gross fixed capital formation | currency: billions of ECU |
| TOTEM | total employment | in 1000 persons |
| COE | compensation of employees | currency: billions of ECU |
| VAFC | gross value added at factor costs | currency: billions of ECU |
| GRP | gross regional product | currency: billions of ECU |
| AREA | regional size | $km^2$ |
| PAT | European R&D patent applications | total number |
| UEWP | total unemployment rates | in % of working population |
| POP | total annual average population | in mio. persons |
| PODEN | population density | in 1000 inhabitants/$km^2$ |
| WAGSAL | wages and salaries | currency: billions of ECU |
| UNITENT | local units of enterprises | total number |

In addition to the available national account data, a number of further variables has been used in the econometric analysis. The distance to the centre **(DIST)** captures peripheral effects. It is measured by the optimal route distance between the regional capital and the centre of the respective country. Centers are Paris, and Rome. The distance is defined to be 1 for Denmark, Luxembourg as well as Ireland, and it is equally 1 for the regions containing the capital of the respective country. These economically most important regions (**CENTR**) in the analysis are Île de France (France), and Lazio (Italy).

**Table A4: List of Further Explanatory Variables**

| Abbreviation | Variable | Unit |
|---|---|---|
| DIST | distance to centre, index of peripherality | 1000 km |
| CENTR | regional dummy set for central region | 0 or 1 |
| QUINN_OPENN | indicator of openness per country | 0-14 (variation by 0.5) |
| RDINT | research intensity | PAT/GDP |
| LABCOST | regional labour cost per unit in sector i | $WAGSAL_i/TOTEM_i$ |
| PROD | regional productivity in sector i | $VAFC_i/TOTEM_i$ |
| ES | regional level of economies of scale in sector i | $VAFC_i/UNITENT_i$ |

Available indicators of liberalisation arising from official sources are mostly indicator variables taking values of either 0 or 1. However, such indicator variables do not allow to differentiate the varying levels of control or to capture a decreasing level of control over time. Measuring a level of integration for each year is therefore a better solution from an econometric point of view. Quinn (1997, 2000) has constructed such a yearly index of openness on the basis of those restrictions published by the IMF since the 1950s. This index is scaled from 0 (highest degree of restrictions) up to 14 (highest degree of liberalization) and aggregates the different indicators of liberalization progress in seven specified fields (capital in- and outflows, im- and exports of goods and of services as well as international conventions of liberalisation) with a respective degree of liberalization between 0.5 and 2.

Quantitative restrictions are attributed the highest weights by Quinn. With respect to the liberalization of imports e.g. he attributes the lowest liberalization index of 0 in case of full quantitative restrictions and 0.5 in case of some quantitative restrictions, existence of laws requiring the approval of international transactions are scored 1, taxes 1.5 and finally free trade 2. With regard to capital account liberalization, Quinn attributes 0 in case of required approval for capital transactions which are rarely granted, 0.5 (1) in case of occasional (frequent) approval and finally 1.5 in case of taxing measurements (without the need of an official approval). A sub index of the overall liberalisation index is a financial liberalization indicator ranging on a score between 0 and 4 which is aggregated from restrictions of capital inward and outward flows in the way explained above. All named potential indicators, however, are only available at country, not regional, level, which has to be taken into account in econometric analysis. Detailed restrictions for Luxembourg are not available as Luxembourg and Belgium are part of a common monetary union since the 1950s. In our analysis the „Quinn-indicator“ for Luxembourg is therefore naturally set equal to the one of Belgium.

The construction of the variables RDINT, ES, LABCOST as well as PROD is explained throughout the text.

**Table A5: Sectoral Shares of GFCF in Total Regional GFCF Compared to Sectoral Share of EU-VAFC in Total EU VAFC: Averages for 1985-94**

| GFCF | AGRO | MANU | SERV | FUEL | META | MINE | CHEM | METP | TREQ | FOOD | TEXT | PAPE | VARI | BUIL | TRLO | TRCO | CRED | OTHS | NMSE | TOTA | % of nat. I |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FRA | 0.029 | 0.231 | 0.740 | 0.050 | 0.012 | 0.008 | 0.016 | 0.040 | 0.022 | 0.024 | 0.007 | 0.014 | 0.014 | 0.024 | 0.085 | 0.086 | 0.021 | 0.401 | 0.147 | 173815 | 1.000 |
| ALS | 0.017 | 0.262 | 0.721 | 0.023 | 0.007 | 0.013 | 0.023 | 0.053 | 0.026 | 0.039 | 0.013 | 0.025 | 0.016 | 0.023 | 0.077 | 0.066 | 0.018 | 0.438 | 0.122 | 6058 | 0.035 |
| AQU | 0.060 | 0.210 | 0.730 | 0.056 | 0.001 | 0.008 | 0.020 | 0.026 | 0.016 | 0.023 | 0.003 | 0.016 | 0.015 | 0.028 | 0.093 | 0.088 | 0.020 | 0.345 | 0.183 | 7140 | 0.041 |
| AUV | 0.059 | 0.240 | 0.701 | 0.030 | 0.007 | 0.009 | 0.012 | 0.037 | 0.009 | 0.033 | 0.006 | 0.011 | 0.058 | 0.028 | 0.078 | 0.071 | 0.021 | 0.335 | 0.196 | 3294 | 0.019 |
| BNO | 0.049 | 0.397 | 0.554 | 0.023 | 0.198 | 0.005 | 0.005 | 0.042 | 0.036 | 0.038 | 0.003 | 0.012 | 0.012 | 0.022 | 0.080 | 0.059 | 0.014 | 0.262 | 0.140 | 4248 | 0.024 |
| BOU | 0.067 | 0.236 | 0.697 | 0.030 | 0.013 | 0.013 | 0.015 | 0.054 | 0.014 | 0.027 | 0.006 | 0.010 | 0.025 | 0.029 | 0.091 | 0.087 | 0.019 | 0.343 | 0.156 | 4310 | 0.025 |
| BRT | 0.070 | 0.195 | 0.734 | 0.025 | 0.001 | 0.007 | 0.004 | 0.024 | 0.029 | 0.056 | 0.002 | 0.008 | 0.013 | 0.026 | 0.089 | 0.068 | 0.020 | 0.388 | 0.170 | 7299 | 0.042 |
| CTR | 0.051 | 0.268 | 0.680 | 0.078 | 0.001 | 0.008 | 0.017 | 0.055 | 0.019 | 0.023 | 0.004 | 0.017 | 0.019 | 0.027 | 0.080 | 0.075 | 0.021 | 0.353 | 0.152 | 6832 | 0.039 |
| CHA | 0.093 | 0.274 | 0.633 | 0.058 | 0.005 | 0.012 | 0.006 | 0.061 | 0.010 | 0.058 | 0.013 | 0.010 | 0.020 | 0.021 | 0.072 | 0.079 | 0.017 | 0.326 | 0.138 | 3958 | 0.023 |
| CRS | 0.043 | 0.101 | 0.856 | 0.041 |  | 0.007 | 0.000 | 0.005 | 0.002 | 0.007 | 0.000 | 0.002 | 0.003 | 0.033 | 0.110 | 0.104 | 0.018 | 0.380 | 0.243 | 583 | 0.003 |
| FRC | 0.031 | 0.303 | 0.665 | 0.019 | 0.003 | 0.009 | 0.019 | 0.073 | 0.090 | 0.021 | 0.004 | 0.007 | 0.031 | 0.027 | 0.072 | 0.067 | 0.015 | 0.352 | 0.160 | 3030 | 0.017 |
| HNO | 0.026 | 0.346 | 0.627 | 0.080 | 0.003 | 0.007 | 0.062 | 0.050 | 0.038 | 0.022 | 0.005 | 0.040 | 0.017 | 0.022 | 0.065 | 0.126 | 0.015 | 0.282 | 0.139 | 5258 | 0.030 |
| IDF | 0.002 | 0.169 | 0.828 | 0.043 | 0.005 | 0.003 | 0.013 | 0.032 | 0.024 | 0.008 | 0.003 | 0.012 | 0.005 | 0.020 | 0.093 | 0.092 | 0.029 | 0.511 | 0.103 | 52067 | 0.300 |
| LRO | 0.015 | 0.163 | 0.823 | 0.039 | 0.016 | 0.013 | 0.008 | 0.023 | 0.001 | 0.021 | 0.004 | 0.006 | 0.006 | 0.026 | 0.090 | 0.097 | 0.021 | 0.392 | 0.222 | 5147 | 0.030 |
| LIS | 0.059 | 0.231 | 0.710 | 0.033 | 0.013 | 0.009 | 0.003 | 0.048 | 0.007 | 0.022 | 0.005 | 0.044 | 0.020 | 0.027 | 0.073 | 0.074 | 0.023 | 0.320 | 0.219 | 1708 | 0.010 |
| LOR | 0.032 | 0.289 | 0.679 | 0.055 | 0.028 | 0.010 | 0.018 | 0.042 | 0.036 | 0.023 | 0.011 | 0.024 | 0.018 | 0.024 | 0.065 | 0.083 | 0.014 | 0.369 | 0.147 | 6674 | 0.038 |
| MPY | 0.049 | 0.225 | 0.726 | 0.064 | 0.003 | 0.011 | 0.009 | 0.024 | 0.037 | 0.020 | 0.010 | 0.012 | 0.009 | 0.026 | 0.085 | 0.078 | 0.020 | 0.353 | 0.191 | 6560 | 0.038 |
| NPC | 0.017 | 0.262 | 0.721 | 0.040 | 0.020 | 0.012 | 0.018 | 0.034 | 0.024 | 0.040 | 0.023 | 0.021 | 0.010 | 0.021 | 0.080 | 0.087 | 0.018 | 0.375 | 0.160 | 9877 | 0.057 |
| PDL | 0.048 | 0.221 | 0.731 | 0.039 | 0.004 | 0.006 | 0.004 | 0.043 | 0.019 | 0.039 | 0.008 | 0.011 | 0.020 | 0.028 | 0.080 | 0.080 | 0.021 | 0.379 | 0.171 | 8159 | 0.047 |
| PIC | 0.059 | 0.286 | 0.655 | 0.022 | 0.014 | 0.016 | 0.037 | 0.056 | 0.012 | 0.053 | 0.012 | 0.016 | 0.025 | 0.023 | 0.075 | 0.083 | 0.015 | 0.330 | 0.153 | 4698 | 0.027 |
| POI | 0.070 | 0.192 | 0.739 | 0.031 | 0.000 | 0.012 | 0.007 | 0.029 | 0.013 | 0.040 | 0.004 | 0.013 | 0.016 | 0.026 | 0.088 | 0.076 | 0.027 | 0.359 | 0.188 | 4163 | 0.024 |
| PAC | 0.015 | 0.218 | 0.768 | 0.095 | 0.005 | 0.008 | 0.026 | 0.019 | 0.009 | 0.017 | 0.001 | 0.006 | 0.005 | 0.027 | 0.093 | 0.113 | 0.021 | 0.372 | 0.170 | 11989 | 0.069 |
| RAL | 0.017 | 0.257 | 0.725 | 0.049 | 0.007 | 0.010 | 0.020 | 0.066 | 0.009 | 0.019 | 0.012 | 0.013 | 0.022 | 0.029 | 0.084 | 0.076 | 0.017 | 0.383 | 0.164 | 17372 | 0.100 |

## Table A5 (cont.)

| GFCF | AGRO | MANU | SERV | FUEL | META | MINE | CHEM | METP | TREQ | FOOD | TEXT | PAPE | VARI | BUIL | TRLO | TRCO | CRED | OTHS | NMSE | TOTA | % of nat. I |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ITA | 0.065 | 0.282 | 0.653 | 0.062 | 0.013 | 0.016 | 0.019 | 0.048 | 0.019 | 0.020 | 0.024 | 0.014 | 0.019 | 0.028 | 0.090 | 0.121 | 0.017 | 0.343 | 0.083 | 149388 | 1.000 |
| ABR | 0.089 | 0.317 | 0.594 | 0.080 | 0.005 | 0.022 | 0.009 | 0.054 | 0.045 | 0.020 | 0.017 | 0.026 | 0.017 | 0.021 | 0.062 | 0.075 | 0.011 | 0.362 | 0.084 | 3237 | 0.022 |
| BAS | 0.140 | 0.248 | 0.612 | 0.084 | 0.002 | 0.010 | 0.015 | 0.019 | 0.030 | 0.027 | 0.005 | 0.003 | 0.007 | 0.046 | 0.036 | 0.061 | 0.009 | 0.325 | 0.182 | 1462 | 0.010 |
| CAL | 0.084 | 0.205 | 0.711 | 0.097 | 0.001 | 0.012 | 0.005 | 0.004 | 0.003 | 0.009 | 0.019 | 0.003 | 0.014 | 0.037 | 0.068 | 0.139 | 0.008 | 0.396 | 0.100 | 4222 | 0.028 |
| CAM | 0.050 | 0.208 | 0.742 | 0.046 | 0.006 | 0.012 | 0.012 | 0.024 | 0.033 | 0.016 | 0.011 | 0.005 | 0.012 | 0.030 | 0.050 | 0.130 | 0.014 | 0.411 | 0.137 | 10766 | 0.072 |
| ERO | 0.094 | 0.337 | 0.570 | 0.050 | 0.005 | 0.036 | 0.019 | 0.083 | 0.014 | 0.053 | 0.018 | 0.013 | 0.020 | 0.029 | 0.112 | 0.095 | 0.019 | 0.268 | 0.076 | 11150 | 0.075 |
| FVG | 0.064 | 0.276 | 0.659 | 0.060 | 0.018 | 0.013 | 0.012 | 0.058 | 0.008 | 0.017 | 0.013 | 0.028 | 0.033 | 0.017 | 0.119 | 0.111 | 0.017 | 0.317 | 0.094 | 3661 | 0.025 |
| LAZ | 0.032 | 0.193 | 0.775 | 0.069 | 0.002 | 0.008 | 0.015 | 0.021 | 0.014 | 0.009 | 0.003 | 0.014 | 0.006 | 0.031 | 0.091 | 0.241 | 0.020 | 0.369 | 0.053 | 16627 | 0.111 |
| LIG | 0.022 | 0.218 | 0.760 | 0.069 | 0.013 | 0.013 | 0.028 | 0.034 | 0.012 | 0.007 | 0.004 | 0.005 | 0.006 | 0.027 | 0.120 | 0.200 | 0.019 | 0.313 | 0.108 | 4562 | 0.031 |
| LOM | 0.043 | 0.347 | 0.610 | 0.043 | 0.021 | 0.010 | 0.033 | 0.085 | 0.014 | 0.021 | 0.042 | 0.020 | 0.029 | 0.029 | 0.100 | 0.080 | 0.020 | 0.345 | 0.064 | 27849 | 0.186 |
| MAR | 0.091 | 0.254 | 0.654 | 0.033 | 0.004 | 0.012 | 0.006 | 0.055 | 0.008 | 0.027 | 0.038 | 0.014 | 0.034 | 0.024 | 0.093 | 0.090 | 0.017 | 0.364 | 0.090 | 3552 | 0.024 |
| MOL | 0.129 | 0.291 | 0.580 | 0.087 | 0.013 | 0.021 | 0.012 | 0.010 | 0.077 | 0.017 | 0.011 | 0.000 | 0.006 | 0.036 | 0.033 | 0.060 | 0.010 | 0.394 | 0.083 | 930 | 0.006 |
| PIE | 0.062 | 0.368 | 0.570 | 0.050 | 0.027 | 0.015 | 0.019 | 0.076 | 0.070 | 0.020 | 0.031 | 0.015 | 0.022 | 0.021 | 0.067 | 0.142 | 0.017 | 0.284 | 0.059 | 12865 | 0.086 |
| PUG | 0.091 | 0.271 | 0.637 | 0.104 | 0.028 | 0.016 | 0.011 | 0.026 | 0.010 | 0.017 | 0.014 | 0.004 | 0.013 | 0.027 | 0.063 | 0.078 | 0.014 | 0.399 | 0.085 | 6982 | 0.047 |
| SAR | 0.094 | 0.304 | 0.603 | 0.147 | 0.018 | 0.019 | 0.040 | 0.008 | 0.002 | 0.012 | 0.024 | 0.002 | 0.009 | 0.023 | 0.091 | 0.091 | 0.010 | 0.306 | 0.105 | 4184 | 0.028 |
| SIC | 0.081 | 0.213 | 0.706 | 0.106 | 0.003 | 0.017 | 0.013 | 0.010 | 0.008 | 0.008 | 0.006 | 0.003 | 0.004 | 0.034 | 0.058 | 0.084 | 0.012 | 0.437 | 0.116 | 9529 | 0.064 |
| TOS | 0.071 | 0.293 | 0.636 | 0.061 | 0.016 | 0.032 | 0.022 | 0.030 | 0.010 | 0.012 | 0.042 | 0.022 | 0.019 | 0.028 | 0.118 | 0.119 | 0.020 | 0.296 | 0.084 | 8360 | 0.056 |
| TAA | 0.089 | 0.193 | 0.718 | 0.036 | 0.011 | 0.012 | 0.005 | 0.027 | 0.006 | 0.024 | 0.006 | 0.011 | 0.028 | 0.027 | 0.209 | 0.103 | 0.013 | 0.277 | 0.117 | 3600 | 0.024 |
| UMB | 0.092 | 0.312 | 0.596 | 0.078 | 0.045 | 0.036 | 0.017 | 0.025 | 0.004 | 0.039 | 0.024 | 0.011 | 0.015 | 0.017 | 0.073 | 0.106 | 0.014 | 0.332 | 0.071 | 2125 | 0.014 |
| VAO | 0.060 | 0.137 | 0.803 | 0.047 | 0.020 | 0.013 | 0.003 | 0.010 | 0.001 | 0.009 | 0.001 | 0.001 | 0.004 | 0.028 | 0.055 | 0.131 | 0.008 | 0.334 | 0.275 | 675 | 0.005 |
| VEN | 0.076 | 0.303 | 0.622 | 0.037 | 0.011 | 0.019 | 0.020 | 0.064 | 0.007 | 0.024 | 0.042 | 0.020 | 0.032 | 0.027 | 0.097 | 0.117 | 0.016 | 0.322 | 0.070 | 13052 | 0.087 |
| DEN | 0.051 | 0.258 | | 0.073 | | 0.012 | | | | 0.027 | 0.007 | 0.019 | | 0.028 | | 0.142 | 0.019 | | 0.122 | 17438 | 1.000 |
| IRE | 0.099 | 0.248 | 0.577 | 0.047 | 0.003 | 0.012 | 0.026 | 0.041 | 0.003 | 0.053 | 0.008 | 0.010 | 0.011 | 0.021 | | 0.128 | 0.047 | | 0.067 | 5576 | 1.000 |
| LUX | 0.024 | 0.180 | 0.592 | 0.026 | 0.046 | 0.011 | 0.004 | 0.022 | 0.001 | 0.011 | 0.021 | 0.005 | 0.026 | 0.015 | 0.082 | 0.080 | 0.119 | 0.166 | 0.187 | 1834 | 1.000 |
| EU-VAFC | 0.030 | 0.323 | 0.600 | 0.036 | 0.013 | 0.013 | 0.031 | 0.074 | 0.026 | 0.030 | 0.018 | 0.020 | 0.015 | 0.060 | 0.152 | 0.070 | 0.052 | 0.181 | 0.154 | 4069824 | |

## Table A6: Relative Sectoral Investment Shares for GFCF: Averages for 1985-94 (in Case of Complete Data)

| | | AGRO | FUEL | META | MINE | CHEM | METP | TREQ | FOOD | TEXT | PAPE | VARI | BUIL | TRLO | TRCO | CRED | OTHS | NMSE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FRA | France | | | | | | | | | | | | | | | | | |
| ALS | Alsace | 0.555 | 0.664 | 0.534 | 1.004 | 0.713 | 0.699 | 0.917 | *1.293** | 0.699 | 1.189 | 1.058 | 0.376 | 0.511 | 0.942 | 0.346 | *2.527* | 0.800 |
| AQU | Aquitaine | *1.950* | *1.573* | 0.051 | 0.589 | 0.606 | 0.345 | 0.579 | 0.750 | 0.156 | 0.753 | 0.960 | 0.464 | 0.619 | 1.257 | 0.388 | *1.999* | 1.186 |
| AUV | Auvergne | *1.909* | 0.844 | 0.528 | 0.690 | 0.372 | 0.482 | 0.348 | 1.087 | 0.319 | 0.512 | *3.769* | 0.458 | 0.521 | 1.012 | 0.406 | *1.940* | 1.275 |
| BNO | Basse-Normandie | *1.577* | 0.640 | *14.292* | 0.422 | 0.162 | 0.553 | 1.331 | 1.251 | 0.169 | 0.578 | 0.793 | 0.366 | 0.525 | 0.844 | 0.265 | *1.495* | 0.905 |
| BOU | Bourgogne | *2.177* | 0.833 | 0.923 | 0.999 | 0.455 | 0.710 | 0.537 | 0.883 | 0.328 | 0.514 | *1.624* | 0.488 | 0.608 | 1.235 | 0.379 | *1.978* | 1.010 |
| BRT | Bretagne | *2.278* | 0.702 | 0.042 | 0.535 | 0.125 | 0.319 | 1.077 | *1.838* | 0.108 | 0.399 | 0.847 | 0.434 | 0.594 | 0.969 | 0.383 | *2.244* | 1.101 |
| CTR | Centre (F) | *1.654* | *2.177* | 0.102 | 0.659 | 0.536 | 0.718 | 0.700 | 0.737 | 0.232 | 0.812 | 1.243 | 0.452 | 0.531 | 1.061 | 0.407 | *2.029* | 0.984 |
| CHA | Champagne-Ardenne | *3.005* | *1.550* | 0.367 | 0.955 | 0.184 | 0.809 | 0.352 | *1.912* | 0.718 | 0.481 | 1.303 | 0.353 | 0.479 | 1.127 | 0.336 | *1.876* | 0.895 |
| CRS | Corse | *1.730* | 1.153 | | 0.566 | 0.184 | 0.073 | 0.070 | 0.220 | 0.014 | 0.086 | 0.220 | 0.540 | 0.749 | 1.499 | 0.349 | *2.197* | *1.609* |
| FRC | Franche-Comté | 1.010 | 0.540 | 0.232 | 0.658 | 0.588 | 0.959 | *3.352* | 0.695 | 0.227 | 0.322 | *2.054* | 0.448 | 0.483 | 0.946 | 0.291 | *2.040* | 1.032 |
| HNO | Haute-Normandie | 0.854 | *2.221* | 0.225 | 0.581 | *1.909* | 0.661 | 1.367 | 0.708 | 0.283 | *2.068* | 1.082 | 0.365 | 0.438 | *1.789* | 0.292 | *1.618* | 0.898 |
| IDF | Île de France | 0.078 | 1.234 | 0.343 | 0.274 | 0.396 | 0.445 | 0.893 | 0.267 | 0.188 | 0.594 | 0.311 | 0.322 | 0.602 | *1.328** | 0.577 | *2.928* | 0.676 |
| LRO | Languedoc-Roussillon | 0.469 | 1.102 | 1.129 | 0.982 | 0.250 | 0.297 | 0.027 | 0.693 | 0.215 | 0.307 | 0.373 | 0.438 | 0.600 | 1.380 | 0.410 | *2.277* | 1.437 |
| LIS | Limousin | *1.915* | 0.921 | 0.907 | 0.725 | 0.095 | 0.634 | 0.258 | 0.714 | 0.267 | *2.057* | 1.309 | 0.447 | 0.489 | 1.057 | 0.443 | *1.867* | 1.423 |
| LOR | Lorraine | 1.048 | *1.528* | *2.014* | 0.778 | 0.544 | 0.555 | 1.335 | 0.758 | 0.583 | 1.125 | 1.178 | 0.390 | 0.433 | 1.187 | 0.278 | *2.132* | 0.954 |
| MPY | Midi-Pyrénées | *1.589* | *1.770* | 0.251 | 0.822 | 0.275 | 0.315 | 1.374 | 0.652 | 0.541 | 0.578 | 0.598 | 0.430 | 0.566 | 1.113 | 0.384 | *2.038* | 1.234 |
| NPC | Nord-Pas-de-Calais | 0.559 | 1.104 | *1.470** | 0.906 | 0.557 | 0.440 | 0.902 | 1.311 | 1.209 | 1.045 | 0.643 | 0.337 | 0.534 | 1.239 | 0.348 | *2.174* | 1.043 |
| PDL | Pays de la Loire | *1.552* | 1.100 | 0.269 | 0.499 | 0.130 | 0.570 | 0.704 | 1.277 | 0.408 | 0.550 | 1.297 | 0.461 | 0.534 | 1.138 | 0.420 | *2.188* | 1.104 |
| PIC | Picardie | *1.931* | 0.624 | 1.004 | 1.190 | 1.140 | 0.735 | 0.461 | *1.747* | 0.627 | 0.812 | *1.607* | 0.380 | 0.506 | 1.171 | 0.302 | *1.895* | 0.986 |
| POI | Poitou-Charentes | *2.269* | 0.851 | 0.025 | 0.935 | 0.234 | 0.387 | 0.467 | 1.296 | 0.194 | 0.664 | 1.038 | 0.443 | 0.581 | 1.084 | 0.528 | *2.080* | 1.217 |
| PAC | Provence-Alpes-Côte d'Azur | 0.476 | *2.640* | 0.350 | 0.601 | 0.793 | 0.262 | 0.330 | 0.555 | 0.076 | 0.307 | 0.344 | 0.433 | 0.614 | *1.612* | 0.400 | *2.135* | 1.104 |
| RAL | Rhône-Alpes | 0.562 | 1.365 | 0.506 | 0.807 | 0.629 | 0.864 | 0.347 | 0.623 | 0.656 | 0.636 | *1.463** | 0.479 | 0.557 | 1.083 | 0.340 | *2.217* | 1.064 |

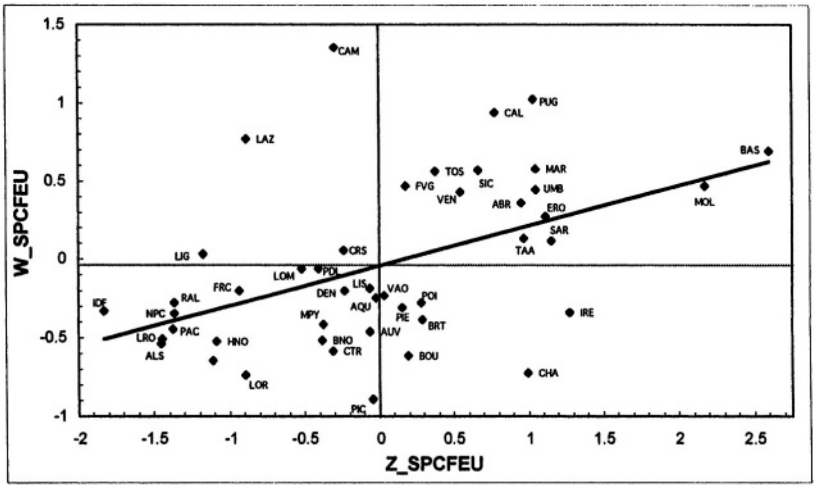
## Table A6 (cont.)

| | | AGRO | FUEL | META | MINE | CHEM | METP | TREQ | FOOD | TEXT | PAPE | VARI | BUIL | TRLO | TRCO | CRED | OTHS | NMSE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ITA | Italia | | | | | | | | | | | | | | | | | |
| ABR | Abruzzo | *2.961* | *2.150* | 0.395 | *1.721* | 0.275 | 0.702 | *1.715* | 0.679 | 0.952 | 1.310 | 1.110 | 0.355 | 0.413 | 1.085 | 0.206 | *2.084* | 0.550 |
| BAS | Basilicata | *4.660* | *2.288* | 0.153 | 0.798 | 0.470 | 0.249 | 1.102 | 0.896 | 0.261 | 0.146 | 0.494 | 0.758 | 0.250 | 0.869 | 0.167 | *1.866* | 1.181 |
| CAL | Calabria | *2.782* | *2.678* | 0.108 | 0.993 | 0.161 | 0.058 | 0.108 | 0.289 | 1.128 | 0.144 | 0.937 | 0.630 | 0.436 | *1.965* | 0.155 | *2.279* | 0.653 |
| CAM | Campania | *1.669* | 1.307 | 0.431 | 0.933 | 0.382 | 0.321 | 1.260 | 0.541 | 0.633 | 0.238 | 0.800 | 0.500 | 0.334 | *1.826* | 0.268 | *2.355* | 0.873 |
| ERO | Emilia-Romagna | *3.129* | 1.363 | 0.367 | *2.792* | 0.588 | 1.106 | 0.538 | *1.741* | 0.959 | 0.635 | 1.310 | 0.475 | 0.726 | 1.351 | 0.372 | *1.505* | 0.496 |
| FVG | Friuli-Venezia Giulia | *2.158* | *1.646* | 1.248 | 0.963 | 0.389 | 0.765 | 0.287 | 0.541 | 0.742 | 1.280 | *2.257* | 0.289 | 0.778 | *1.595* | 0.333 | *1.792* | 0.626 |
| LAZ | Lazio | 1.062 | *1.908* | 0.125 | 0.652 | 0.472 | 0.289 | 0.568 | 0.310 | 0.150 | 0.703 | 0.399 | 0.530 | 0.601 | *3.340* | 0.395 | *2.094* | 0.357 |
| LIG | Liguria | 0.761 | *1.908* | 0.930 | 1.015 | 0.869 | 0.466 | 0.460 | 0.246 | 0.185 | 0.278 | 0.406 | 0.447 | 0.790 | *2.828* | 0.356 | *1.802* | 0.681 |
| LOM | Lombardia | 1.442 | 1.172 | *1.566* | 0.777 | 1.040 | 1.148 | 0.544 | 0.696 | *2.328* | 0.985 | *1.877* | 0.477 | 0.664 | 1.132 | 0.387 | *1.957* | 0.417 |
| MAR | Marche | *3.062* | 0.896 | 0.328 | 0.957 | 0.182 | 0.740 | 0.302 | 0.863 | *2.097* | 0.677 | *2.245* | 0.407 | 0.612 | 1.277 | 0.322 | *2.052* | 0.591 |
| MOL | Molise | *4.222* | *2.351* | 1.160 | *1.838* | 0.377 | 0.137 | *2.905* | 0.585 | 0.646 | 0.009 | 0.458 | 0.557 | 0.224 | 0.856 | 0.192 | *2.199* | 0.550 |
| PIE | Piemonte | *2.137* | 1.400 | *1.965* | 1.165 | 0.577 | 1.026 | *2.702* | 0.662 | *1.737* | 0.757 | 1.452 | 0.358 | 0.443 | *1.995* | 0.329 | *1.598* | 0.393 |
| PUG | Puglia | *3.047* | *2.839* | *2.101* | 1.227 | 0.350 | 0.336 | 0.397 | 0.563 | 0.790 | 0.202 | 0.907 | 0.446 | 0.411 | 1.095 | 0.255 | *2.278* | 0.549 |
| SAR | Sardegna | *3.169* | *4.006* | 1.369 | 1.479 | 1.252 | 0.099 | 0.069 | 0.401 | 1.257 | 0.118 | 0.607 | 0.391 | 0.590 | 1.278 | 0.187 | *1.783* | 0.680 |
| SIC | Sicilia | *2.670* | *2.924* | 0.245 | 1.361 | 0.422 | 0.144 | 0.328 | 0.264 | 0.319 | 0.162 | 0.294 | 0.551 | 0.379 | 1.203 | 0.222 | *2.482* | 0.739 |
| TOS | Toscana | *2.366* | *1.670* | 1.191 | *2.514* | 0.684 | 0.399 | 0.370 | 0.392 | *2.316* | 1.089 | 1.251 | 0.468 | 0.787 | *1.675* | 0.378 | *1.660* | 0.540 |
| TAA | Trentino-Alto Adige | *2.978* | 0.988 | 0.864 | 0.916 | 0.154 | 0.361 | 0.211 | 0.790 | 0.318 | 0.583 | *1.815* | 0.452 | 1.367 | 1.463 | 0.248 | *1.574* | 0.756 |
| UMB | Umbria | *3.067* | *2.118* | *3.441* | *2.801* | 0.542 | 0.327 | 0.174 | 1.261 | 1.334 | 0.568 | 0.972 | 0.292 | 0.498 | *1.528* | 0.269 | *1.855* | 0.467 |
| VAO | Valle d'Aosta | *2.011* | 1.287 | *1.562* | 1.072 | 0.101 | 0.138 | 0.058 | 0.282 | 0.037 | 0.059 | 0.238 | 0.480 | 0.366 | *1.813* | 0.145 | *1.880* | *1.772* |
| VEN | Veneto | *2.540* | 1.028 | 0.829 | *1.507* | 0.617 | 0.854 | 0.271 | 0.774 | *2.308* | 0.988 | *2.104* | 0.445 | 0.629 | *1.665* | 0.299 | *1.822* | 0.458 |
| DEN | Danmark | *1.739* | *2.085* | | | | | | | | | | 0.470 | | | | | 0.791 |
| IRE | Ireland | *3.299* | 1.343 | 0.242 | 1.108 | 0.947 | 0.649 | 0.120 | *2.042* | 0.496 | 0.611 | 0.843 | 0.347 | | *1.962* | 0.968 | | 0.444 |
| LUX | Luxembourg | 0.826 | 0.725 | *4.017* | 1.057 | 0.162 | 0.355 | 0.036 | 0.449 | 1.402 | 0.302 | *2.242* | 0.308 | 0.682 | 1.416 | *2.850* | 1.241 | 1.211 |
| | no. of regions with B > 1.5 | 32 | 20 | 8 | 6 | 1 | 0 | 4 | 5 | 5 | 2 | 10 | 0 | 0 | 13 | 1 | 41 | 2 |

Note: Index is cursive when it reaches at least 1.5; it is cursive and marked by * when the sector turns out to be one of the two most important in the respective region though the index does not reach 1.5

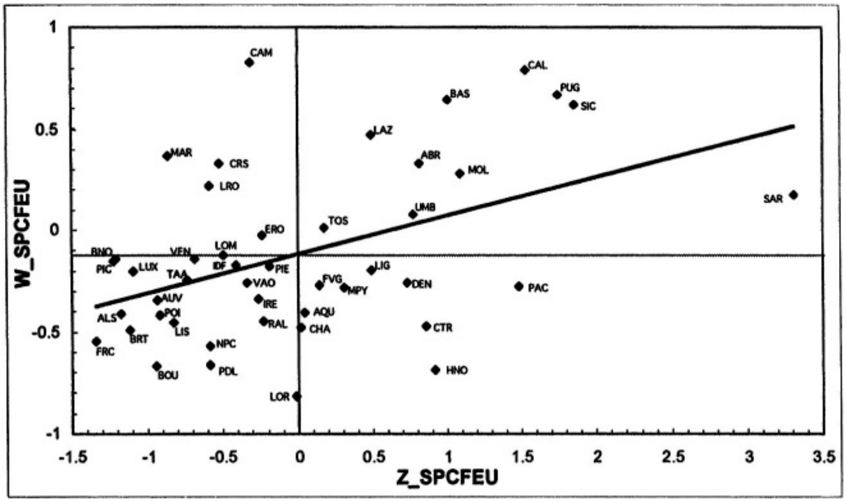
## MORAN SCATTER PLOTS

**Figure B1: Moran Scatter Plot: Agricultural, Forestry & Fishery Products, NUTS 2**



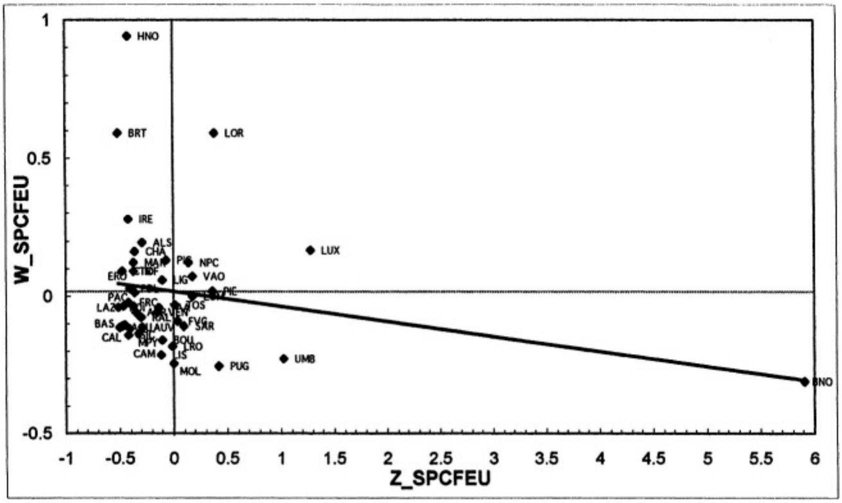

Note: See Figure 1.

**Figure B2: Moran Scatter Plot: Fuel & Power Products, NUTS 2**



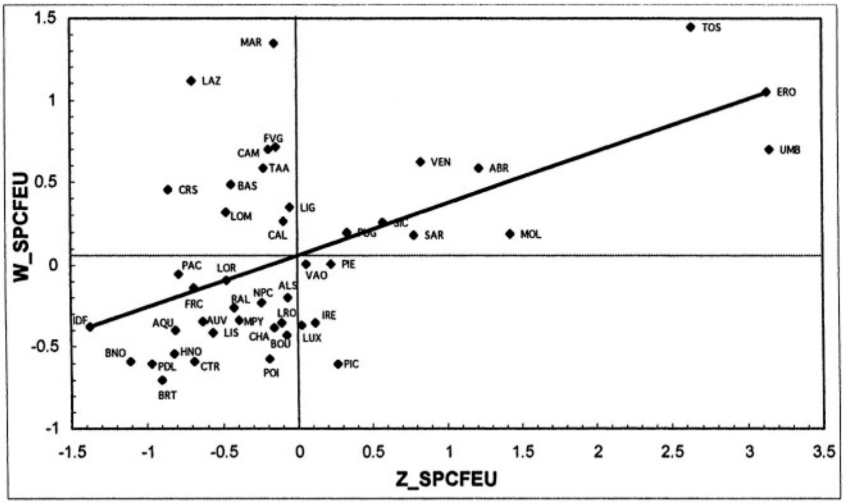

Note: See Figure 1.

**Figure B3: Moran Scatter Plot: Ferrous & Non-Ferrous Ores & Metals, NUTS 2**



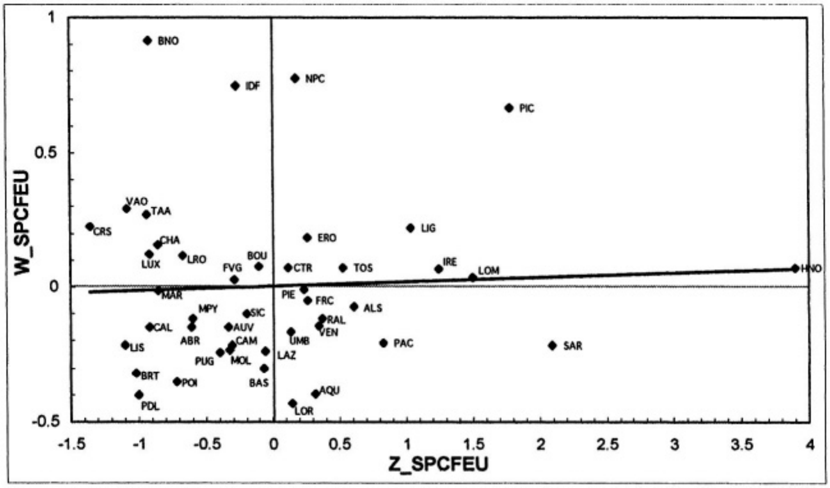

Note: See Figure 1.

**Figure B4: Moran Scatter Plot: Non-Metallic Minerals & Mineral Products, NUTS 2**



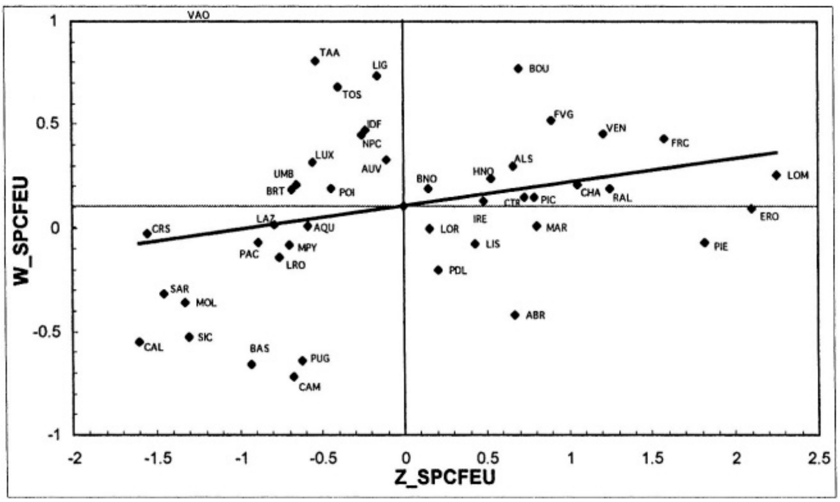

Note: See Figure 1.

**Figure B5: Moran Scatter Plot: Chemical Products, NUTS 2**



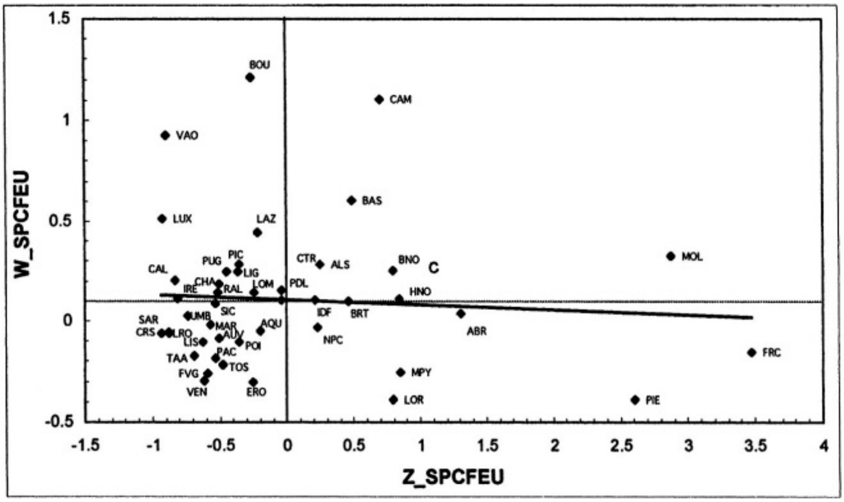

Note: See Figure 1.

**Figure B6: Moran Scatter Plot: Metal Products, Machinery, Equipment, Electrical Goods, NUTS 2**



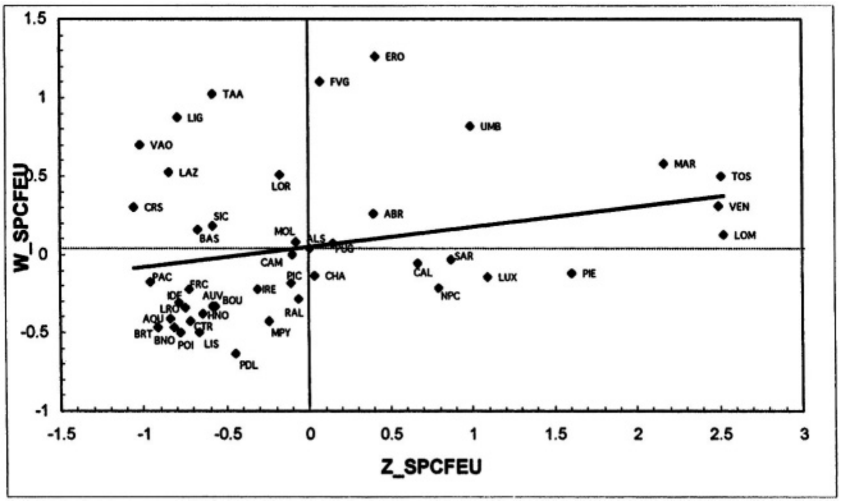

Note: See Figure 1.

**Figure B7: Moran Scatter Plot: Transport Equipment, NUTS 2**



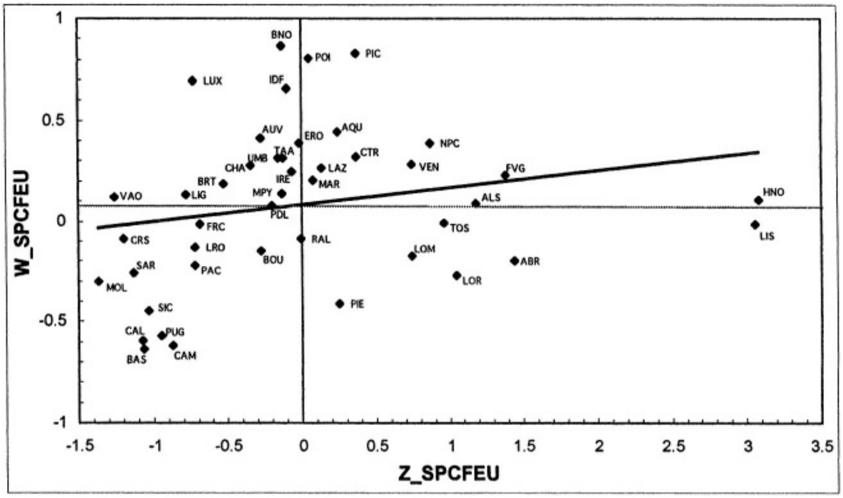

Note: See Figure 1.

**Figure B8: Moran Scatter Plot: Textiles Industries, NUTS 2**



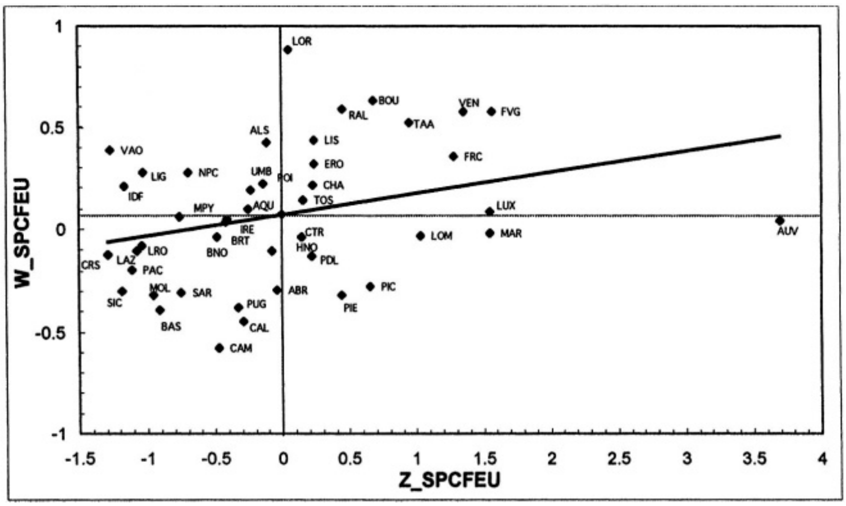

Note: See Figure 1.

**Figure B9: Moran Scatter Plot: Paper & Printing Products, NUTS 2**



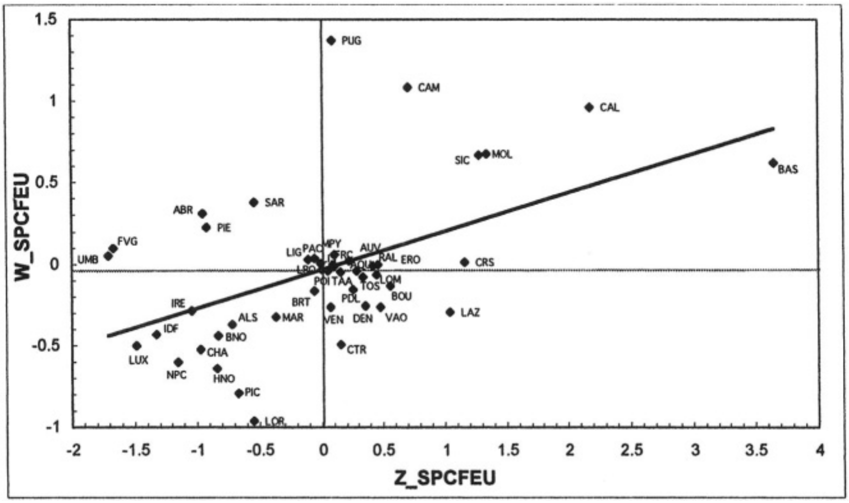

Note: See Figure 1.

**Figure B10: Moran Scatter Plot: Products of Various Industries, NUTS 2**



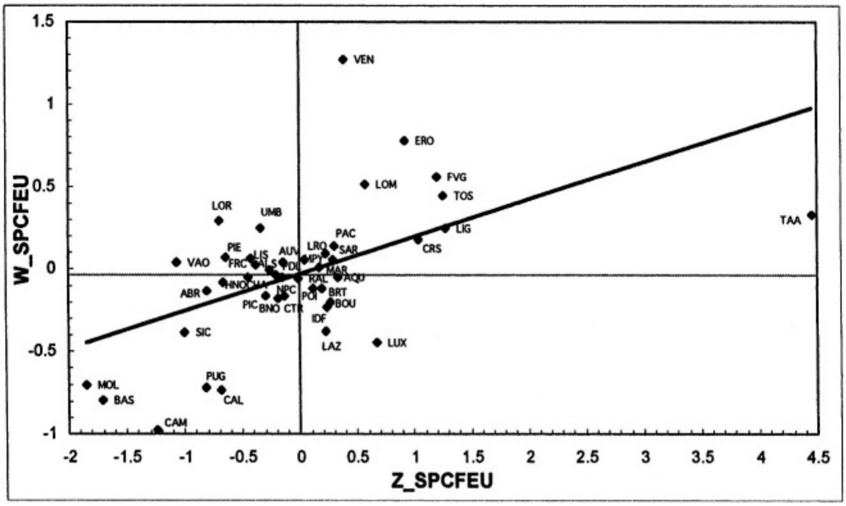

Note: See Figure 1.

**Figure B11: Moran Scatter Plot: Building & Construction, NUTS 2**



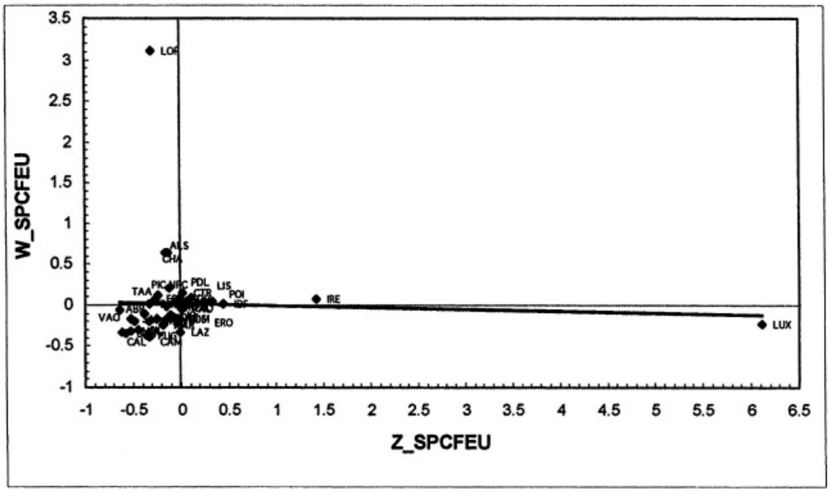

Note: See Figure 1.

**Figure B12: Moran Scatter Plot: Trade & Lodging Services, NUTS 2**



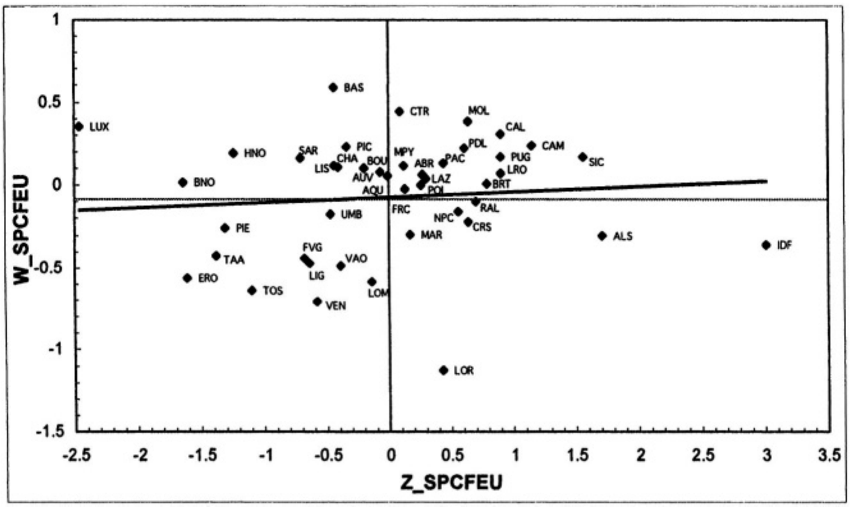

Note: See Figure 1.

**Figure B13: Moran Scatter Plot: Services of Credit & Insurance Institutions, NUTS 2**



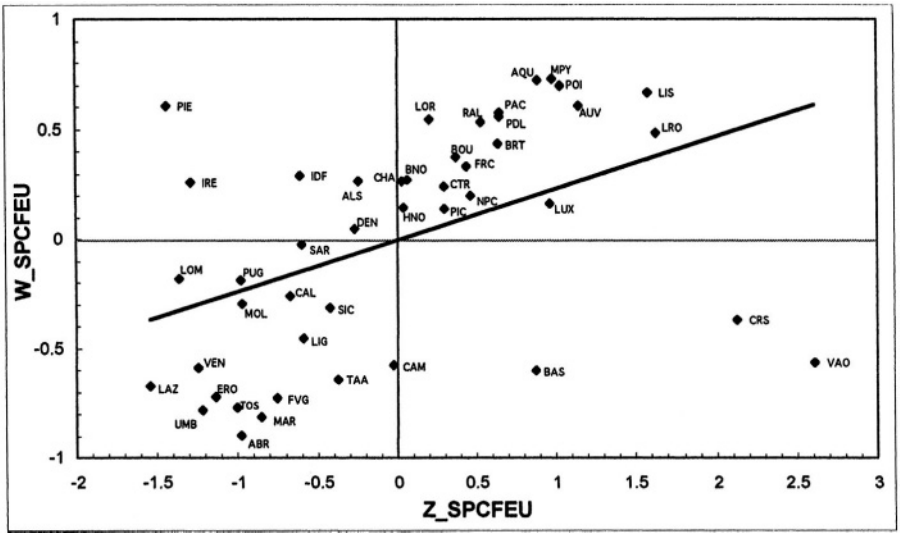

Note: See Figure 1.

**Figure B14: Moran Scatter Plot: Other Market Services, NUTS 2**




Note: See Figure 1.

**Figure B15: Moran Scatter Plot: Non-Market Services, NUTS 2**




Note: See Figure 1.

## ESTIMATION RESULTS

### Table C1: GLS-Estimates of the Determinants of Sectoral Specialization, Regional Characteristics

| | AGRO | FUEL | META | MINE | CHEM | METP | TREQ | FOOD | TEXT | PAPE | VARI | BUIL | TRLO | TRCO | CRED | OTHS | NMSE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONSTANT | 3.6645 | -0.3870 | 3.5323 | 1.9030 | 0.3975 | 0.8764 | 0.3562 | 0.8488 | 1.5497 | 1.2906 | 1.8888 | 0.7304 | 0.7538 | -0.0152 | 0.3518 | 2.6416 | 0.4809 |
| | 9.19 | -0.94 | 2.78 | 5.41 | 1.83 | 6.76 | 0.60 | 3.93 | 4.62 | 3.94 | 4.90 | 12.20 | 6.49 | -0.06 | 5.94 | 16.89 | 3.45 |
| MAR | 0.0124 | 0.0014 | 0.0135 | 0.0035 | 0.0045 | 0.0031 | 0.0039 | 0.0029 | 0.0106 | 0.0011 | 0.0019 | 0.0009 | -0.0018 | -0.0113 | -0.0009 | -0.0020 | -0.0008 |
| | 5.15 | 0.58 | 1.81 | 1.71 | 3.53 | 4.00 | 1.13 | 2.26 | 5.38 | 0.56 | 0.85 | 2.57 | -2.71 | -7.24 | -2.49 | -2.14 | -0.89 |
| CENTR | -0.7152 | 0.6094 | -1.3718 | -0.8509 | -0.5506 | -0.7050 | -0.5671 | -0.8720 | -1.7857 | -0.4652 | -1.2109 | 0.0874 | 0.1351 | 1.6121 | 0.0857 | 0.2696 | 0.1205 |
| | -3.13 | 2.59 | -1.91 | -4.38 | -4.59 | -9.85 | -1.74 | -7.32 | -9.62 | -2.57 | -5.70 | 2.55 | 2.11 | 11.05 | 2.62 | 3.12 | 1.51 |
| UEWP | 0.0660 | 0.0973 | -0.0116 | -0.0098 | 0.0104 | -0.0346 | 0.0038 | -0.0119 | -0.0151 | -0.0384 | -0.0657 | 0.0097 | -0.0251 | -0.0258 | -0.0101 | 0.0202 | 0.0081 |
| | 6.73 | 9.64 | -0.38 | -1.17 | 2.01 | -11.16 | 0.27 | -2.30 | -1.88 | -4.90 | -7.14 | 6.62 | -9.05 | -4.09 | -7.15 | 5.40 | 2.37 |
| PODEN | -6.8820 | -1.3280 | -4.3186 | -1.3549 | -0.4305 | -0.0103 | -0.9823 | -1.0061 | -0.9594 | 0.0826 | -0.3548 | -0.4181 | 0.5347 | 2.6983 | 0.4755 | 1.3921 | -0.5275 |
| | -9.77 | -1.83 | -1.96 | -2.25 | -1.16 | -0.05 | -0.97 | -2.72 | -1.66 | 0.15 | -0.54 | -3.95 | 2.68 | 5.95 | 4.68 | 5.19 | -2.14 |
| AREA | -0.0213 | 0.0120 | -0.0587 | 0.0003 | -0.0024 | 0.0034 | -0.0153 | -0.0031 | 0.0030 | -0.0024 | 0.0093 | -0.0009 | 0.0054 | 0.0161 | 0.0043 | 0.0006 | -0.0078 |
| | -3.77 | 2.06 | -3.14 | 0.06 | -0.81 | 1.91 | -1.87 | -1.04 | 0.64 | -0.53 | 1.75 | -1.12 | 3.39 | 4.44 | 5.28 | 0.28 | -3.95 |
| DIST | -1.0713 | 0.1735 | -0.7398 | -0.7202 | -0.3286 | -0.3770 | -0.8404 | -0.8967 | -0.6950 | -0.6214 | -0.6639 | 0.0540 | 0.2104 | 0.4607 | 0.0163 | 0.2565 | 0.4727 |
| | -6.89 | 1.08 | -1.24 | -5.44 | -3.94 | -7.73 | -3.73 | -11.04 | -5.39 | -5.04 | -4.58 | 2.31 | 4.81 | 4.63 | 0.73 | 4.36 | 8.68 |
| INT | -0.0141 | 0.0959 | -0.0700 | 0.0029 | 0.0087 | -0.0001 | 0.0814 | 0.0385 | -0.0206 | -0.0054 | 0.0071 | -0.0278 | -0.0113 | 0.1057 | -0.0082 | -0.0983 | 0.0100 |
| | -0.49 | 3.22 | -0.75 | 0.11 | 0.55 | -0.01 | 1.87 | 2.44 | -0.84 | -0.23 | 0.25 | -6.38 | -1.33 | 5.47 | -1.90 | -8.60 | 0.99 |
| DUM_FRA | -1.3308 | -0.7341 | 0.4700 | -0.7401 | -0.0173 | -0.0135 | 0.1876 | 0.2881 | -0.7965 | 0.1771 | -0.1144 | -0.0658 | -0.0490 | -0.3410 | 0.0752 | 0.1531 | 0.5026 |
| | -15.51 | -8.31 | 1.64 | -10.12 | -0.38 | -0.50 | 1.54 | 6.42 | -11.34 | 2.60 | -1.43 | -5.11 | -2.03 | -6.21 | 6.10 | 4.71 | 16.74 |
| DUM_IRE | 0.8755 | -2.3674 | 2.9846 | 0.1481 | 0.8922 | 0.7598 | 0.4253 | 2.0546 | 0.7526 | 0.6465 | 0.5525 | -0.2444 | - | -1.2490 | 0.4803 | - | 0.1992 |
| | 2.02 | -5.31 | 1.79 | 0.33 | 3.18 | 4.53 | 0.56 | 7.36 | 1.73 | 1.52 | 1.11 | -3.76 | | -4.13 | 7.08 | | 1.32 |
| DUM_DEN | -1.0486 | -0.6364 | - | - | - | - | - | - | - | - | - | -0.0652 | - | - | - | - | 0.4732 |
| | -3.03 | -1.78 | | | | | | | | | | -1.25 | | | | | 3.90 |
| DUM_LUX | -1.1348 | -0.7172 | 3.3211 | 0.1656 | 0.2371 | 0.2296 | -0.4839 | 0.2160 | 1.9503 | -0.3970 | 1.6401 | -0.1424 | -0.1114 | -1.6229 | 2.4484 | -0.8406 | 0.5754 |
| | -3.36 | -2.06 | 2.81 | 0.50 | 1.17 | 1.89 | -0.88 | 1.07 | 6.22 | -1.30 | 4.55 | -2.81 | -1.03 | -6.57 | 44.2 | -5.75 | 4.87 |
| no. of obs. | 377 | 377 | 353 | 361 | 360 | 361 | 353 | 361 | 360 | 361 | 361 | 377 | 358 | 363 | 363 | 358 | 377 |
| Prob $Chi^2$ | 0.0000 | 0.0000 | 0.0003 | 0.0000 | 0.0000 | 0.0000 | 0.0010 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

Note: Lines below coefficients report the z-values of the GLS estimates. The probability of the $Chi^2$-test gives the joint significance of all coefficients.

**Table C2: Instrumental-Variable Estimates of the Determinants of Sectoral Specialization, Regional Characteristics**

| | AGRO | FUEL | META | MINE | CHEM | METP | TREQ | FOOD | TEXT | PAPE | VARI | BUIL | TRLO | TRCO | CRED | OTHS | NMSE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONSTANT | 4.1133 | 0.1035 | 2.4779 | 3.5885 | 0.5799 | 0.9230 | -0.0689 | 1.0466 | 1.4919 | 0.7240 | 2.1542 | 0.6701 | 0.7149 | 0.3764 | 0.5655 | 2.1454 | 0.6660 |
| | 6.13 | 0.14 | 1.34 | 5.44 | 1.39 | 4.24 | -0.07 | 2.51 | 2.53 | 1.14 | 3.05 | 7.28 | 3.45 | 0.77 | 5.41 | 9.21 | 2.85 |
| MAR | 0.0125 | 0.0034 | 0.0174 | 0.0030 | 0.0028 | 0.0018 | -0.0016 | 0.0030 | 0.0111 | -0.0012 | 0.0005 | 0.0015 | -0.0025 | -0.0129 | -0.0007 | 0.0001 | 0.0003 |
| | 4.10 | 1.01 | 2.15 | 1.05 | 1.53 | 1.93 | -0.39 | 1.66 | 4.32 | -0.42 | 0.15 | 3.51 | -2.77 | -6.04 | -1.54 | 0.11 | 0.31 |
| CENTR | -1.0865 | 0.4123 | -1.5501 | -0.9904 | -0.5511 | -0.7260 | -0.8149 | -0.9342 | -1.8806 | -0.2716 | -1.2023 | 0.0503 | 0.1842 | 1.9619 | -0.0026 | 0.2212 | 0.0985 |
| | -3.77 | 1.31 | -2.04 | -3.66 | -3.22 | -8.14 | -2.14 | -5.47 | -7.78 | -1.05 | -4.16 | 1.27 | 2.17 | 9.77 | -0.06 | 2.32 | 0.98 |
| UEWP | 0.0367 | 0.1211 | -0.0318 | 0.0082 | 0.0253 | -0.0214 | 0.0024 | -0.0136 | 0.0146 | -0.0399 | -0.0456 | 0.0074 | -0.0271 | -0.0224 | -0.0132 | 0.0215 | -0.0058 |
| | 2.68 | 8.13 | -0.87 | 0.63 | 3.09 | -5.01 | 0.13 | -1.67 | 1.26 | -3.22 | -3.29 | 3.95 | -6.68 | -2.33 | -6.42 | 4.72 | -1.23 |
| PODEN | -6.2533 | -1.9967 | -4.5494 | -1.6611 | -0.5617 | -0.2778 | 0.8723 | -1.0115 | -1.6714 | 0.3255 | -0.7656 | -0.4584 | 0.7979 | 3.0794 | 0.5762 | 0.6855 | -0.4135 |
| | -6.61 | -1.94 | -1.80 | -1.86 | -0.99 | -0.94 | 0.69 | -1.79 | -2.09 | 0.38 | -0.80 | -3.53 | 2.85 | 4.64 | 4.07 | 2.17 | -1.26 |
| AREA | -0.0102 | 0.0059 | -0.0543 | 0.0042 | -0.0062 | 0.0023 | -0.0015 | -0.0039 | 0.0026 | -0.0008 | 0.0065 | -0.0021 | 0.0075 | 0.0217 | 0.0050 | -0.0047 | -0.0078 |
| | -1.28 | 0.68 | -2.56 | 0.56 | -1.31 | 0.94 | -0.14 | -0.82 | 0.38 | -0.12 | 0.81 | -1.88 | 3.16 | 3.88 | 4.23 | -1.76 | -2.80 |
| DIST | -1.4943 | 0.1317 | -0.6397 | -1.1883 | -0.4030 | -0.5439 | -0.9568 | -0.8748 | -0.9861 | -0.4279 | -0.7923 | 0.0252 | 0.2308 | 0.4144 | -0.0016 | 0.2019 | 0.6682 |
| | -6.17 | 0.50 | -1.00 | -5.23 | -2.80 | -7.25 | -2.77 | -6.09 | -4.85 | -1.96 | -3.26 | 0.76 | 3.24 | 2.45 | -0.04 | 2.52 | 7.92 |
| INT | -0.0265 | 0.0574 | 0.0246 | -0.1205 | -0.0119 | -0.0086 | 0.0815 | 0.0257 | -0.0212 | 0.0289 | -0.0220 | -0.0203 | -0.0103 | 0.0702 | -0.0214 | -0.0534 | 0.0023 |
| | -0.55 | 1.10 | 0.19 | -2.55 | -0.40 | -0.55 | 1.23 | 0.86 | -0.50 | 0.64 | -0.43 | -3.10 | -0.70 | 2.00 | -2.87 | -3.20 | 0.14 |
| RDINT | -0.0910 | 0.0032 | -0.1163 | 0.0602 | 0.0858 | 0.0762 | 0.0567 | -0.0137 | 0.0357 | 0.0292 | 0.0985 | -0.0026 | 0.0014 | 0.0019 | -0.0138 | 0.0130 | -0.0722 |
| | -2.41 | 0.08 | -1.16 | 1.69 | 3.80 | 6.48 | 1.12 | -0.61 | 1.12 | 0.85 | 2.58 | -0.50 | 0.12 | 0.07 | -2.44 | 1.03 | -5.49 |
| DUM_FRA | -1.1326 | -0.8878 | 0.6170 | -1.2895 | -0.1884 | -0.2193 | 0.1023 | 0.3861 | -1.0134 | 0.1701 | -0.3029 | -0.0605 | -0.1258 | -0.4153 | 0.0461 | 0.1548 | 0.7686 |
| | -7.28 | -5.24 | 1.49 | -8.76 | -2.02 | -4.51 | 0.49 | 4.15 | -7.70 | 1.20 | -1.92 | -2.84 | -2.72 | -3.80 | 1.98 | 2.98 | 14.2 |
| DUM_IRE | 1.0721 | -2.1278 | - | - | - | - | - | - | - | - | - | -0.1154 | - | -1.8847 | 0.5376 | - | 0.4023 |
| | 1.92 | -3.50 | | | | | | | | | | -1.51 | | -4.02 | 5.38 | | 2.07 |
| DUM_DEN | -0.8474 | -0.4824 | - | - | - | - | - | - | - | - | - | -0.0592 | - | - | - | - | 0.7408 |
| | -1.97 | -1.03 | | | | | | | | | | -1.00 | | | | | 4.94 |
| DUM_LUX | -0.7105 | -0.4881 | 3.6216 | 0.0278 | -0.1039 | 0.0917 | -0.3988 | 0.2164 | 0.8072 | -0.5341 | 0.6796 | -0.0837 | -0.1007 | -2.2604 | 2.8708 | -0.7074 | 0.7914 |
| | -1.71 | -1.08 | 2.49 | 0.05 | -0.32 | 0.54 | -0.56 | 0.66 | 1.75 | -1.08 | 1.23 | -1.46 | -0.62 | -5.89 | 35.06 | -3.87 | 5.46 |
| no. of obs. | 216 | 216 | 202 | 203 | 203 | 203 | 197 | 203 | 203 | 203 | 203 | 216 | 203 | 205 | 205 | 203 | 216 |
| Prob Chi$^2$ | 0.0000 | 0.0000 | 0.0101 | 0.0000 | 0.0000 | 0.0000 | 0.0447 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

*Note*: Lines below coefficients report the t-values of the IV estimates. The probability of the F-test gives the joint significance of all coefficients.

**Table C3: GLS Estimates of the Determinants of Sectoral Specialization, Regional Characteristics Including RDINT**

| | AGRO | FUEL | META | MINE | CHEM | METP | TREQ | FOOD | TEXT | PAPE | VARI | BUIL | TRLO | TRCO | CRED | OTHS | NMSE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONSTANT | 4.1133 | 0.1035 | 2.4779 | 3.5885 | 0.5799 | 0.9230 | -0.0689 | 1.0466 | 1.4919 | 0.7240 | 2.1542 | 0.6701 | 0.7149 | 0.3764 | 0.5655 | 2.1454 | 0.6660 |
| | 6.13 | 0.14 | 1.34 | 5.44 | 1.39 | 4.24 | -0.07 | 2.51 | 2.53 | 1.14 | 3.05 | 7.28 | 3.45 | 0.77 | 5.41 | 9.21 | 2.85 |
| MAR | 0.0125 | 0.0034 | 0.0174 | 0.0030 | 0.0028 | 0.0018 | -0.0016 | 0.0030 | 0.0111 | -0.0012 | 0.0005 | 0.0015 | -0.0025 | -0.0129 | -0.0007 | 0.0001 | 0.0003 |
| | 4.10 | 1.01 | 2.15 | 1.05 | 1.53 | 1.93 | -0.39 | 1.66 | 4.32 | -0.42 | 0.15 | 3.51 | -2.77 | -6.04 | -1.54 | 0.11 | 0.31 |
| CENTR | -1.0865 | 0.4123 | -1.5501 | -0.9904 | -0.5511 | -0.7260 | -0.8149 | -0.9342 | -1.8806 | -0.2716 | -1.2023 | 0.0503 | 0.1842 | 1.9619 | -0.0026 | 0.2212 | 0.0985 |
| | -3.77 | 1.31 | -2.04 | -3.66 | -3.22 | -8.14 | -2.14 | -5.47 | -7.78 | -1.05 | -4.16 | 1.27 | 2.17 | 9.77 | -0.06 | 2.32 | 0.98 |
| UEWP | 0.0367 | 0.1211 | -0.0318 | 0.0082 | 0.0253 | -0.0214 | 0.0024 | -0.0136 | 0.0146 | -0.0399 | -0.0456 | 0.0074 | -0.0271 | -0.0224 | -0.0132 | 0.0215 | -0.0058 |
| | 2.68 | 8.13 | -0.87 | 0.63 | 3.09 | -5.01 | 0.13 | -1.67 | 1.26 | -3.22 | -3.29 | 3.95 | -6.68 | -2.33 | -6.42 | 4.72 | -1.23 |
| PODEN | -6.2533 | -1.9967 | -4.5494 | -1.6611 | -0.5617 | -0.2778 | 0.8723 | -1.0115 | -1.6714 | 0.3255 | -0.7656 | -0.4584 | 0.7979 | 3.0794 | 0.5762 | 0.6855 | -0.4135 |
| | -6.61 | -1.94 | -1.80 | -1.86 | -0.99 | -0.94 | 0.69 | -1.79 | -2.09 | 0.38 | -0.80 | -3.53 | 2.85 | 4.64 | 4.07 | 2.17 | -1.26 |
| AREA | -0.0102 | 0.0059 | -0.0543 | 0.0042 | -0.0062 | 0.0023 | -0.0015 | -0.0039 | 0.0026 | -0.0008 | 0.0065 | -0.0021 | 0.0075 | 0.0217 | 0.0050 | -0.0047 | -0.0078 |
| | -1.28 | 0.68 | -2.56 | 0.56 | -1.31 | 0.94 | -0.14 | -0.82 | 0.38 | -0.12 | 0.81 | -1.88 | 3.16 | 3.88 | 4.23 | -1.76 | -2.80 |
| DIST | -1.4943 | 0.1317 | -0.6397 | -1.1883 | -0.4030 | -0.5439 | -0.9568 | -0.8748 | -0.9861 | -0.4279 | -0.7923 | 0.0252 | 0.2308 | 0.4144 | -0.0016 | 0.2019 | 0.6682 |
| | -6.17 | 0.50 | -1.00 | -5.23 | -2.80 | -7.25 | -2.77 | -6.09 | -4.85 | -1.96 | -3.26 | 0.76 | 3.24 | 2.45 | -0.04 | 2.52 | 7.92 |
| INT | -0.0265 | 0.0574 | 0.0246 | -0.1205 | -0.0119 | -0.0086 | 0.0815 | 0.0257 | -0.0212 | 0.0289 | -0.0220 | -0.0203 | -0.0103 | 0.0702 | -0.0214 | -0.0534 | 0.0023 |
| | -0.55 | 1.10 | 0.19 | -2.55 | -0.40 | -0.55 | 1.23 | 0.86 | -0.50 | 0.64 | -0.43 | -3.10 | -0.70 | 2.00 | -2.87 | -3.20 | 0.14 |
| RDINT | -0.0910 | 0.0032 | -0.1163 | 0.0602 | 0.0858 | 0.0762 | 0.0567 | -0.0137 | 0.0357 | 0.0292 | 0.0985 | -0.0026 | 0.0014 | 0.0019 | -0.0138 | 0.0130 | -0.0722 |
| | -2.41 | 0.08 | -1.16 | 1.69 | 3.80 | 6.48 | 1.12 | -0.61 | 1.12 | 0.85 | 2.58 | -0.50 | 0.12 | 0.07 | -2.44 | 1.03 | -5.49 |
| DUM_FRA | -1.1326 | -0.8878 | 0.6170 | -1.2895 | -0.1884 | -0.2193 | 0.1023 | 0.3861 | -1.0134 | 0.1701 | -0.3029 | -0.0605 | -0.1258 | -0.4153 | 0.0461 | 0.1548 | 0.7686 |
| | -7.28 | -5.24 | 1.49 | -8.76 | -2.02 | -4.51 | 0.49 | 4.15 | -7.70 | 1.20 | -1.92 | -2.84 | -2.72 | -3.80 | 1.98 | 2.98 | 14.2 |
| DUM_IRE | 1.0721 | -2.1278 | – | – | – | – | – | – | – | – | – | -0.1154 | – | -1.8847 | 0.5376 | – | 0.4023 |
| | 1.92 | -3.50 | | | | | | | | | | -1.51 | | -4.02 | 5.38 | | 2.07 |
| DUM_DEN | -0.8474 | -0.4824 | – | – | – | – | – | – | – | – | – | -0.0592 | – | – | – | – | 0.7408 |
| | -1.97 | -1.03 | | | | | | | | | | -1.00 | | | | | 4.94 |
| DUM_LUX | -0.7105 | -0.4881 | 3.6216 | 0.0278 | -0.1039 | 0.0917 | -0.3988 | 0.2164 | 0.8072 | -0.5341 | 0.6796 | -0.0837 | -0.1007 | -2.2604 | 2.8708 | -0.7074 | 0.7914 |
| | -1.71 | -1.08 | 2.49 | 0.05 | -0.32 | 0.54 | -0.56 | 0.66 | 1.75 | -1.08 | 1.23 | -1.46 | -0.62 | -5.89 | 35.06 | -3.87 | 5.46 |
| no. of obs. | 216 | 216 | 202 | 203 | 203 | 203 | 197 | 203 | 203 | 203 | 203 | 216 | 203 | 205 | 205 | 203 | 216 |
| Prob Chi$^2$ | 0.0000 | 0.0000 | 0.0101 | 0.0000 | 0.0000 | 0.0000 | 0.0447 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

Note: Lines below coefficients report the z-values of the GLS estimates. The probability of the Chi$^2$-test gives the joint significance of all coefficients.

**Table C4: GLS and IV Estimates of the Determinants of Sectoral Specialization, Including Sector-Specific DPROD**

| | FUEL | | MINE | | CHEM | | METP | | TREQ | | FOOD | | TEXT | | PAPE | | BUIL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GLS | IV | GLS | IV | GLS | IV | GLS | IV | GLS | IV | GLS | IV | GLS | IV | GLS | IV | GLS | IV |
| CONSTANT | -0.7608 | -0.6941 | 1.4478 | 1.6150 | 0.3171 | 0.2649 | 0.8645 | 0.9544 | -0.0618 | 0.1164 | 0.8483 | 0.8606 | 1.5615 | 1.4407 | 1.3157 | 1.3861 | 0.8240 | 0.7956 |
| | -1.60 | -1.36 | 3.50 | 3.35 | 1.49 | 1.05 | 6.08 | 5.88 | -0.09 | 0.14 | 3.68 | 3.12 | 3.97 | 3.21 | 4.33 | 3.95 | 11.36 | 9.75 |
| MAR | -0.0028 | -0.0025 | 0.0018 | 0.0009 | 0.0037 | 0.0034 | 0.0040 | 0.0032 | 0.0092 | 0.0082 | 0.0032 | 0.0035 | 0.0132 | 0.0131 | 0.0034 | 0.0029 | 0.0010 | 0.0015 |
| | -0.98 | -0.81 | 0.74 | 0.29 | 2.83 | 2.17 | 4.73 | 3.14 | 2.36 | 1.66 | 2.34 | 2.14 | 5.72 | 4.89 | 1.97 | 1.46 | 2.37 | 3.10 |
| CENTR | 0.7020 | 0.6580 | -0.9439 | -0.9871 | -0.4561 | -0.4914 | -0.6699 | -0.6810 | -0.4365 | -0.5214 | -0.8084 | -0.8391 | -1.7939 | -1.7957 | -0.6014 | -0.6709 | 0.1034 | 0.0960 |
| | 2.87 | 2.57 | -4.47 | -4.12 | -4.14 | -3.88 | -9.21 | -8.45 | -1.28 | -1.33 | -6.95 | -6.36 | -8.90 | -8.06 | -3.84 | -3.69 | 2.81 | 2.45 |
| UEWP | 0.0822 | 0.0915 | -0.0083 | -0.0078 | 0.0138 | 0.0190 | -0.0310 | -0.0386 | 0.0515 | 0.0351 | -0.0084 | -0.0045 | -0.0183 | -0.0130 | -0.0149 | -0.0095 | 0.0037 | 0.0035 |
| | 7.52 | 7.37 | -0.86 | -0.66 | 2.87 | 3.13 | -7.27 | -6.46 | 3.10 | 1.46 | -1.64 | -0.70 | -1.89 | -0.88 | -1.81 | -0.81 | 1.69 | 1.04 |
| PODEN | -1.0314 | -0.9767 | -1.2232 | -1.1116 | -0.2961 | -0.3055 | -0.0512 | 0.2464 | -3.0013 | -2.6540 | -1.0615 | -1.1796 | -1.4035 | -1.5100 | -0.5240 | -0.5156 | -0.4525 | -0.5783 |
| | -1.33 | -1.14 | -1.82 | -1.37 | -0.86 | -0.73 | -0.21 | 0.79 | -2.71 | -1.80 | -2.86 | -2.65 | -2.21 | -2.03 | -1.09 | -0.91 | -3.91 | -4.36 |
| AREA | 0.0142 | 0.0149 | 0.0074 | 0.0114 | 0.0014 | 0.0011 | 0.0037 | 0.0051 | -0.0259 | -0.0241 | -0.0012 | -0.0014 | 0.0048 | 0.0060 | -0.0047 | -0.0033 | -0.0012 | -0.0029 |
| | 2.03 | 1.90 | 1.21 | 1.52 | 0.42 | 0.28 | 1.75 | 2.02 | -2.61 | -1.90 | -0.37 | -0.35 | 0.83 | 0.85 | -1.08 | -0.63 | -1.19 | -2.43 |
| DIST | 0.1578 | 0.2562 | -0.9588 | -1.0699 | -0.2631 | -0.2858 | -0.3478 | -0.3506 | -0.5828 | -0.7635 | -0.8654 | -0.9236 | -0.8430 | -0.8573 | -0.6937 | -0.7415 | 0.0598 | 0.0545 |
| | 0.85 | 1.28 | -5.87 | -5.61 | -2.72 | -2.55 | -6.27 | -5.52 | -2.15 | -2.37 | -9.78 | -8.91 | -5.32 | -4.50 | -5.88 | -5.36 | 2.14 | 1.78 |
| INT | 0.1441 | 0.1268 | 0.0432 | 0.0318 | 0.0055 | 0.0077 | -0.0059 | -0.0097 | 0.0883 | 0.0907 | 0.0314 | 0.0304 | -0.0179 | -0.0120 | -0.0184 | -0.0255 | -0.0300 | -0.0256 |
| | 4.09 | 3.39 | 1.42 | 0.90 | 0.35 | 0.42 | -0.56 | -0.81 | 1.78 | 1.56 | 1.85 | 1.53 | -0.62 | -0.37 | -0.83 | -1.03 | -5.71 | -4.53 |
| DPROD | 0.0110 | 0.0115 | 0.0133 | 0.0139 | 0.0104 | 0.0145 | 0.0018 | -0.0042 | 0.0531 | 0.0375 | 0.0108 | 0.0157 | -0.0104 | -0.0093 | 0.0191 | 0.0265 | -0.0074 | -0.0084 |
| | 5.91 | 5.10 | 1.70 | 1.42 | 3.77 | 3.36 | 0.51 | -0.88 | 5.52 | 2.42 | 3.24 | 2.71 | -1.57 | -0.62 | 4.19 | 3.85 | -4.62 | -3.48 |
| DUM_FRA | -0.5501 | -0.6742 | -0.6899 | -0.7437 | -0.0669 | -0.0511 | -0.0333 | -0.0478 | 0.3168 | 0.3252 | 0.2526 | 0.2726 | -0.7970 | -0.8067 | 0.1261 | 0.1067 | -0.0525 | -0.0330 |
| | -4.80 | -5.19 | -6.87 | -6.02 | -1.26 | -0.79 | -0.96 | -1.15 | 2.01 | 1.64 | 4.68 | 4.11 | -8.37 | -6.88 | 1.81 | 1.31 | -3.09 | -1.71 |
| DUM_IRE | – | – | -0.1129 | -0.3896 | 0.5355 | 0.6301 | – | – | – | – | 1.8890 | 1.8203 | 0.5246 | 0.4353 | 0.7949 | 0.7991 | -0.2880 | -0.2264 |
| | | | -0.22 | -0.62 | 2.01 | 1.91 | | | | | 6.72 | 5.21 | 1.08 | 0.74 | 2.19 | 1.84 | -3.49 | -2.44 |
| DUM_DEN | -0.8637 | -0.8163 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | -0.0708 | -0.0665 |
| | -2.05 | -1.80 | | | | | | | | | | | | | | | -1.13 | -0.97 |
| DUM_LUX | -0.9157 | -0.7576 | 0.0977 | 0.0042 | 0.1709 | 0.1698 | 0.2531 | 0.1953 | 0.3931 | 0.1641 | 0.3151 | 0.3771 | 2.1666 | 2.1256 | -0.0218 | 0.0994 | -0.2953 | -0.2927 |
| | -2.25 | -1.72 | 0.27 | 0.01 | 0.97 | 0.81 | 2.10 | 1.42 | 0.68 | 0.23 | 1.61 | 1.61 | 6.15 | 4.49 | -0.08 | 0.30 | -4.58 | -3.79 |
| no. of obs. | 297 | 253 | 295 | 251 | 291 | 248 | 292 | 249 | 284 | 241 | 295 | 251 | 294 | 250 | 289 | 244 | 301 | 256 |
| Prob $Chi^2$ / F | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.1110 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

Note: Lines below coefficients report the z-(t-)values of the GLS (IV) estimates. The probability of the $Chi^2$/F-test gives the joint significance of all coefficients.

## Table C5: GLS and IV Estimates of the Determinants of Sectoral Specialization, Including Sector-Specific DLABCOST

| | FUEL | | MINE | | CHEM | | METP | | TREQ | | FOOD | | TEXT | | PAPE | | BUIL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GLS | IV | GLS | IV | GLS | IV | GLS | IV | GLS | IV | GLS | IV | GLS | IV | GLS | IV | GLS | IV |
| CONSTANT | -0.5926 | -4.0129 | 1.5320 | 2.0262 | 0.4917 | 0.4337 | 0.8843 | 0.5000 | -0.3690 | -0.3983 | 0.9922 | 0.9535 | 1.6079 | 1.2914 | 1.8042 | 2.0533 | 0.7257 | 0.7030 |
| | -1.18 | -0.67 | 3.65 | 1.76 | 2.23 | 1.49 | 6.23 | 0.76 | -0.52 | -0.44 | 4.25 | 3.13 | 3.99 | 2.24 | 5.50 | 5.38 | 9.89 | 8.05 |
| MAR | 0.0000 | -0.0112 | 0.0028 | 0.0035 | 0.0052 | 0.0050 | 0.0039 | 0.0021 | 0.0038 | 0.0027 | 0.0041 | 0.0046 | 0.0127 | 0.0133 | 0.0048 | 0.0046 | 0.0011 | 0.0018 |
| | 0.00 | -0.52 | 1.14 | 0.38 | 4.12 | 2.98 | 4.74 | 0.81 | 0.93 | 0.51 | 3.02 | 2.66 | 5.47 | 4.00 | 2.59 | 2.12 | 2.47 | 3.46 |
| CENTR | 0.6511 | 0.6710 | -0.9640 | -1.1559 | -0.3868 | -0.3892 | -0.6642 | -0.8276 | -0.5268 | -0.4878 | -0.8265 | -0.8594 | -1.7961 | -1.8277 | -0.3964 | -0.4141 | 0.0837 | 0.0742 |
| | 2.51 | 1.01 | -4.51 | -2.61 | -3.44 | -2.81 | -9.13 | -3.40 | -1.41 | -1.04 | -6.70 | -5.50 | -8.52 | -6.05 | -2.46 | -2.20 | 2.18 | 1.36 |
| UEWP | 0.0938 | 0.0893 | -0.0136 | -0.0223 | 0.0103 | 0.0142 | -0.0330 | -0.0280 | 0.0040 | -0.0087 | -0.0107 | -0.0061 | -0.0135 | 0.0007 | -0.0328 | -0.0353 | 0.0113 | 0.0111 |
| | 8.22 | 2.17 | -1.44 | -0.81 | 2.10 | 2.15 | -10.31 | -2.35 | 0.25 | -0.41 | -2.03 | -0.87 | -1.49 | 0.05 | -4.35 | -3.70 | 6.56 | 2.34 |
| PODEN | -1.3764 | 3.1175 | -1.3499 | -1.5177 | -0.5688 | -0.4899 | -0.0198 | 0.7407 | -0.7234 | -0.5626 | -1.2293 | -1.3558 | -1.3795 | -1.6275 | -0.9729 | -1.0570 | -0.4680 | -0.6486 |
| | -1.67 | 0.39 | -2.01 | -0.82 | -1.61 | -1.00 | -0.09 | 0.79 | -0.63 | -0.37 | -3.27 | -2.83 | -2.14 | -1.74 | -1.84 | -1.62 | -3.89 | -4.16 |
| AREA | 0.0138 | 0.0720 | 0.0066 | 0.0055 | -0.0020 | -0.0006 | 0.0035 | 0.0172 | -0.0107 | -0.0077 | -0.0035 | -0.0018 | 0.0054 | 0.0122 | -0.0131 | -0.0153 | -0.0005 | -0.0033 |
| | 1.82 | 0.71 | 1.07 | 0.17 | -0.58 | -0.13 | 1.66 | 1.13 | -0.96 | -0.52 | -1.02 | -0.36 | 0.90 | 1.33 | -2.68 | -2.44 | -0.47 | -1.00 |
| DIST | 0.1943 | 0.4719 | -0.9821 | -1.2923 | -0.1816 | -0.1874 | -0.3396 | -0.6357 | -0.6087 | -0.5303 | -0.8529 | -0.9402 | -0.9054 | -1.1835 | -0.5553 | -0.5210 | 0.0414 | 0.0222 |
| | 0.95 | 0.80 | -5.83 | -4.27 | -1.80 | -1.46 | -5.94 | -1.86 | -1.80 | -1.25 | -9.11 | -7.43 | -5.43 | -4.56 | -4.30 | -3.17 | 1.38 | 0.37 |
| INT | 0.1180 | 0.2734 | 0.0405 | 0.0209 | -0.0054 | -0.0046 | -0.0062 | 0.0088 | 0.1177 | 0.1236 | 0.0239 | 0.0252 | -0.0222 | -0.0045 | -0.0335 | -0.0458 | -0.0282 | -0.0230 |
| | 3.20 | 0.90 | 1.31 | 0.45 | -0.33 | -0.22 | -0.59 | 0.24 | 2.26 | 1.92 | 1.38 | 1.15 | -0.75 | -0.11 | -1.41 | -1.70 | -5.19 | -3.28 |
| DLABCOST | -0.0011 | 0.0381 | 0.0005 | -0.0216 | -0.0001 | 0.0006 | -0.0004 | 0.0074 | 0.0000 | -0.0003 | -0.0004 | 0.0027 | -0.0005 | 0.0092 | -0.0007 | 0.0001 | 0.0028 | -0.0047 |
| | -0.99 | 0.58 | 0.16 | -0.23 | -1.25 | 0.96 | -1.67 | 0.87 | 0.07 | -0.17 | -0.82 | 1.14 | -0.59 | 1.83 | -1.88 | 0.02 | 2.24 | -0.31 |
| DUM_FRA | -0.6720 | -0.0978 | -0.6710 | -0.7741 | -0.0691 | -0.0724 | -0.0328 | -0.0376 | 0.2976 | 0.3514 | 0.2424 | 0.2598 | -0.8348 | -0.8623 | 0.1272 | 0.1291 | -0.0639 | -0.0367 |
| | -5.49 | -0.08 | -6.73 | -5.59 | -1.27 | -0.99 | -0.96 | -0.38 | 1.71 | 1.53 | 4.34 | 3.47 | -8.65 | -5.86 | 1.74 | 1.38 | -3.56 | -0.84 |
| DUM_IRE | -2.2424 | -4.4100 | -0.2876 | – | 0.9557 | – | 0.7353 | – | 0.3429 | – | 1.9227 | – | – | – | 1.1736 | – | -0.5751 | – |
| | -3.50 | -1.13 | -0.31 | | 2.53 | | 2.99 | | 0.24 | | 4.75 | | | | 2.23 | | -3.51 | |
| DUM_DEN | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | -0.3237 | – |
| | | | | | | | | | | | | | | | | | -2.14 | |
| DUM_LUX | -0.8072 | -0.5131 | 0.2263 | 0.9185 | 0.2267 | -0.3461 | 0.2838 | 0.3920 | -0.2554 | -0.1846 | 0.2614 | -0.1647 | 2.0216 | 0.5354 | -0.4234 | -0.5986 | -0.1511 | -0.0405 |
| | -2.08 | -0.47 | 0.63 | 0.28 | 1.18 | -0.66 | 2.21 | 0.88 | -0.41 | -0.16 | 1.26 | -0.39 | 5.71 | 0.59 | -1.60 | -1.28 | -2.62 | -0.30 |
| no. of obs. | 296 | 249 | 291 | 245 | 285 | 240 | 291 | 245 | 265 | 210 | 291 | 245 | 286 | 240 | 266 | 212 | 294 | 246 |
| Prob $Chi^2$ / F | 0.0000 | 0.0006 | 0.0000 | 0.0000 | 0.0000 | 0.0002 | 0.0000 | 0.0000 | 0.0964 | 0.2879 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

Note: Lines below coefficients report the z-(t-)values of the GLS (IV) estimates. The probability of the $Chi^2$/F-test gives the joint significance of all coefficients.

**Table C6: GLS and IV Estimates of the Determinants of Sectoral Specialization, Including Sector-Specific ES**

| | FUEL | | MINE | | CHEM | | METP | | TREQ | | FOOD | | TEXT | | PAPE | | BUIL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GLS | IV | GLS | IV | GLS | IV | GLS | IV | GLS | IV | GLS | IV | GLS | IV | GLS | IV | GLS | IV |
| CONSTANT | 0.8180 | 0.2758 | 2.3444 | 3.6543 | 0.1678 | -0.5443 | 0.8974 | 0.6599 | -0.6072 | -1.0852 | 0.6984 | 0.1658 | 1.4898 | 1.5681 | 1.0207 | 0.6256 | 0.6405 | 0.7523 |
| | 1.62 | 0.47 | 5.48 | 5.76 | 0.74 | -1.56 | 6.14 | 3.13 | -1.00 | -1.30 | 2.56 | 0.40 | 3.56 | 2.40 | 2.53 | 1.14 | 8.25 | 5.98 |
| MAR | 0.0015 | 0.0025 | 0.0040 | 0.0049 | 0.0047 | 0.0066 | 0.0039 | 0.0064 | 0.0025 | 0.0035 | 0.0007 | -0.0013 | 0.0100 | 0.0106 | -0.0001 | -0.0009 | 0.0014 | 0.0019 |
| | 0.56 | 0.86 | 1.74 | 1.70 | 3.76 | 4.09 | 4.92 | 5.70 | 0.76 | 0.86 | 0.47 | -0.66 | 4.65 | 3.87 | -0.03 | -0.35 | 3.44 | 4.03 |
| CENTR | 0.0326 | -0.2963 | -0.9168 | -1.0129 | -0.8926 | -1.4816 | -0.7064 | -0.8153 | -0.5508 | -0.5776 | -0.8274 | -0.9160 | -1.9990 | -1.9453 | -0.5334 | -0.5548 | 0.0920 | 0.0833 |
| | 0.13 | -1.11 | -4.39 | -4.25 | -7.72 | -8.80 | -9.83 | -9.29 | -1.86 | -1.65 | -6.34 | -5.68 | -9.37 | -6.40 | -2.74 | -2.47 | 2.52 | 1.93 |
| UEWP | 0.0645 | 0.0623 | -0.0048 | -0.0069 | 0.0028 | -0.0068 | -0.0323 | -0.0318 | 0.0031 | 0.0002 | -0.0115 | -0.0134 | -0.0089 | 0.0045 | -0.0365 | -0.0452 | 0.0092 | 0.0111 |
| | 5.42 | 4.26 | -0.51 | -0.57 | 0.55 | -0.94 | -10.10 | -7.56 | 0.23 | 0.01 | -2.05 | -1.86 | -1.04 | 0.41 | -4.23 | -4.17 | 5.87 | 5.72 |
| PODEN | -1.2902 | -1.1909 | -1.4416 | -1.7174 | -0.4378 | -0.6988 | -0.4763 | -1.3996 | -0.5700 | -0.9556 | -0.5061 | 0.0840 | -0.7840 | -1.1886 | 0.3524 | 0.5674 | -0.5754 | -0.7148 |
| | -1.60 | -1.32 | -2.06 | -1.96 | -1.17 | -1.42 | -1.94 | -3.88 | -0.57 | -0.75 | -1.16 | 0.15 | -1.19 | -1.39 | 0.54 | 0.72 | -4.87 | -4.98 |
| AREA | 0.0037 | 0.0014 | -0.0011 | -0.0023 | -0.0056 | -0.0101 | -0.0005 | -0.0067 | -0.0029 | -0.0054 | 0.0013 | 0.0066 | 0.0070 | 0.0058 | -0.0037 | -0.0028 | -0.0015 | -0.0026 |
| | 0.60 | 0.20 | -0.20 | -0.37 | -1.96 | -2.71 | -0.25 | -2.55 | -0.38 | -0.57 | 0.38 | 1.43 | 1.29 | 0.82 | -0.74 | -0.49 | -1.59 | -2.29 |
| DIST | -0.1392 | -0.1714 | -0.7639 | -0.8267 | -0.3369 | -0.3332 | -0.3743 | -0.3579 | -0.6295 | -0.7105 | -0.8551 | -0.8749 | -1.0001 | -0.9155 | -0.5288 | -0.4504 | 0.0535 | 0.0479 |
| | -0.83 | -0.96 | -5.29 | -4.59 | -4.32 | -3.37 | -7.67 | -5.90 | -3.09 | -2.91 | -9.69 | -8.23 | -5.83 | -4.13 | -3.93 | -2.83 | 2.13 | 1.61 |
| INT | 0.0053 | 0.0346 | -0.0467 | -0.1392 | 0.0062 | 0.0333 | -0.0099 | -0.0126 | 0.0806 | 0.1308 | 0.0126 | 0.0136 | -0.0246 | -0.0275 | -0.0062 | 0.0176 | -0.0203 | -0.0266 |
| | 0.14 | 0.81 | -1.51 | -3.45 | 0.37 | 1.40 | -0.93 | -0.87 | 1.83 | 2.21 | 0.64 | 0.51 | -0.83 | -0.60 | -0.22 | 0.47 | -3.54 | -3.22 |
| ES | 0.0119 | 0.0152 | 0.0373 | 0.0477 | 0.0874 | 0.1927 | 0.0486 | 0.1557 | 0.0572 | 0.0495 | 0.0752 | 0.1579 | 0.0441 | 0.0018 | 0.0619 | 0.0873 | 0.0013 | -0.0021 |
| | 7.20 | 7.22 | 2.49 | 1.25 | 10.35 | 8.89 | 6.10 | 5.70 | 10.74 | 6.58 | 5.74 | 5.53 | 2.11 | 0.04 | 4.00 | 3.34 | 0.32 | -0.27 |
| DUM_FRA | -0.4090 | -0.2582 | -0.7184 | -0.8921 | 0.2203 | 0.5750 | 0.0384 | 0.1651 | 0.1904 | 0.2697 | 0.2409 | 0.2660 | -0.8374 | -0.9224 | 0.2887 | 0.3826 | -0.0401 | -0.0623 |
| | -3.75 | -1.89 | -7.84 | -5.62 | 4.43 | 6.44 | 1.28 | 3.41 | 1.65 | 1.82 | 4.51 | 3.78 | -9.01 | -6.91 | 3.56 | 3.62 | -2.22 | -1.92 |
| no. of obs. | 314 | 262 | 313 | 260 | 312 | 259 | 314 | 262 | 305 | 252 | 291 | 238 | 279 | 202 | 313 | 260 | 287 | 230 |
| Prob $Chi^2$ / F | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

*Note*: Lines below coefficients report the z-(t-)values of the GLS (IV) estimates. The probability of the $Chi^2$/F-test gives the joint significance of all coefficients.

# 6

# CATCHING-UP PROCESS, SOUTH-SOUTH INTEGRATION AND LOCATION OF INDUSTRIAL ACTIVITY

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## INTRODUCTION

During the last decade, Preferential Trading Arrangements (PTAs) have spread all over the world as an alternative to unilateral or multilateral trade liberalization. On the one hand, a growing process of globalization tends to reduce distances and therefore the role of geographical proximity; but on the other hand, regional clustering of industrial activities has pushed into the periphery a substantial number of areas. This renewal of interest for regional trading agreements as another way to integrate markets has opened policy debates (Baldwin and Venables, 1995). How do different trading arrangements influence the industrialization process in developing countries? Do these agreements encourage convergence or divergence of real income?

Traditional analysis answers these questions using the ideas of trade creation and trade diversion (Viner, 1950). According to this approach, North-South and South-South PTAs operate in quite different ways. Early experiments of South-South integration in Africa and Latin America demonstrated a welfare reduction for the poorest members, trade diversion prevailing over trade creation in most cases (de Melo and Panagariya, 1993). Unless compensation schemes like the Structural Funds in the European Union are put in place, South-South integration (or 'horizontal regionalism') tends to lead to divergence of member country incomes (Venables, 2000). On the other hand, if PTAs include relatively high income countries, it is the lower income countries that experience a welfare gain from trade creation. North-South integration ('vertical regionalism') would cause convergence, thus creating an incentive for developing countries to establish trade links with industrial countries. Relying on an analysis in terms of trade creation *versus* trade diversion, North-South arrangements are better than South-South arrangements from the point of view of the participating Southern countries (World Bank, 2000).

The problem with this analysis is that it relies on differences in relative factor endowments that generate immutable patterns of comparative advantage. However, the present renewal of interest for PTAs does not refer to the pattern of trade: rather, the process of regional integration concerns identical countries and disturbs relocation of industrial activity through agglomeration forces. From the point of view of the Southern countries, integration within a PTA can either trigger or hinder industrial development according to firms' location decisions. What is striking is that cumulative causation may create concentrations of industrial activity in particular locations and leave other areas more dependent on primary activities. The renewal of economic geography, along the lines of Krugman (1991) and Venables (1996), has provided new theoretical insights on these phenomena and explained geographic agglomeration through the interaction among centrifugal and centripetal forces. Puga and Venables (1998) illustrate this view in a model of new economic geography. According to this approach, economic development can be thought of as the spread of concentrations of firms from country to country, and different trading arrangements may have a major impact on this development process. Their model shows notably that the gains from liberalization through PTA membership are likely to exceed those from unilateral action.

Puga and Venables (1998) focus, however, on the effects of PTAs on North-South location of industrial activity. In recent years, many developing countries have instead undertaken growing experiments of South-South integration: MERCOSUR in Latin America, ECWA in Africa, AFTA in Southeast Asia, and China recently signed a free trade agreement with the ASEAN. In practice, these regional agreements have resulted in real tensions among the member countries because of internal disputes over the location of industry. Conflicts between Argentina and Brazil within the MERCOSUR or between Kenya and its partners in the old East African Common Market illustrate political tensions arising from industrial relocation within the integrating region (de Melo and Panagariya, 1993; World Bank, 2000). The failure of early Southern PTAs can perhaps be attributed to inadequate attention on spatial issues of regional integration. Relying on these stylized facts, our paper focuses on the intra-South location of industrial activity. And as far as we are concerned, there are few writings on the internal geography of South-South integration.

By the same token, the standard theory of economic integration does not take into account the outcomes of regional integration during a catching-up process, within which growth can affect trade flows and industrial location. How can countries' rates of growth affect the results of PTAs? Relying on the rapid take-off of the Newly Industrializing Countries of East Asia, Puga and Venables (1996) describe the spread of industry between countries as a region grows. Their approach is based on a tension between agglomeration forces, which tend to hold industry in a few locations, and wage differences which encourage the dispersion of industry. Economic growth may change the relative strengths of the forces at work, and thereby trigger the spread of industry between countries.

This paper analyzes the consequences of take-off on the internal geography of a region. Our investigation is conducted by introducing technological progress in a model of economic geography and seeing how trading arrangements can shape economic development during the convergence path. However, our focus is neither to investigate the growth effects of PTAs, nor to see how trading arrangements can change the incentives for factor accumulation. We assume an exogenous technological progress which raises the endowment of labour in efficiency units in the developing countries. Throughout the article, we focus on firm location and particularly on the spatial implications of take-off within a trading bloc. Therefore, we take the catching-up process as given and investigate the early transitional dynamics towards the steady state equilibrium.

The next section sets up the model and focuses on a world economy in which there are three countries. We then investigate the spatial implications of take-off on developing countries according to various PTAs. We conclude with a summary of our results.

## A MODEL OF ECONOMIC GEOGRAPHY

In this section, we develop our theoretical underpinnings in three main stages. First, we start from a formal model applied to the analysis of international trade closely based on Fujita *et al* (1999). Then we particularize it to a three-country framework: one Northern and two Southern countries. Finally, we analyze the forces driving the spatial dynamics of productive activities.

### The Basic Model

We consider an economy with two sectors, agriculture and industry. The industrial sector is monopolistically competitive *à la* Dixit-Stiglitz and produces differentiated goods under increasing returns to scale. In addition to labour, industry uses intermediate goods into the production of each variety (Krugman and Venables, 1995). The presence of intermediate goods creates forward and backward linkages that arise between firms producing and using them. Rather than working with a full input-output structure as in Puga and Venables (1996), we assume an aggregate industrial sector: each firm produces a variety which is both sold for final consumption and used as an input into the production of other varieties. Furthermore, the input used by industry is a Cobb-Douglas composite of labour and intermediates priced respectively $w_r$ and $q_r$ with share $(1-\mu)$ and $\mu$. By denoting $x_r$ the output, $\varepsilon$ and $\beta$ the fixed and marginal input requirements per unit of output, the minimum cost function for an industrial firm at location $r$ is:

$$CT_r = w_r^{1-\mu} q_r^{\mu} \left(\varepsilon + \beta x_r\right) \tag{1}$$

The intermediate is assumed to be a CES function of the varieties available. Thus, the price index of the aggregate of industrial goods in location $r$ takes the form:

$$q_r = \left[\sum_s n_s \left(p_s \tau t_{rs}\right)^{1-\sigma}\right]^{\frac{1}{1-\sigma}} \tag{2}$$

where $p_s$ is the producer price of an individual variety, $n_s$ the number of available varieties –also the number of industrial firms– in location $s$ and $\sigma$ the elasticity of substitution between varieties $(\sigma>1)$. The sales of industrial goods in distant locations incur transport and trade costs. First, shipments of the industrial goods are subject to Samuelson's iceberg transport costs: $\tau$ $(>1)$ units have to be shipped so that one unit arrives in the other location. Second, an ad valorem tariff rate $t_{rs}-1$ $(t_{rs}>1)$ is levied on industrial goods exported from $s$ to $r$ and generates some fiscal revenue. Hence, an industrial good produced in country $s$ will be sold at price $\mathbf{p}_s$ on the home market and at price $\tau t_{rs} p_s$ on the export market $r$.

Every firm faces a price elasticity of demand $\sigma$ and sets output price as a constant relative mark-up over marginal cost. By using equation (1) and choosing units of measurement such that the marginal input requirement equals the price-cost mark-up ($\beta = (\sigma - 1)/\sigma$), prices are set according to the condition:

$$p_r = w_r^{1-\mu} q_r^{\mu} \tag{3}$$

Off equilibrium, the profits of a firm at location $r$ are derived from (1) and (3):

$$\pi_r = \frac{p_r}{\sigma}\left[x_r - \sigma\varepsilon\right] \tag{4}$$

Firms enter and exit in response to short-run profit opportunities. The long-run zero profit condition implies that the equilibrium output of any industrial firm is:

$$x^* = \frac{1}{1-\mu} \tag{5}$$

Each location is endowed with quantity $L_r$ of labour. We assume that this primary factor is internationally immobile but intersectorally mobile between industry and agriculture. In order to focus on its allocation among sectors (rather than the number of firms), we denote $\lambda_r$ the share of location $r$ labour force in industry. Furthermore, we denote $\mathbf{A}_r$ the level of technology in location $r$ and we consider an exogenous technical change ($\Delta A_r$) to investigate the spatial implications of growth. This technological progress raises the endowment of labour in efficiency units and is the same in both sectors. Thus, $\lambda_r A_r L_r$ and $(1-\lambda_r)A_r L_r$ are the number of efficiency units of labour operating in location $r$ industry and agriculture respectively; $\mathbf{w}_r$ is then reinterpreted as the wage per efficiency unit of labour.

Assuming that firms are at zero-profit equilibrium with sales x*, the total costs of location $r$ firms equal the total value of their production, $n_r p_r x^*$. So, the manufacturing wage bill in location $r$ is a fraction $(1-\mu)$ of the total value of output:

$$w_r \lambda_r A_r L_r = (1-\mu) n_r p_r x^* \tag{6}$$

Turning to the demand side of the economy, consumers have Cobb-Douglas preferences over the consumption of the agricultural good and that of the composite industrial good, denoted by $C_a$ and $C_m$ respectively:

$$U = C_a^{1-\gamma} C_m^{\gamma} \tag{7}$$

where $\gamma$ is the share of manufactures in consumers' expenditure. All industrial varieties produced enter consumers' utility function with the same constant elasticity of substitution with which they enter firms' technology.

Demand for industrial goods coming from both consumers as final consumption and firms for intermediate usage is derived from equations (1), (2) and (7). Using this demand function and equations (3) and (5), we define the long run market-clearing condition in industrial goods[48]:

$$\left(w_r^{1-\mu} q_r^{\mu}\right)^{\sigma} = (1-\mu)\sum_s E_s q_s^{\sigma-1}(\tau t_{sr})^{1-\sigma} \tag{8}$$

where E is expenditure on industrial goods:

$$E_r = \gamma Y_r + \mu n_r p_r x^* \tag{9}$$

The first term on the right-hand side is the value of consumers expenditure: it is assumed that consumers spend a fraction $\gamma$ of their income on manufactures. The second term on the right-hand side is the derived demand for intermediates as firms spend a fraction $\mu$ of their costs (i.e. the total value of their production) on intermediate goods.

The income in location *r* results from industrial employment, the value of agricultural output ($y_{ar}$) and total tariff revenue ($R_r$) which is distributed to households in a lump-sum manner:

$$Y_r = w_r \lambda_r A_r L_r + y_{ar} + R_r \tag{10}$$

The value of tariff revenue in location *r* is derived from equations (1), (2) and (7):

$$R_r = \sum_{s \neq r}(t_{rs}-1) n_s q_r^{\sigma-1}\left(p_s \tau t_{rs}\right)^{1-\sigma} E_r \tag{11}$$

The agricultural sector is perfectly competitive and produces a homogeneous good using a constant-returns technology. As labour is the single factor, agricultural output is given by: $y_{ar} = \left(1-\lambda_r\right)A_r L_r$. Because agricultural goods are costlessly tradable, the agricultural wage rate will be the same in all locations. By choosing it as the *numeraire,* intersectoral mobility of labour implies that the wage in the economy will be:

$$w_r \geq 1 \tag{12}$$

where $w_r = 1$ if location *r* has an agricultural sector.

## A Three-Country Model

We set out the model described above for a world economy in which there are three countries, one North and two South (with subscripts N, S1 and S2). To focus analysis entirely on the internal geography of the Southern region, we take the economic structure of the North as exogenous: its number of efficiency units of labour $A_N L_N$ is in fixed supply and is hired at a given wage rate $w_N$ and to simplify further, we consider that this country has no constant-returns sector[49]. Our purpose consists in investigating the consequences of technological catching-up on the spatial distribution of industrial activity among the two developing countries. So,

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[48] Fujita et al. (1999) refer to it as the wage equation: it gives the maximum manufacturing wage that could be paid by a firm considering production in location *r*.

[49] Holding the industrial structure of the North as entirely exogenous, this assumption does much to simplify analysis without modifying our results.

we focus on changes in the efficiency parameter in both Southern countries (assumed to be the same, $A_{S1}=A_{S2}=A_S$), holding it constant in the North[50]. As it is at a steady state with no technological change ($\Delta A_N=0$), the North is therefore characterized by both higher technological ($A_N>A_S$) and income ($Y_N>Y_S$) levels, enabling a catching-up process of the Southern region ($\Delta A_S>0$).

As labour is internationally immobile, the spatial dynamics will be provided by firm location. Moreover, according to our focus on the internal geography of South-South integration, firm mobility is confined to the two Southern countries. Their industrial structure is endogenous to the extent that the geographical distribution of activity across countries evolves over time. Assuming that both countries have identical factor endowments[51] ($L_{S1}=L_{S2}=1$), relocation of labour from agriculture to industry will inform us about industrial development in the two countries. Our analysis focuses then on $\lambda_{S1}$ and $\lambda_{S2}$ which represent the share of industrial labour force in country S1 and S2 respectively. Finally, to illustrate asymmetry in trade flows between industrial and less industrialized countries –the latter being often characterized by an uneven market access to the Core and insufficient export capacities– we assume that the two Southern countries import industrial goods from the North, but do not export to the latter. However, tariffs will be levied on any importation from the North, while industrial goods are freely traded within the Southern region ($t_{S1S2}=t_{S2S1}=1$).

The following equations rewrite the basic model to incorporate these assumptions. Using equations (3), (5) and (6) into (2) and taking into account trade asymmetry described above, we have the price indices in the three countries:

$$q_N = \left[A_N L_N w_N^{1-\sigma(1-\mu)} q_N^{-\mu\sigma}\right]^{1/1-\sigma} \tag{13}$$

$$q_{S1} = \left[\left(\tau t_{S1N} q_N\right)^{1-\sigma} + A_S \lambda_{S1} w_{S1}^{1-\sigma(1-\mu)} q_{S1}^{-\mu\sigma} + A_S \lambda_{S2} w_{S2}^{1-\sigma(1-\mu)} q_{S2}^{-\mu\sigma} \tau^{1-\sigma}\right]^{1/1-\sigma} \tag{14}$$

$$q_{S2} = \left[\left(\tau t_{S2N} q_N\right)^{1-\sigma} + A_S \lambda_{S1} w_{S1}^{1-\sigma(1-\mu)} q_{S1}^{-\mu\sigma} \tau^{1-\sigma} + A_S \lambda_{S2} w_{S2}^{1-\sigma(1-\mu)} q_{S2}^{-\mu\sigma}\right]^{1/1-\sigma} \tag{15}$$

At equilibrium, any profit is exhausted by free entry and exit. Therefore, the zero-profit condition (8) together with trade asymmetry between the North and the Southern countries can be expressed as:

$$\left(w_{S1}^{1-\mu} q_{S1}^{\mu}\right)^{\sigma} = (1-\mu)\left[E_{S1} q_{S1}^{\sigma-1} + E_{S2} q_{S2}^{\sigma-1} \tau^{1-\sigma}\right] \tag{16}$$

$$\left(w_{S2}^{1-\mu} q_{S2}^{\mu}\right)^{\sigma} = (1-\mu)\left[E_{S1} q_{S1}^{\sigma-1} \tau^{1-\sigma} + E_{S2} q_{S2}^{\sigma-1}\right] \tag{17}$$

Recall that manufacturing expenditure in each country comes both from consumer expenditure and from intermediate demand, introducing expressions (5) and (6) into (9) gives:

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[50] A homogeneous process of technological change, raising simultaneously the technological parameter in all countries ( $\Delta A_{S1} = \Delta A_{S2} = \Delta A_N$), would not have any spatial effects.

[51] By abstracting from traditional comparative advantage, we seek to focus exclusively on the trade flows generated by agglomeration forces and their influence on industrial location.

$$E_N = Y_N + \frac{\mu}{1-\mu} A_N L_N w_N \tag{18}$$

$$E_{S1} = \gamma Y_{S1} + \frac{\mu}{1-\mu} A_S \lambda_{S1} w_{S1} \tag{19}$$

$$E_{S2} = \gamma Y_{S2} + \frac{\mu}{1-\mu} A_S \lambda_{S2} w_{S2} \tag{20}$$

As both industry and agriculture may operate in the two Southern countries while the North is wholly industrialized, income in each country is derived using equation (10):

$$Y_N = A_N L_N w_N \tag{21}$$

$$Y_{S1} = A_S \lambda_{S1} w_{S1} + A_S(1-\lambda_{S1}) + R_{S1} \tag{22}$$

$$Y_{S2} = A_S \lambda_{S2} w_{S2} + A_S(1-\lambda_{S2}) + R_{S2} \tag{23}$$

Finally, relations (3), (5) and (6) enable us to derive tariff revenue in the Southern countries. Replacing them by (13) into expression (11) gives:

$$R_{S1} = (t_{S1N}-1)(\tau t_{S1N} q_N)^{1-\sigma} q_{S1}^{\sigma-1} E_{S1} \tag{24}$$

$$R_{S2} = (t_{S2N}-1)(\tau t_{S2N} q_N)^{1-\sigma} q_{S2}^{\sigma-1} E_{S2} \tag{25}$$

## The Forces at Work

Equilibria of the model are given by equations (13)-(25) and will be analyzed in the next section. Before that, we need to understand the locational forces at work in our model by considering the effects of an exogenous industrial development in country S1 $(\Delta\lambda_{S1} > 0)$. As labour is internationally immobile, such an industrial development requires relocation of workers among sectors. Within the country, labour moves from agriculture to industry if and only if any wage gap motivates this intersectoral mobility. Therefore, the forces at work are determined by analyzing the effects of increasing the share of labour force in industry on the manufacturing wage $(dw_{S1}/d\lambda_{S1})$, assuming that the wage rate in the agricultural sector equals one. It is a centripetal force if the derivative is positive and a centrifugal force if the derivative is negative[52].

Three forces determine the equilibrium pattern of location. The first is the competition that the firm faces in the product market and has the effect of reducing firm profitability. With regards to this force, an industrial development in country

[52] This approach is similar to that in Puga (1999), which consists in analyzing variations of firm profits following potential entry of a firm in country S1. Any mechanism which has the effect of raising profits of existing firms is called centripetal force as it encourages agglomeration in S1. Conversely, any force pulling in the opposite direction (i.e. reducing profits of existing firms) is centrifugal as it encourages dispersion of industry from S1.

S1 is associated with the supply of more varieties and reduction of demand for each firm's output. Analytically, an increase in $\lambda_{S1}$ raises $n_{S1}$ in expression (6); it lowers the price index $q_{S1}$ according to relation (14) and reduces the manufacturing wage $w_{S1}$ via the price index term on the right-hand side of the wage equation (16). This *product market competition* is a centrifugal force as workers will not be incited to move to industry, leading to firm exit from country S1.

The second force is the cost or *forward linkage.* By lowering the price index, an industrial development in country S1 also reduces the costs of firms using the firm's product as an intermediate, inducing higher manufacturing wage and firm relocation into S1. This effect occurs via the term $q_{S1}$ on the left-hand side of the wage equation (16). Finally, a demand or *backward linkage* arises as a higher value of $\lambda_{S1}$ raises local expenditure on intermediates according to relation (19). This effect tends to raise the manufacturing wage via the term $E_{S1}$ on the right-hand side of the wage equation (16). Both forward and backward linkages are centripetal forces and encourage agglomeration as they tend to increase firm profitability in country S1.

## CATCHING-UP PROCESS AND SOUTH-SOUTH INTEGRATION

The tension among theses forces are the subject of this section. Two variables can influence this tension and consequent distribution of industrial activity among the two Southern countries: trade barriers and technical change.

For a given level of technology, trade policy in the South may influence the movements of firm entry and exit, changing the pattern of industrial location within the trading bloc. For example, a rise of the tariff levied by country S1 on imports from the North $(t_{S1N})$ has three effects (Rieber and Tran, 2002a and 2002b). First, by making imported inputs more expensive, it increases the price index $q_{S1}$ (equation (14)) and reduces the manufacturing wage via the term on the left-hand side of equation (16). This *import cost effect* results in a lower industrial development $\lambda_{S1}$. Second, a rise of the price index tends conversely to increase the manufacturing wage via the term $q_{S1}$ on the right-hand side of equation (16). This *market protection effect* captures the benefits of import substitution: the larger is $t_{S1N}$, the higher is the proportion of manufacturing expenditure $E_{S1}$ spent on local firms[53] and the higher is $\lambda_{S1}$. The third effect concerns *demand spillovers* arising from tariff revenue. When $t_{S1N}$ rises, tariff revenue increases (relation (24)) and spurs consumer expenditure on manufactures (relation (19)). By increasing the manufacturing wage via the term $E_{S1}$ on the right-hand side of equation (16), this effect stimulates industrial development $\lambda_{S1}$.

As trade policy may have a major impact on the industrialization process, it may also cause welfare effects illustrated by the evolution of real income $(y_r = Y_r/q_r^{\gamma})$. Four mechanisms are at work: first, due to import barriers, the higher price index $q_{S1}$ (equation (14)) reduces real income. The second and third mechanisms have to do with the industrialization or de-industrialization process of the two Southern

[53] This effect is often known as the *home-market effect* in models of international trade under imperfect competition (Krugman, 1980; Helpman and Krugman, 1989).

economies: as industrialization of S1 implies a better local supply of manufactures (equation (6)), it lowers the price index (equation (14)) and elevates real income. In the same way, industrialization of S2, by increasing the number of available varieties $n_{S2}$, contributes to lower the price index in S1 (equation (14)). Therefore, industrialization of the other country *s* can improve the welfare level in country *r*. The fourth mechanism concerns tariff revenue which is distributed to households in a lump-sum manner: a higher $t_{S1N}$ increases tariff revenue and nominal income $Y_{S1}$ (expression (22)).

Our focus in this paper is mainly to investigate the spatial implications of take-off. Recall that we are not concerned with the engines of growth, taking this process as exogenous and identical in both Southern countries ($\Delta A_{S1}=\Delta A_{S2}=\Delta A_S$). By the same token, we do not investigate structural changes resulting from the development process and assume henceforth that the rate of technological progress is the same in agriculture and industry. Retaining the case of S1, an increase in $A_S$ has six effects on its industrialization process:

1) *Growing supply effect.* An increase in $A_S$ implies more available varieties $n_{S1}$ and $n_{S2}$ (expression (6)) and hence higher competition in the product market. This tends to reduce the price index $q_{S1}$ (equation (14)) and the manufacturing wage via the term on the right-hand side of equation (16). As manufacturing production becomes less profitable, industrial development in country S1 will be hampered. In other words, any technological progress may be counter-productive to the industrialization process.

2) *Cost effect.* By lowering the price index, an increase in $A_S$ reduces also the cost of intermediates, raising the manufacturing wage via the term $q_{S1}$ on the left-hand side of equation (16). Hence, the technological catching-up process amplifies the forward linkage described above.

3) *Income effect.* The catching-up process raises income $Y_{S1}$ (expression (22)) and consumer expenditure on manufactures (expression (19)) through higher manufacturing wage bill and value of agricultural output. This effect elevates the manufacturing wage via the term $E_{S1}$ on the right-hand side of equation (16), thereby triggering industrialization in S1.

4) *Intermediates effect.* By raising $n_{S1}$ the number of industrial firms in S1, the catching-up process also stimulates local expenditure on intermediates (expression (19)), thus strengthening the backward linkage in favour of S1.

The two last effects influence indirectly the industrialization process through tariff revenue:

5) *Indirect price index effect.* As it causes a better local supply of manufactures, an increase in $A_S$ reduces importation from the North and hence tariff revenue in S1. This effect occurs via the lower term $q_{S1}$ in expression (24), diminishing income and consumer expenditure on manufactures (expression (19)). The reduction in $E_{S1}$ lowers the manufacturing wage via the right-hand side of equation (16).

6) *Indirect expenditure effect.* As manufacturing expenditure increases both from final consumption and from intermediate demand, this means more importation

from the North and higher tariff revenue (expression (24)). In contrast to the indirect price index effect, we have here an increase in income and consumer expenditure on manufactures (expression (19)) which raises the manufacturing wage via the term $E_{S1}$ on the right-hand side of equation (16).

We can demonstrate that the indirect price index effect prevails over the indirect expenditure effect if:

$$dR_{S1}/dq_{S1} > dR_{S1}/dE_{S1} \Leftrightarrow (\sigma-1)/q_{S1} > 1/E_{S1} \Leftrightarrow E_{S1}/q_{S1} > 1/(\sigma-1).$$

However, the higher is $A_S$, the higher the demand for manufactures $E_{S1}$ and the lower the price index $q_{S1}$, and so the more likely this inequality holds. Therefore, the likelihood that tariff revenue declines (as the indirect price index effect prevails) is increased with the technological process.

Whether the Southern catching-up process can trigger industrialization in S1 depends on the balance between these six effects. While the effects 2), 3), 4) and 6) point towards industrialization of the country, the other effects 1) and 5) work in the opposite direction.

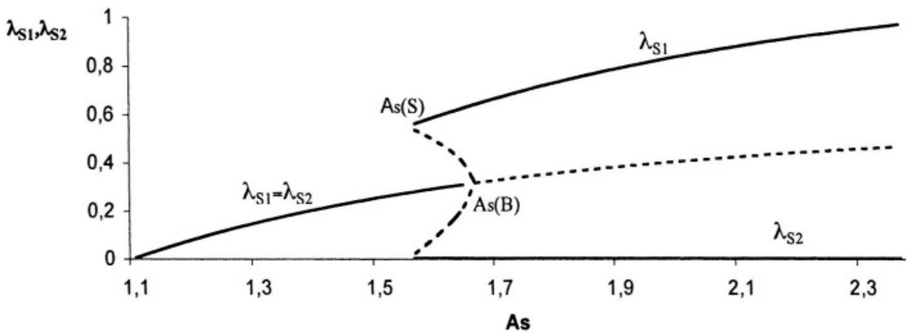
Real income changes are associated with a country's pattern of industrialization. For a given tariff rate, the catching-up process affects the evolution of real income through three main mechanisms. First, a rise of $A_S$ improves the local supply of manufactures and reduces the price index, thus elevating real income. The second and third mechanism work through nominal income $Y_{S1}$ (expression (22)): by increasing the manufacturing wage bill and the value of agricultural output, the catching-up process raises nominal income. At the same time, an increase in $A_S$ reduces tariff revenue by lowering the price index, but raises it by expanding demand for manufactures (both in expression (24)). As suggested above, the former dominates with growing $A_S$, reducing tariff revenue and nominal income.

Different forms of PTAs interact differently with the technological progress to influence the equilibrium pattern of location among the developing countries. Two trading arrangements will be discussed here: customs union and free trade area.

## The Customs Union

According to a customs union agreement, the two Southern countries dismantle trade barriers between each other and follow identical policies *vis-à-vis* of the rest of the world. We denote $t_{S1N}=t_{S2N}=t_{SN}$ the External Common Tariff (ECT) levied on imports from the North. Figures 1 and 2 illustrate the outcomes of a catching-up process respectively in terms of industrialization and welfare. Figure 1 is constructed by raising $A_S$ from its initial level ($\Delta A_S>0$ and $\Delta A_N=0$ with $A_N>A_S$), holding $t_{SN}$ constant. It plots the share of industrial labour force in each of the two Southern countries against the exogenous level of technology. The figure exhibits a bifurcation point which arises because of the tension between centripetal forces and centrifugal forces at work in our model. Solid lines indicate stable equilibria, broken lines unstable.

**Figure 1: Industrial Development in the Customs Union**




Values of parameters are: $\mu = 0.4$; $\sigma = 5$; $\gamma = 0.65$; $\tau = 1.5$; $t_{SN} = 1.9$; $A_N = 4$; $L_N = 10$; $w_N = 2$

At low $A_S$, South-South integration under a customs union generates a unique, stable symmetric equilibrium in which industry is equally divided between countries as the centrifugal forces are stronger than the centripetal forces. Rieber and Tran (2002a) detail the effects of various trade policy experiments on industrialization in a similar model, and we do not discuss them here. Recall that market enlargement due to intra-South liberalization and import substitution by means of trade protection against the North are the driving forces behind industrialization under a customs union. Holding the ECT constant, our primary concern is the spatial implications of growth. An increase in $A_S$ triggers simultaneous industrialization in all the integrating countries through different mechanisms: as suggested above, the effects 2), 3), 4) and 6) dominate. Hence, a technological progress coupled with import substitution policies drive industrial development through the linkage benefits and as changes in $A_S$ have similar effects on the location of industry, the two Southern economies have identical economic structures.

At a high enough value of $A_S$, the symmetric equilibrium is broken as the balance between the forces at work in the model shifts in favour of centripetal forces. Indeed, growth in $A_S$ causes increase in supply and demand for manufactures, illustrated by a reduction of the price index and a rise of expenditure on manufactures. But as the volume of manufacturing increases so do the associated linkages and pecuniary externalities. The backward and forward linkages are strengthened by the catching-up process and may be strong enough to encourage agglomeration in a single location. There comes a critical point (the so-called 'break point', $A_S(B)$) at which simultaneous industrialization in all the Southern region ceases to be a stable equilibrium (illustrated by the broken line). The Appendix gives analytical resolution of the break point.

To complete the description of bifurcation, let us now consider the sustainability of industrial concentration in one of the countries (say country S1). To see if such a

Core-Periphery pattern is an equilibrium, we posit a situation in which $\lambda_{S2}=0$ to derive the simultaneous solution of equations (13)-(25). Agglomeration in country S1 is an equilibrium as far as $w_{S2}<1$ in expression (17), so that labour in country S2 does not move out from agriculture. Conversely, it ceases to exist if $w_{S2}>1$. The 'sustain point' $A_S(S)$ derived from $\lambda_{S2}=0$ and $w_{S2}=1$ designates the point at which agglomeration in country S1, once established, is sustainable. Before this point, industrial concentration is not sustainable because, as the manufacturing wage $w_{S2}$ is greater than 1, it becomes profitable for firms to relocate in the Periphery. This means that country S2 no more specializes in agriculture ($\lambda_{S2}>0$).

At a position in which industry is agglomerated in country S1, increasing $A_S$ contributes to develop the Core's manufacturing sector through the same mechanisms than at the symmetric equilibrium. Nevertheless, as country S2 is totally de-industrialized ($\lambda_{S2}=0$), the decrease in the price index $q_{S1}$ is less pronounced than before, thereby weakening the effects 1) and 5) working against industrialization. This results in a greater level of industrial development $\lambda_{S1}$ than at the symmetric equilibrium.

The structure of equilibria shown in Figure 1 suggests that technological catching-up under a customs union is profitable to both integrating countries, provided that it remains low. But if it reaches a critical value, discontinuities may arise and the two Southern economies jump to a Core-Periphery pattern. The catching-up process may result then in a catastrophic agglomeration, wherein just one of the countries monopolizes all the benefits of growth, the others staying in the poverty trap. Our results are closely akin to predictions of Puga and Venables (1997), according to which agglomeration forces may foster regional disparity inside a preferential trading bloc, with one member country gaining industry at the expense of others.

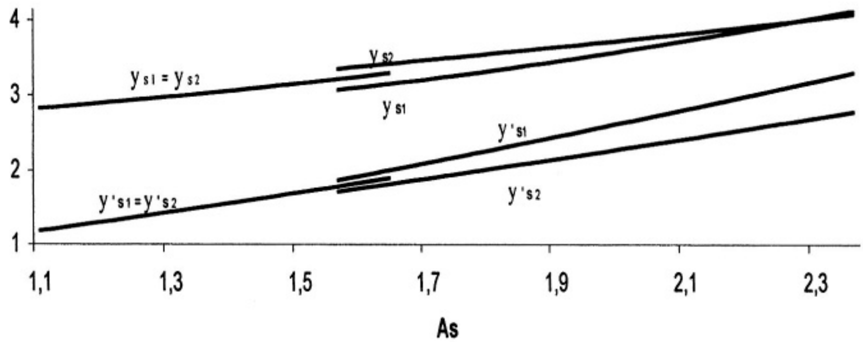
Starting from this point, Table 1 shows what happens to the break point $A_S(B)$ and the associated level of industrial development $\lambda_S(B)$ when the two Southern countries reduce their common import barriers against the North. What we see is that a decrease in $t_{SN}$ raises $A_S(B)$ and reduces $\lambda_S(B)$. Trade liberalization causes symmetric equilibrium to be sustainable over a wider range of $A_S$ but at the expense of industrial development among the integrating economies. We have therefore a trade-off between the sustainability of the symmetric equilibrium and the industrialization process. The former occurs because there are additional gains from trade liberalization: when the Southern region dismantles its import barriers with the North, the backward and forward linkages are weakened and simultaneous industrialization occurs at a higher value of $A_S$. However, industrial development in the integrating countries is lowered because opening access to the enlarged Southern market causes the Southern firms to face more competition from the Northern firms (although they import cheaper intermediate inputs). When the ECT declines, import competition has a negative effect through the product market (Rieber and Tran, 2002a).

**Table 1 Impact of the ECT**

| | | | | | | |
|---|---|---|---|---|---|---|
| $t_{SN}$ | 1.75 | 1.80 | 1.85 | 1.90 | 1.95 | 2 |
| $A_S(B)$ | 1.74 | 1.71 | 1.68 | 1.65 | 1.62 | 1.59 |
| $\lambda_S(B)$ | 0.09 | 0.18 | 0.26 | 0.32 | 0.37 | 0.41 |

Figure 2 plots real income in each of the two Southern countries against the level of technical parameter and reports only stable equilibria. We can see that the evolution of real income excluding tariff revenue (denoted $y'_r$) is similar to that presented with ($y_r$). When there is symmetric industrialization, growing $A_S$ improves the welfare level in the Southern region as nominal income ($Y_{S1}=Y_{S2}=Y_S$) increases and the price index ($q_{S1}=q_{S2}=q_S$) decreases. Differences in welfare appear however at higher values of $A_S$, when the two Southern economies jump to a Core-Periphery pattern. The evolution of real income excluding tariff revenue is favourable to the Core (country S1) because, as it is industrialized its price index will be lower ($q_{S1}<q_{S2}$). The evolution of real income inclusive of tariff revenue is divided into two stages: at relatively low values of $A_S$, real income in the Periphery (country S2) is higher because it has to import all its industrial goods either from the Core S1 or from the North, the latter causing larger tariff revenue $R_{S2}$ compared with $R_{S1}$. At relatively high values of $A_S$, industrialization in the Core is high enough so that the Periphery substitutes importation from its Southern partner to those from the North, reducing tariff revenue. The combined effects of lower price index in S1 due to its industrialization process and declining tariff revenue in S2 will favour the Core's real income.

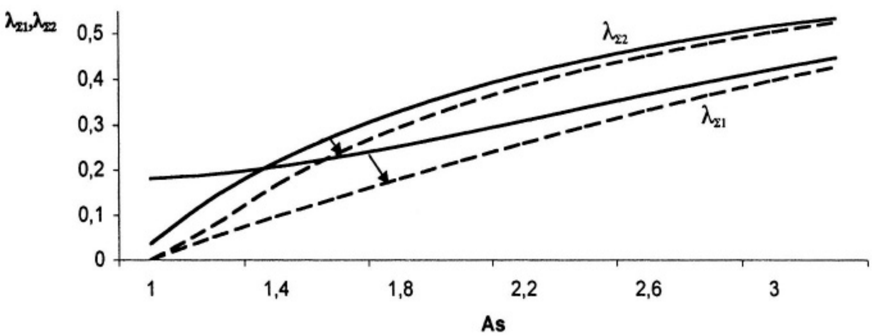
**Figure 2: Welfare in the Customs Union**



### The Free Trade Area

In the case of a free trade area, the two Southern countries engage in bilateral import tariff liberalization, but keep autonomy in their trade policies *vis-à-vis* of the rest of the world. To distinguish trade policy implemented by the two Southern countries, we consider a situation in which Northern exports to country S1 face a tariff barrier ($t_{S1N}>1$), while country S2's imports from the North are untaxed ($t_{S2N}=1$). This means that, whatever the level of $A_S$ and for identical levels of industrialization, the price index in country S2 will be lower than in country S1 ($q_{S2}<q_{S1}$) because of the fall in the price of imported intermediate goods. Moreover, as it freely trades with the North, country S2 loses tariff revenue and its consequent effects (demand spillovers arising from trade protection and both indirect price index and expenditure effects arising from growth). Figures 3 and 4 summarize the results of the catching-up process in a free trade area: like the customs union, increase in $A_S$ generates industrial development and welfare improvement in both integrating countries but without catastrophic agglomeration.

**Figure 3: Industrial Development in the Free Trade Area**




Values of parameters are: $\mu = 0.4$; $\sigma = 5$; $\gamma = 0.75$; $\tau = 1.3$; $A_N = 4$; $L_N = 4$; $w_N = 2$

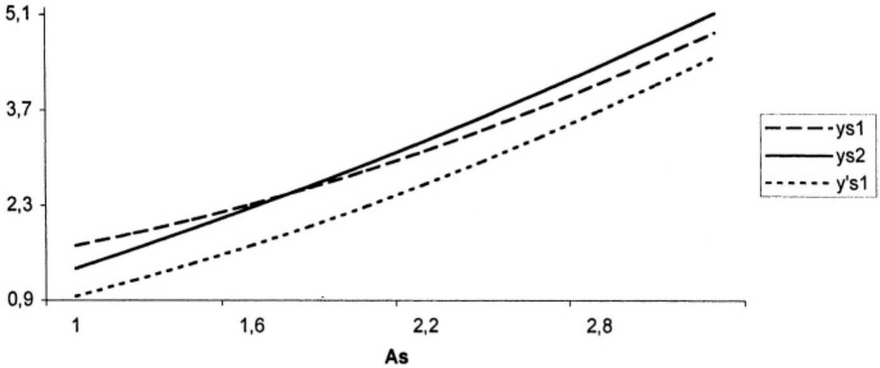
As the free trade area is a PTA, the gains from intra-South liberalization are similar to those from the customs union. The divergence of industrialization paths between the two countries results then from their differentiated trade policy *vis-à-vis* of the North. Assuming initially that $t_{S1N}=1.7$ (illustrated by the solid lines in Figure 3), country S1 industrializes for the same reasons than in Figure 1: a catching-up process coupled with import substitution from the North drive its industrial development. Moreover, as it benefits from tariff revenue, its industrial development is higher than in country S2 for low values of $A_S$. As suggested above, further growth in $A_S$ strengthens however the likelihood that the indirect price index effect dominates the indirect expenditure effect. This tends to reduce tariff revenue, thereby weakening industrialization in country S1. In country S2, openness to Northern imports causes strong competition in the product market; but the cheaper supply of intermediates becomes the dominant force, enabling industrialization through its linkage benefits. At a high enough value of $A_S$, the loss of the indirect price index effect explains its higher industrial development compared with country S1.

Figure 3 shows that either trade liberalization with the North or import substitution policies may be successful in triggering industrialization under a free trade area. But they have different effects, with trade liberalization yielding higher performance than import substitution policies. Let us now consider a situation in which country S1 decides in turn to reduce its import barriers with the North. The dashed lines in the figure outline the industrialization process of the two Southern countries for $t_{S1N}=1.6$. Trade liberalization in country S1 shifts the curves downwards, although growing $A_S$ still causes industrial development in both countries. The lower level of industrial development in country S1 results from stronger competition in the product market and lower tariff revenue, despite cheaper supply of Northern intermediates. As its manufacturing expenditure is weakened by lower demand spillovers, industrialization in country S1 is always inferior to that in country S2, even at low $A_S$. This phenomenon affects also the industrialization process of S2 through exportation: the reduction in $E_{S1}$ induces lower export sales for country S2 (expression (17)), thereby weakening its industrialization. So, the important point here is that country S2 benefits from its free trade policy under a free trade area, provided that its partner remains protectionist. If the latter decided instead to dismantle its trade barriers, both countries would register lower industrial performance. This arises because of growing competitive pressures in the protectionist country and lower export outlets in its liberalizing partner.

Turning to the welfare effects, the dashed line and the broken line in Figure 4 represent country S1 real income respectively with ($y_{S1}$) and without tariff revenue ($y'_{S1}$); the solid line outlines the evolution of real income in country S2 and because of its free trade policy, there is no tariff revenue ($y_{S2}=y'_{S2}$). For a given $A_S$ and identical levels of industrialization, the higher level of real income out of tariff revenue in country S2 compared with country S1 stems from its lower price index ($q_{S2}<q_{S1}$). Furthermore, a rise of $A_S$ elevates real income in both countries: first, by reducing the price index (as the local supply of manufactures is improved) and second, by increasing the manufacturing wage bill and the value of agricultural output.

The divergent evolution of real income inclusive of tariff revenue depends on the level of tariff revenue in S1. When the technological progress is low, tariff revenue in the protectionist country is high enough so that it outmatches the import cost effect arising from trade barriers, causing better performance of country S1 in terms of welfare. However, the higher is $A_S$, the lower is $R_{S1}$ (as the likelihood of indirect price index effect prevailing is increased) and the lower the spread between $y_{S1}$ and $y_{S2}$. Welfare improvements in country S2 outmatch those in country S1 when the decline in $R_{S1}$ is high enough so that: $R_{S1} < A_S\left[\left(q_{S1}/q_{S2}\right)^{\gamma} - 1\right]$.

**Figure 4: Welfare in the Free Trade Area**




## CONCLUSION

Relying on a model of new economic geography, this paper has studied how economic growth in an integrating region changes the relative strengths of the forces driving firm location. In response to growing PTAs between Southern economies, we have partly analyzed the effects of regional integration on the intra-South distribution of industrial activity. The renewal of interest for regional integration arises because it can play a major role on firm location. With regard to this point, the new economic geography provides new insights on the effects of trading arrangements on industrial development and welfare. Other forces than traditional forces of trade creation and diversion may be important in determining effects of regional trade agreements.

On the other hand, the standard theory of economic integration does not take into account the outcomes of regional integration during a catching-up process, within which growth (illustrated here by an exogenous technological progress) can affect trade flows and industrial location. As far as we are concerned, there are few writings on the location effects of the catching-up process under South-South integration. Our paper has focused then on this internal geography issue, which caused so many political tensions among member countries in early experiments of Southern PTAs.

From this analysis, we derive several conclusions. It is not surprising that our results suggest that the Southern catching-up process has positive consequences on industrialization and welfare, whatever the PTA. A comparison of customs union and free trade area shows that in either case, technological changes result in industrial development and welfare improvements in both integrating countries. However, a bifurcation point may appear in the case of a customs union, due to the tension between centripetal and centrifugal forces at work in our model. A South-South liberalization coupled with protection *vis-à-vis* of the North improves the production structure and welfare level without asymmetry among the integrating countries. But they share the same benefits of growth only if the latter is not too high, otherwise a Core-Periphery pattern may emerge. In other words, a catching-up process under integration among identical Southern countries can result in catastrophic agglomeration, wherein just one of the countries monopolizes all the benefits of growth, the others staying in the poverty trap. Trade liberalization only delays this regional disparity, as the decline of the ECT causes symmetric equilibrium to be sustainable over a wider range of technological change but at the expense of industrial development among the integrating economies. This result illustrates the great difficulty in implementing customs unions.

When instead there is a free trade area among the Southern countries, we show that either trade liberalization with the North or import substitution policies may be successful in boosting industrial development. But they have different effects, with trade liberalization yielding higher industrialization and welfare than import substitution policies. However, the liberalizing country benefits from its free trade policy, provided that its partner remains protectionist. If the latter decided instead to dismantle its trade barriers, both countries would register lower industrial performance. Our results suggest that trade policy recommendations depend on initial conditions, especially on the behaviour of other partners of the PTA.

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## APPENDIX: DEFINITION OF THE BREAK POINT

To find the point at which symmetry is broken, we have to look at the stability of the symmetric equilibrium. Symmetric solution to our model is the simultaneous solution of the following equations:

$$q_N = (A_N L_N)^{\sigma(1-\mu)-1} w_N \tag{A1}$$

$$q_S = \left[(\tau t_{SN} q_N)^{1-\sigma} + (1+\tau^{1-\sigma}) A_S \lambda_S q_S^{-\mu\sigma}\right]^{1/(1-\sigma)} \tag{A2}$$

$$q_S^{\mu\sigma} = (1-\mu)(1+\tau^{1-\sigma})(E_S q_S^{\sigma-1}) \tag{A3}$$

$$E_N = Y_N + \frac{\mu}{1-\mu} A_N L_N w_N \tag{A4}$$

$$E_S = \gamma Y_S + \frac{\mu}{1-\mu} A_S \lambda_S \tag{A5}$$

$$Y_N = w_N A_N L_N \tag{A6}$$

$$Y_S = A_S + R_S \tag{A7}$$

where the subscript S denotes symmetric equilibrium values for the two Southern countries.

At the symmetric equilibrium, manufacturing wages in country S1 and S2 equal the agricultural wage. The equilibrium is stable if increasing manufacturing employment drives manufacturing wages below the agricultural wage, and unstable otherwise. We define therefore the break point as the point at which a symmetric equilibrium becomes unstable and in which symmetry is broken.

Assuming an industrial transfer from country S2 to country S1 $(d\lambda_S = d\lambda_{S1} = -d\lambda_{S2})$, the symmetric equilibrium is stable if $dw_S / d\lambda_S$ is negative and unstable if it is positive. Thus, the break point is at point $A_S(B)$, where $dw_S / d\lambda_S$ changes sign. In order to determine $dw_S / d\lambda_S$, we have to differentiate equations (13)-(25) around the symmetric equilibrium. Around this point, any change in a variable in one location is always associated with a change of opposite sign but of equal absolute magnitude in the corresponding variable in the other location.

As the industrial transfer implies $dE_S = dE_{S1} = -dE_{S2}$, $dq_S = dq_{S1} = -dq_{S2}, \ldots$, we define –as in Fujita et al. (1999)– a variable Z:

$$Z = \frac{1-\tau^{1-\sigma}}{1+\tau^{1-\sigma}} = (1-\mu)E_s q_s^{\sigma(1-\mu)-1}(1-\tau^{1-\sigma}) \tag{A8}$$

Differentiating the price indices (14) and (15) around the symmetric equilibrium gives:

$$\left[(1-\sigma)+\frac{\mu\sigma\lambda_s ZA_s}{(1-\mu)E_s}\right]\frac{dq_s}{q_s}-\left[\frac{A_s Z\lambda_s(1-\sigma(1-\mu))}{(1-\mu)E_s}\right]dw_s = \left[\frac{ZA_s}{(1-\mu)E_s}\right]d\lambda_s \tag{A9}$$

Proceeding analogously, the total differential of the wage equations (16) and (17) is:

$$\sigma(1-\mu)dw_s + \left[\mu\sigma - Z(\sigma-1)\right]\frac{dq_s}{q_s} - Z\frac{dE_s}{E_s} = 0 \tag{A10}$$

Using the income equations (22) and (23), we can also totally differentiate relations (19) and (20) defining expenditure on manufactures:

$$dE_s = \left[\gamma A_s\lambda_s + \frac{\mu A_s\lambda_s}{(1-\mu)}\right]dw_s + \frac{\mu A_s}{(1-\mu)}d\lambda_s + \gamma dR_s \tag{A11}$$

Finally, the total differential of tariff revenue (24) and (25) is:

$$dR_s = (t_{SN}-1)(\tau t_{SN}q_N)^{1-\sigma}\left[(\sigma-1)E_s q_s^{\sigma-2}dq_s + q_s^{\sigma-1}dE_s\right] \tag{A12}$$

Substitution of relations (A11) and (A12) into (A10) gives:

$$\begin{aligned}&\left[\mu\sigma - Z(\sigma-1) - \frac{Z\Omega q_s^{\sigma-1}(\sigma-1)}{(1-\Omega q_s^{\sigma-1})}\right]\frac{dq_s}{q_s}\\ &+\left[\sigma(1-\mu) - \frac{Z}{E_s(1-\Omega q_s^{\sigma-1})}\left(\gamma A_s\lambda_s + \frac{\mu A_s\lambda_s}{1-\mu}\right)\right]dw_s\\ &= \left[\frac{Z\mu A_s}{(1-\mu)(1-\Omega q_s^{\sigma-1})E_s}\right]d\lambda_s\end{aligned} \tag{A13}$$

where $\Omega = \gamma(t_{SN}-1)(\tau t_{SN}q_N)^{1-\sigma}$

Combining relations (A9) and (A13), we derive the required expression for $dw_s / d\lambda_s$:

$$\frac{dw}{d\lambda} = \frac{ZA_s}{\delta(1-\mu)(1-\Omega q_s^{\sigma-1})E_s}\left[(1-\sigma)(\mu - Z) + \frac{\mu^2\sigma\lambda_s Z_s A_s}{(1-\mu)E_s} - (1-\Omega q_s^{\sigma-1})\mu\sigma\right] \tag{A14}$$

where

$$\delta = \left[\sigma(1-\mu) - \frac{Z\left(\gamma A_s \lambda_s + \frac{\mu A_s \lambda_s}{1-\mu}\right)}{E_s(1-\Omega q_s^{\sigma-1})}\right]\left[(1-\sigma) + \frac{\mu\sigma\lambda_s A_s Z}{(1-\mu)E_s}\right] + \left[\left(\frac{A_s Z\lambda_s(1-\sigma(1-\mu))}{(1-\mu)E_s}\right)\left(\mu\sigma - \frac{Z(\sigma-1)}{(1-\Omega q_s^{\sigma-1})}\right)\right].$$

The point of symmetry breaking occurs when $dw_s/d\lambda_s = 0$. This can be described by the following relation:

$$(1-\sigma)(\mu - Z) + \frac{\mu^2\sigma\lambda_s Z_s A_s}{(1-\mu)E_s} - (1-\Omega q_s^{\sigma-1})\mu\sigma = 0 \tag{A15}$$

There is no simple analytical expression for the break point value $A_S(B)$, as it is the simultaneous solution of the set of equations (A1)-(A7) and (A15). However, we can solve numerically this expression to derive the break values at which the symmetric equilibrium becomes unstable, notably $\lambda_S(B)$ (see Table 1).

We can deduce that $A_S > A_S(B) \Rightarrow dw_S/d\lambda_S > 0$, so that the symmetric equilibrium is unstable, and stable conversely.

# 7

# A HISTORICAL INVESTIGATION OF REGIONAL PATTERNS OF SPECIALIZATION: THE CASE OF ITALY

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## INTRODUCTION

Geographical disparities have always been a typical feature of the Italian economic development. Italy is a country that did not develop evenly across its regions. The Italian dualism has been known since the reunification of the country in 1861, and has been widely increased since the reconstruction period, after the Second World War.

The debate about the geographical differences in Italy can be divided into three periods, which identify three main different bodies of literature. During the 1950s and the 1960s, the literature was mainly concentrated on the dualism of the Italian system (Graziani, 1969; Lutz, 1962; Marzano, 1969, Sylos Labini, 1970). The famous *miracolo italiano* occurred in those decades and the highest rate of economic growth divided the country in two halves, the newly industrialized North and the backward South. At that time, the debate was all concerned with the causes of this economically divided Italy. Economists attempted to find reasons and explanations; while policy makers tried to implement economic policies which could support the development of the underdeveloped South or, at least, stop the dualism process from going too far.

During the 1970s, the Italian literature acknowledged an important phenomenon that was going on in the country, the decentralisation and the subcontracting of production from larger firms to smaller ones. The dualism model did not work anymore because the country became an incubator of small firms with geographically concentrated networks. The model of the "Third Italy" was then proposed (Bagnasco, 1977; Muscarà, 1967) in order to distinguish the North-Eastern-Central part of the country, where this phenomenon was unmistakable, from the advanced North-West and the backward South. Moreover, the recognition that Italy had became scattered by distinctive locations with different economic and social systems, brought back into life the Marshallian idea of industrial district (Marshall, 1890). Becattini's revisiting Marshallian ideas cast new light on the mechanisms working within industrial districts by focusing on the externalities giving the district firms a competitive advantage over isolated firms (Becattini, 1979, 1987).

Since the 1990s, a growing body of the literature has been concentrating on regional development and regional disparities. The global economy has underlined the importance of economic geography (Krugman, 1991, 1995, Ohmae 1995, Scott, 1998). Moreover, the formation of the Monetary Union in 1992 and the following stronger economic integration has given rise to many studies about the convergence debate, in order to investigate whether economic convergence has occurred among European countries and regions (Acconcia, 2002; Adams and Pigliaru, 1999; Boldrin and Canova, 2001; Canova and Marcet 1995). In a country such as Italy, the analysis of regional disparities has become an imperative. Many studies have analyzed the problem of convergence among the Italian regions (Bianchi and Menegatti, 1997; Mauro and Podrecca, 1994; Paci and Pigliaru, 1995; Paci and Saba, 1998; Terrasi, 1999), the role played by either human capital (Carmeci and Mauro 2002; Coppola, De Blasio, Gallo, 1998; Di Liberto, 2001; Lodde, 2000; Piras, 1996) or infrastructures (Acconcia and Del Monte, 2000; Benvenuti and Marangoni, 1999; La Ferrara, 1999; Picci, 1999; Viviani and Vulpes, 1999) on Italian regional convergence.

This chapter moves away from the convergence debate and focuses on the Italian long-run regional specialisation during the Second post-war period. The aim is to investigate the ability of Italian regions to change their profiles of specialisation in order to fine tune towards more competitive sectors. It is believed that each region has its own history, tradition and, especially, path of economic development. The focus of this chapter is to look into this in an historical perspective.

## THE EMPIRICAL ANALYSIS

The empirical work of this paper is based on the Istat[54] Census Data of Industry, which collects data about the number of firms and employees, broken down by industry and location. This data is used at the regional level, which means at the NUTS 2 level[55], in order to calculate an index of Regional Specialisation (RS*) based on employment data and given by the following expression:

$$RS^*_{ij} = (e_{ij} / \sum_i e_{ij}) / (\sum_j e_{ij} / \sum_i \sum_j e_{ij})$$

where $e_{ij}$ stands for the employment of region $i$ in sector $j$. The numerator indicates the regional share of employment in a specific sector $j$ and compares the regional employment in a given sector with the national one in the same sector. The denominator indicates the total regional share of employment and compares the regional employment in all sectors with the national one in all sectors. Unfortunately, RS* is asymmetric because it can assume only positive values with the critical point at one:

[54] ISTAT is the Italian Statistical Office

[55] NUTS (Nomenclature of Territorial Units for Statistics) is the Eurostat scheme of classification based on the institutional divisions currently in force in the Member States, according to the task allocated to territorial communities, to the size of population necessary to carry out these tasks efficiently and economically, and to historical, cultural and other factors (Eurostat, 1995).

- $RS^* > 1$ shows that, the regional share of employment in a specific sector is greater than the national one, thus indicating a specialisation of the region in that sector;
- $RS^* < 1$ shows that the regional share of employment in a specific sector is lower than the national one, thus indicating a lack of specialisation of the region in that sector.

To make the index symmetric, the following transformation has been adopted:

$$RS_{ij} = (RS^*_{ij} - 1) / (RS^*_{ij} + 1)$$

In this way, RS varies from minus one to one with the critical value at zero:

- $-1 < RS < 0$ indicates the lack of regional specialisation;
- $0 < RS < 1$ indicates regional specialisation.

The same index has been used by other authors working with employment data at the regional level (Cainelli, Leoncini, Montini 2001; Paci and Usai 2000).

The RS index has been calculated for each of the 20 Italian regions in 1951, 1961, 1971, 1981, 1991, according to the five ISTAT Censuses[56]. A problem of homogeneity occurs because different sectors were surveyed by different Censuses. Some sectors were surveyed only in 1951 and split in different sectors later on, with the aim to improve the detail of the analysis. By contrast, other sectors were surveyed only in the later Censuses and never in the previous ones. Table A1 in the appendix shows the surveyed sectors in each Census and indicates the number of observations for each period used in the empirical work. In order to make the analysis historically comparable without loosing too many sectors, aggregations have been made, when possible and when appropriate.

For each Italian region, the profile of specialisation is, therefore, represented by five RS distributions across different sectors. It is most important to remark that, the sectors used in this work are not only manufacturing sectors but they cover all economic activities. This approach is quite different with that of similar works (Cainelli, Leoncini, Montini 2001; Paci and Usai 2000) where the analysis is confined within the industrial sectors. The rationale of this choice is strictly related to the object of the analysis, the long-run development in the Italian regional specialisation. We believe that it becomes possible to detect shifts in the Italian regional specialisation only by spreading the analysis across all economic activities. Including non-industrial sectors enables the analysis to be carried out by looking at the historical shift from agricultural towards industrial, and from there towards services, eventually.

The RS index has been used to test the stability of the specialisation of the Italian regions over time with a Galtonian regression model of the following form:

$$RS_{i,t} = \alpha + \beta RS_{i,t-1} + \varepsilon_{it}$$

[56]Unfortunately, at the time of writing, the data of the latest Census is not yet available.

where the subscript $i$ refers to the sector of the pertinent region in question. The regression shows whether RS at time t is correlated with the same index in the earlier period (t-1). This model is used to estimate the correlation between two RS distributions at two different periods and the significance of the estimated slope coefficient gives an indication of the strength of the correlation. The Galtonian regression model has been successfully adopted in other works in order to test the stability of countries' productivity (Hart, 1995a, 1995b), the stability of earnings (Hart, 1976) and the stability of technological specialisation across countries (Vertova, 1999), across firms (Cantwell and Fai, 1999) and across industries (Cantwell and Andersen, 1996).

As far as stability is concerned, the theoretical explanation suggests that regional specialisation is persistent over time because regions are more likely to continue to do what they have done in the past. Therefore, the sectoral distribution of the RS index should remain stable or should change only gradually over time. It means that regions should maintain RS distributions of similar ranking, with the specialized sectors at the top of the distribution and the unspecialized ones at the bottom. Hence, for the same region, two RS distributions at two periods, not too distant in time from one another, should show a similar range of sectors, resulting in a positive correlation between the two distributions. The statistical and econometric implication for stability is that the correlation coefficient $\rho$ should be statistically greater than zero, thus expressing some degree of correlation between the two distributions.

A measure of the inverse of stability is the mobility effect, which measures the mobility of sectors up and down the ranking of the RS distributions. The mobility effect can identify if, on average, the sectors move from their original positions in the ranked RS distribution at the period (t-1) towards different positions in the new ranked RS distribution of the next period t. Hart and Prais (1956) first introduced the concept of mobility effect measured by the inverse of the correlation coefficient $1/\rho$. The same approach was further developed by Hart, in his later works, in which the inverse of the correlation coefficient measures the mobility of firms (Hart 1971), the mobility of earnings (Hart 1976) and the mobility of countries (Hart 1995a; 1995b).

In this work, the mobility effect is measured by $(1-\rho)$ thus demonstrating a strict inverse relationship between the mobility effect and the correlation coefficient. Therefore, two cases are possible:

- if there is a significant positive correlation between the two RS distributions, $\rho$ is very close to one and, therefore, the mobility effect is very small;
- if there is no significant correlation $\rho$ tends towards zero and, consequently, the mobility effect is very high and close to one.

A test for stability is given by the t-test on the estimated regression coefficient $\hat{\beta}$. The t-test on whether $\hat{\beta}$ is statistically different from zero can also be used as a test of whether $\hat{\rho}$ is statistically different from zero.

Despite persistence in regional specialisation, regions can change their specialisation gradually over time, due to the slow adaptation to changes in the external environment, leading to new specialisation in related or even unrelated fields. Therefore, in the ranking of the RS distribution, a movement between sectors can occur, with the specialized sectors slipping back and the unspecialized ones catching up, and a process of "regression towards the mean" can occur. The statistical and econometric implication of incremental change is that $\beta$ should be statistically different from one. With the regression model discussed above, the possible outcomes concerning incremental change are the following:

- when $\beta = 1$, the profile of specialisation does not change because, on average, the position of sectors does not change. There is no process of convergence and, on average, sectors maintain their position in the ranked RS distribution;
- when $0 < \beta < 1$, the profile of specialization changes and a regression towards the mean occurs. On average, sectors tend to converge with the unspecialized ones catching up the specialized ones. Specialisation is still stable over time, but a *diversifying incremental change* occurs. Regions tend to move their specialisation gradually into new fields in which they made comparatively little effort in the past;
- when $\beta > 1$, the profile of specialisation does change because the position of sectors change but, instead of converging towards the mean, they tend to move further apart. On average, the specialized sectors become even more specialized and the unspecialized ones even more unspecialized. Specialisation is still stable over time, but a *reinforcing incremental change* occurs. Regions tend to strengthen their specialisation into their existing fields of expertise.

A measure of incremental change is given by what has been termed the regression effect, expressed by the magnitude of $(1-\beta)$, which measures whether sectors of specialisation are becoming relatively stronger or weaker, on average. There is an inverse relationship between the hypothesis of incremental change and the regression effect:

- if there is no incremental change, $\beta$ equals unity and, consequently, the regression effect is equal to zero. The profiles of specialisation is similar to that of the previous period, on average;
- if there is diversifying incremental change, $\beta$ is below unity and, consequently, the regression effect is positive. Regions tend to diversify their specialisation into new sectors;
- is there is reinforcing incremental change, $\beta$ is above unity and, consequently, the regression effect is negative. Regions tend to maintain their specialisation in the same sectors, on average.

## STABILITY OF REGIONAL SPECIALISATION

This section shows the results from the regressions, by putting together those whose length of time is the same.

### Stability Over 10 Years

Tables 1, 2, 3, and 4 show the results from the regressions over a 10-year period. It is not surprising that, over such a short period of time, all regions present very stable profiles of specialisation. Regions are not very likely to change their profiles of specialisation over such a short period of time. The mobility effect is very small and statistically insignificant for all Italian regions. Moreover, in the most recent cases, when 1991 is compared with 1981 and 1981 is compared with 1971 (Tables 1 and 2), the regression effect is statistically significant and positive, thus indicating a diversifying incremental change. Almost all Italian regions have been maintaining their profiles of specialisation in the same sectors, on average, despite some gradual shift into new related fields. Veneto and Liguria are the only two exceptions to this general trend, with sticky profiles of specialisation, on average, when 1971 is compared to 1981 (Table 2).

**Table 1: Results of the Regression of the RS Index in 1991 on RS in 1981**

| Region | $\hat{\alpha}$ | $\hat{\beta}$ | t-test $\hat{\beta}=0$ | mobility effect $(1-\hat{\rho})$ | t-test $\hat{\beta}=1$ | regression effect $(1-\hat{\beta})$ |
|---|---|---|---|---|---|---|
| Piemonte | -0.03 | 0.64 | 7.77* | 0.29 | -4.45* | 0.36 |
| Valle d'Aosta | -0.06 | 0.73 | 8.01* | 0.28 | -2.92* | 0.27 |
| Lombardia | -0.01 | 0.78 | 10.63* | 0.19 | -2.94* | 0.22 |
| Trentino Alto Adige | 0.00 | 0.79 | 10.83* | 0.18 | -2.89* | 0.21 |
| Veneto | -0.02 | 0.71 | 9.88* | 0.21 | -4.09* | 0.29 |
| Friuli Venezia Giulia | -0.03 | 0.64 | 6.90* | 0.33 | -3.82* | 0.36 |
| Liguria | -0.02 | 0.77 | 11.11* | 0.18 | -3.39* | 0.23 |
| Emilia Romagna | -0.02 | 0.64 | 8.21* | 0.27 | -4.70* | 0.36 |
| Toscana | -0.03 | 0.63 | 8.90* | 0.24 | -5.15* | 0.37 |
| Umbria | 0.02 | 0.77 | 10.54* | 0.19 | -3.14* | 0.23 |
| Marche | -0.04 | 0.77 | 11.59* | 0.16 | -3.42* | 0.23 |
| Lazio | -0.04 | 0.71 | 8.64* | 0.25 | -3.60* | 0.29 |
| Abruzzo | 0.03 | 0.70 | 10.70* | 0.19 | -4.53* | 0.30 |
| Molise | -0.05 | 0.69 | 9.82* | 0.21 | -4.39* | 0.31 |
| Campania | -0.04 | 0.73 | 10.41* | 0.19 | -3.84* | 0.27 |
| Puglia | -0.01 | 0.78 | 14.00* | 0.12 | -3.97* | 0.22 |
| Basilicata | -0.06 | 0.65 | 7.55* | 0.30 | -4.13* | 0.35 |
| Calabria | -0.10 | 0.65 | 8.52* | 0.25 | -4.65* | 0.35 |
| Sicilia | -0.03 | 0.81 | 13.20* | 0.13 | -3.16* | 0.19 |
| Sardegna | 0.01 | 0.76 | 10.84* | 0.18 | -3.42* | 0.24 |

* indicates significance at the 1% level

**Table 2: Results of the Regression of the RS Index in 1981 on RS in 1971**

| Region | $\hat{\alpha}$ | $\hat{\beta}$ | t-test $\hat{\beta}=0$ | mobility effect $(1-\hat{\rho})$ | t-test $\hat{\beta}=1$ | regression effect $(1-\hat{\beta})$ |
|---|---|---|---|---|---|---|
| Piemonte | 0.01 | 0.73 | 9.35* | 0.21 | -3.49* | 0.27 |
| Valle d'Aosta | -0.06 | 0.75 | 11.18* | 0.16 | -3.79* | 0.25 |
| Lombardia | 0.01 | 0.79 | 9.96* | 0.19 | -2.69* | 0.21 |
| Trentino Alto Adige | -0.04 | 0.78 | 12.76* | 0.13 | -3.70* | 0.22 |
| Veneto | 0.00 | 0.87 | 11.47* | 0.15 | -1.73 | 0.13 |
| Friuli Venezia Giulia | -0.04 | 0.80 | 12.61* | 0.13 | -3.11* | 0.20 |
| Liguria | 0.00 | 0.95 | 14.70* | 0.10 | -0.85 | 0.05 |
| Emilia Romagna | 0.00 | 0.68 | 8.38* | 0.24 | -3.95* | 0.32 |
| Toscana | -0.01 | 0.79 | 10.54* | 0.17 | -2.85* | 0.21 |
| Umbria | -0.05 | 0.69 | 8.92* | 0.22 | -4.02* | 0.31 |
| Marche | 0.01 | 0.74 | 10.53* | 0.17 | -3.64* | 0.26 |
| Lazio | -0.03 | 0.78 | 15.57* | 0.09 | -4.38* | 0.22 |
| Abruzzo | -0.01 | 0.77 | 12.40* | 0.13 | -3.70* | 0.23 |
| Molise | -0.08 | 0.76 | 11.89* | 0.14 | -3.78* | 0.24 |
| Campania | -0.02 | 0.82 | 15.18* | 0.10 | -3.44* | 0.18 |
| Puglia | -0.02 | 0.83 | 15.15* | 0.10 | -3.07* | 0.17 |
| Basilicata | -0.04 | 0.80 | 12.66* | 0.13 | -3.16* | 0.20 |
| Calabria | -0.07 | 0.78 | 13.62* | 0.11 | -3.94* | 0.22 |
| Sicilia | -0.02 | 0.87 | 18.91* | 0.06 | -2.86* | 0.13 |
| Sardegna | 0.02 | 0.79 | 9.02* | 0.22 | -2.37* | 0.21 |

*** indicates significance at the 1% level**

However, when looking at the other two oldest cases, when 1971 is compared with 1961 and 1961 is compared with 1951 (Tables 3 and 4), the general trend seems to be different. For most of the regions the regression effect is null. In those periods, the Italian regions maintained their profiles of specialisation almost unchanged, on average, despite some few exceptions. Lombardia, Toscana, Umbria, Lazio, Abruzzo, Puglia, Basilicata, Sicilia and Sardegna show some degree of diversifying incremental change during the 1970s (Table 3), and Umbria, Abruzzo and Calabria during the 1960s (Table 4).

Even with few exceptions, the results of the regression over a 10-year period show that, from the end of the Second World War up to 1971, Italian regions were completely stable in their profiles of specialisation, on average. The stickiness of the Italian regional specialisation at that time is quite surprising because that was a period of great changes in the Italian economy, due to the Marshall plan, the Italian miracle and the integration of the Italian economy in the international context (Graziani, 1989). Yet, in spite of those great changes, there is no sign of any tendency of Italian regions to either move into new areas of specialisation or increase the level of specialisation of the already advantage sectors. By using the same unemployment data, Terrasi (1978) finds the same level of immobility in the specialisation of Italian regions from 1951 to 1971, although confined to the manufacturing sectors.

By contrast, when looking at the more recent periods, the general trend seems to be characterized by some degree of diversifying incremental change. From 1971 onwards, Italian regions, show a tendency to diversify their specialisation into new fields, yet without changing their usual kind of specialisation, on average. It seems that Italian regions made an attempt to specialise into new sectors, according to the big changes occurring in the national and international context. The 1970s witnessed the crisis of the Fordism mass production and the beginning of the flexible specialisation method of production, based on the flexible use of increasingly productive technology and the creation of regional or local institutions, balancing competition and cooperation among firms (Piore and Sabel, 1984). Therefore, the diversifying incremental change can be viewed as the result of the change in the methods of production.

**Table 3: Results of the Regression of RS Index in 1971 on RS in 1961**

| Region | $\hat{\alpha}$ | $\hat{\beta}$ | t-test $\hat{\beta}=0$ | mobility effect $(1-\hat{\rho})$ | t-test $\hat{\beta}=1$ | regression effect $(1-\hat{\beta})$ |
|---|---|---|---|---|---|---|
| Piemonte | -0.01 | 0.96 | 22.42* | 0.04 | -1.05 | 0.04 |
| Valle d'Aosta | 0.00 | 0.81 | 9.97* | 0.17 | -2.27 | 0.19 |
| Lombardia | -0.02 | 0.74 | 10.22* | 0.17 | -3.55* | 0.26 |
| Trentino Alto Adige | 0.00 | 0.92 | 15.70* | 0.09 | -1.46 | 0.08 |
| Veneto | -0.02 | 0.87 | 14.00* | 0.10 | -2.11 | 0.13 |
| Friuli Venezia Giulia | 0.00 | 0.90 | 15.87* | 0.08 | -1.75 | 0.10 |
| Liguria | 0.00 | 0.92 | 24.66* | 0.04 | -2.10 | 0.08 |
| Emilia Romagna | -0.02 | 0.88 | 19.88* | 0.06 | -2.64 | 0.12 |
| Toscana | 0.02 | 0.77 | 10.16* | 0.17 | -3.05* | 0.23 |
| Umbria | -0.01 | 0.79 | 10.16* | 0.17 | -2.73* | 0.21 |
| Marche | -0.01 | 0.88 | 19.41* | 0.06 | -2.63 | 0.12 |
| Lazio | 0.02 | 0.73 | 8.65* | 0.22 | -3.16* | 0.27 |
| Abruzzo | -0.03 | 0.78 | 11.43* | 0.14 | -3.28* | 0.22 |
| Molise | 0.00 | 0.89 | 14.37* | 0.10 | -1.75 | 0.11 |
| Campania | 0.02 | 0.85 | 13.89* | 0.11 | -2.39 | 0.15 |
| Puglia | -0.02 | 0.82 | 15.29* | 0.09 | -3.35* | 0.18 |
| Basilicata | -0.01 | 0.72 | 8.40* | 0.23 | -3.29* | 0.28 |
| Calabria | -0.01 | 0.89 | 16.44* | 0.08 | -2.08 | 0.11 |
| Sicilia | 0.00 | 0.87 | 19.35* | 0.06 | -2.88* | 0.13 |
| Sardegna | 0.02 | 0.79 | 11.69* | 0.14 | -3.04* | 0.21 |

*** indicates significance at the 1% level**

**Table 4: Results of the Regression of RS Index in 1961 on RS in 1951**

| Region | $\hat{\alpha}$ | $\hat{\beta}$ | t-test $\hat{\beta}=0$ | mobility effect $(1-\hat{\rho})$ | t-test $\hat{\beta}=1$ | regression effect $(1-\hat{\beta})$ |
|---|---|---|---|---|---|---|
| Piemonte | 0.01 | 1.06 | 16.18* | 0.05 | 0.91 | -0.06 |
| Valle d'Aosta | 0.05 | 0.92 | 16.13* | 0.05 | -1.32 | 0.08 |
| Lombardia | 0.02 | 0.93 | 31.59* | 0.01 | -2.38 | 0.07 |
| Trentino Alto Adige | -0.01 | 0.92 | 12.17* | 0.08 | -1.08 | 0.08 |
| Veneto | -0.01 | 0.85 | 10.19* | 0.11 | -1.73 | 0.15 |
| Friuli Venezia Giulia | 0.00 | 0.88 | 13.24* | 0.07 | -1.72 | 0.12 |
| Liguria | -0.01 | 0.96 | 9.58* | 0.07 | -0.37 | 0.04 |
| Emilia Romagna | -0.03 | 0.83 | 13.10* | 0.07 | -2.75 | 0.17 |
| Toscana | -0.01 | 0.96 | 10.46* | 0.11 | -0.39 | 0.04 |
| Umbria | -0.02 | 0.76 | 13.79* | 0.07 | -4.24* | 0.24 |
| Marche | -0.04 | 0.86 | 15.81* | 0.05 | -2.64 | 0.14 |
| Lazio | 0.00 | 0.91 | 17.66* | 0.04 | -1.71 | 0.09 |
| Abruzzo | 0.00 | 0.72 | 10.72* | 0.10 | -4.12* | 0.28 |
| Molise | 0.00 | 0.94 | 18.85* | 0.04 | -1.23 | 0.06 |
| Campania | 0.00 | 0.91 | 22.43* | 0.03 | -2.21 | 0.09 |
| Puglia | -0.02 | 0.90 | 12.95* | 0.07 | -1.51 | 0.10 |
| Basilicata | -0.01 | 0.89 | 15.34* | 0.05 | -1.82 | 0.11 |
| Calabria | 0.00 | 0.84 | 16.83* | 0.05 | -3.23* | 0.16 |
| Sicilia | 0.01 | 0.92 | 20.49* | 0.03 | -1.77 | 0.08 |
| Sardegna | 0.03 | 0.93 | 20.69* | 0.03 | -1.53 | 0.07 |

* indicates significance at the 1% level

## Stability Over 20 Years

Tables 5, 6 and 7 show the results from the regressions over a 20-year period. In these cases, also, the general trend is a mobility effect that is statistically insignificant. That means that, again, the Italian regions maintain, on average, their profiles of specialisation over 20 years. As far as the regression effect is concerned, the general trend is, again, a diversifying incremental change. Yet, there are some exceptions. Lombardia and Veneto shows sticky profiles of specialisation, when 1971 is compared with 1991 (Table 5); and also Liguria shows a statistically insignificant regression effect, when 1961 is compared with 1981 (Table 6). Even more exceptions can be found when 1951 is compared with 1971 (Table 7). Eight regions out of twenty - Piemonte, Valle d'Aosta, Veneto, Friuli Venezia Giulia, Liguria, Toscana, Molise and Campania - show a fixed profile of specialisation. This result is quite consistent with the previous one, thus indicating that after the Second World War, some Italian regions maintained, on average, their specialisation in traditional areas of expertise. It is worth noticing that this thickness is spread among Northern, Central and Southern regions, thus suggesting that the difficulty to change profiles of specialisation is not only a problem of the South, but it belongs also to the North and Central part of the country.

**Table 5: Results of the Regression of RS Index in 1991 on RS in 1971**

| Region | $\hat{\alpha}$ | $\hat{\beta}$ | t-test $\hat{\beta}=0$ | mobility effect $(1-\hat{\rho})$ | t-test $\hat{\beta}=1$ | regression effect $(1-\hat{\beta})$ |
|---|---|---|---|---|---|---|
| Piemonte | 0.01 | 0.75 | 14.01* | 0.11 | -4.76* | 0.25 |
| Valle d'Aosta | -0.15 | 0.47 | 4.35* | 0.48 | -4.93* | 0.53 |
| Lombardia | 0.01 | 0.92 | 17.23* | 0.08 | -1.56 | 0.08 |
| Trentino Alto Adige | -0.02 | 0.68 | 8.46* | 0.24 | -4.04* | 0.32 |
| Veneto | 0.00 | 0.83 | 12.44* | 0.13 | -2.54 | 0.17 |
| Friuli Venezia Giulia | -0.07 | 0.53 | 4.99* | 0.43 | -4.49* | 0.47 |
| Liguria | -0.01 | 0.88 | 14.93* | 0.10 | -2.00 | 0.12 |
| Emilia Romagna | 0.00 | 0.63 | 8.69* | 0.23 | -5.19* | 0.37 |
| Toscana | -0.04 | 0.55 | 6.26* | 0.34 | -5.17* | 0.45 |
| Umbria | 0.02 | 0.78 | 14.12* | 0.11 | -4.08* | 0.22 |
| Marche | -0.01 | 0.73 | 11.81* | 0.14 | -4.31* | 0.27 |
| Lazio | -0.07 | 0.70 | 10.09* | 0.18 | -4.27* | 0.30 |
| Abruzzo | 0.02 | 0.57 | 7.35* | 0.28 | -5.65* | 0.43 |
| Molise | -0.11 | 0.53 | 6.59* | 0.32 | -5.76* | 0.47 |
| Campania | -0.04 | 0.70 | 10.93* | 0.16 | -4.63* | 0.30 |
| Puglia | -0.02 | 0.69 | 10.17* | 0.18 | -4.58* | 0.31 |
| Basilicata | -0.06 | 0.64 | 8.05* | 0.25 | -4.53* | 0.36 |
| Calabria | -0.11 | 0.57 | 7.81* | 0.26 | -5.86* | 0.43 |
| Sicilia | -0.04 | 0.80 | 15.12* | 0.10 | -3.87* | 0.20 |
| Sardegna | 0.06 | 0.78 | 9.59* | 0.20 | -2.74* | 0.22 |

* indicates significance at the 1% level

**Table 6: Results of the Regression of RS Index in 1981 on RS in 1961**

| Region | $\hat{\alpha}$ | $\hat{\beta}$ | t-test $\hat{\beta}=0$ | mobility effect $(1-\hat{\rho})$ | t-test $\hat{\beta}=1$ | regression effect $(1-\hat{\beta})$ |
|---|---|---|---|---|---|---|
| Piemonte | -0.01 | 0.64 | 6.44* | 0.32 | -3.68* | 0.36 |
| Valle d'Aosta | -0.12 | 0.56 | 6.25* | 0.33 | -4.98* | 0.44 |
| Lombardia | -0.01 | 0.62 | 7.11* | 0.28 | -4.33* | 0.38 |
| Trentino Alto Adige | -0.04 | 0.73 | 8.79* | 0.21 | -3.22* | 0.27 |
| Veneto | -0.03 | 0.63 | 5.38* | 0.39 | -3.16* | 0.37 |
| Friuli Venezia Giulia | -0.03 | 0.77 | 10.06* | 0.18 | -3.08* | 0.23 |
| Liguria | -0.01 | 0.89 | 10.06* | 0.13 | -1.45 | 0.11 |
| Emilia Romagna | -0.01 | 0.57 | 6.57* | 0.31 | -4.91* | 0.43 |
| Toscana | 0.02 | 0.80 | 11.44* | 0.14 | -2.83* | 0.20 |
| Umbria | -0.08 | 0.47 | 4.62* | 0.45 | -5.17* | 0.53 |
| Marche | 0.00 | 0.63 | 7.12* | 0.28 | -4.26* | 0.37 |
| Lazio | -0.02 | 0.61 | 8.27* | 0.23 | -5.22* | 0.39 |
| Abruzzo | -0.04 | 0.57 | 7.20* | 0.28 | -5.33* | 0.43 |
| Molise | -0.09 | 0.63 | 7.44* | 0.27 | -4.29* | 0.37 |
| Campania | -0.01 | 0.69 | 8.62* | 0.22 | -3.93* | 0.31 |
| Puglia | -0.04 | 0.66 | 8.37* | 0.23 | -4.24* | 0.34 |
| Basilicata | -0.07 | 0.52 | 5.25* | 0.40 | -4.90* | 0.48 |
| Calabria | -0.09 | 0.64 | 7.99* | 0.24 | -4.42* | 0.36 |
| Sicilia | -0.03 | 0.71 | 9.84* | 0.18 | -4.07* | 0.29 |
| Sardegna | 0.04 | 0.55 | 5.38* | 0.39 | -4.34* | 0.45 |

* indicates significance at the 1% level

**Table 7: Results of the Regression of RS Index in 1971 on RS in 1951**

| Region | $\hat{\alpha}$ | $\hat{\beta}$ | t-test $\hat{\beta}=0$ | mobility effect $(1-\hat{\rho})$ | t-test $\hat{\beta}=1$ | regression effect $(1-\hat{\beta})$ |
|---|---|---|---|---|---|---|
| Piemonte | 0.00 | 0.95 | 7.42* | 0.19 | -0.42 | 0.05 |
| Valle d'Aosta | 0.05 | 0.86 | 10.78* | 0.10 | -1.81 | 0.14 |
| Lombardia | 0.01 | 0.83 | 14.02* | 0.06 | -2.82* | 0.17 |
| Trentino Alto Adige | 0.00 | 0.74 | 8.50* | 0.15 | -3.05* | 0.26 |
| Veneto | -0.02 | 0.77 | 7.40* | 0.19 | -2.18 | 0.23 |
| Friuli Venezia Giulia | 0.01 | 0.85 | 9.94* | 0.12 | -1.72 | 0.15 |
| Liguria | -0.01 | 0.99 | 11.46* | 0.09 | -0.15 | 0.01 |
| Emilia Romagna | -0.02 | 0.76 | 9.47* | 0.13 | -3.06* | 0.24 |
| Toscana | 0.00 | 0.83 | 7.42* | 0.19 | -1.48 | 0.17 |
| Umbria | -0.03 | 0.69 | 10.42* | 0.11 | -4.61* | 0.31 |
| Marche | -0.06 | 0.64 | 6.95* | 0.20 | -3.97* | 0.36 |
| Lazio | 0.01 | 0.74 | 10.57* | 0.11 | -3.79* | 0.26 |
| Abruzzo | 0.00 | 0.64 | 7.28* | 0.19 | -4.11* | 0.36 |
| Molise | -0.01 | 0.77 | 8.23* | 0.16 | -2.45 | 0.23 |
| Campania | 0.00 | 0.84 | 12.80* | 0.08 | -2.46 | 0.16 |
| Puglia | -0.01 | 0.50 | 4.59* | 0.34 | -4.52* | 0.50 |
| Basilicata | -0.04 | 0.56 | 5.41* | 0.29 | -4.29* | 0.44 |
| Calabria | 0.00 | 0.80 | 11.79* | 0.09 | -2.91* | 0.20 |
| Sicilia | 0.00 | 0.75 | 9.62* | 0.12 | -3.25* | 0.25 |
| Sardegna | 0.04 | 0.68 | 7.50* | 0.18 | -3.48* | 0.32 |

* indicates significance at the 1% level

## Stability Over 30 Years

Tables 8 and 9 show the results from the regression over a 30-year period. Although it would be more likely to see discontinuity in regional profiles of specialisation over such a long period of time, this is not the case for the Italian regions. Even over a 30-year period, almost all Italian regions show a stable profile of specialisation, with very few exceptions, Valle d'Aosta when 1991 is compared with 1961 (Table 8), and Veneto when 1981 is compared with 1951 (Table 9). These are the only two regions with very strong mobility effect, hence suggesting a radical change in their profiles of specialisation. Nevertheless, almost all Italian regions show statistically significant regression effect, which means a strong degree of diversifying incremental change. Also in this case, the exceptions are very few, Liguria when 1991 is compared with 1961 (Table 8), and Piemonte, Friuli Venezia Giulia, Liguria when 1981 is compared with 1951. These regions, all from the North and Centre part of the country, show a negligible regression effect, which means immobility of their profiles of specialisation. The result is quite surprising because that part of the country is the most economically active and competitive and, therefore, a big change in the profiles of specialisation could have been expected over such a long period of time.

**Table 8: Results of the Regression of RS Index in 1991 on RS in 1961**

| Region | $\hat{\alpha}$ | $\hat{\beta}$ | t-test $\hat{\beta}=0$ | mobility effect $(1-\hat{\rho})$ | t-test $\hat{\beta}=1$ | regression effect $(1-\hat{\beta})$ |
|---|---|---|---|---|---|---|
| Piemonte | -0.01 | 0.72 | 10.01* | 0.18 | -3.83* | 0.28 |
| Valle d'Aosta | -0.23 | 0.29 | 2.64 | 0.64 | -6.37* | 0.71 |
| Lombardia | 0.00 | 0.74 | 10.52* | 0.16 | -3.69* | 0.26 |
| Trentino Alto Adige | -0.01 | 0.74 | 8.64* | 0.22 | -3.00* | 0.26 |
| Veneto | -0.03 | 0.69 | 6.46* | 0.32 | -2.85* | 0.31 |
| Friuli Venezia Giulia | -0.07 | 0.58 | 5.23* | 0.40 | -3.80* | 0.42 |
| Liguria | -0.02 | 0.80 | 10.15* | 0.17 | -2.52 | 0.20 |
| Emilia Romagna | -0.02 | 0.56 | 7.11* | 0.28 | -5.60* | 0.44 |
| Toscana | -0.01 | 0.61 | 7.11* | 0.53 | -4.46* | 0.39 |
| Umbria | -0.01 | 0.55 | 5.89* | 0.35 | -4.77* | 0.45 |
| Marche | -0.02 | 0.66 | 8.54* | 0.22 | -4.44* | 0.34 |
| Lazio | -0.04 | 0.65 | 8.44* | 0.23 | -4.56* | 0.35 |
| Abruzzo | 0.00 | 0.42 | 5.01* | 0.41 | -6.82* | 0.58 |
| Molise | -0.09 | 0.49 | 5.64* | 0.37 | -5.89* | 0.51 |
| Campania | -0.03 | 0.66 | 8.49* | 0.23 | -4.35* | 0.34 |
| Puglia | -0.04 | 0.58 | 7.28* | 0.28 | -5.25* | 0.42 |
| Basilicata | -0.08 | 0.44 | 4.49* | 0.46 | -5.60* | 0.56 |
| Calabria | -0.11 | 0.53 | 6.90* | 0.29 | -6.04* | 0.47 |
| Sicilia | -0.05 | 0.68 | 9.22* | 0.20 | -4.30* | 0.32 |
| Sardegna | 0.06 | 0.58 | 5.73* | 0.36 | -4.18* | 0.42 |

* indicates significance at the 1% level

**Table 9: Results of the Regression of RS Index in 1981 on RS in 1951**

| Region | $\hat{\alpha}$ | $\hat{\beta}$ | t-test $\hat{\beta}=0$ | mobility effect $(1-\hat{\rho})$ | t-test $\hat{\beta}=1$ | regression effect $(1-\hat{\beta})$ |
|---|---|---|---|---|---|---|
| Piemonte | 0.00 | 0.89 | 5.47* | 0.28 | -0.70 | 0.11 |
| Valle d'Aosta | -0.03 | 0.56 | 5.24* | 0.30 | -4.12* | 0.44 |
| Lombardia | 0.00 | 0.66 | 7.87* | 0.17 | -4.07* | 0.34 |
| Trentino Alto Adige | -0.06 | 0.66 | 5.43* | 0.28 | -2.85* | 0.34 |
| Veneto | -0.04 | 0.16 | 1.09 | 0.80 | -5.64* | 0.84 |
| Friuli Venezia Giulia | -0.01 | 0.80 | 8.42* | 0.15 | -2.11 | 0.20 |
| Liguria | -0.03 | 1.16 | 8.46* | 0.15 | 1.14 | -0.16 |
| Emilia Romagna | -0.03 | 0.69 | 7.58* | 0.18 | -3.46* | 0.31 |
| Toscana | -0.01 | 0.65 | 4.87* | 0.32 | -2.66 | 0.35 |
| Umbria | -0.03 | 0.52 | 5.77* | 0.26 | -5.24* | 0.48 |
| Marche | -0.06 | 0.60 | 5.77* | 0.26 | -3.86* | 0.40 |
| Lazio | 0.00 | 0.61 | 7.46* | 0.18 | -4.67* | 0.39 |
| Abruzzo | -0.01 | 0.37 | 3.85* | 0.41 | -6.52* | 0.63 |
| Molise | -0.03 | 0.68 | 7.12* | 0.20 | -3.33* | 0.32 |
| Campania | 0.00 | 0.75 | 8.54* | 0.15 | -2.81* | 0.25 |
| Puglia | -0.02 | 0.41 | 3.03* | 0.50 | -4.36* | 0.59 |
| Basilicata | -0.03 | 0.50 | 4.29* | 0.37 | -4.36* | 0.50 |
| Calabria | -0.03 | 0.56 | 6.57* | 0.22 | -5.20* | 0.44 |
| Sicilia | 0.00 | 0.65 | 7.07* | 0.20 | -3.89* | 0.35 |
| Sardegna | 0.05 | 0.58 | 5.60* | 0.27 | -4.01* | 0.42 |

* indicates significance at the 1% level

## Stability Over 40 Years

Table 10 shows the results of the regression over a 40-year period. Over such a long period of time, we would have expected to see a strong change in regional profiles of specialisation. Yet, this is not the case for the Italian regions. Among all Italian regions, only Toscana and Abruzzo present a statistically significant mobility effect, thus indicating a strong shift in their profiles of specialisation. For these regions, the sectors in which they were specialized into in 1951 are not, on average, the same sector in which they were specialized in 1991. As far as the regression effect is concerned, again, almost all Italian regions exhibit a diversifying incremental change. Piemonte, Veneto, Friuli Venezia Giulia and Liguria are the only exceptions to this general trend. Those regions show a statistically insignificant regression effect. This result is quite surprising because regional profiles of specialisation would be expected to change, at least gradually, over such a long period of time, especially when one realises that, in 1951, Italy was coming out from the distraction of the Second World War; while, in 1991, the country was modern and among the advanced industrialized ones.

**Table 10: Results of the Regression of RS Index in 1991 on RS in 1951**

| Region | $\hat{\alpha}$ | $\hat{\beta}$ | t-test $\hat{\beta}=0$ | mobility effect $(1-\hat{\rho})$ | t-test $\hat{\beta}=1$ | regression effect $(1-\hat{\beta})$ |
|---|---|---|---|---|---|---|
| Piemonte | 0.00 | 0.89 | 5.37* | 0.29 | -0.65 | 0.11 |
| Valle d'Aosta | -0.10 | 0.40 | 2.78* | 0.53 | -4.15* | 0.60 |
| Lombardia | 0.01 | 0.70 | 7.24* | 0.19 | -3.10* | 0.30 |
| Trentino Alto Adige | -0.03 | 0.52 | 3.06* | 0.50 | -2.87* | 0.48 |
| Veneto | -0.04 | 0.86 | 5.37* | 0.29 | -0.88 | 0.14 |
| Friuli Venezia Giulia | -0.05 | 0.64 | 3.97* | 0.40 | -2.19 | 0.36 |
| Liguria | -0.03 | 1.09 | 7.35* | 0.19 | 0.59 | -0.09 |
| Emilia Romagna | -0.04 | 0.62 | 6.50* | 0.22 | -3.91* | 0.38 |
| Toscana | -0.03 | 0.39 | 2.15 | 0.62 | -3.40* | 0.61 |
| Umbria | 0.01 | 0.62 | 6.84* | 0.21 | -4.22* | 0.38 |
| Marche | -0.08 | 0.54 | 5.07* | 0.31 | -4.36* | 0.46 |
| Lazio | -0.04 | 0.75 | 9.41* | 0.13 | -3.10* | 0.25 |
| Abruzzo | -0.02 | 0.24 | 2.19 | 0.62 | -6.81* | 0.76 |
| Molise | -0.02 | 0.54 | 5.21* | 0.30 | -4.43* | 0.46 |
| Campania | -0.02 | 0.76 | 8.60* | 0.15 | -2.79* | 0.25 |
| Puglia | -0.03 | 0.44 | 3.09* | 0.50 | -3.92* | 0.56 |
| Basilicata | -0.06 | 0.42 | 3.44* | 0.46 | -4.75* | 0.58 |
| Calabria | -0.06 | 0.55 | 5.59* | 0.27 | -4.49* | 0.45 |
| Sicilia | -0.02 | 0.65 | 6.62* | 0.22 | -3.62* | 0.35 |
| Sardegna | 0.07 | 0.62 | 5.88* | 0.26 | -3.68* | 0.38 |

*** indicates significance at the 1% level**

## CONCLUSIONS

This work has provided quantitative evidence about the stability of the profiles of specialisation of the Italian regions. Despite some degree of diversifying incremental change, the ability of regions to diversify into new fields of specialisation does not cause a strong change in their profiles of specialisation. In fact, on average, the Italian regions maintain their specialisation in their existing and traditional spheres of expertise. This result is quite discouraging because it shows the typical immobility of the Italian regional specialisation. Although no sectoral analysis has been attempted here, the results show that, on average, regions have been specialized in the same sectors since 1951. The results over the longest period (40-year period) are quite discouraging too because, over such a long period of time, big changes in regional profiles of specialisation would have been expected due to the great transformation that occurred in the external and national environment and the development of new technological paradigms.

A worthwhile remark is that the stickiness of the Italian regional profiles of specialisation occurs for all Italian regions, despite their localisation. There are no differences among the Northern regions, the Southern ones and the regions of the

'Third Italy'. Their profiles of specialisation are unchanging in any case, despite some degree of diversifying incremental change. This result is quite surprising because, on the one hand, more mobility in the regional specialisation of the North part of the country, which is the most industrialized, responding and adapting to new economic situations, would have been likely. On the other hand, some degree of mobility in the regional specialisation of the Southern regions would have been predicted, due to the intensive policy adopted by the central government in order to support the industrialisation of that part of the country. The empirical results confirm that no shift of regional specialisation has occurred in the whole country.

The results of the regressions show that diversifying incremental change has been found to be a continuous, consistent and strong phenomenon among Italian regions. Regions are likely to undergo incremental change in the distribution of their activities as they adapt to changing economic conditions. Moreover, the evidence presented in this work suggests that the longer the distance in time the stronger the incremental change, because it is in the long run that regions tend to diversify across a wider range of economic activities. It seems that Italian regions need a long time in order to change their specialisation, thus indicating the specific tendency of Italian regions to be locked into traditional paths of economic development.

This conclusion could lead to some suggestions for regional policy. Indeed, the role of public policy can be twofold. On the one hand, it might stimulate progress along the prevailing specialisation and, on the other hand, it might support and help the shift from old paths of economic development to new ones. However, the evidence that we present shows that regional profiles of specialisation are more likely to incrementally change over long period. Therefore, policy makers should keep in mind that the natural stickiness of regional profiles of specialisation does not enable them to vary too much in the short run. In the long run, diversifying incremental change takes time and efforts because a complete re-organisation and restructuring of the economy is needed. Furthermore, institutions have to learn how to adapt and change according to the new productive structure of the society and this may cause a mismatch between the institutional set-up of the society and its economic side. Therefore, public intervention and regional policy could be a bridging mechanism between the institutional and the economic side of the society, thus supporting the shift towards new paths of economic development.

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## APPENDIX

### Table A1: Sectors Surveyed by the ISTAT Census

| Code | Sector | 1991 | 1981 | 1971 | 1961 | 1951 |
|---|---|---|---|---|---|---|
| 1010 | forest-related activities | | | | | no |
| 1020 | fishing | | | | | no |
| 1030 | agriculture-related activities | | | | | no |
| 1040 | legal and commercial activities, and the like | | | | | no |
| 1050 | research and development | | | no | no | no |
| 1060 | vigilance and investigation | | | no | no | no |
| 1070 | public administration | | | no | no | no |
| 1080 | education | | | | | no |
| 1090 | health services | | | no | no | no |
| 1100 | associative organisations | | | no | no | no |
| 1110 | cultural and sportive activities | | | no | no | no |
| 1120 | other educational productive activities | | no | no | no | no |
| 2010 | extraction of metalliferous mineral | | | | | |
| 2020 | extraction of non-metalliferous mineral | no | no | no | no | |
| 2021 | extraction of fossil coal, lignite and turf | | | | | no |
| 2022 | extraction of coal oil and natural gas | | | | | no |
| 2023 | extraction of uranium and thorium | | | | | no |
| 2024 | other extractive industries | | | | | no |
| 3010 | food and beverage industry | | | | | |
| 3020 | tobacco industry | | | | | |
| 3030 | leather and hide industry | | | | | |
| 3040 | textile industry | | | | | |
| 3050 | clothing and footwear industry | no | no | no | no | |
| 3051 | clothing industry | | | | | no |
| 3052 | footwear industry | | | | | no |
| 3060 | wooden and furniture industry | no | no | no | no | |
| 3061 | wooden production and products | | | | | no |
| 3062 | furniture industry | | | | | no |
| 3070 | paper and cardboard industry | | | | | |
| 3080 | publishing and press industry | | | | | |
| 3090 | photography and cinematography industry | no | no | no | | |
| 3091 | photography-related activities | | | | no | no |
| 3092 | film and video production | | | | no | no |
| 3093 | reproduction of recorded supports | | | | no | no |
| 3100 | metallurgical industry | no | no | no | | |

**Table A1 (cont.)**

| Code | Sector | 1991 | 1981 | 1971 | 1961 | 1951 |
|---|---|---|---|---|---|---|
| 3101 | metallurgy | | | | no | no |
| 3102 | metal forging, drawing, pressing and profiling | | | | no | no |
| 3110 | mechanical industry | no | no | no | no | |
| 3111 | foundry of second fusion, production of non-electrical machinery and metal carpentry | | | | | no |
| 3112 | production of machinery, equipment and electrical instruments for telecommunication | | | | | no |
| 3113 | medical and precision instruments production, coin production, jewellery, silverware | | | | | no |
| 3114 | workshop for mechanical production and repairing | | | | | no |
| 3115 | production of transport means | | | | | no |
| 3120 | industry for the transformation of non-metalliferous minerals | | | | | |
| 3130 | petrochemical industry | no | no | no | no | |
| 3131 | chemical industry | | | | | no |
| 3132 | oil industry | | | | | no |
| 3133 | industry for the production of textile uses cellulose. artificial and synthetic textile fibres | | | | | no |
| 3140 | rubber industry | | | | | |
| 3150 | plastic industry and other manufacturing industries not previously classified | no | no | no | no | |
| 3151 | production of plastic material goods | | | | | no |
| 3152 | other manufacturing activities not previously classified | | | | | no |
| 4010 | building and installation plant industry | | | | | |
| 5010 | production and distribution of electrical and gas energy | | | | | |
| 5020 | collecting, depuration and distribution of drinking and not drinking water | | | | | |
| 6010 | wholesale trade | | | | | |
| 6020 | retail trade | | | | | |
| 6030 | hotels and restaurants | | | | | |
| 7010 | transports | no | no | no | no | |
| 7011 | land transports | | | | | no |
| 7012 | sea freights | | | | | no |
| 7013 | air transports | | | | | no |
| 7014 | transport subsidiary activities | | | | | no |
| 7020 | communications | | | | | |
| 8010 | credit | | | | | |
| 8020 | insurance | | | | | |
| 9010 | business services | | | | | |
| 9020 | entertainment industry | | | | | |
| 9030 | sanitary and cleaning services | | | | | |
| | number of observations | 60 | 59 | 53 | 50 | 30 |

# PART II:

# EVALUATIONS OF COHESION POLICIES

# 8

# PROMOTING COHESION IN THE ENLARGED EU: IS THERE A ROLE FOR NATIONAL DEVELOPMENT PLANS?

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## INTRODUCTION

The term "cohesion" first came into use in the late 1980s at the time major reforms and expansions of EU regional aid were being carried out. As set out in Article 130a of the Treaty on European Union, there is an explicit aim to promote "harmonious development" with a specific geographical dimension: "reducing disparities between the levels of development of the various regions and the backwardness of the least favoured regions". Thus, there is an explicit recognition that wide disparities are intolerable in any community, if that term has any real meaning.

To measure the extent to which Greece, Ireland and Portugal lagged behind the other European states in the late 1950s is a difficult task, since comparisons based on the simple conversion of domestic prices to a common currency are beset by problems. However, from the year 1960 we have standardised data that makes this comparison in terms of purchasing power parity (Table 1). Ignoring the special case of Luxembourg, the original six member states of the then EEC formed a relatively homogeneous group, with Germany leading (at 122 relative to the average of 100) and Italy lagging (at 87). In the case of Italy, the low average concealed the fact that the Northern sub-regions were well above the European average, while the Southern (or *Mezzogiorno*) sub-region was well below. The other nine future members of what is now the EU consisted at that time of five wealthy countries (Denmark, Austria, Finland, Sweden and the UK, ranging from a high of 124 (UK) to a low of 88 (Finland)) and four much poorer countries (Greece, Spain, Ireland and Portugal, ranging from a high of 57 (Spain) to a low of 43 (Greece)).

At the time of the first enlargement in 1973, the Danish and Irish GDP per head figures had changed very little relative to the EU average, but the UK had declined in relative terms to about the EU average. Since Ireland was a heavily agricultural country even as late as 1973, debate on the wisdom of its entry into the then EEC focused attention on the likely benefits from higher prices of agricultural produce under the CAP rather than on any EU regional investment policy.

**Table 1: GDP per head of population: (PPS), EU-15 = 100**

| Country | 1960 | 1973 | 1986 | 1999 |
|---|---|---|---|---|
| Belgium | 98.6 | 104.5 | 104.2 | 112.5 |
| Germany | 122.1 | 114.5 | 116.8 | 109.1 |
| France | 105.3 | 110.5 | 109.8 | 103.7 |
| Italy | 87.3 | 94.0 | 102.5 | 101.2 |
| Luxembourg | 168.7 | 153.1 | 138.8 | 165.9 |
| The Netherlands | 112.1 | 107.1 | 102.2 | 105.3 |
| Denmark (73) | 119.9 | 114.4 | 117.9 | 114.6 |
| *Ireland (73)* | *60.8* | *58.9* | *63.7* | *111.0* |
| United Kingdom (73) | 123.9 | 104.4 | 101.9 | 98.4 |
| *Greece (82)* | *42.5* | *62.4* | *61.4* | *68.7* |
| *Portugal (86)* | *43.2* | *61.1* | *54.0* | *74.1* |
| *Spain (86)* | *56.9* | *74.8* | *69.7* | *80.2* |
| Austria (95) | 94.8 | 98.5 | 105.4 | 110.9 |
| Finland (95) | 87.8 | 94.3 | 100.6 | 101.8 |
| Sweden (95) | 122.7 | 115.0 | 112.5 | 96.5 |

Source: European Economy, 1998 pp. 80-81

Today the less developed countries of the EU - like Greece, Ireland and Portugal - enjoy the many economic advantages that come with full membership of the European Union. One crucial advantage is that policy makers in these countries – in both the public and private sectors – have been able over the past decade to engage in investment planning in a more stable environment, with the co-operation as well as with the active financial support of other member states through the medium of generous Structural Fund development aid. This is just another aspect of today's increasingly internationalised economy, where elements of domestic policy-making autonomy have been ceded by small states to supranational organisations (such as the European Union). Indeed, the policy-making autonomy of small nation states wishing to be integral parts of the international economy is now heavily circumscribed and recognising this fact, and exploiting the consequences, is a wise exercise of national sovereignty.

National development planning had gone out of fashion in the West in the early 1970s, but was revived in the less developed EU member states in the late 1980s in the form of a massive enlargement of the EU regional aid budget. In the CEE region, which had suffered the trauma and dislocation of almost 50 years of central planning in one form or another, liberalisation in the late 1980s and early 1990s was seen perhaps as a period when the state would take a back-stage role, and the private sector would be the engine of economic reform and development. In this paper I wish to explore some of the main issues concerning the role of economic planning as it evolved in the EU and as it is likely to evolve in the new member states from the CEE region.

Four major driving forces were behind the revival of national development planning in the EU in the late 1980s and set the scene for dramatic changes in public policy making in those member states and regions of member states whose general level of economic development lagged behind the average:

The progressive enlargement of the EU after its foundation in 1956 – when there had been a high degree of homogeneity at the national level – brought about an ever increasing socio-economic heterogeneity with the entry of Ireland (1973), Greece (1982), Portugal and Spain (1986). This forced a growing awareness of the need to address regional disparities within nation states as well as disparities between states. Today, the EU is faced with a new enlargement, involving a group of very low income states from Central and Eastern Europe, and regional policy in the context of the new EU faces daunting challenges.

In addition to the simple aspect of enlargement, the internal and external socio-economic challenges faced by the member states and regions became more complex and forced EU policy makers to address the task of how the weaker states and regions might be assisted in handling such initiatives as the Single Market (SEM), the Social Chapter of the Maastricht Treaty, and Economic and Monetary Union (EMU).

While all nation states operated internal regional policies of various types, what was different about EU-wide regional policy was that significant financial resources were made available by the wealthier member states to fund policy initiatives in a limited number of the poorer member states as well as poorer regions of states. The available EU budget from the time of the signing of the Treaty of Rome in 1956 had been dominated by the need to support a very costly Common Agricultural Policy (CAP), but there were major expansions in resources to fund regional development aid through the so-called *Community Support Frameworks* (CSFs) of Structural Funds over the periods 1989-93, 1994-99 and 2000-06.

Finally, the state of economic theory had a significant influence on the expansion of resources for regional and national development within the EU. Another driving force of EU regional policy came from the insights and guidance provided by theory, in particular by advances in the "new" trade and growth theories of the mid-1980s (Helpman and Krugman, 1985; Barro and Sala-i-Martin, 1995) and in economic geography in the 1990s (Fujita, Krugman and Venables, 1999).

The reform of EU national and regional investment aid programmes into fully integrated Structural Fund (or *Community Support Frameworks* (CSFs)) in the late 1980s presented EU as well as national policy makers and analysts in recipient countries like Ireland, Portugal and Greece with major challenges. The political rationale behind the CSF had come from the fear that not all EU member states were likely to benefit equally from the Single Market, whose purpose was to dismantle all remaining non-tariff barriers within the Union. In particular, the less advanced economies of the Southern and Western periphery (mainly Greece, Ireland, Portugal, Spain, the Italian Mezzogiorno and Northern Ireland) were felt to be particularly vulnerable unless they received development aid (Cecchini, 1988).

What was special about the reformed regional investment aid policies was their goals, i.e., the provision of financial aid to assist the design and implementation of policies whose explicit aim was to transform the underlying structure of the beneficiary economies in order to prepare them for exposure to the competitive forces about to be unleashed by the Single Market and EMU. Thus, CSF policies moved far beyond the conventional Keynesian demand-side stabilisation role of public expenditure policies, and were directed at the promotion of structural change, faster long-term growth, and real convergence through improvement of mainly supply-side processes.

Ireland, together with Portugal and Greece, were the only countries designated in their entirety as *Objective 1* (i.e., countries whose general level of development lagged behind that of the EU average and whose GDP per head was less that 75 per cent of that average). Such countries (as well as large regions within Spain, Italy, Germany and the United Kingdom) received very generous development aid, measured as a share of GDP or as a share of total public investment. In the cases of Greece, Ireland and Portugal, the resulting Community Support Frameworks (usually abbreviated to CSF) came to dominate the entire programme of public sector investment expenditure in each country. For example, in the Irish case, this had important implications for monitoring and for evaluation procedures in the public sector.

A second important factor in the main recipient countries - and in particular in Ireland - was that domestic public investment policies shifted from a purely domestic process, buffeted by the short-term exigencies of maintaining balance in the public finances, to a more stable longer-term process that was carried out in co-operation with the European Commission. Of course, in Ireland as in the other aid recipients, there continued to be a very natural desire to maximise local control over design, monitoring and evaluation of development policy. However, the ceding of some policy autonomy to the Commission in Brussels seems to have generated minimal friction since the whole Structural Fund or CSF process was perceived to be a genuine partnership that allowed successive political administrations to break with the previous process of annual capital budgeting and put in place development plans of much longer duration (i.e., five, six and seven years), and to finance them with far less difficulty in terms of increased public sector borrowing or taxation.[57]

The strict monitoring arrangements that were mandatory for the Structural Funds, as well as the need to carry out *ex-ante,* mid-term and *ex-post* evaluations served to promote and guide applied economic research agendas in Ireland and in Southern Europe since 1989. Indeed, research at the most aggregate level of monitoring/evaluation became something of an Irish area of specialisation during the past decade, and some of the approaches developed came to be widely used in other recipient countries as well as by the Commission itself.[58] More recently, Irish researchers have collaborated with applicant states in Central and Eastern Europe,

[57] On the financing issue, the Structural Funds were an important factor in stimulating higher economic growth, which generated increased revenue buoyancy. Only in the very early years of the CSF 1989-93 programme was the issue of absorptive capacity regarded as a possible problem. During the later years of CSF 1994-99 the Irish public finances moved into surplus, facilitating a much higher level of domestic public investment during CSF 2000-06 when the EU funding declined.

[58] For example, the work of the ESRI was used in the *Second Report on Economic and Social Cohesion,* and used research from Ireland to develop evaluation procedures for the other Objective 1 countries and regions.

where the development challenges have many similarities to those faced by the present EU periphery countries, but are of a much more challenging nature.[59]

Why might the Irish experience of monitoring and evaluating EU Structural Fund aid be of interest to other CEE policy makers? First, some of the background of how Structural Fund monitoring was initiated and evolved over the decade since 1989 may be of interest. Techniques of monitoring/evaluation are still evolving, and have grown in their degree of formality and sophistication over the years. The CEE applicant states are coming to this process after a decade of evolution in which they have not yet participated. Second, an Irish perspective on the crucial interdependencies between the monitoring and the evaluation of Structural Fund programmes may also be of interest. The Irish experience is that monitoring and evaluation are best seen as a very integrated process rather than as two completely separate and unrelated processes. Perhaps definitions of these two terms – monitoring and evaluation - may be useful at this stage:

*Monitoring:* This term is usually used to describe the verification of adequate compliance with policies agreed and codified in the CSF treaties and their supporting documents, including financial aspects (was funding spent according to the plan?), as well as the collection and analysis of relevant activity and performance indicators (length of roads built, numbers of people trained, etc.).

*Evaluation:* This term refers to the examination of whether the Structural Fund programmes implemented actually brought about the achievement of the desired goals. This involves the tracing out and quantification of the chain of causality between the structural measures being applied and the securing of the intended objectives. At the most aggregate level, the basic question is whether or not the Structural Fund programmes taken as a whole promoted convergence (or cohesion).[60] At the most detailed level, one might seek to evaluate how an individual project (such as the construction of a specific section of new road, the execution of a specific training scheme, or the provision of a specific aid to company export marketing) increased economic efficiency or addressed market failure.

However, not all aspects of the Irish and wider EU experience of monitoring and evaluation are likely to be equally relevant to CEE policy makers and analysts. For example, Ireland is a very small country, with a population of 3.8 million. It also has a very centralised system of public administration and has never had to address the challenges that large countries like Poland, Romania and Hungary face in tackling serious regional disparities within partly devolved regional administrations. Furthermore, by the time the Structural Fund aid arrived in 1989, Ireland had been an EU member for 17 years, Greece for eight years, and Portugal and Spain for four years and all had well functioning market economies and market-based institutions.

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[59] In the cases of Latvia and Estonia, documentation on ex-ante evaluation of pre-accession Structural Fund aid is available in Bradley *et al,* 2000 and 2001. Work on East Germany is available in Bradley, Morgenroth and Untiedt, 2001. Work on Poland is presently under way.

[60] The term "convergence" is often used to describe the type of nominal convergence issues stated in, say, the Maastricht criteria. The term "cohesion" is used to indicate "real" convergence, such as the level of GDP per head.

In Ireland the transparent systems of accountability for domestic public finances had been well established long before the arrival of EU financial aid. These existing systems, with relatively minor modifications, were broadly used to receive and record EU aid, to combine it with domestic co-finance in the appropriate proportions, and to monitor its disbursement to institutions, firms and individuals who operated approved schemes. Thus, the actual financial monitoring of the Structural Funds posed few new challenges for Irish policy makers and created few problems for the European Commission. Perhaps this encouraged increased emphasis on designing optimal investment programmes and on monitoring of physical activity indicators (i.e., outputs) as well as on programme evaluation (i.e., causality and achievements of targets).

Monitoring of Structural Funds has always gone far beyond the simple verification of adequate compliance with agreed policies. Those responsible for monitoring have a duty to ensure that best value for money is obtained in achieving the stated goals of the underlying National Development Plans. In particular, the EU aid is never treated as "free" money. Rather the same "opportunity cost" is used for EU as for purely local expenditures. If a project cannot be justified in terms of purely domestic funding, it tends not to be approved for Structural Fund purposes. In simplified terms, what the Structural Funds permitted was a level of public investment that was considerably higher than would have been possible if all public expenditure had to be financed by domestic tax revenue or borrowing.

It is of interest to explore the role of Structural Funds within three separate themes:

- Institutional and organisational aspects of EU funds
- Procedures and instruments associated with EU funds
- Interrelations of monitoring, evaluation and management of EU funds

Having explored these themes in the following three sections, in the remainder of the paper we turn to some broader issues. First, we consider the types of economic models that are needed to carry out evaluations of the aggregate impacts of Structural Funds on an economy. Then we go on to review some of the lessons learned from Structural Fund impact evaluations. We conclude with some thoughts on the similarities between cohesion and transition and examine strategic policy options in the transition economies of the CEE region.

## INSTITUTIONS AND ORGANISATION OF STRUCTURAL FUNDS

The institutional and organisational set-up of National Development Planning for Structural Funds has important horizontal and vertical elements. We illustrate these issues drawing on the Irish situation as an example of the vigorous use of Structural Funds. Concerning *horizontal* aspects, an active system of Social Partnership has always operated in Ireland, and this has been increasingly formalised since the year 1986, i.e., just before the enlargement and reform of Structural Fund aid in the year 1989. The Social Partnership consists of the main Trade Union organisation (The Irish Congress of Trades Unions, ICTU), the main employers organisation (the Irish Business and Employers Confederation, IBEC), the main Farmers organisations, representatives of the unemployed and socially excluded, and Government. This Social Partnership operates at the very heart of strategic policy-making, and in particular is a vehicle used to negotiate a social pact every three years that covers issues such as wage determination, the level of social support and many other aspects of government policy. The Social Partners tend to become involved in the monitoring of EU funds mainly through participation in Steering Committees for the individual Operational Programmes of the Structural Funds. Social Partners also lobby government on the formulation and priorities of the National Development Plans that precede the agreement of the Community Support Frameworks with the European Commission. But they are not normally involved directly in actual policy decisions.

Concerning *vertical* aspects, it must be stressed that regional government in Ireland is very weak, with little or no policy-making discretion or fund-raising powers. The small size of the country has tended to encourage centralisation in policy-making, particularly in aspects such as planning the physical infrastructure of the country in an integrated way, and in ensuring that systems of education and training, as well as investment incentives, were designed with national interests and standards in mind. In the case of Spain, where there are strong regional governments, the vertical aspects are more important.

The first two EU Structural Funds (or Community Support Frameworks) covered the periods 1989-93 and 1994-99, and were designed and implemented in Ireland with a purely national focus. For the purposes of these CSFs, the whole country of Ireland was designated as Objective 1, i.e., as a lagging region with average GDP per head less than 75 per cent of the EU average and in need of development and structural adjustment. These CSFs were designed and administered centrally, by various Government Departments as will be described below. The nature of monitoring was determined at the implementation stage. For example, the actual construction of roads were administered at the level of Local Government, which also had a role in monitoring progress. Education and training schemes were designed by the responsible Central Government department and administered through a mix of central institutions (such as the national training agency, FáS) as well as through vocational schools, which came under the control of Local Government.

In summary, it could be said that the first two Irish CSFs were designed, monitored and evaluated within a system that had strong *horizontal* elements, but only limited *vertical* elements. Only at the implementation stage did *vertical* organisational elements come to the fore. This had implications for outsourcing for CSF evaluation. Prior to the year 1996, almost all evaluation, and some aspects of monitoring, of the CSFs were commissioned by the responsible Central Government departments and carried out by private consultants, under remits set by the government. At the most detailed level of monitoring and evaluation of individual projects, as well as of Operational Programmes (i.e., groupings of similar and interrelated projects), this work was usually undertaken by firms of private consultants in the commercial sector. More aggregate analysis (at the level of the entire CSF), as well as analysis requiring technical or research aspects, were usually carried out by national research organisations. Individual government departments also carried out some evaluation "within-house", and of course were responsible to the European Commission for the monitoring of expenditure of funds.

The above situation was adequate in the early stages of the CSFs, but was acknowledged to be less than ideal. In order to bring a greater degree of uniformity to the monitoring and evaluation function, in 1996 the government set up a centralised *CSF Evaluation Unit,* which reported to the Monitoring Committee of the Technical Assistance Operational Programme.[61] This is a relatively small unit whose function is to advise and assist the government and the European Commission on the evaluation of EU Structural Fund programmes. It also promotes co-ordination and best practice in Structural Fund evaluation work, as well as acting in the role of "evaluator of the evaluators". In other words, much of the evaluation work is still outsourced, but the *CSF Evaluation Unit* ensures that high quality and best practice standards are observed.[62]

The Managing Authority for each Operational Programme of the CSF is vested in a range of different bodies. Taking the latest CSF for the period 2000-2006, the Managing Authority for the overall CSF is the Department of Finance and there are seven Operational Programmes, as set out below:

1. Economic and Social Infrastructure (Dept of Environment and Local Government)
2. Employment and Human Resources Development (Dept of Enterprise, Trade and Employment)
3. Productive Investment (Dept of Enterprise, Trade and Employment)
4. Border, Midlands and West Regional Programme (BMW Regional Assembly)[63]
5. Southern and Eastern Regional Programme (S&E Regional Assembly)
6. Peace Programme (Special EU Programmes Body)[64]
7. Cohesion Fund (Department of Finance)

[61] Prior to 1996 there were four separate government evaluation units: Analysis and Evaluation Unit in the Agriculture, Rural Development and Forestry Operational Programme; an ESF Programme Evaluation Unit; an Industry Evaluation Unit; and an overall CSF Evaluation Unit.

[62] The *CSF Evaluation Unit* estimated that the total annual cost of all activities in the area of monitoring and evaluation (i.e., both its own work and that of work outsourced) was in the region of 1 to 1.5 per cent of Structural Fund expenditures. The average level of expenditure lay close to 1 per cent, but some Operational Programmes proved more expensive to evaluate (e.g., Fisheries (3.5 per cent), and Local Urban and Rural Development (1.4 per cent)). Details of the cost of monitoring and evaluation are given in CSF Evaluation Unit (1998), pp. 34-37). A list of publications by the *CSF Evaluation Unit* is given in the bibliographic appendix.

[63] For the purposes of CSF 2000-2006, Ireland has been divided into two regions: the Border, Midlands, West (BMW!) region, designated as Objective 1, and the Southern and Eastern (S&E) region, designated for transitional aid. An account of how these new levels of regional government may operate in the future is provided in Morgenroth (2000).

[64] The Peace funding is a special issue related to the civil conflict in Northern Ireland, which has affected the border areas of the Republic of Ireland adversely.

The principal responsibilities of the Managing Authority for each Operational Programme is as follows:

- Chairing and providing the secretariat for the Monitoring Committee.
- Assembling statistical and financial information required for monitoring and supplying this information to the CSF Evaluation Unit in the Department of Finance.
- Drawing up an annual implementation report for approval by the Monitoring Committee and for submission to the European Commission.
- Submitting payment claims to the paying authorities for Structural Funds.
- Ensuring that EU funded expenditure is properly accounted for and managed.
- Ensuring compliance with EU policies on public procurement, publicity, the environment and equality.

Each Operational Programme and the CSF as a whole, is supervised by Monitoring Committees, whose membership has remained fairly stable over all previous CSFs. Typically, there are representatives from the Managing Authority, the Department of Finance (which exercises a general supervisory role), other Government Departments and public bodies involved in implementation of programme measures, representatives from the regional assemblies and from the Social Partners (all pillars). In addition, there are representatives of equal opportunity and environmental interests drawn from relevant Government Departments or other statutory bodies.

The Monitoring Committee is responsible for decisions regarding EU co-funded measures in the Operational Programmes, including decisions on the reallocation of co-funded expenditure between measures within the Operational Programmes or between Operational Programme in the case of the overall CSF Monitoring Committee. They are also responsible for the mid-term review of the Operational Programmes in conjunction with the CSF Evaluation Unit in the Department of Finance. As regards operating procedures, each Monitoring Committee is responsible for drawing up its own rules of procedure and agreeing them with the Managing Authority and the Department of Finance. The Monitoring Committee is chaired by a representative of the Managing Authority.

The Department of Finance is the Managing Authority of the overall CSF and has representatives on all the other Operational Programme Monitoring Committees. All statistical and financial information must be supplied to the Department of Finance acting in its role as CSF Managing Authority. The special character of the EU funded programmes is that they oblige the Irish government to carry out monitoring and evaluation in the full glare of publicity. Hence, the Social partners and the European Commission authorities are an integral part of the monitoring and evaluation system, and this has obvious and tangible benefits.

In general, it can be said that all domestic public expenditure is monitored and evaluated with a high degree of diligence. When standards fall below the acceptable, the Comptroller and Auditor General highlights the facts in his annual report to Parliament, and this usually attracts the full glare of media and public attention.

## PROCEDURES FOR MONITORING STRUCTURAL FUNDS

Three aspects can be distinguished here: financial, physical and socio-economic. With respect to the financial focus, the monitoring of EU funded programmes builds on and extends the underlying monitoring systems that are used for all domestic public expenditure. With respect to financial accountability, within the Irish public sector no distinction is made between purely domestic expenditure and programmes involving co-funded EU expenditure such as the CSF. Of course, the technical aspects of financial accountability for co-funded EU programmes must be set up in a more open and internationally accountable way, but the underlying principles of accountability and procedures are the same across all public expenditure.

With respect to physical monitoring, this tends to reflect the nature of the particular Operational Programme or project within an Operational Programme. The systems used depend on whether or not there are "intermediate" funding agencies involved that interface between central government and individual grant-aided projects. For example, projects within the Operational Programme for Economic and Social Infrastructure are managed by the Department of Environment and Local Government. Actual projects (such as roads, ports, etc.) tend to be commissioned by Local Government authorities as approved by the Department and the National Roads Authority. Physical monitoring will involve a process of data flow from individual projects, to the implementing Local Authority or the National Roads Authority (in the case of national highways), and from there to the Department and the Operational Programme Monitoring Committee.

In the case of projects within the Operational Programme for Employment and Human Resources Development, these are commissioned by the Department of Enterprise, Trade and Employment and are delivered mainly by state training agencies, universities and colleges of technology. Physical monitoring takes place within the state training agency, the universities and the colleges of technology, and data are fed up to the Monitoring Committee chaired by the Department as Managing Authority.

Aid to the productive sector (investment incentives, management training, marketing and design, trade fairs, etc.) is administered mainly by the two state agencies: *Enterprise Ireland* (with responsibility for local industry) and the *Industrial Development Agency (IDA)* (with responsibility for attracting foreign direct investment). Once again, the physical monitoring takes place within these two agencies, and data are fed up to the Monitoring Committee.

The new regionalisation of Ireland (into a poorer Border-Midlands-West region and a more developed South-East region) poses very difficult problems in terms of the role that the two new regional Assemblies will play in monitoring and evaluating their respective Operational Programmes during 2000-2006. As the paper by

Morgenroth (2000) describes, the political and administrative modalities of regional devolution in Ireland in the context of EU funding have yet to be worked out.[65] Pending new arrangements, it is likely that the Department of Finance, together with the Department of Environment and Local Government, will play a key role is making sure that all monitoring and evaluation procedures are followed.

Aspects of EU programmes related to socio-economic impact tend to be handled by specialist agencies such as *Combat Poverty* and the *National Economic and Social Forum (NESF),* with basic research provided by other research organisations and the universities. In the case of my own institution, the ESRI, a large-scale and regular survey of living conditions is carried out and used to examine the longer-term impacts of public policy, including EU-funded policies. In addition, the ESRI has developed a range of macroeconomic and sectoral models that are used for CSF evaluation exercises.

During the first two CSFs (1989-93 and 1994-99), there was little or no standardisation of monitoring indicators. The selection of indicators varied between Operational Programmes. In the case of basic infrastructural projects, the selection of *performance* indicators is relatively simple (kms of roads constructed, additional telecommunication capacity, kms of upgraded rail links, etc.). For projects aimed at employment and human resources, *performance* indicators are also relatively easy to design, although in the case of employment there are usually many other forces influencing the outcome, particularly in the private sector. As part of the remit in monitoring and evaluation, external consultants were usually asked to devise monitoring and performance indicators.

The difficulties tended to arise in the design of *impact* indicators, i.e., measures of how effective the policy interventions were in achieving the targets and goals of the programmes. For example, shorter travel times over specified road links usually result when the roads are first improved, but often degrade again as traffic levels build up and congestion problems occur.

In the mid-term review of the Irish CSF 1994-99, a review was carried out of the collection, analysis and review of performance indicators by the various Monitoring Committees (Honohan (ed.), 1997). In the case of the large programme of economic infrastructure, shortcomings regarding indicators were highlighted, including the absence of indicators in some sub-programmes, the very broad nature of indicators relating to infrastructural telecommunications upgrades and postal services. Across all the Operational Programmes the feeling was that the development of monitoring indicators was an inexact science, and it tended to be handled in an *ad-hoc* manner, depending on the nature and quality of data flowing from individual projects, In Operational Programmes below a certain size, monitoring data were expensive to collect and were not always of much use. In Operational Programmes above a certain size, and where only a limited number were involved, mainly in the public sector, monitoring indicators were easier to gather and process.

[65] A similar issue has arisen in Poland, where there is tension between the local governments of the 16 new administrative regions and their centrally appointed regional Governors.

In the first two CSFs there were no centralised IT-based systems to handle all aspects of EU-funded programmes. Such systems are under development in the IT section of the CSF Evaluation Unit and have recently been commissioned and implemented. The experience gained in operating the previous manual and partially computerised systems has provided an invaluable guide to the systems analysts as they designed a uniform data-driven IT system. For the near future, both systems will be run in parallel.

## INTERRELATIONS OF MONITORING, EVALUATION AND MANAGEMENT

The simplest form of monitoring and management operates through the phased payments made to individual projects. A fraction of the funds are paid up-front. Subsequent payments are made only when project milestones are met and documentary evidence produced to accompany any demand for payment. At this simple level, monitoring tends to be used as a "control" tool rather than as a "management" tool.

However, there are wider issues involved here. Monitoring operates in its most detailed form at the level of individual projects. Evaluation tends to take place at the level of Operational Programmes and sub-Programmes, other than for very large-scale individual projects (e.g., the construction of electricity power stations).[66]

During the mandatory mid-term review, each Operational Programme is evaluated in great detail, based on the existing monitoring data. This work is almost always outsourced and carried out by specialised and expert consultants. Shortly afterwards, all the mid-term evaluations of the Operational Programmes are collated and used as inputs to a full macroeconomic evaluation of the entire CSF. An example of this aggregate mid-term evaluation is Honohan (ed.), 1997.

So, the interrelation between monitoring and evaluation takes place in its simplest form as a process of collection of data at the level of individual projects, and the subsequent systematic aggregation of those data into full Operational Programmes and into the complete CSF. However, evaluation at the level of individual projects is also a part of large-scale projects, such as those mentioned above. Here, an *ex-ante* cost-benefit analysis will be an essential element of evaluation at the proposal stage, before approval for funding. This process can often throw up difficult problems and choices, for example what is the correct "opportunity cost" of labour, even when the level of unemployment is high?

The CSF is designed to ensure that good choices are likely to be made *ex-ante*. So, the European Commission insists on an *ex-ante* evaluation of any proposed National Development Plan, which must include a full macroeconomic evaluation of the

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[66] A full discussion of cost-benefit analysis carried out on a range of large-scale Irish projects is provided in CSF Evaluation Unit (1997).

likely impacts of the plan on the "cohesion" objective. In the Irish case, the first such *ex-ante* evaluation of CSF 1989-93 was published in Bradley *et al,* 1992.[67]

No matter how careful the *ex-ante* evaluation, problems always arise during a CSF. In some cases, these problems become clear when negative side-effects of programmes manifest themselves. In other cases, rapid changes in technology occur as the CSF is implemented, in areas that were not envisaged at the time of drawing up the original National Development Plan upon which the CSF was based. These types of problems tend to be identified during the mid-term evaluation, at a time when consideration is being given to any follow-up CSF a few years down the line.[68] For example, in the mid-term review of CSF 1994-99, the authors designated what they called "sunset" and "sun-rise" areas in the CSF, and we illustrate some of these below (Honohan, (ed.), 1997).

**Sunset Areas:**

- Poorly designed schemes of rural relief (e.g., headage payments for mountain sheep, which resulted in environmental degradation and no increased production..
- Under-priced business services (e.g., subsidised venture capital services by the state development agencies).
- Proliferation of local development entities that get in the way of larger regional and national initiatives that offer better outcomes at the local level.
- Expansion grants for immobile firms, where there is often a very high dead-weight element.

**Sun-Rise Areas:**

- Investment in the new broad-band telecommunications (to facilitate inward investment in the IT industry).
- Greater provision of managed urban transport (made increasing necessary by the growing congestion in the national capital and elsewhere).
- Upgrading of rural networks in areas such as telecommunications, electricity, television and roads.
- More reliance on pricing mechanisms in projects.

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[67] The *ex-ante* evaluation of CSF 1989-93 was carried out in 1988 and early 1989, although was not published until 1992. In fact, it had never occurred to the ESRI authors that such an evaluation would be of wider international interest! After making manuscript versions of the report available to anybody who requested one, the ESRI eventually realised that there was a wider interest and published the report.

[68] In a perfect world, the problems of one CSF would be identified fully in an *ex-post* evaluation. But, in practice, the *ex-post* evaluation comes too late in the process of designing the follow-on National Development Plan. So, the mid-term evaluation tends to be very influential.

These areas were identified in the mid-term evaluation of CSF 1994-99 and the lessons were incorporated into the following CSF 2000-06. Six years had separated the design stages of these two CSFs. This is such a long period that the particular need to carry out a thorough and searching *ex-ante* evaluation of national development requirements must be emphasised. Mistakes of omission or commission made in the design of the CSF can be costly and opportunities to engineer structural changes and modernisation can easily be lost.

Prior to the year 1989 (when the first CSF started), there had been no culture of carrying out detailed national planning in the full glare of publicity and with a process of consultation that involved oversight by a supra-national agency like the European Commission. Previous national plans had been developed, starting in 1958 with the path-breaking *First Programme for Economic Expansion.* But these had been "indicative" or aspirational plans, and never committed the government to public expenditure programmes spanning many years (and possibly, many administrations). The level of evaluation of these earlier plans was very limited, even if monitoring of public expenditure was carried out carefully through the annual budgetary process.

The high and rigorous level of monitoring and evaluation of the CSFs served to transform the culture of these practices in Ireland. Back in 1989, monitoring and evaluation tended to carried out in a grudging way simply because it was required in order to gain access to EU funds. Since then, the utility of monitoring and evaluation has made it a part of public culture. Not only are such standards required within the public sector, but the European Commission's requirement that these be carried in the public domain has generated interest all across civil society. This has been assisted by the pro-active stance on publication.

We interpret "published" as meaning the placing of the results in the public domain by means of printed reports and monographs, as well as in the form of postings on web-sites.[69] An obvious form of publication consists of "inspirational" accounts of particularly significant EU programmes, written in an informal way and usually lavishly illustrated by coloured photographs. These clearly serve an important purpose in bring home to the general public how EU funds are aiding development at the very basic human level. An example is the recent publication of *A European success story: EU regional policy in Ireland,* published by the Commission in 2001.

Detailed monitoring results tend not to be published, although could be regarded as being in the public domain. Project evaluations (in the case of large-scale projects such as mentioned previously) as well as evaluations carried out at the Operational Programme or sub-programme level, are usually placed in the public domain and could be considered as "published". However, their readership would be very limited, and the form of publication would usually be simple "ring-bound" photocopies of the original report. In effect, these reports are best regarded as inputs to the Operational Programme Monitoring Committees and tend to be read only narrowly within the relevant government departments and agencies.

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[69] The web site of the CSF Evaluation Unit is as follows: www.eustructuralfunds.ie

Where there is an important role for proper publication is either at the aggregate CSF evaluation level or when special research studies are carried out on particular Operational Programmes, sub-Programmes or Projects, Three example of the publication of analysis at the aggregate level would include the first *ex-ante* evaluation of the Irish CSF 1989-93 (Bradley *et al,* 1992); the mid-term review of the Irish CSF 1994-99 (Honohan (ed.), 1997; and the *ex-ante* exploration of national investment priorities for the most recent Irish National Development Plan (Fitz Gerald *et al,* 1999). An example of a research-based evaluation of aspects of the ESF labour market programmes was Denny, Harmon and O'Connell (2000). An earlier examination of the role of EU loan instruments through the EIB is Honohan, 1992. When placed in the context of a wider domestic public interest in Irish economic development, and given the large size of the EU funds as a proportion of GDP, such published studies usually generate a high degree of interest and present relatively accessible accounts of how the CSF adds up to produce significant increased growth and employment.

## MACROECONOMIC EVALUATION OF STRUCTURAL FUNDS

### Introduction

The design of a National Development Plan, in the context of the preparation of a submission for Structural Fund investment aid, is influenced by a mixture of political, social and economic forces. Analysis of the impact and effectiveness of the resulting Community Support Frameworks (or CSFs) can take place ex-ante (as part of the Commission's evaluation of the National Development Plan, in mid term (as part of a continuous process of monitoring and evaluation, and ex-post. Evaluation can also proceed at many different levels, where the essential difference between levels is the extent to which the rest of the economy is assumed to remain unchanged while a specific policy initiative is investigated. These stages are often denoted by the terms micro, meso, and macro in CSF evaluations.

In the case of an individual project (e.g., a particular stretch of road), a conventional cost-benefit analysis could be carried out, with competing projects ranked in terms of increasing internal rate of return. Such analysis, however, gives rise to obvious difficulties in relation to the need to evaluate the impact of spillover effects and externalities in the context of the complete CSF. Moving up the scale of aggregation, the totality of projects targeted at a general or systemic problem (say, long-term unemployment or industrial competitiveness), could be evaluated in terms of how successful they are in attaining their overall priority objective. Finally, the effectiveness of the entire CSF can be evaluated as an integrated whole. Given the large size of the funding in relation to the size of the recipient economy, and the obvious implications for domestic fiscal policy, it is usually necessary to examine the impact of the CSF in a context that includes economy-wide feedbacks and interactions, attempting to account for spillover effects and externalities. Here one needs to make use of formal national or regional economy models: input-output (I-O), macro-econometric, computable general equilibrium (CGE), growth, etc. Our paper deals entirely with this higher level of analysis.

Since its inception, analysis of the aggregate impact of the CSF has been carried out to some extent at least using all four of the above model types: (I-O) models (Beutel, 1993), macro-econometric models (Bradley, Fitz Gerald and Kearney, 1992; ESRI, 1997); CGE models (Bourguignon *et al,* 1992) and dynamic growth models (Gaspar and Pereira, 1999), all of which have particular strengths and weaknesses. Although there was potentially a wide range of model types suitable for aggregate CSF analysis, the actual state of availability of national empirical models in the four cohesion countries was far from ideal in the late 1980s.

The implementation provisions of the CSF treaties included an obligation for tight monitoring, evaluation and control by the Commission and the responsible national authorities. Thus, the requirement for aggregate impact analysis arises out of these monitoring provisions, and is designed to be carried out by independent experts acceptable to Commission and national authorities alike. Thus, the interaction between policy makers and modellers usually takes place at arms-length, since the national ministries – at least in the case of Ireland - seldom had suitable models and expertise available for in-house use.

The first major problem that arose between policy makers and analysts was prompted by the two differing conceptual approaches to the aggregate CSF analysis: should it be built up from an accumulated series on individual micro and meso-level evaluations, or should it be a top-down macroeconomic analysis. The earlier Commission analysis of the impact of the Single Market had appeared to do both simultaneously, using a micro-based approach and arriving at impacts that were very similar to a model-based macroeconomic evaluation (Emerson et al, 1988, pp. 196-264). However, it was quickly clear that a micro-based approach was not feasible in the case of the CSF, since the basic research inputs for such analysis were not available. More seriously, even the "reformed" macromodels of the late 1980s were still only able to quantify the demand-side impacts of public expenditure programmes, and not the "structuring" effects, i.e., those having a lasting impact on economic and social structures that would endure even after the CSF policy aid ceased.[70]

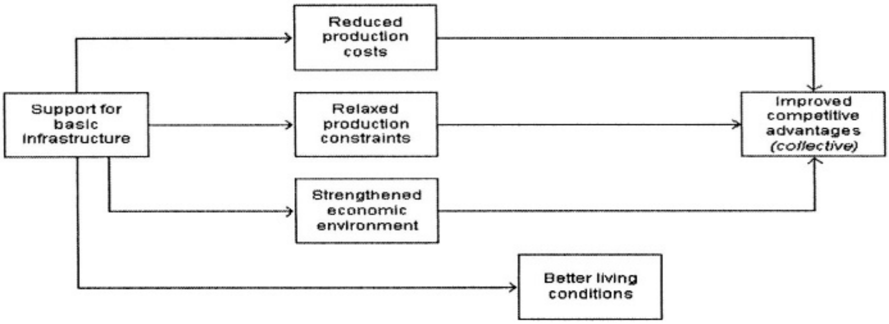
The need to analyse structural policies pushes CSF evaluation into areas which are still at the frontiers of economic research, requiring fresh ways of translating the insights of new growth theory into modelling the long-term impacts of investment in infrastructure and human capital. For such model-based macro evaluation to be credible requires that it be presented transparently, in terms of the logical chains of causes and effects illustrating how CSF policies achieve their stated cohesion goals.

Structuring effects can be described for a key CSF policy instrument – investment in basic infrastructure - as follows. In Figure 1 we illustrate the economic logic connecting the CSF policy and the desired intermediate target – competitive advantage. Thus, improvements to basic infrastructure lead to reduced production costs (cheaper transport), relaxed production constraints (smaller inventories), and a

[70] The term "structuring effects" was coined to alert policy makers to the fundamental nature of the goals of the CSF (MEANS, 1995). Figures 1 to 4 are based on this work.

strengthened economic environment (growth in demand for output, easier access to labour). All three effects combine to improve competitive advantage.

**Figure 1: CSF Impacts of Investment in Basic Infrastructure**




Ways in which the improvement in competitive advantage promotes sustained benefits are illustrated in Figures 2 and 3. The more familiar sustainability mechanisms operate through fixed structures, with the gains through factor mobility being driven by relative cost advantages (Figure 2). These are not too difficult to incorporate into macromodels of small open economies through shocks to exogenous variables. Another set of mechanisms is more complex, and operates through specialisation, diversification and agglomeration, thereby strengthening the local economic base (Figure 3). While these mechanisms can be explored in small theoretical endogenous growth models, they are difficult to introduce into larger empirical macromodels.

These are typical of the types of logic chains that needed to be incorporated into the models, with analogous mechanisms for human resources and for productive structures. However, before turning to details of how the models needed to be designed and used for CSF evaluation, we try to summarise the attitudes and expectations of the three main actors: domestic policy makers, Commission monitors and policy modellers.

**Figure 2: CSF Long-Term Benefits: Exogenous Process**

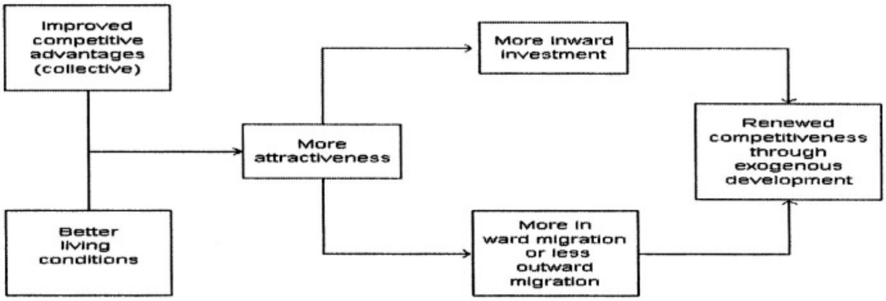
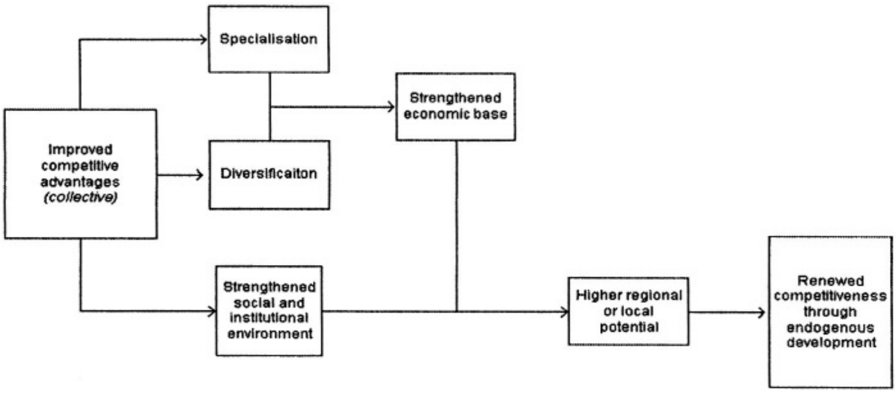



**Figure 3: CSF Long-Term Benefits: Endogenous Process**




*Domestic policy makers:* The design of the CSF is mainly their prerogative, subject only to an overseeing role by the Commission. The actual package of measures put together in the CSF responds to national and regional political and economic priorities, often extending many existing, but smaller domestic programmes. There is usually only limited interest in the finer details of mechanisms and impacts, possibly encouraged by the generous and relatively unconditional external aid element. Instead, crude measures of the likely immediate benefits of the CSF tend to be believed, derived by augmenting the public element of the CSF expenditure (the EU grant plus domestic co-finance) by a multiplier of between unity (pessimistic) and about one and a half (optimistic), with little thought initially given to exit strategies from the CSF aid programmes.

*The Commission monitors:* The overall size of the CSF budget and its allocation across countries is decided at the highest level of the EU, mainly in a political context. The bulk of the activity of DG-REGIO, the responsible Directorate-General, is focused on monitoring activity (i.e., ensuring that the EU aid is spent on what was approved within the CSF) rather than on macroeconomic evaluation (i.e., on finding out what impact was the CSF likely to have). Thus DG-REGIO itself finances only a very limited model development, although some tends to be incorporated into the evaluation contract budgets of the modellers as "sectoral studies".[71]

*Policy modellers:* The modellers, although reporting to national administrations and to the Commission, are outside the CSF design loop. The availability of models has been uneven throughout the Objective 1 regions, with perhaps Ireland best, and Portugal least well served. The situation in the CEE area is more serious, although progress has been made in East Germany, Latvia and Estonia (Bradley *et al,* 2000 and 2001). Moreover, although the widely available models are suitable for evaluation of the expenditure (or demand-side) impacts of the CSF, they were seldom suitable for evaluating its structuring effects. Thus, modellers had to deal with a situation where CSF impact evaluation analysis is never an "off-the-shelf" routine application of standard models, but often calls for new research and model development.

The situation that prevailed during the early stages of analysis of the impacts of the CSF was that two of the three participants – the domestic policy makers and the Commission monitors – believed that it should be possible to give relatively straightforward answers to questions concerning the likely impact of the CSF on a recipient country's economy. The model-using analysts, on the other hand, were acutely conscious of both the scarcity of models in the Objective 1 countries and of the complexity of the channels of influence of CSF-type policies on the level and growth rate of output, a preoccupation that treated with a certain degree of impatience by the two previous groups.

The problem was compounded by the fact that both groups had radically different conceptual frames of reference. The policy makers/monitors thought in terms of a "theory of action", i.e., a set of relatively simple cause-and-effect assumptions which linked CSF initiatives directly to the cohesion objective, as shown in Figure 4 (MEANS, 1995). The analysts/modellers, on the other hand, worked with a "global theory", which tried to describe all significant phenomena in the policy field, all the relevant effects of the CSF initiatives, and all the relevant causes of cohesion (Figure 5). In effect, a conceptual gulf opened up between policy makers/monitors, who saw issues in a straightforward cause-effect descriptive way, and the analyst/modellers, who needed to disentangle the CSF processes from a wide range of other complex factors.

[71] For example, the HERMIN modelling project for the four main Objective 1 regions, described in another paper in this volume, was financed as part of the JOULE II energy-environment research programme of DG XII and on an ad-hoc basis within ACE-Phare projects.

**Figure 4: CSF Impact Analysis: Theory of Action**

*Theory of action:*

| Causes \ Effects | Economic and social cohesion | Other effects |
|---|---|---|
| Structural Funds | Theory of action | |
| Other policies and all other external causes | | |

**Figure 5: CSF Impact Analysis: Global Theory**

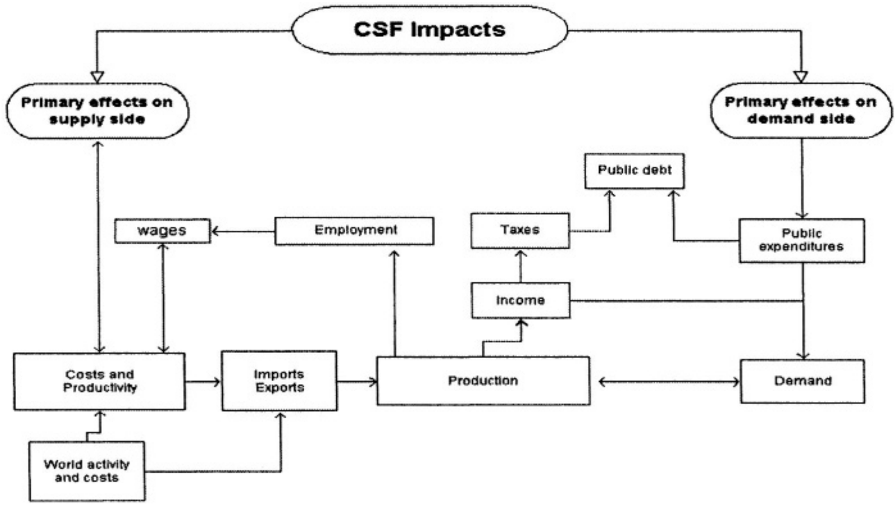
*Global theory*

<table>
<tr><th>Causes \ Effects</th><th>Economic and social cohesion</th><th>Other effects</th></tr>
<tr><td>Structural Funds</td><td colspan="2" rowspan="2">Global Theory</td></tr>
<tr><td>Other policies and all other external causes</td></tr>
</table>

## Modellers' Responses to CSF Policy Analysis Needs

The first formal model-based evaluation of the impact of the CSF was carried out using the Irish version of the multi-sectoral HERMES model that had been developed during the mid-to-late 1980s as part of a trans-EU exercise financed by DG XII (Bradley, Fitz Gerald and Kearney, 1992). Since the time scale of the evaluation was compressed into just over one year, very little could be done to modify the model mechanisms in a way that would reflect how CSF policies would influence private sector behaviour, particularly since little was known about these mechanisms. A simple approach (in modellers' terms) had to be adopted, and the main components of the HERMES-based analysis are illustrated in Figure 6 below.

**Figure 6: Model-Based CSF Evaluation: Main Causal Links**




The key stages were as follows:

The aggregation of the wide variety of CSF programmes from the administrative and departmental categories used by the policy makers into categories related to the key economic mechanisms, i.e., physical infrastructure, human resources, productive structures;

Definition of a suitable benchmark simulation for the economy in the absence of the CSF but with explicit assumptions about other policies like the Single Market, the Common Agriculture Policy, GATT, etc.;

Analysis of the standard Keynesian impacts of the CSF programmes, tracing out the impacts of domestic and EU financed investment expenditures on aggregate demand and the public sector finances;

Implementation of a method of quantifying the long-term supply-side impacts of the CSF programmes, working through factor productivity and cost mechanisms;

Quantification of the CSF impacts in terms of deviations from the benchmark simulation.

Each of the above five stages involved quite complex explicit and implicit assumptions and choices. However, if there was a single innovation in the first Irish CSF evaluation it was the admittedly crude distinction made between transitory demand-side impacts and possibly enduring supply-side effects. Rather than modelling how long-term effects of CSF policies came about, the initial model-based CSF evaluation was forced to address a different question: i.e., what were the likely macro consequences if the long-term returns on CSF investments were of a specified size. The assumptions that were made were found to be very useful from conceptual and practical points of view to the policy makers/monitors.[72] After all, the supply side consequences went to the heart of the CSF, while the demand-side effects, although providing welcome transient boosts to the economy, were not its ultimate goal. Nevertheless, there was a certain amount of unhappiness on the part of the policy makers/monitors with the crude rate-of-return assumptions, but no clear ideas as to how to improve on the evaluation methodology.

Turning to the other EU Objective 1 countries, the situation with respect to the non-availability of HERMES models for the Southern periphery would not have been serious if other, equally appropriate models had been available and were in the public domain. However, that was not the case. To remedy this modelling "deficit", a project was funded by the Commission as part of the JOULE energy research programme having as its main objective the construction of comparable macro-econometric models for all the Objective 1 countries. An early account of these models is available in Bradley, Herce and Modesto, 1995. The resulting HERMIN models were of medium-size (about 150 equations), had four sectors (manufacturing, market services, agriculture and government), and were motivated by the previous more complex HERMES blueprint. Within the HERMIN project one was able to compare and contrast the four cohesion economies without arbitrary country-specific modelling choices getting in the way, as well being able to carry out impact analysis of the CSF using a common methodology.

Since the crude rate-of-return assumptions used in the earlier HERMES-based analysis had been criticised by the Commission, an attempt was made in HERMIN to provide more justification by actually trying to model the association between CSF investments and their long-run impacts. During the late 1980s, developments in "new" growth theory had begun to provide a more adequate treatment of the processes of economic growth by moving beyond the earlier neo-classical growth theory to look at the externalities associated with human capital, public capital and technology.[73] Indeed, de Melo and Robinson, 1992 assert that:

> If there appear to be externalities to be exploited, policy makers should pursue them aggressively and not worry overmuch about getting the instruments just right.

Two types of externalities associated with the CSF expenditures were examined:

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[72] Some of the Commission's reactions to the distinction between demand and supply impacts are given in Spenlehauer and Toulemonde, 1993.

[73] Externalities associated with public policy actions cannot be perceived by private agents in their optimising behaviour. In the presence of externalities, many of the simple policy rules emanating from the orthodox neo-classical theory are invalid. Policy rules aimed at minimising static efficiency losses may miss potential gains arising from policy links to externalities.

*Factor Productivity Externalities*

In HERMIN, a factor productivity externality was associated with improved supply conditions in the economy arising as a result of CSF investment in human capital and public infrastructure. They were incorporated by endogenising the scale parameter, *A*, in the production function, which was modelled as a function of the stock of public and human capital.[74]

Consider the following production process:

$$Q = A * f(L,K)$$

where *A* is a scale parameter, which can be considered to represent the state of technology, *L* and *K* are the labour and capital inputs, respectively. The infrastructure factor productivity externality was incorporated into the production function of the non-traded sector as follows:

$$A_t = A_0 \ (KGINF_t \,/\, KGINF_0)^{\eta}$$

where $A_t$ is the original estimated value of the scale parameter and $\eta$ is an unknown externality elasticity that can be assigned different numerical values in the empirical model. *KGINF* is the stock of public infrastructure, computed as an accumulation of infrastructure investments. The baseline stock of infrastructure, $KGINF_0$, is taken as the stock that would have been there in the absence of the CSF increases decided for the period under consideration.

*Output and Industrial Composition Externalities*

These refer to the increasing sophistication of manufacturing as a result of globalisation. This externality can be viewed as operating directly through the multinational and indigenous firm location and growth process that is so important in the case of small open economies like Ireland and Portugal. The treatment of the tradable sector in HERMIN posits a supply side approach in which the share of the world's output being allocated to, or generated within, the domestic economy is determined by a labour cost measure of international competitiveness (Bradley and Fitz Gerald, 1988). However, this neglects the fact that industries will require more than simply an appropriate level of labour costs before they locate in the periphery, or before they grow spontaneously. Without an available labour force that is qualified to work in these industries, or appropriate minimum levels of public infrastructure, many firms simply may not even be able to consider a country on the periphery as a location for production. Thus, a more realistic framework is one which posits a two stage process in which basic infrastructure and labour force quality conditions dictate the number of industries that could conceivably locate in the periphery, while competitiveness decides how many of the industries that could locate there actually do.

[74] The trade effects of increased inter-country competition are ignored here, but have been examined by ESRI, 1997 in the context of the Single market and the CSF.

### *Externalities: Choosing Parameter Values*

The magnitude of the externality effects described above are related to the relative improvement in a stock (e.g., infrastructure or trained workers) and to an elasticity parameter. In order to operationalise the process within a model one needs to assign numerical values to these elasticities.[75] Aschauer's early work suggested that the impact of public capital on private sector output and productivity was very large, implying that an increase of 1% in public capital could give rise to an increase of about 0.40% in output (Aschauer, 1989). Of more relevance to CSF analysis, it was found that as the geographical focus narrows (from the whole nation, to States, to metropolitan areas in the U.S.), the elasticity falls because of leakages (i.e. it is impossible to capture all the benefits from an infrastructural investment within a small geographical area). In a survey of econometric results, Munnell (1993) showed that the elasticity with respect to public capital ranges from an upper bound of 0.39 for the entire U.S., through 0.15-0.20 for individual States, to lower bounds of 0.03-0.08 for individual metropolitan areas. The CSF analysis examined the case where the externality elasticities are zero, and involved a sensitivity analysis over the range of values indicated by the literature as relevant for small regional economies.

There is also a literature that examines the quantitative impact of human capital on growth, as well as much work examining the private and social returns to education and training (Psacharopoulos, 1994; Sianesi and Reenen, 2002). Once again there is a wide range of estimates for the social rate of return, from high rates of 25% to lower rates of 5%. The international findings seem to imply that there is a law of diminishing returns: the social returns to education fall, by and large, as national income and aggregate spending on education rises. Psacharopoulos (1994) found that, even for the richer OECD countries, the social rate of return for higher education (the least beneficial case) is over 8%. The empirical CSF analysis examined the case of zero human capital elasticities and involved a sensitivity analysis over a likely range of values.

### *Summary on Externality Mechanisms*

The two types of beneficial externalities described above are likely to enhance the standard neo-Keynesian impacts of well designed infrastructure investment, education and training and investment aid policy initiatives. The first externality arises through the increased total or embodied factor productivity likely to be associated with improved infrastructure or a higher level of human capital associated with training and education. Of course, a side effect of increased factor productivity is that, in the restricted context of fixed output, labour is shed. This is particularly serious in economies like Estonia and Latvia, where the rate of actual and hidden unemployment is very high.

The second type of externality is associated with the role of improved infrastructure and training in attracting productive activities through foreign direct investment, and

[75] A detailed review of international empirical evidence is provided in the study of the impacts of the Estonian National Development Plan by Bradley *et al,* 2001.

enhancing the ability of indigenous industries to compete in the international market place. We have called this an output, or industrial composition, externality since it is well known that the range of products manufactured in developing countries changes during the process of development, and becomes more complex and technologically advanced.

The early simulations of the combined effects of CSF 1989-93 and CSF 1994-99 for Greece, Ireland, Portugal and Spain, described in ESRI, 1997, indicated that the factor productivity externality is a two edged process: industry and market services become more productive and competitive, but labour demand (for a given level of output) is weakened. The role of the industrial composition externality is more unambiguously beneficial: the higher it is, the faster the period of transitional growth to a higher income plateau.

The externality elasticities, particularly in relation to infrastructure, are usually chosen on the basis of an exhaustive literature review. Since such elasticities do not exist for CEE economies, one is forced to utilise those taken from research on more advanced economies. However, sensitivity analysis can be carried out.

*Simulations*

Full details of the HERMIN-based model simulations of the CSF for the four "cohesion" countries are reported elsewhere (Bradley *et al,* 1995; ESRI, 1997). Results for Latvia, Estonia and East Germany are available in Bradley *et al,* 2000 and 2001. Here we simply summarise some key qualitative findings of particular relevance to the policy makers.

First, focusing on the purely Keynesian impacts of the CSF (i.e., under the assumption of zero externalities), the CSF impacts tend to be broadly in line with the known multiplier properties of the country models. Thus, the public investment multipliers are largest for Portugal (in the range 1.5) and smallest for Ireland (in the range 1.0). On the other hand, the multipliers associated with the transfer payments of the human resource programmes were less than unity for all models. Thus, to a certain extent these results validated crude *ex ante* views held about the impacts of investment policies.

Second, as would be expected, increasing the size of the externality elasticities boosts the impact of the CSF programmes. This was most dramatically illustrated by the Irish simulations, which suggested that GDP impact is tripled relative to the zero elasticity case when elasticity values in the mid-range suggested by the literature were used. More modest improvements were found in the other three countries, basically because they are less open to the world economy.

Third, if the CSF is terminated and the externality effects are absent, then there are no long-term benefits. Thus, the withdrawal of the CSF simply reverses the previous Keynesian expansion, a rather trivial finding from the point of view of the modellers, but regarded with a degree of puzzled scepticism by the policy makers.

Fourth, even in the presence of positive externality elasticities, the beneficial impacts of the CSF programmes decay after its termination, since the incremental stocks of infrastructure and human capital also decay. However, there are modest positive effects even the long run, due to the increased stocks of infrastructure and human capital.

Fifth, the finding that the benefits from the CSF in isolation can appear to be modest draws attention to the fact that the real long-term benefits of the CSF are more likely to be associated with the way in which each of the less developed economies responded to opportunities arising in the rest of the EU and world rather than with the CSF in isolation. This emphasises the need to work within the wider "global theory" of macro modelling rather than the narrower "theory of action" that tends to motivate policy makers who are focused on specific programmes.

Finally, when the HERMIN models were used to examine the likely impacts of the Single Market on the four cohesion countries, the model-based analysis did not always bear out the original pessimism that gave rise to the CSF. Thus, neither Ireland nor Portugal appeared to loose out relative to the core economies, when the Single Market impact on the core was taken from Emerson *et al,* 1988. Greece, on the other hand, did appear to be rather vulnerable to the Single Market, mainly due to the uncompetitive nature of its indigenous industries and the low actual and potential inflows of FDI (ESRI, 1997).

## LESSONS FROM STRUCTURAL FUND MACRO-EVALUATIONS

The experience of evaluating the impacts of the CSF provides some insights into the nature and benefits of interaction between policy makers and policy analysts in a situation where these occur at arms length rather than within an institution like a Central Bank or Finance Ministry. A key aspect of this process is that the work was monitored by the EU Commission, who insisted that the various national CSF programmes be evaluated impartially and publicly. Very little such analysis had ever been carried out for pre-CSF domestic investment programmes, tied up as they usually were with sensitive political budget and electoral cycles. As a consequence, almost no systematic international comparisons of public investment policy initiatives had ever been carried out.

The first lesson of the exercise concerned the tools of analysis. It pointed up a serious lack of well-documented economic models in the four cohesion countries at the time of the reforms in EU regional investment aid in the late 1980s. Thus, the capability of analysing even the Keynesian or demand-side impacts of programmes like the CSF was rather weak, particularly in the Southern periphery. Because of that, none of the four so-called cohesion countries had been included in the earlier EU model-based analysis of the impact of the Single Market (Emerson *et al,* 1988).

Many reasons could be advanced to explain the underdeveloped state of modelling in the periphery: the scarcity of the necessary skills in small countries; linguistic factors that tended to isolate non-English speaking countries from the main modelling centres; data problems, which were quite serious in the cases of Greece and Spain; the complex developmental nature of the peripheral economies, as they made a transition to greater openness and competitiveness. However, once the CSF evaluation studies were initiated, a series of fruitful developments occurred. First, it was possible to fund some model development through the European Commission, in situations where resources had not always been available domestically. The fact that the model developments were tied directly into the need to analyse the impacts of major public investment programme tended to direct research towards those aspects of the economy that were most exposed to the new programmes.

The second lesson concerned the relationship between the analytical requirements of the CSF evaluation and the body of research available to draw from. In order to achieve the cohesion objective in the context of transitional aid, there had to be a sustained increase in the growth rate of the peripheral economies for an extended period. However, the present state of growth theory, although it deals with cross-country comparisons, has only a limited amount to say about the empirics of growth within an economy (Fischer, 1991). The incorporation of externality mechanisms into the HERMIN econometric models represented an attempt to move towards this growth analysis, but a proper growth-theoretic analysis was impossible. In effect, the policy makers were posing empirical questions to the modellers that were almost impossible to answer adequately with the present state of knowledge.

The third lesson concerned difficulties that the policy makers and monitors experienced in absorbing whatever limited insights and advice that the modellers were able to offer them. Here the Commission moved decisively and set up the MEANS programme, designed to improve methods of evaluating structural policies and their practices within national administrations (Monnier and Toulemonde, 1993). There was an awareness of the diversity and compartmentalization of evaluation practices, and, based on an analysis of existing practices and experience within different administrations, the MEANS programme had three strategic aims: to establish zones of agreement concerning the proper use of tools to evaluate structural policies; to adjust evaluation methods to enable better co-ordination of partnership evaluations; and to promote acquired knowledge and thus increase the number and quality of qualified partners.

The MEANS programme acknowledged that models were potentially capable of extracting the pure CSF impacts from the background of all the other domestic and external shocks that were affecting the economy at the same time. It was also recognised that the distinction between the demand-side impacts and the enduring supply-side impacts was valuable, even if it was implemented in a crude fashion in the models. However, the model-based analysis was found to suffer from the "black box" problem, where the answers given by the modellers to the policy makers were often more complex than the original questions. Thus, the strengths of the model-based approach were identified as the analytical framework to represent the economy; the ability to quantify feed-backs and policy linkages; and the ability to rank different policies in terms of their impacts on economic indicators like GDP per capita. Difficulties with the model-based approach were identified as the costs of building and maintaining models, where the Objective 1 countries were particularly vulnerable; the need to step outside the purely macroeconomic framework in order to identify and design the primary CSF impact channels; and the need to rely on inadequate results from micro-studies in order to quantify these mechanisms.

A final spin-off from the model-based analysis of the cohesion member states of the EU concerns the applicability to the transition economies of Central and Eastern Europe. Indeed, the processes generating change in the CEE countries have begun to resemble forces familiar in the development of the EU periphery: progressive trade liberalisation, foreign direct investment, technical change, fiscal and monetary policy reforms, and the market re-orientation of areas previously under state control (Barry and Bradley, 1999). The encouragement by the EC Commission of cross-country co-operation and sharing of experiences within Europe has led to considerable insights and understanding. Nevertheless, the full potential of well-designed models to enhance the conceptualisation, implementation and evaluation of the consequences of policy reforms in an increasingly inter-related world remains to be exploited.

## TRANSITION AND COHESION: SIMILARITIES AND DIFFERENCES

The first phase of the transition of the former command economies of Central and Eastern Europe has involved, and will further involve, considerable disorganisation and a very basic overhauling of industrial and institutional capacity. Socio-economic mechanisms operating during this phase entail the creation of market-based institutional structures accompanied by substantial reallocation of labour between the public and private sectors as well as between manufacturing and market services. The initial impacts of restructuring generate the well-known U-shaped pattern for income and employment (Blanchard, 1997).

However, the processes that characterise the early years of transition should not be taken as the pattern of behaviour that is likely to apply in the future. Future stages of transition are more likely to resemble the paths followed in recent decades by the cohesion countries, not located at the core of the EU, in particular Greece, Ireland and Portugal. These countries are ones whose structural adjustment lagged behind that of the more developed core EU states. The driving forces behind cohesion (or catch-up) include:

- progressive trade integration;
- foreign direct investment inflows;
- technology transfer;
- EU-aided investment programmes, mainly for the support of infrastructural and human-capital development.

It might be useful for the purposes of thinking through the various stages of strategic economic planning in the CEE area to distinguish two phases of transition:

*Phase 1:* Initial institution building and sectoral re-organisation and re-allocation

*Phase 2:* A period during which cohesion processes operate in the context of a fairly stable institutional framework.

As the CEE states grapple with the difficult challenges of Phase 1 of their transition, they are unlikely to be very motivated to engage in speculation about

Phase 2. However, in the real world Phases 1 and 2 are intertwined and operate simultaneously. In other words, the initial dramatic and necessary institutional and economic changes away from the rigidities of central planning towards a free market system within the global economy tend to cross over into the subsequent cohesion process in a way that may be difficult to foresee or disentangle.

We can stylise the main difference between the challenges being faced by the EU cohesion economies and the CEE transition economies by saying that the former only have to grapple with Phase 2 processes. So, it is likely that similar Phase 2 processes will operate in the CEE countries during future stages of their transition, as soon as the initial Phase 1 restructuring and institution-building are completed. From a planning point of view it is important to be aware of the two different conceptual phases, however closely they actually operate in the real world.

Our recent research on six CEE countries (the Czech Republic, Romania, Slovenia, East Germany, Latvia and Estonia) drew on experience of studying and modelling development processes in the EU to explore scenarios that highlight key policy issues likely to face transition country decision-makers in the immediate future.[76] Our results suggested that we might be able to foresee many aspects of likely paths of CEE evolution by looking at the performance of the initially poorer EU member states as they adjusted to the rigors of the Single Market and Monetary Union. After the initial (and as yet unfinished) transition, the CEE economies are likely to have a relative standard of living roughly comparable to (or perhaps somewhat below) that of the EU cohesion countries immediately prior to their entry into the EU in the 1970s and 1980s. To reach the present EU average, the CEE economies must, therefore, grow for a sustained period at a rate higher than the EU average. Our research facilitates the exploration of available options and suggests likely outcomes.

Industrial strategy is likely to be at the centre of socio-economic renewal in the CEE regions. The required growth acceleration will come about through a complex of policy measures and changes with some common themes such as macroeconomic stability and high investment. But otherwise, countries are likely to exercise a wide range of different choices, characterised by Dani Rodrik as follows:

> The rules of the international economy must be flexible enough to allow individual developing countries to develop their own "styles" of capitalism. (Rodrik, 1999).

For the purposes of exposition, two different stylised policy directions can be distinguished. The first direction might be characterised as the "South Korean" model. Here, policy is directed mainly at selected segments of indigenous industry with the objective of gaining in efficiency and capturing greater export market share. Success from this strategic direction depends on the ability of domestic entrepreneurs to overcome entry barriers associated with the dominance of

[76] This research was supported under the EU's ACE-Phare programme and involved teams from Romania, the Czech Republic, Slovenia and Ireland. The results are documented in Bradley, *et al,* 1995; ESRI, 1997; Barry and Bradley, 1999; Ciupagea and Manda, 1999; Kejak and Vavra, 1999; Simoncic *et al*, 1999.

multinational firms from more highly developed market economies. This would entail the development of innovative and highly income elastic products, efficient marketing and distribution systems, and substantial process and product innovation.

The second direction could be characterised as the "Irish" model of convergence. Here, growth acceleration is sought from policies designed mainly to encourage export-oriented foreign direct investment inflows. Success from this strategic direction depends on the ability of policy makers to make the business and productive climate in their economies sufficiently attractive to capture a significant share of internationally mobile investment. Some of this attractiveness will be based on the efficiency of the domestic economy (in particular, the availability and quality of physical infrastructure and human resources). However, other crucial aspects are only partially subject to domestic policy influence, such as being located inside the EU with easy access to the benefits of the Single Market.

Obviously a range of supporting domestic policy interventions are required to guide an economy in one direction or the other. The whole spectrum of macroeconomic, industrial, labour market, infrastructural and educational policies have a role to play, against the background of an evolving and improving social infrastructure.

Analysis of the likely consequences of the above two alternative strategic directions requires one to conceptualise the CEE economy as it might look after the completion of Phase 1 of its transition. This is difficult to do, but our research has drawn on the modelling experience of the EU cohesion economies, who faced Phase 2 type challenges. Cutting through the details, what they indicate is that the pursuit of a pure "Korean" strategy is likely to run up against difficulties in breaking into dynamic export markets that are dominated by global firms with access to superior technology. However, a "Korean" strategy aimed at more traditional products (clothing, food, furniture, etc.) is unlikely to deliver fast growth since such products have low income elasticities of demand and the position of lowest cost producer may be in conflict with the target of income convergence with the EU. In this strategy, the domestic cost base is crucial and any breakdown in the appropriate evolution of wages quickly destroys a country's international competitiveness and puts a brake on convergence.

The "Irish" strategy of FDI-led growth appears to be superficially more attractive since it encompasses and facilitates a massive transfer of technology and brings with it ready-made access to global markets. However, a down-side is that FDI-led growth tends to be associated with very high growth of labour productivity. Consequently, there is a serious risk of "jobless" growth and this was indeed a difficulty in the early stages of the Irish convergence. Another characteristic of the "Irish" strategy is that it gives rise to a dual economy: a high-technology, foreign-owned export-oriented modern sector and a more traditional, locally owned sector that is oriented towards the domestic market or easy-to-enter adjoining markets. If wage growth in the modern sector is permitted to destabilise the continued competitiveness of the traditional sector, then the strategy becomes a zero-sum game. Once again, wage setting policy is a crucial component of the strategy. In practice both strategies are pursued simultaneously, but the interrelationship between them can be complex and difficult to understand.

Almost without exception, the small European states have carved a path between liberalism and statism, and have evolved towards indirect forms of economic control (Katzenstein, 1985). What characterises the economic and political experience of small European states and sets them apart from the large industrial countries is the "premise" of their planning efforts: namely, adaptation to external market forces. They have generally come to find detailed comprehensive sectoral planning efforts increasingly inapplicable, simply because of the openness and vulnerability of their economies. Their problem is one of selecting the devices of planning that are in harmony with their social objectives. Hence, the *rationale* for state intervention depends on the ability or otherwise of market forces to yield results consistent with these social objectives. Because of their lack of autonomy, their strategy must be flexible, reactive and incremental. They cannot oppose change by shifting its costs to others abroad. Neither can they ignore change if they wish to prosper. That has been the main lesson from the EU "cohesion" countries that is of relevance for the CEE states.

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# 9

## HERMIN: A MACRO MODEL FRAMEWORK FOR THE STUDY OF COHESION AND TRANSITION*

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### INTRODUCTION

In this paper we look back over a period of ten years of international collaborative research on the development of macro modelling for the evaluation of the impacts of National Development Plans (NDPs) and Community Support Frameworks (CSFs). This work started in Ireland in 1989, driven by the evaluation needs of CSF 1989-93, was then extended via international collaborative research to the other cohesion countries (Greece, Portugal and Spain) during the first half of the 1990s, and was further extended at the end of the 1990s to the analysis of the pre-accession investment aid programmes of the newly liberalised economies of Central and Eastern Europe (CEE). We discuss some of the lessons of this trans-European collaborative effort, drawing in particular on the Irish, Estonian and more recent Hungarian experiences.

In the first substantive section we illustrate how the conjunction of international advances in applied macroeconomics as well as new trade and growth theories, combined with the influence of the EU HERMES modelling project of the 1980s, served to influence modelling research on the analysis of the impacts of the large-scale investment programmes that were implemented in EU Community Support Frameworks (CSFs) from 1989 onwards.

In the subsequent section we present a brief overview of how the four cohesion country HERMIN models were calibrated, their responses to a series of stylized

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external and policy shocks, and a summary of what we learn about developing economies from models like HERMIN.

After the first dramatic stage of CEE market liberalisation in the late 1980s and early 1990s, the economic reforms that had been carried out from the mid-1990s onwards involved the emergence of processes that had many similarities with earlier developments in the EU cohesion countries. In the section that follows we describe how the second stage of CEE transition (following the initial severe output decline and early recovery) was examined by means of adaptations of the HERMIN framework to these economies. In particular, because of the extreme limitations on availability of time-series data, special approaches to calibration of the CEE models were needed. After early modelling experiments in the Czech Republic, Romania, Slovenia and Latvia, the most detailed and systematic modelling application was carried out for Estonia in 2000.

More recently, we have applied the HERMIN modelling approach to Hungary. Drawing on the earlier Irish and Estonian experiences, we show in the next section how a modelling methodology that stresses standardisation and cross-country comparisons can be implemented quickly and at relatively low cost, and facilitates institutional learning on modelling, medium-term forecasting and policy analysis. In such an exercise, rather than just studying the specific features of the Hungarian economy in depth, the HERMIN model invites comparisons with other CEE and EU economies/models. We argue that the HERMIN approach is a useful complement to the alternative, detailed, stand-alone and country-specific approaches that have tended to dominate modelling research.

In the concluding section we review the main issues in our paper and discuss some of the administrative and practical challenges that arise when HERMIN models are implemented with a view to evaluating the medium-term impacts of major programmes of public investment. In a second paper in this volume, we describe how the HERMIN models have been adapted for use in the analysis of the impacts of the EU Structural Fund programmes and the main features of this analysis.

## NEW PROBLEMS, NEW THEORIES, NEW MODELS

### Introduction

The reform and expansion of EU regional investment programmes (or Structural Funds) into the so-called *Community Support Frameworks* (CSFs) in the late 1980s presented the European Commission as well as domestic policy makers and analysts with major challenges. Although the CSF investment expenditures were very large, this in itself was not a problem for policy design or analysis.[77] Indeed, evaluating the macroeconomic impact of public expenditure initiatives had been an active area of work since quantitative models were first developed in the 1930s (Tinbergen,

[77] Typically, CSF expenditures range from about 1 percent of GDP annually in the case of Spain to over 3 per cent in the case of Greece. The macro consequences are clearly important.

1939).[78] What was special about the CSF was its declared goal to implement policies whose explicit aim was to transform and modernise the underlying structure of the beneficiary economies in order to prepare them for greater exposure to international competitive forces within the Single Market and EMU. Thus, CSF policies moved far beyond a conventional demand-side stabilization role, being aimed rather at the promotion of structural change, accelerated medium-term growth and real cohesion through mainly supply-side mechanisms.

The new breed of macroeconomic models of the late 1980s had addressed the theoretical deficiencies of conventional Keynesian econometric models that had precipitated the decline of modelling activity from the mid-1970s (Klein, 1983; Helliwell *et al,* 1985). However, policy makers and policy analysts were still faced with the dilemma of having to use conventional economic models, calibrated using historical time-series data, to address the consequences of future structural changes. The Lucas critique was potentially a serious threat to such model-based policy impact evaluations (Lucas, 1976). In particular, the relationship between public investment policies and private sector supply-side responses - matters that were at the heart of the CSFs - were not very well understood or articulated from a modelling point of view.

The revival of the study of growth theory in the mid-1980s provided some guidelines to the complex issues involved in designing policies to boost a country's growth rate, either permanently or temporally, but was more suggestive of mechanisms than of magnitudes (Barro and Sala-y-Martin, 1995; Jones, 1998). Furthermore, the available empirical growth studies tended to be predominantly aggregate and cross-country rather than disaggregated and country-specific.[79] Yet another complication facing the designers and analysts of the CSF was that the four main beneficiary countries - Greece, Ireland, Portugal and Spain - were on the geographical periphery of the EU, thus introducing spatial issues into their development processes. With advances in the treatment of imperfect competition, the field of economic geography (or the study of the location of economic activity) had also revived during the 1980s (Krugman, 1995; Fujita, Krugman and Venables, 1999). But the insights of the new research were confined to small theoretical models and seldom penetrated up to the type of large-scale empirical models that are typically required for realistic policy analysis.

## New Approaches to Policy Modelling

The Keynesian demand-driven view of the world that dominated macro modelling prior to the mid-1970s was exposed as being entirely inadequate when the economies of the OECD were hit by the supply-side shocks of the crisis-wracked 1970s (Blinder, 1979). From the mid-1970s onwards, attention came to be focused on issues of cost competitiveness as an important ingredient in output

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[78] Tinbergen's early contribution to the literature on the design and evaluation of supply-side policies still reads remarkably well after more than 40 years (Tinbergen, 1958).

[79] Fischer (1991) suggested that identifying the determinants of investment, and the other factors contributing to growth, would probably require a switch away from simple cross-country regressions to time series studies of individual countries.

determination, at least in highly open economies. More generally, the importance of the manner in which expectation formation was handled by modellers could no longer be ignored, and the reformulation of empirical macro models took place against the background of a radical renewal of macroeconomic theory in general (Blanchard and Fischer, 1990).

The HERMIN model framework draws on some aspects of the above revision and renewal of macro economic modelling. Its origins lay in the complex multi-sectoral HERMES model that was developed by the European Commission from the early 1980s (d'Alcantara and Italianer, 1982). HERMIN was initially designed to be a small-scale version of the HERMES model framework in order to take account of the very limited data availability in the poorer, less-developed EU member states and regions on the Western and Southern periphery (i.e., Ireland, Northern Ireland, Portugal, Spain, the Italian *Mezzogiorno,* and Greece).[80] A consequence of the lack of detailed macro-sectoral data and of sufficiently long time-series that had no structural breaks was that the HERMIN modelling framework needed to be based on a fairly simple theoretical framework that permitted inter-country and inter-region comparisons and that facilitated the selection of key behavioural parameters in situations where sophisticated econometric analysis was impossible.

An example of a useful theoretical modelling framework is one that treats goods as being tradeable and non-tradeable (Lindbeck, 1979). Drawing on this literature, relatively simple versions of the model can be used to structure debates that take place over macroeconomic issues in small open economies (SOEs) and regions.[81] The HERMIN model shows how an empirical model can be constructed that incorporates many of these insights.

## One-Sector and Two-Sector Small-Open-Economy Models

In the one-sector model all goods are assumed to be internationally tradeable, and all firms in the small open economy (SOE) are assumed to be perfect competitors. This has two implications;

a. Goods produced domestically are perfect substitutes for goods produced elsewhere, so that prices (mediated through the exchange rate) cannot deviate from world levels;

b. Firms are able to sell as much as they desire to produce at going world prices. It rules out Keynesian phenomena right from the start.

The 'law of one price', operating through goods and services arbitrage, therefore ensures that

$$p_t = e p_t^* \tag{1}$$

[80] After German unification, the former East Germany was added to the list of "lagging" EU regions.
[81] Our use of the term SOE to indicate a "small open economy" should not be confused with its other use, i.e., to indicate a "state-owned enterprise"!

where $e$ is the price of foreign currency and $p_t^*$ is the world price. Under a fixed exchange rate this means that in this simple stylised model, domestic inflation is determined entirely abroad. The second implication of perfect competition is that the SOE faces an infinitely elastic world demand function for its output, and an infinitely elastic world supply function for whatever it wishes to purchase.

A major weakness of the one-sector model as a description of economic reality, even for as open an economy as that of Ireland, Estonia or Slovenia, is that the assumption (implied by perfect competition) that domestic firms can sell all they desire to produce at going world prices is patently unrealistic. To take account of the phenomenon that world demand exerted an impact on Irish output independent of its impact on price, Bradley and Fitz Gerald (1988 and 1990) proposed a model in which all tradeable-sector production is assumed to be carried out by internationally footloose companies (multi-national corporations, or MNCs) where price-setting decisions are independent of the SOE's factor costs. When world output expands, MNCs expand production at all their production locations. However, the proportion of MNC investment located in any individual SOE depends on the relative competitiveness of the SOE in question. This allows SOE output to be determined both by domestic factor costs and by world demand. However, since SOE demand is tiny relative to world demand, it plays no role in the MNC's output decisions.

Another weakness of the one-sector SOE model is that, as already noted, government spending is precluded from having any positive effects. Yet most studies of Irish employment and unemployment conclude that the debt-financed fiscal expansion of the late-1970s did indeed boost employment and reduce unemployment, albeit at the expense of requiring very contractionary policies over the course of the whole 1980s (Barry and Bradley, 1991).

To address these criticisms, one can add an extra sector, the non-tradeable (NT) sector, to the one sector model. Output and employment in tradeables continues to be determined as before, while the NT sector operates more like a closed economy model. The interactions between the two sectors prove interesting however. The price of NTs is determined by the interaction of supply and demand for these goods.

## The Structure of the HERMIN Model

We now discuss some practical and empirical implications for designing and building a small empirical model of a typical European peripheral economy, building on the insights of the SOE model. Since the model is being constructed in order to analyse medium-term policy impacts, basically there are three requirements which it should satisfy:

i. It must be disaggregated into a small number of crucial sectors which allows one at least to identify and treat the key sectoral shifts in the economy over the years of development.

ii. It must specify the mechanisms through which a "cohesion-type" economy is connected to the external world. The external (or world) economy is a very important direct and indirect factor influencing the economic growth and convergence of the lagging EU and CEE economies, through trade of goods and services, inflation transmission, population migration and inward foreign direct investment.

iii. It must recognise that a possible conflict may exist between the actual situation in the country, as captured in a HERMIN model calibrated with the use of historical data, and the desired situation towards which the cohesion or transition economy is evolving in an economic environment dominated by EMU and the Single European Market.

The HERMIN model framework focuses on key structural features of a cohesion-type economy:

- The degree of economic openness, exposure to world trade, and response to external and internal shocks;
- The relative sizes and features of the traded and non-traded sectors and their development, production technology and structural change;
- The mechanisms of wage and price determination;
- The functioning and flexibility of labour markets with the possible role of international and inter-regional labour migration;
- The role of the public sector and the possible consequences of public debt accumulation, as well as the interactions between the public and private sector trade-offs in public policies.

To satisfy these requirements, the basic HERMIN framework has four sectors: manufacturing (a mainly traded sector), market services (a mainly non-traded sector), agriculture and government (or non-market) services. Given the data restrictions that often face modellers in cohesion and transition economies, this is as close an empirical representation of the traded/non-traded disaggregation as we are likely to be able to implement in practice. Although agriculture also has important traded elements, its underlying characteristics demand special treatment. Similarly, the government (or non-market) sector is non-traded, but is best formulated in a way that recognises that it is mainly driven by policy instruments that are available – to some extent, at least – to policy makers.[82]

The structure of the model framework can be best thought as being composed of three main blocks: a supply block, an absorption block and an income distribution block. Obviously, the model functions as integrated systems of equations, with interrelationships between all their sub-components. However, for expositional purposes we describe the HERMIN modelling framework in terms of the above three sub-components, which are schematically illustrated in Figures 1 and 2.

Conventional Keynesian mechanisms are at the core of any HERMIN model. Expenditure and income distribution sub-components generate the standard income-

[82] Elements of public policy are endogenous, but we handle these in terms of policy feed-back rules rather than behaviourally.

expenditure mechanisms. But the model also has neoclassical features. Thus, output in manufacturing is not simply driven by demand. It is also potentially influenced by price and cost competitiveness, where firms seek out minimum cost locations for production (Bradley and Fitz Gerald, 1988). In addition, factor demands in manufacturing and market services are derived using a CES production function constraint, where the capital/labour ratio is sensitive to relative factor prices. The incorporation of a structural Phillips curve mechanism in the wage bargaining mechanism introduces further relative price effects.

From Figure 2 we see that the model, like the national accounts, uses three complementary ways of measuring GDP: the output, expenditure and income basis. On the output basis, HERMIN disaggregates GDP into four sectors: manufacturing (OT), market services (ON), agriculture (OA) and the public (or non-market) sector (OG). On the expenditure side, HERMIN disaggregates the GDP into the conventional five components: private consumption (CONS), public consumption (G), investment (I), stock changes (DS), and the net trade balance (NTS).[83] Finally, national income is determined on the output side, and is disaggregated into private and public sector elements.

Since all elements of output are modelled, the output-expenditure identity is used to determine the net trade surplus/deficit residually. The output-income identity is used to determine corporate profits residually. Finally, the equations in the model can be classified as behavioural or identity. In the case of the former, economic theory and calibration to the data are used to define the relationships. In the case of identities, these follow from the logic of the national accounts, but have important consequences for the behaviour of the model as well.

## The Supply Side of the HERMIN Model

### *Output Determination*

The theory underlying the macroeconomic modelling of a small open economy requires that the equation for output in a mainly traded sector reflects both purely supply side factors (such as the real unit labour costs and international price competitiveness), as well as the extent of dependence of output on a general level of world demand, e.g. through operations of multinational enterprises, as described by Bradley and Fitz Gerald (1988). By contrast, domestic demand should play only a limited role in a mainly traded sector, mostly in terms of its impact on the rate of capacity utilisation. However, manufacturing in any but extreme cases includes a large number of partially sheltered subsectors producing items that are effectively (or partially) non-traded. Hence, we would expect domestic demand to play a more substantial role in this sector, possibly also influencing capacity output decisions of firms. HERMIN posits a hybrid supply-demand equation of the form:

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[83] The traded/non-traded disaggregation implies that only a net trade surplus is logically consistent. Separate equations for exports and imports could be appended to the model, but would function merely as conveniently calculated “memo” items that were not an essential part of the model’s behavioural logic.

$$\log(OT) = a_1 + a_2 \log(OW) + a_3 \log(ULCT / POT) \\ +a_4 \log(FDOT) + a_5 \log(POT / PWORLD) + a_6 t \qquad (2)$$

where OW represents the crucial external (or world) demand, and FDOT represents the influence of domestic absorption. We further expect OT to be negatively influenced by real unit labour costs (ULCT/POT) and the relative price of domestic versus world goods (POT/PWORLD).

A fairly simple form of the market service sector output equation (ON) is specified in HERMIN:

$$ON = a_1 + a_2\, FDON + a_3\, t \qquad (3)$$

where FDON is a measure of domestic demand.[84]. Output in agriculture is modelled very simply as an inverted labour productivity equation;

$$log(OA/LA) = a_0 + a_1\, t \qquad (4)$$

and output in the public sector is determined by public sector employment, which is a policy instrument.

*Factor Demands*

Macro models usually feature production functions of the general form:

$$Q = f(K,L) \qquad (5)$$

(where Q represents output, K capital stock and L employment), without output being actually determined by this relationship. We have seen above that manufacturing output is determined in HERMIN by a mixture of world and domestic demand, together with price and cost competitiveness terms. Having determined output in this way, the role of the production function is to constrain the determination of factor demands in the process of cost minimisation that is assumed. Hence, given *Q* (determined as above in a hybrid supply-demand relationship), and given (exogenous) relative factor prices, the factor inputs, *L* and *K,* are determined by the production function constraint. Hence, the production function operates in the model as a *technology constraint* and is only indirectly involved in the determination of output. It is partially through these interrelated factor demands that the longer run efficiency enhancing effects of policy and other shocks like the EU Single Market and the Structural Funds are believed to operate.

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[84] Logically, world activity should have no role in determining non-traded output. However, in certain economies (such as Ireland, Estonia, Latvia and Greece), some service activities that are traded (e.g., transit trade, tourism, financial services, etc.).

**Figure 1: The HERMIN Model Schema**

## Supply Aspects

***Manufacturing Sector (mainly tradable goods)***

*Output* $= f_1$ *(World Demand, Domestic Demand, Competitiveness, t)*
*Employment* $= f_2$ *(Output, Relative Factor Price Ratio, t)*
*Investment* $= f_3$ *(Output, Relative Factor Price Ratio, t)*
*Capital Stock = Investment + (1-δ) Capital Stock*$_{t-1}$
*Output Price* $= f_4$ *(World Price * Exchange Rate, Unit Labour Costs)*
*Wage Rate* $= f_5$ *(Output Price, Tax Wedge, Unemployment, Productivity)*
*Competitiveness = National/World Output Prices*

***Market Service Sector (mainly non-tradable)***

*Output* $= f_6$ *(Domestic Demand, World Demand)*
*Employment* $= f_7$ *(Output, Relative Factor Price Ratio, t)*
*Investment* $= f_8$ *(Output, Relative Factor Price Ratio, t)*
*Capital Stock = Investment + (1-δ) Capital Stock*$_{t-1}$
*Output Price = Mark-Up On Unit Labour Costs*
*Wage Inflation = Manufacturing Sector Wage Inflation*

***Agriculture and Non-Market Services: mainly exogenous and/or instrumental***

***Demographics and Labour Supply***

*Population Growth* $= f_9$ *(Natural Growth, Migration)*
*Labour Force* $= f_{10}$ *(Population, Labour Force Participation Rate)*
*Unemployment = Labour Force – Total Employment*
*Migration* $= f_{11}$ *(Relative expected wage)*

## Demand (Absorption) Aspects

*Consumption* $= f_{12}$ *(Personal Disposable Income)*
*Domestic Demand = Private and Public Consumption + Investment + Stock*

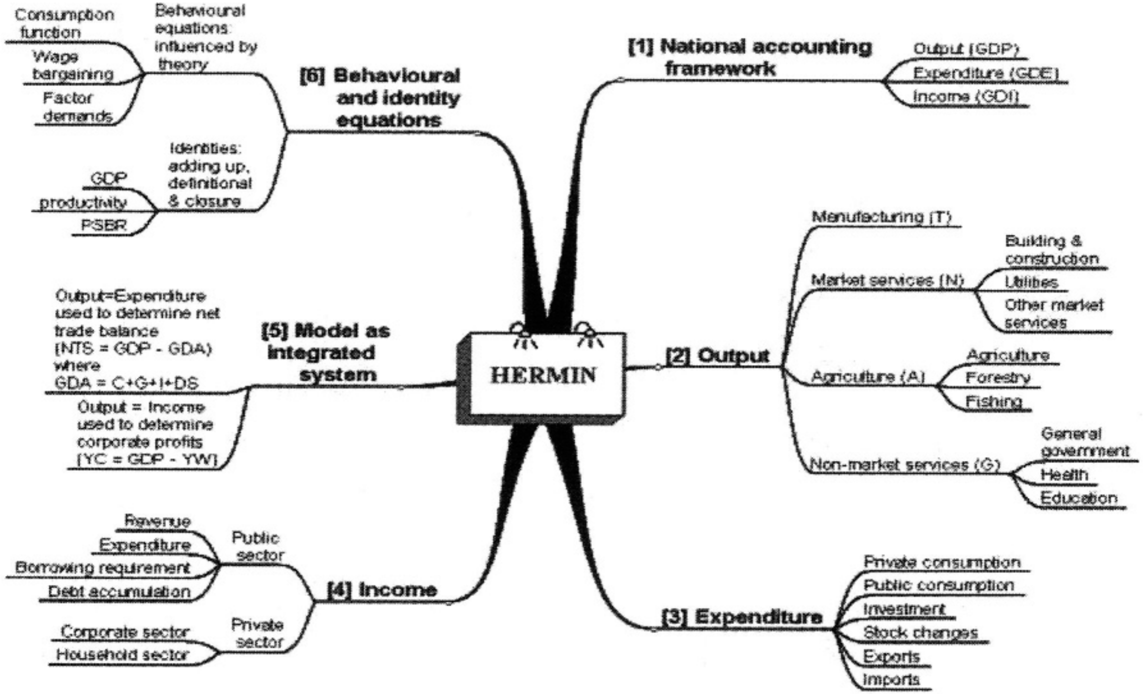
*Changes*
*Net Trade Surplus = Total Output - Domestic Demand*

## Income Distribution Aspects

*Expenditure prices* $= f_{13}$ *(Output Prices, Import Prices, Indirect Tax Rates)*
*Income = Total Output*
*Personal Disposable Income = Income + Transfers - Direct Taxes*
*Current Account = Net Trade Surplus + Net Factor Income From Abroad*
*Public Sector Borrowing = Public Expenditure - Tax Rate * Tax Base*
*Public Sector Debt = (1 + Interest Rate) Debt*$_{t-1}$ *+ Public Sector Borrowing*

Key Exogenous Variables
*External:* World output and prices; exchange rates; interest rates;
*Domestic:* Public expenditure; tax rates.

**Figure 2: Schematic Outline of the HERMIN Modelling Approach**



Ideally, a macro policy model should allow for a production function with a fairly flexible functional form that permits a variable elasticity of substitution. As the recent experience of several peripheral countries, especially Ireland, suggests (Bradley *et al.,* 1995), the issue is important. When an economy opens and becomes progressively more influenced by activities of foreign-owned multinational companies, the traditional substitution of capital for labour following an increase in the relative price of labour need no longer happen to the same extent. The internationally mobile capital may choose to move to a different location than seek to replace costly domestic labour. In terms of the neoclassical theory of firm, the isoquants get more curved as the technology moves away from a Cobb-Douglas towards a Leontief type.

Since the Cobb-Douglas production function is too restrictive, we use the CES form of the added value production function and impose it on both manufacturing (T) and market service (N) sectors. Thus, in the case of manufacturing,

$$OT = A\exp(\lambda t)\left[\delta\{LT\}^{-\rho} + (1-\delta)\{KT\}^{-\rho}\right]^{-\frac{1}{\rho}}. \tag{6}$$

In this equation, *OT, LT* and *KT* are added value, employment and the capital stock, respectively, *A* is a scale parameter, $\rho$ is related to the constant elasticity of substitution, $\delta$ is a factor intensity parameter, and $\lambda$ is the rate of Hicks neutral technical progress.

In both the manufacturing and market service sectors, factor demands are derived on the basis of cost minimisation subject to given output, yielding a joint factor demand equation system of the schematic form:

$$K = g_1\left(Q, \frac{r}{w}\right) \tag{7a}$$

$$L = g_2\left(Q, \frac{r}{w}\right) \tag{7b}$$

where *w* and *r* are the cost of labour and capital, respectively.[85]

The above simple scheme, using a putty-putty model of the capital stock (i.e., malleable *ex ante and ex post),* proved difficult to estimate in practice. This is not surprising in light of the derived nature of the capital stock data. Hence, a switch was made to a marginal, or putty-clay, system where investment, the new vintage of capital stock, is driven by output and relative factor prices, and the capital stock is assumed to be malleable *ex ante* but not *ex post.* In the absence of data on vintage output and labour inputs, the corresponding marginal output and employment are crudely proxied by the total levels of these variables. Alternatively, we can focus on

[85] The above treatment of the capital input to production in HERMIN is influenced by the earlier work of d'Alcantara and Italianer, 1982 on the vintage production functions in the HERMES model. The implementation of a full vintage model was impossible, even for the four EU cohesion countries. A hybrid putty-clay model is adopted in HERMIN (Bradley, Modesto and Sosvilla-Rivero, 1995).

the long-term formulation of the equation, when the ratio of capital to output is proportional to the ratio of investment to output.

$$\frac{I}{Q} = \frac{(\delta + g)}{(1 + g)} \frac{K}{Q}$$

where g is the growth in output and $\delta$ is the depreciation rate. Hence, the modified joint factor demand system can be written in the form:

$$I = h_1\left(Q, \frac{c}{w}\right)$$

$$L = h_2\left(Q, \frac{c}{w}\right)$$

where the capital stock is now generated by a perpetual inventory formula,

$$K_t = I_t - (1 - \delta)K_{t-1}$$

Although the central factor demand systems in the manufacturing and market service sectors are functionally identical, together with their ancillary identities, they will have different estimated parameter values and other crucial differences. For example, in the Irish case a fraction of manufacturing sector profits is repatriated through the balance of payments, mirroring the known behaviour of multinational firms that dominate the Irish manufacturing sector. This profit repatriation mechanism is not yet included in the Greek, Portuguese and Spanish models, where the role of multinationals is considerably smaller as a share of total manufacturing activity. No such mechanism is included in the market service sector, where distributed profits are assumed simply to go directly into private income.

There are two further crucial differences between the way that the two sectors are modelled.

a. As explained earlier, output in the traded sector (OT) is driven by world demand (OW) and domestic demand (FDOT), and is influenced by international price competitiveness (PCOMPT) and real unit labour costs (RULCT). In the non-traded sector, on the other hand, output (ON) is driven purely by final demand (FDON), with possibly a limited role for world demand (OW). This captures the essential difference between the neoclassical-like tradable sector and the sheltered Keynesian non-traded sector.

b. Second, the output price in the manufacturing (T) sector is partially externally determined by the world price. In the market services (N) sector, the producer price is a pure mark-up on costs. This puts another difference between the partially price taking tradable sector and the price making non-tradable sector.

[86] Logically, world activity should have no role in determining non-traded output. However, in certain economies (such as Ireland, Estonia, Latvia and Greece), some service activities that are traded (e.g., transit trade, tourism, financial services, etc.).

The modelling of factor demands in the agriculture sector is treated very simply in HEMIN, but can always be extended in later versions as satellite models, where the institutional aspects of agriculture are fully included. Value added in agriculture is modelled as an inverted productivity relationship (see above). Labour inputs into agriculture are modelled as a (declining) time trend, and not as part of a neo-classical optimising system, as in manufacturing and market services. The capital stock in agriculture is modelled as a trended capital/output ratio.

Finally, in the non-market service sector, factor demands (i.e., numbers employed and fixed capital formation) are exogenous instruments and can be varied by policy makers, subject to fiscal solvency criteria.

*Sectoral Wage Determination*

Modelling of the determination of wages and prices in HERMIN is influenced by the so-called Scandinavian model (Lindbeck, 1979). Thus, the behaviour of the manufacturing (T) sector is assumed to be dominant in relation to wage determination. The wage inflation determined in the manufacturing sector are passed through to the down-stream "sheltered sectors, i.e., market services, agriculture and non-market services, in equations of the form:

$$\text{WNDOT} = \text{WTDOT} + \text{stochastic error} \tag{8a}$$

$$\text{WADOT} = \text{WTDOT} + \text{stochastic error} \tag{8b}$$

$$\text{WGDOT} = \text{WTDOT} + \text{stochastic error} \tag{8c}$$

where WTDOT, WNDOT, WADOT and WGDOT are the wage inflation rates in manufacturing, market services, agriculture and non-market services, respectively.

In the crucial case of manufacturing, wage rates are modelled as the outcome of a bargaining process that takes place between organised trades unions and employers, with the possible intervention of the government. Formalised theory of wage bargaining points to four paramount explanatory variables (Layard, Nickell and Jackman (LNJ), 1990):

1. *Output prices:* The price that the producer can obtain for output clearly influences the price at which factor inputs, particularly labour, can be purchased profitably.
2. *The tax wedge:* This wedge is driven by total taxation between the wage denominated in output prices and the take home consumption wage actually enjoyed by workers.
3. *The rate of unemployment:* The unemployment or Phillips curve effect in the LNJ model is a proxy for bargaining power. For example, unemployment is usually inversely related to the bargaining power of trades unions. The converse applies to employers.
4. *Labour productivity:* The productivity effect comes from workers' efforts to maintain their share of added value, i.e. to enjoy some of the gains from higher output per worker.

A simple log-linear formulation of the LNJ-type wage equation might take the following form:

$$Log(WT) = a_1 + a_2 \log(POT) + a_3 \log(WEDGE) + a_4 \log(LPRT) + a_5 UR \tag{9}$$

where WT represents the wage rate, POT the price of manufactured goods, WEDGE the tax "wedge", LPRT labour productivity and UR the rate of unemployment.

*Demographics and Labour Supply*

Population growth is endogenised through a "natural" growth rate, corrected for net additions or subtractions due to migration. Net migration flows are modelled using a standard Harris-Todaro approach that drives migration by the relative attractiveness of the local (or national) and international labour markets, where the latter can be proxied by an appropriate destination of migrants, e.g., the UK in the case of Ireland; Germany and France in other cases (Harris and Todaro, 1970). Attractiveness can be measured in terms of the relative expected wage, i.e., the product of the probability of being employed by the average wage in each region. Finally, the labour force participation rate (i.e., LFPR, or the fraction of the working-age population (NWORK) that participates in the labour force (LF)), can be modelled as a function of the unemployment rate (UR) and a time trend that is designed to capture slowly changing socio-economic and demographic conditions.

$$LFPR = a_1 + a_2 \, UR + a_3 \, t \tag{10}$$

## Absorption in HERMIN

*Private Consumption*

Household consumption represents by far the largest component of aggregate demand in most developed economies. The properties of the consumption function play a central role in transmitting the effects of changes in fiscal policy to aggregate demand via the Keynesian multiplier. The determination of household consumption is kept simple in the basic HERMIN model, and private consumption (CONS) is determined purely by real personal disposable income (YRPERD).

$$CONS = a_1 + a_2 \, YRPERD \tag{11}$$

In other words, households are assumed to be liquidity constrained, in the sense of having very limited access to savings or credit in order to smooth their consumption. In later extensions of the HERMIN model, a more sophisticated approach was adopted.[87]

[87] For example, in the Irish HERMIN model, experiments were carried out with hybrid liquidity constrained and permanent income models of consumption. It was found that the long-run properties of the model were relatively invariant to the choice between a hybrid and a pure liquidity constrained

As for the remaining elements of absorption, public consumption is determined primarily by public employment, which is a policy instrument. Private investment is determined within three of the four sectors as the investment part of the sectoral factor demand systems. Public investment is a policy instrument. Due to the absence of data on inventory changes, this element of absorption is often ignored, but when available is modelled using the standard stock-adjustment approach. Finally, in keeping with the guiding spirit of the two-sector small-open-economy model, exports and imports are not modelled explicitly in HERMIN. Instead, the net trade surplus is residually determined from the balance between GDP on an output basis (GDPFC) and domestic absorption (GDA). Hence, to the extent that a policy shock drives up domestic absorption more than output, the net trade surplus deteriorates.

## National Income in HERMIN

### *The Public Sector*

With a view to its future use for policy analysis, HERMIN includes a conventional degree of institutional detail in the public sector. Within total public expenditure, we distinguish public consumption (mainly wages of public sector employees), transfers (social welfare, subsidies, debt interest payments), and capital expenditure (public housing, infrastructure, investment grants to industry). Within public sector debt interest, we would ideally like to distinguish interest payments to domestic residents from interest payments to foreigners, the latter representing a leakage out of GDP through the balance of payments.

One needs a method of altering public policy within the model in reaction to the economic consequences of any given policy shock. If all the policy instruments are exogenous, this is not possible, although instruments can be changed on the basis of off-model calculations. A solution of the problem by incorporating an "intertemporal fiscal closure rule" has been suggested in Bryant and Zhang, 1994. If it is appropriate, one can include a closure or policy feed back rule in HERMIN, whose task is to ensure that the direct tax rate is manipulated in such a way as to keep the debt/GNP ratio close to an exogenous notional target debt/GNP ratio. A policy feed back rule can be based on the IMF world model, MULTIMOD (Masson *et al.,* 1989), and might take the following form:

$$\Delta RGTY = \alpha\left\{\frac{(GNDT - GNDT^{*})}{GNPV}\right\} - \beta\left\{\frac{(GNDT - GNDT^{*}) - (GNDT_{-1} - GNDT^{*}_{-1})}{GNPV}\right\} \tag{12}$$

Here, RGTY is the direct tax rate, GNDT is the total national debt, GNDT* is the target value of GNDT, GNPV is nominal GNP, and the values of the parameters $\alpha$

function. However, if a forward looking model of wage income is used, the adjustment properties of the model change radically (Bradley and Whelan, 1997).

and $\beta$ are selected in the light of model simulations. The performance of the rule can be quite sensitive to the choice of the numerical values of $\alpha$, $\beta$.

### *The National Income Identities*

The income-output identity is used in HERMIN to derive corporate profits. In the actual model, there are various data refinements, but the identity is essentially of the form:

$$YC = GDPFCV - YW \tag{13}$$

where *YC* is profits, *GDPFCV* is GDP at factor cost, and *YW* is the wage bill for the entire economy. Income of the private sector *(YP)* is determined in a relationship of form:

$$YP = GDPFCV + GTR \tag{14}$$

where *GTR* is total public sector transfers to the private sector. Income of the household (or personal) sector *(YPER)* is defined essentially as:

$$YPER = YP - YCU \tag{15}$$

where *YCU* is that element of total profits *(YC)* that is retained within the corporate sector for reinvestment, as distinct from being distributed to households as dividends. Finally, personal disposable income *(YPERD)* is defined as

$$YPERD = YPER - GTY \tag{16}$$

where *GTY* represents total direct taxes (income and employee social contributions) paid by the household sector. It is the constant price version of *YPERD* (i.e., *YRPERD=YPERD/PCONS)* which drives private consumption in the simple Keynesian consumption function, referred to above:

$$CONS = a_1 + a_2\, YRPERD \tag{17}$$

### *The Monetary Sector*

There is effectively no monetary sector in HERMIN, so both the exchange rate and domestic interest rates are treated as exogenous. Thus, the nominal 'anchor' in each model is the world price in foreign currency. Furthermore, the financing of public sector borrowing is handled in a rudimentary fashion and public debt is simply the accumulated stock of the net flow of annual borrowing. For the Irish case, these assumptions are not as serious as they would be in a model of a larger, more closed, economy like France, Germany, Italy or the United Kingdom. In fact they accord very well with Ireland's pre-EMS and post-EMS history of financial integration (Bradley and Whelan, 1992). However, these assumptions are simplifications in the cases of Greece, Portugal and Spain. In effect, by treating exchange rates and interest rates as exogenous in Greece, Portugal and Spain we are positing a process of EMU-type financial integration rather than modelling their actual past behaviour.

## CALIBRATING AND TESTING HERMIN MODELS

### Model Calibration

A typical HERMIN model contains a total about 250 equations, many of which are included to increase the model's transparency and facilitate simulation and policy analysis exercises.[88] The essential core of the model consists of a smaller number of equations, of which less than twenty are behavioural in a strictly economic sense (i.e., empirical versions derived from underlying theoretical specifications, containing parameters that must be assigned data-dependent numerical values).

There are about fifteen main behavioural equations that have to be calibrated in a HERMIN model, as follows:

- GDP arising in manufacturing (OT)
- The factor demand system in manufacturing (employment (LT) and investment (IT)
- The GDP deflator for manufacturing (POT)
- Average annual earnings in manufacturing (WT)

- GDP arising in marketed services (ON)
- The factor demand system in marketed services (employment (LLN) and investment (IN)
- The GDP deflator for market services (PON)

- GDP arising in agriculture, forestry and fishing (OA)
- Labour input in agriculture, forestry and fishing (LA)
- Fixed capital stock in agriculture, forestry and fishing (KA)

- Household consumption (CONS)

- Expenditure prices (investment (PI) and consumption (PCONS))

The above set of behavioural equations is embedded amongst a larger set of identities, which are of vital importance to the performance and properties of the model, but do not contain numerical parameters that need to be calibrated.

[88] For example, the wage in manufacturing (WT) is determined in a behavioural equation. But the wage inflation rate (WTDOT) is determined in an identity, merely to facilitate the examination of simulation output.

Together, the behavioural equations and the identities form an integrated system, and cannot be considered in isolation from each other.

The HERMIN models are econometric in that the key behavioural equations are estimated using annual time series. However, a very simple approach to econometric estimation has been taken with all four country models. The behavioural equations are estimated by ordinary least squares (OLS), with correction for first order auto-correlation where needed. Some experimentation with instrumental variables techniques (IV) has been carried out. However, since we use annual time series data, only covering the period 1980-2000, more sophisticated techniques may be of limited value.

In most cases we have taken little account of the non-stationarity that one would expect to find in most economic variables. However, it is well-known that if our behavioural equations were in fact co-integrating relationships, then the simultaneity bias in OLS would disappear asymptotically. With improved and extended data series, it would be possible to address issues of non-stationarity and the dynamic specification of the equations using co-integration analysis and its associated error-correction model, combining the latter flexibility in dynamic specification with desirable long-run properties.

With restricted-length time series, useful econometric estimation is only feasible if the number of parameters in each behavioural equation is kept to an absolute minimum. Hence, all HERMIN behavioural equations are kept as simple as possible, often at the price of poor within-sample tracking. We do not use any dummy variables. Structures such as the CES production function are imposed to make calibration easier. There is an obvious loss in modelling sophistication and in capturing dynamics of adjustment and behaviour, but there is little or nothing that one can do about these problems.

The models are simulated using WINSOLVE (Pierse, 1998), and are subjected to a battery of standard shocks, such as world recessions, public expenditure cuts, tax increases, etc.[89] The results of these tests are compared to other available empirical evidence (and to results from other models, in the rare cases where these are available), and the model structure can then be re-examined and re-formulated if anomalous behaviour patterns are detected.

### *Manufacturing Output*[90]

In estimation the Irish and Spanish models appeared as polar opposites. The small size and extreme openness of the Irish economy, and the dominant position occupied by branch plants of foreign-owned multinational firms, dictate a particular approach to manufacturing output determination, with consequences for the behaviour of manufactured exports. Domestic demand is found to play a relatively

[89] WINSOLVE is a sophisticated and flexible model dedicated simulation program that can be easily interfaced with standard econometric packages, but which has much better model handling features than most standard econometric packages like TSP, EVIEWS, etc. A fully functioned trial version of WINSOLVE, plus documentation, is downloadable from the web (www.econ.surrey.ac.uk/winsolve/).
[90] More complete calibration details are available elsewhere (e.g., ESRI, 1997, and 2002).

small part in the long-run decisions of Irish manufacturing firms, and output prices are almost completely determined abroad. Irish manufacturing output is driven primarily by world demand and cost competitiveness.

In the Spanish HERMIN model, on the other hand, manufactured output responds strongly to changes in both domestic demand and world demand conditions. Spanish prices are also more strongly affected by domestic costs, in contrast to the strong degree of externally determined pricing behaviour found for Irish manufacturing.

Focusing first on the CES production functions, we summarise below the elasticities of substitution between capital and labour in the manufacturing sector. The main finding (shown in Table 1) that comes through is the fact that the Irish elasticity is much smaller than those for Portugal and Spain.[91]

**Table 1: Elasticities of Substitution in Manufacturing**

| Ireland | Portugal (and Greece) | Spain |
|---|---|---|
| 0.34 | 0.88 | 0.77 |

Source: Own estimates

The smaller elasticity for Ireland can be understood as follows. In a traditional and/or relatively closed economy, the substitution of capital for labour as a result of shifting relative factor prices normally takes place within the economy in question. However, in an economy dominated by multinationals, this substitution will often involve a shift in production capacity to other countries (i.e. capital will not replace labour in the Irish factory but will instead seek out lower costs elsewhere). Due to difficulties with the Greek estimation, we have imposed the Portuguese elasticity of substitution, but estimated the other CES parameters freely from the data.

A CES production function is also used in the market service (or N-sector) for each model. The main finding that comes through is the fact that the Irish elasticity is much smaller than those for Portugal and Spain.

### *The Price of Manufacturing Output (POT)*

Output prices in the manufacturing sector are determined as a mixture of price taking (PWORLD) and a mark-up on unit labour costs (ULCT). Ireland stands out as a more extreme case of price-taking, with an elasticity of 0.80 on PWORLD. Greece has a value of 0.70 and Portugal 0.62. Spain is lowest, with a value of 0.41. In every case price homogeneity was imposed, ensuring that the mark-up elasticity was one minus the price-taking elasticity.

[91] The volume of output is held constant in determining the values of these elasticities.

### Wage Rate in Manufacturing

The form of manufacturing wage equation estimated for the Irish and Spanish models is as follows:

$$\log(WT) = a_1 + a_2 \log(POT) + a_3 \log(WEDGE) + a_4 \log(LPRT) + a_5 UR$$

where WT and POT are the wage rate and output price, WEDGE is the tax wedge, combining all direct and indirect tax effects, LPRT is labour productivity and UR is the unemployment rate. This equation could also be written in rate-of-change form, and the issue of hysteresis explored through using the level and change in UR in the Phillips curve term. Wages in the Greek and Portuguese models are determined in a slightly simpler way and use the consumption deflator (incorporating only an indirect tax wedge), as follows:

$$\log(WT) = a_1 + a_2 \log(PC) + a_3 \log(LPRT) + a_4 UR$$

In all cases we imposed full price indexation, which was not rejected by the data in the case of Ireland and Portugal. In the case of Spain we believed that anything less than full price indexation would complicate the interpretation of the long-run simulation analysis that is required for major policy investigations. While international studies show dramatic differences in the pass-through of productivity, they tend to show full indexation to prices in the long run (Dreze and Bean, 1990). We failed to estimate sensible equations for wage setting in Greek manufacturing and were forced to impose the following properties: full indexation to consumer prices; full pass-through of labour productivity; and a Phillips curve effect that is the same as in the case of Portugal.

It is in the impact of unemployment on wage demands (the ‘Phillips Curve’ effect) that the four wage equations differ most. Wage bargaining in the manufacturing sector was found to be least influenced by the level of unemployment in the Spanish case. The Phillips curve parameters are very similar in the cases of Greece, Ireland and Portugal. However, the labour supply is exogenous in the cases of Greece and Portugal. Hence, deviations of unemployment from a baseline can only be removed through changes in the demand for labour. For Ireland, on the other hand, the labour supply is highly elastic, due to the presence of an unemployment-sensitive migration mechanism in the Irish model. This will serve to drive any deviations of the Irish unemployment rate to zero in the medium term, as the British-Irish equilibrium is reestablished. Hence, the long-run effective role of the Phillips curve mechanism is very diminished in the Irish model.

### Labour Supply and Migration

In the case of Ireland, the supply of labour by households is modelled carefully in order to take into account the known open properties of the Irish labour market. Population of working age is driven by an exogenous ‘natural’ growth rate, modified by migration outflows and inflows. The participation rate is influenced by unemployment (the discouraged worker effect) and the replacement ratio (i.e., the fraction of average earnings replaced by social welfare transfers) (Newell and

Symons, 1990). International migration is driven by relative expected earnings and employment probabilities between Ireland and Britain (Walsh, 1974).

Unfortunately, estimation of the crucial migration relationship is never very robust, due to the poor quality of the inter-censal estimated data on migration flows. However, the migration mechanism in the Irish model is unique among macroeconometric models in the EU, and, for example, no other European macromodel treats migration endogenously. The performance of the Irish labour market is crucially dependent on the migration outlet as a means of providing employment for excess Irish population in world (mainly British) labour markets. When we analyse the economic benefits of training and other EC regional and social CSF policies that boost the demand for labour, we see that the resulting net inflows of migrants can often bring about a radical change in outcome compared to the case of a closed labour market.

With respect to labour supply, the Irish and Greek/Portuguese models are also polar extremes, with the labour supply exogenous in the Portuguese and Greek models and both endogenous and highly elastic (because of the migration links between Ireland and the UK) in the Irish case. The Spanish model permits some endogeneity to enter via discouraged worker effects in the male and female labour force participation decisions. Consequently, in the Portuguese and Greek models there is a one-to-one relationship between employment and unemployment: at the margin, a job created means one less unemployed person. Once again however, one could argue that the Portuguese model may become more similar to the Irish case as the Portuguese labour market integrates with labour markets in the European core economies. Alternatively, the labour supply may be quite elastic due to internal migration (e.g., of the classic Harris-Todaro rural-urban kind). This obviously is an area where further research is needed, given the importance of the Phillips curve effects in all the model simulations.

*Private Consumption*

In the standard version of HERMIN, the determination of household consumption is quite simple and orthodox. Private consumption is related to real personal disposable income. In practice consumers in the periphery are found to be mainly liquidity constrained, a fact that is not surprising in light of the less sophisticated financial sectors in these countries.

The estimation results for the marginal propensity to consume in the simple liquidity constrained consumption functions were as follows:

**Table 2: Long-Run Marginal Propensity to Consume**

| | Greece | Ireland | Portugal | Spain |
|---|---|---|---|---|
| MPC | 0.790 | 0.800 | 0.826 | 0.882 |

Source: own estimations

## How the Models React to Exogenous Shocks

In all four models an attempt has been made to carry out comparable shocks to observe how each model reacts. We briefly review the responses of each model to a range of shocks that serves to illustrate certain mechanisms that are central to the subsequent analysis of the EU Structural Funds. These shocks originate from the year 1990, and are carried out against the background of a baseline *anti-monde* projection that runs out to 2010.

Our choice of four test shocks is carefully designed to illustrate those properties of the HERMIN model that will prove to be important in the Structural Fund simulation exercises that are reported in the second paper. For example, the response of each model to a stimulus in world activity (specifically, to world manufacturing output, OW) is important when analysing the impact on the periphery of growth in the rest of the EU. The shock to public sector employment (LG) permits the evaluation of standard fiscal multipliers both in the case of debt financing and in the case of tax financing. The shock to public sector investment (IGV) permits the evaluation of Keynesian-type expenditure multipliers, where the specific response of the private sector to better quality infrastructure is ignored for the moment.[92] Finally, the shock to social welfare income transfers explores the standard Keynesian impacts associated with Social Fund-type expenditures.[93]

### *The Impact of World Manufacturing Activity (OW)[94]*

The Irish results stand out in this exercise in that the manufacturing sector responds very strongly to the world demand boost. This arises from the form of the manufacturing output equation, where there is a higher elasticity with respect to OW than is the case in the other three models. The least responsive models are the Greek and Spanish, where once again this is merely reflecting the characteristics of the country coefficients of the manufacturing output equation. Since domestic demand plays a greater role in the Southern periphery models, the service sector responds relatively more strongly than in the Irish case to secondary effects of a rise in manufacturing output. On the other hand, the direct impact of changes in OW on market services is greatest in the case of Greece, and smallest in the case of Ireland. Besides boosting GDP, the world demand shock improves the public finance situation: borrowing falls as does the public debt level.

### *The Impact of an Increase in Government Employment (LG)*

In this shock we raise permanently public employment numbers above their 1989 baseline value. Two special cases of this shock can be distinguished. In the first, no attempt is made to finance the increased public expenditure by raising taxes, and

[92] In the second HERMIN-related paper we show how the Keynesian multiplier effects can be enhanced through the incorporation of externality mechanisms that attempt to capture the complex response of the private sector to improved infrastructure.
[93] In the second HERMIN-related paper we explore how mechanisms can be used to enhance the Keynesian effects through externalities associated with transfers spent on education and training.
[94] More complete details can be found in ESRI (1997) and ESRI(2002).

in the second, a policy feed-back rule is used to attempt to prevent deviations in the national debt to GDP ratio from its baseline values (see equation (12) and text above that where the form of the rule is described).

One can calculate a multiplier by taking the ratio of the rise in real GDP (relative to the baseline) to the increase in public consumption (in real terms, relative to the baseline). For all four models the long run fiscal multipliers are quite high in the policy unconstrained case, ranging from about 1.5 for Ireland to about 2 for Greece. In this case, for Greece, Ireland and Portugal there is a serious deterioration in the fiscal position (i.e. a rise of about ten percentage points in the debt/GDP ratio).

In the policy constrained case the policy rule is endogenised to attempt to moderate the rise in the debt/GDP ratio over its baseline. The rule is not perfect, but it is reasonably successful in controlling post-shock deviations in the debt/GDP ratio. The fiscal multipliers are drastically reduced in the policy constrained (semi balanced budget) case. The reduction is greatest in the case of Greece, where they become negative towards the end of the simulation period. In the case of Ireland the multiplier falls eventually to zero, indicating that the balanced budget multiplier is zero in the medium to long term.

*The Impact of an Increase in Public Sector Investment (IGV)*

In this shock, we raise nominal public investment (an exogenous variable in all four models) by 1% of nominal GDP in the base year 1989, i.e., the year immediately preceding the shock. In the policy unconstrained case, the long run multipliers are in the range 1.0 to 1.8, with Ireland at the lower end and Portugal at the higher end. For all four models there is a serious deterioration in the long-run debt/GDP ratio, ranging from 9 percentage points in the case of Spain to about 14 percentage points in the case of Portugal.

Once again, one can switch on the policy feedback rule in an effort to prevent the rise in the debt/GDP ratio from its baseline. The results for Ireland indicate an approximately zero balanced budget multiplier. For Greece, Portugal, Spain the multiplier is drastically reduced.

*The Impact of an Increase in Income Transfers (GTRSW)*

In this shock we increase social welfare income transfers by an amount equivalent to 1% of nominal GDP in the base year 1989. In the policy unconstrained case, there is a pattern of multipliers ranging from 0.7 (in the case of Greece) to 0.9 (in the case of Portugal and Spain), with a deterioration in the debt/GDP ratio in every case of about 12 percentage points. Switching in the policy feedback rule partially eliminates the build up of debt and drastically reduces the size of these multipliers.

**Overall Perspective on the HERMIN Cohesion Country Models**

In the Irish case the HERMIN model reflects an economy whose manufacturing sector reacts rather rapidly to movements in world demand, indicating the close supply-side links with foreign multinational activity. The limited role for domestic fiscal expansion is reflected in the fiscal multipliers, which are effectively zero in the balanced budget case when the national debt is capped.

In the Greek and Portuguese cases the HERMIN model reflects economies that are only partially exposed to international competition. Increases in world demand bring only limited increases in domestic production, reflecting the more traditional nature of their exports and the predominance of imports of finished goods. The fiscal multipliers also appear to be relatively large, though they probably characterise an era that has now passed, when Portugal and Greece were relatively insulated from world economic forces. We expect that both these economies will become much more like the Irish case in future years.

The Spanish results are interesting. Our expectation was that Spain would behave as a semi-closed economy, given its large size relative to Greece, Ireland and Portugal. This is partially borne out in the world output shock. However, the fiscal multipliers were found to be rather smaller than expected. The institutional rigidities of the labour market, captured in a stylised way by the very small Phillips curve parameter in the wage bargaining equation, appear to be responsible for this, but the matter clearly merits further research and investigation.

## THE EAST MOVES WEST: COHESION AND TRANSITION

### From Transition to Cohesion

The initial decline in output and employment during the CEE transition process can be ascribed to a combination of reallocation, restructuring and disorganisation (Blanchard, 1997). By market-economy standards centrally-planned economies had industrial sectors that were too large and service sectors that were too small. Thus substantial sectoral reallocation was required during transition (c.f. Gács, 2003). Furthermore, due to the prevailing incentive system, state firms were too large and too vertically integrated (in order to protect against supply disruptions); they paid little attention to the demand of their customers which resulted in shortages and poor quality of their products; they engaged in considerable labour hoarding as well as hoarding of input materials.

The sectoral reallocation that takes place as services expand at the expense of manufacturing would by itself increase unemployment, due to the difficulties of intersectoral reallocation. The sluggishness of reallocation of production factors from firms (mostly state owned) that manufactured products that were no more demanded to firms (mostly privately owned) that manufactured products that were demanded was also a reason for the collapse of output.

However, there were two further interrelated forces at work which increased the unemployment consequences of this early phase of transition. The first was the disorganisation associated with systemic collapse, and the second the low levels of aggregate demand prevailing at the time.

The structure of the command economy was such that firms were typically nominated exclusive producers of certain products, while trading enterprises were exclusive distributors of certain products. The potential for disruption was controlled by the central planners, who could induce firms to offer certain levels of supply most of the time. The disappearance of central-planning and the emergence of alternative private-sector producers and traders could not but disrupt these old links, however, resulted in serious output collapse only in the successor states of the Soviet Union (see Kornai, 1993).

Explosive price rises following price liberalization, the emergence of unemployment resulting from the decline of the state sector and the lack of effective trade unions could put downward pressure on wages and stimulate private-sector growth through the reduction of input costs.. However, there were effects also operating in the opposite direction. Rapid closure of state firms could deprive private firms of the opportunities for learning through supplying to the state sector. There were also the fiscal feedback effect, whereby welfare expenditure rose as unemployment grew, necessitating higher taxes which further impinged on private-sector growth.

There were a number of other factors which also served to constrain private-sector growth in the early phase of transition. Among these were the lack of entrepreneurial experience, which led to high rates of business failures, and the attendant difficulty in obtaining business credit. A more general factor operating in the same direction was the low aggregate demand in the early phase of transition partly related to stabilization measures necessitated by wide-scale price liberalization. The reduction in tax revenues as the economy contracted led on occasions to reduced fiscal spending, and cutbacks in capital spending could reduce the ability of the economy to attract FDI (Blanchard, 1997, p. 125).

The driving force behind eventual recovery is of course private-sector employment creation. As this eats into unemployment the opposition to further restructuring of state firms diminishes; output increases more rapidly than before, and transition is now driven by both the private and the state sector.

Although the empirical study of the impact of reallocation, restructuring and disorganisation on the initial decline of output during transition is of interest, it is better analysed by small theoretical models of the kind used by Blanchard (1997). Our focus is more on the causes and characteristics of the sustained recovery that becomes feasible after the initial stages of transition, and the HERMIN model has been designed for this purpose.

The processes of transition and cohesion are systemic, in that they involve specific sectors (such as the restructuring of manufacturing and the growth of market services) as well as the interrelationship of all sectors in the economy through the determination of output, expenditure and income. Consequently, their analysis should ideally be carried out within a general equilibrium or a macroeconomic framework. For the most part, analysis of these processes in the CEE countries has been carried out using computable general equilibrium (CGE) frameworks (see Potocnik and Majcen, 1996). For empirical work, the main advantage of CGE models is that they can be calibrated using data for only one year.

Drawing on research findings from previous work on the EU periphery that was based on the HERMIN macro model framework, models of three CEE countries (the Czech republic, Slovenia and Romania) were developed in the late 1990s, based on that general framework and with a view to addressing dynamic issues in economies undergoing large-scale structural change in the presence of market rigidities, particularly in the labour market (Barry and Bradley, 1999; Kejak and Vavra, 1999; Ciupagea and Manda, 1999; Simoncic *et al,* 1999). Thus, the HERMIN model was intended to provide an applied theoretical schema to assist with the exploration of how the economies of the cohesion countries have *actually* functioned and how the economies of the CEE countries *must* function if they are to make a successful transition to Western-style economics. Thus, while the HERMIN models of the cohesion countries are mainly *positive* in nature (in that they attempt to explain what *is*), the prototype HERMIN models of the transition countries are in many ways *normative* (in that they attempt to explain what *must be*).

Because of the very limited time series data available, the approach used in modelling the CEE economies needs to be simplified and is intended to provide a tool for exploring two different aspects of the transition process:

1. The basic process of convergence after the first stages of transition from centrally planned to market-based economies are complete;
2. The type of public policy choices that will need to be made in CEE countries if they are to succeed in adjustment to EU membership;

## Calibrating CEE HERMIN Models

In the case of the EU cohesion economies, the nature of structural change suggests that the data sample should be restricted to the post-1980 or post-1985 period. In the case of the CEE transition economies, data constraints enable us to work only with about eight annual data observations for the period 1994-2001 at best, since the data prior to 1994 are incomplete and not very reliable. The small number of observations available prevents us from undertaking the sophisticated econometric estimation and hypothesis testing techniques commonly used to calibrate macro models. Consequently, three different approaches to model calibration (or estimation) are used in the literature of modelling the transition economies of the CEE region:

(i) Extending the data sample over different economic regimes

There is a temptation to make use of data from the pre-transition era.[95] The advantage is that this provides more annual observations and facilitates econometric hypothesis testing and estimation. The disadvantage is that the extended data sample covers three very different economic regimes: the era of communist economic planning; the years immediately following the collapse of the communist economic system; and the era of rapid recovery and growth that followed the post-communist collapse. An additional hurdle to the application of this approach is that

[95] For the Polish W8-2000 model, data for the period 1960-1998 are used (Welfe *et al,* 2002).

out of the ten CEE candidate countries six are new states established after 1990 (these are the three Baltic states, the Czech and Slovak republics, and Slovenia). For these new entities no reliable data could have been collected for the pre-transition period.

(ii) The panel data approach

This is the approach used within the CEE models contained in the NIGEM model of the world economy developed by the London-based NIESR (Barrell and Holland, 2002). A series of CEE economic data bases are assembled for the post Communist era, a generalised model is posited that is appropriate to each of the constituent economies, and cross-economy constraints are imposed. For example, a common marginal propensity to consume might be imposed on all models. This has the advantage of increasing the degrees of freedom and obtaining more precise parameter estimates. A possible disadvantage is that the cross-economy restrictions are difficult to test, and may be inappropriate.

(iii) Simple curve-fitting to post 1994 data

This is the approach we have used for all the CEE HERMIN models. The limitation of about eight to ten annual observations excludes econometrics, in the sense of hypothesis testing. By keeping the behavioural equations very simple, and ignoring lags, the number of behavioural parameters is kept to a minimum. Using ordinary least squares, a form of "curve-fitting" is used, where the derived parameters are examined and related to a range of estimates from other EU models, where longer data sets are available. In its extreme form, this reduces to the way in which computable general equilibrium (CGE) models are calibrated, by imposing all important parameters, and using one year's data to force congruence. Advantages include the tight theoretical control imposed on the model, the use of the most recent and consequently, most relevant data sample, and the use of judgement to ensure the relevance of the parameters. Disadvantages are numerous, including a complete lack of formal hypothesis testing.

The curve-fitting approach to calibrating the CEE HERMIN models relies on judgement, aided by single equation estimation using "ordinary least squares" (OLS). We look to the OLS output to give us some usable curve-fitting information on the values of model parameters that appear to make the behavioural equation roughly congruent with the data. However, we sometimes modify these calibrated parameters in the light of the underlying theoretical implications for the range of values as well as the empirical experience from others modelling exercises in the EU cohesion countries (such as Greece, Ireland and Portugal). Sometimes we impose a particular parameter value for which we have some prior (extra-model) knowledge in order to be able to estimate the remainder of the parameters. On almost all occasions we have therefore run several regressions with modified structure, from which we picked up the one fitting best the underlying assumptions. In a few equations, we are simply unable to calibrate the parameters using OLS, and in those cases we impose values that are plausible in the light of known characteristics of the economy being studied. This is not a very satisfactory situation, but is somewhat better than the technique used in computable general equilibrium (CGE) models of calibration using a single observation.

## Lessons from the Estonian HERMIN Exercise[96]

The focus of the HERMIN CEE research was on the process of integration and convergence that is likely to take place after the initial mainly institutional transition is over. Since the data for the CEE economies are very limited, they relate to the earlier transition process rather than to the post-transition structure that we wish to develop. Consequently, although we can make some use of the available data in order to calibrate CEE HERMIN models, we also need to look at other EU economies of broadly comparable size and structure to obtain guidance in our quantification of key post-transition market mechanisms such as the development of cost competitiveness, the nature of wage bargaining, the likely evolution of technological progress, and the underlying nature of production technology.

Two separate issues are involved here. First, the standard macroeconomic interrelationships that characterise the EU economies may already exist in some of the more advanced CEE economies such as the Czech Republic, Slovenia and Estonia (i.e., sensitivity to international cost-competition and wage determination mechanisms that are becoming consistent with the need to maintain a cost-competitive position in the global economy), but we may simply have too few data observations to isolate the magnitudes of the relevant elasticities and parameters. Second, it may be the case that these interrelationships are not yet fully developed, but will develop in the immediate future as the CEE economies move to full membership of the EU.

The question then must be posed: is it premature to develop HERMIN-type macroeconomic models for CEE economies where data limitations place severe restrictions on our ability to pin down likely parameter values, and where, furthermore, the underlying model structures may be undergoing evolution and change? If such empirical model frameworks are not developed, then it may prove difficult to explore and study the development choices that will undoubtedly face the CEE economies as their decision makers attempt to design policies and structures that will ensure convergence to average EU standards of living. However, if such models are developed, then their experimental and speculative nature must be kept in mind and model simulations must be regarded as explorative consistency checks rather than firm forecasts (Barry, *et al,* 2003)..

We believe that empirical modelling frameworks like HERMIN do provide an essential tool for CEE policy analysts, and although initially their structure will be tentative, they can be systematically refined and improved over time as more and better data become available. It is clear that once transition is completed, the CEE countries will end up as more or less efficiently functioning small open economies. This immediately allows us envisage many aspects of their likely ultimate

[96] A full description of the construction and testing of the Estonian HERMIN model is available in Bradley, Kangur and Kearney, 2001.

properties and structures and suggests that we should incorporate into the CEE models many of the features and parameters of other EU small open economies.

The main objective in building HERMIN models of the CEE economies was to study the options available to them as they face into the need to design policies that will take them from the immediate post-transition situation towards the EU average standard of living. After the initial transition, the CEE economies have a relative standard of living roughly comparable to that of the EU cohesion countries immediately prior to their entry into the EU. To reach the EU average, they must, therefore, grow for a sustained period at a rate higher than the EU average. Our modelling activities are designed to provide tools to facilitate an exploration of the options and likely outcomes.

In spite of all its inadequacies and failings, the HERMIN modelling framework should serve as a useful sign post for future CEE modelling developments. More and better data will become available and the model equations can be improved.

## HERMIN IN HUNGARY: A MODELLING "EXPERIENCE CURVE"

### Introductory Remarks

The Hungarian economy is a particularly interesting case to study by means of a HERMIN model. Its reforms were launched earlier than in the case of most other CEE economies, and it has a longer history of exposure to economic analysis in the "western" tradition. Building a macroeconomic model for Hungary along the lines of the HERMIN model family has a special advantage since this model was first elaborated for and tested on the Irish economy. In recent years several analysts have recognised the resemblance of the Hungarian development to that of Ireland (c.f. Gács, 2003). The dominance of multinational companies in the manufacturing of tradables and in certain services and the ensuing large profit transfers pose special macroeconomic problems in both economies. The fact that the HERMIN framework can handle the implications of the transfers explicitly is a clear advantage for policy makers who want to develop alternative scenarios for Hungary's development in the framework of EU membership and emerging financial interventions.

While a HERMIN model clearly offers assistance to strategic decisions, we are perhaps less convinced about the "effective demand" for such a policy tool from the side of the Hungarian policy makers and administration. In the past years, the Hungarian administration (at various levels) has suffered sizable delays in the preparations for the reception and utilization of various EU funds. One recent indication of this was the delay in the preparation of the National Development Plan (NDP), as well as of the Comprehensive Development Plan (CDP). While the NDP was presented to Brussels in March and April 2003, there is no sign yet of the CDP, despite promises since 1999.

There are probably two main reasons for these problems experienced in putting together national plans in Hungary. First, there is a strong psychological and organizational inhibition to macroeconomic planning due to the discredited reputation of central planning under the communist system. Somehow in the political usage of words and phrases "planning" has become identical with the communist system, so even those experts who still possess skills of macroeconomic planning would hesitate to initiate or join such an activity in the current atmosphere. Second, in the past decade a general antagonism has developed divisions among Hungarian policy makers belonging to different political parties (particularly those on the left and right side of the political spectrum) and this spoiled many administrative developments of national interest. The prevailing hostile antagonism could have prevented reaching the minimal level of consensus required to put together and adopt development plans like these in an efficient and timely fashion.[97].

There is reason for concern that in this environment many crucial issues related to the future reception and use of Structural Funds have not yet been resolved. For example, the delineation of NUTS II level regions is not finalised yet and disputes about it continue. An informed, professional debate about the concept of the use of Structural and Cohesion Funds has not yet been conducted, particularly not about the issue of whether EU support should be used overwhelmingly to bring up underdeveloped regions or to enhance the activity of existing growth poles. Without the long postponed reform of local government financing it is difficult to foresee that even the limited local public co-financing part of the NDP (EUR 56 million for 2004-2006) will be secured. On the macro-level, the central public part of the co-financing of the NDP (EUR 594 million) seems to be in danger, given the high budgetary deficits in 2002-2003, high public indebtedness at the level of 57-58 per cent of GDP, as well as the necessity to slash the comparatively high Hungarian VAT tax rates in the coming years.

At the level of individual projects which require the collaboration of neighbouring micro-regions as well as of central authorities, the dominance of party politics may cause serious harm. As long as the Hungarian polity makers are not able to accept that the economic and political returns from development projects with EU funds cannot be utilized in a partisan political way, the necessary level of collaboration and consensus will be missing for these projects.

Even if the political and institutional environment for dealing with the EU's Structural and Cohesion Funds does not look mature enough yet in Hungary, there is hope that the necessary progress can be made in the next one or two years. One should not wait with elaborating tools that can assist policy makers until all the necessary conditions of the application are available. This is what led us to launch the work on the elaboration of the Hungarian HERMIN model.[98]

In the case of each economy that was previously modelled using the HERMIN framework, several country-specific technical problems emerged in the adaptation of the model to local conditions. In the case of Hungary the excellent quality of the

[97] Since even the referendum in April 2003 on joining the EU could not receive full support of the main political parties, it is no surprise that putting together basic documents and the necessary institutions to control EU funds are also strongly politicised in Hungary. About the "immature" Hungarian political elite, see the Supplement on Hungary in the Financial Times, 27 May 2003.

[98] Full details of the new Hungarian HERMIN model are available in Bradley and Gács (2003).

National Accounts statistics in Hungary turned out to be a mixed blessing. Hungary's National Accounts statistics have a long tradition, with relatively reliable, decade-long, comprehensive data series for the specific macro-sectoral variables that HERMIN requires. The Hungarian National Accounts statistics, however, have the drawback that they are ways at least two years behind the present time. For instance, in June 2003 the data end in the year 2000. In addition, since publicly available and consistent budgetary data for Hungary are very scarce, one has to use data from the IMF's Government Finance Statistics. The latter, however, is as a rule, not compatible with data in the National Accounts statistics. The problem is pronounced in the case of Hungary, because due to Hungary's vulnerability to indebtedness and the precarious situation of the budget modelling links to the budget needs special attention.

Finally, in the case of Hungary it is possible that the missing explicit modelling of the monetary sector by HERMIN would be a drawback that needs to be addressed. In the past decade Hungary had various exchange rate regimes and monetary regimes which had deep, but distinct impacts on the production and exports of tradables as well as on the disinflation process. Moreover, the major nominal variables of the model will become decisive in the coming years due to Hungary's pending entry the euro-zone with the implication of the requirement to fulfil the Maastricht criteria.

## Modelling with Limited Resources: Building the Hungarian HERMIN

One of the reasons why policy-makers are often reluctant to engage in model-building is that there is a misguided notion that this is an exercise that requires large resources and delivers disappointing returns in terms of practical policy analysis and guidance. The HERMIN model-building system was designed with this critique in mind, and it attempts to refute these views.

Let it be said first that HERMIN models tend to be built in environments where there has often been little by way of previous modelling experience and, in the case of the CEE area in particular, little by way of previous econometric research that could guide a more sophisticated modelling exercise.[99] Consequently, a critique of the basic simplicity of the HERMIN model tends to overlook the fact that the choice – particularly in CEE economies - is often between a simple model or no model at all!

The following steps are standard in any HERMIN:

i. A review of the existing econometric research that is relevant to model building, e.g., price determination, consumption studies, employment and investment equations, wage determination, labour force participation, etc.

ii. The preparation of a basic HERMIN model schema, of the kind illustrated in above Figure 1, and the articulation of this schema into a formalised set of equations (behavioural and identities) in the WINSOLVE user-friendly notation.

[99] Hungary, however, does not belong to the countries without experience in econometric modelling.

iii. The designation of a core set of "basic" or "necessary" raw data series from local and international data sources. The point here is that not all the 250-plus variables in a HERMIN model have to be collected and computerised from original National Accounting and other sources.[100] A typical HERMIN model has about sixty to one hundred "basic" data series from local sources, of which over twenty are taken from standard international sources that are common to all HERMIN models.[101]

iv. One constructs a TSP batch file that generates all the remaining HERMIN data series from the "basic" or "necessary" series.

v. One then explores the model calibration, using the previously defined model database, and simple curve-fitting techniques. The standardisation of the HERMIN design is an advantage here, since it is possible to examine an international cross-section of HERMIN calibration results, and to draw on them if – due to data limitations – it is impossible to obtain a plausible "curve fit".

vi. Having selected a plausible set of parameters, one finalises the model design and proceeds to the model testing phase. This usually consists of the following elements:

   a. Basic within-sample simulations to test the consistency of the model, and to detect programming and specification errors. For Hungary, this is the period 1992-2000, i.e., nine years;

   b. Construction of a baseline projection, typically for the period from the last year of historical data, out to about 2020. In the case of Hungary, currently the year 2000 is the last one for which a complete set of National Accounts are available that is consistent with earlier data.

   c. Execution of a series of policy and other "shocks" that examine how international and domestic policy variables affect the model.

If the model successfully passes this sequence of steps, it can be commissioned for use in policy analysis. For example, its use for NDP analysis requires the addition of a series of equations, of the type discussed in the second HERMIN-related paper in this volume.

In the Hungarian case, it could be said that the modelling exercise benefited from an "experience curve". Problems that might have looked intractable if treated in isolation, were relatively easy to solve in the light of the previous HERMIN modelling activities. It was exactly for this reason that attempts had been made to keep a degree of standardisation in the design of the "basic" HERMIN model. Many previous modelling projects have either failed, or not lived up to expectations because of what might be termed "premature" complexity.

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[100] For example, if one gathers manufacturing output in value (OTV) and the deflator of manufacturing output (POT), one does not also have to gather output in real terms (OT), since OT=OTV/POT. Similarly, if one has output (OT) and employment (LT), one does not have to gather productivity (LPRT), since LPRT=OT/LT.

[101] All the international data are taken from the NIESR NIGEM database, which has the added advantage that the National Institute's authoritative forecasts can be used (NIGEM, 2003).

## SUMMARY AND CONCLUSIONS

The first HERMIN model – of the Irish economy – was built over ten years ago. The most recent addition is the Hungarian HERMIN model, which is being tested and commissioned at present. During the intervening years HERMIN models have been built for Greece, Portugal, Spain, Northern Ireland, the Czech Republic, Slovenia, Romania, East Germany, Latvia, Estonia and Poland. Work is in progress on a HERMIN model for the Italian *Mezzogiorno,* as an ESRI-CRENoS collaboration. All the EU Objective 1 countries have HERMIN models, and so have two – soon to be three – of the big "macro" regions. Among the acceding states of CEE, only Lithuania and Slovakia remain HERMIN-less!

In the case of the Irish HERMIN model, a major programme of sophisticated model-based research has resulted in the construction of a more disaggregated (11 sector) model, used in the ESRI biennial *Medium-term Review,* a sophisticated and detailed forecasting exercise with a five-year time horizon. The basic four-sector HERMIN has been modified to include model-consistent expectations and used to explore the "expansionary fiscal contraction " hypothesis (Bradley and Whelan, 1997).

But it remains the case that the HERMIN modelling project has developed in an "extensive" rather than in an "intensive" way. Focus has been on extending the same basic model structure to an ever-wider group of countries, many of which lack modelling "cultures" and suffer from a serious lack of long time-series data that would facilitate and support econometric research. Only in the case of Estonia and Poland has the work advanced to the stage that has permitted a "deepening" of the modelling in the direction of a more useful and appropriate level of sectoral disaggregation. It remains to be seen if the type of model standardisation encouraged by the HERMIN project can survive in an era where the "lagging" EU countries are no longer "lagging", and the CEE countries acquire the necessary expertise to move beyond the basic HERMIN model.

But HERMIN models are not just built in order to study comparative economic structures. Their main utility lies in their ability to explore the macro-sectoral mechanisms through which the EU Structural Funds can alter these structures and promote cohesion. In the second HERMIN-related paper we turn to this important issue.

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# 10

# MACRO IMPACT EVALUATION OF NATIONAL DEVELOPMENT PLANS: IRELAND AND ESTONIA*

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## INTRODUCTION

The EU Structural Fund programmes, when they are in their design phase, are usually referred to as National Development Plans (or NDPs). However, when the NDPs have been approved by the European Commission, and are being implemented, they are usually referred to as Community Support Frameworks (or CSFs), and we will use the term CSF in this paper. First we describe how macroeconomic model-based techniques were developed in the late 1980s to carry out systematic ex-ante impact evaluations of the Irish CSF 1989-93 (Bradley, Fitz Gerald and Kearney, 1992; Bradley, et alet al., 1993 and 1995). This involved adapting the HERMIN model framework (described in Chapter 9) to take account of the re-structuring effects of the EU programmes, and how the separate role of the Structural Funds can be separated from other external and domestic influences.

We then show how the early Irish work was extended in a series of analyses of the CSFs for the four cohesion countries – Greece, Ireland, Portugal and Spain - and resulted in the further evolution of a modelling framework (HERMIN) specifically tailored to facilitate national and cross-national comparative NDP/CSF impact analysis.[102]

The economic reforms that had been carried out from the mid-1990s onwards in the CEE area involved the emergence of processes that had many similarities with earlier developments in the EU cohesion countries. We describe the first systematic impact analyses of pre-accession Structural Funds that were carried out for Estonia

* Based on a paper presented at the Fifth European Conference on Evaluation of the Structural Funds, *Challenges for Evaluation in an Enlarged Europe,* Budapest, June 26-27, 2003.

[102] The name HERMIN draws attention to the intellectual origins of the CSF modelling framework in the earlier HERMES model of d'Alcantara and Italianer, 1982. HERMIN has many of the structural characteristics of HERMES (HER), but is smaller in scale (MIN)!

in 2000, where revised and improved HERMIN models have recently been used in the analysis of the Estonian NDP 2004-2006.

Influenced by the MEANS programme of the mid-1990s (MEANS, 1995), we show how CSF impact analysis in the cohesion countries was combined with analysis of the impact of the Single Market, in a move away from what the MEANS programme refers to as a restricted CSF "theory of action" towards a more holistic "explanatory" and "global" study of cohesion, where a wider range of EU policy initiatives beyond investment aid were can be additional driving forces of transformation and growth.

Finally, we review the main issues in our paper and discuss some of the administrative and practical challenges that arise when HERMIN models are used to evaluate the impacts of NDPs and CSFs. The complexity of such analysis, combined with the relative sophistication of the modelling tools, gives rise to particular challenges in presenting the impact analysis results in a way that feeds into the institutional learning process for the CSF. We make some suggestions on how CSF impact results should be presented, drawing on the Irish and Estonian experiences. Finally, we briefly compare and contrast the HERMIN-based approach to CSF impact analysis with recently proposed alternatives that are based on a looser and more eclectic approach to econometric modelling and we offer explanations for why these two approaches can produce radically different impact evaluations.

## HERMIN AND A THE METHODOLOGY FOR CSF IMPACT ANALYSIS

### Simplifying and Aggregating the CSF Programmes

A useful and logical way of aggregating the CSF investment measures and their constituent Operational Programmes (OPs) is to consider the following three categories:

1. Investment expenditures on physical infrastructure;
2. Investment expenditures on human resources;
3. Expenditures on direct production/investment aid to the private sector.

For each of these economic categories of public and private expenditure, there are three possible sources of funding:

i. EU transfers in the form of subventions to the domestic public authorities;

ii. Domestic public sector co-financing;

iii. Domestic private sector co-financing.

CSF actions influence the economies through a mixture of supply and demand effects. Short term demand (or Keynesian) effects arise as a consequence of increases in the expenditure and income policy instruments associated with CSF policy initiatives. Through "multiplier" effects there will be some further knock-on increases in all the components of domestic expenditure (e.g., total investment, private consumption, the net trade surplus, etc.) and the components of domestic output and income. These demand effects are of transitory importance and are not the *raison d'être* of the CSF, but merely a side-effect. Rather, the CSF interventions are intended to influence the long-run supply potential of the economy.

These so-called "supply-side" effects arise through policies designed to:

1. increase investment in order to improve physical infrastructure as an input to private sector productive activity;
2. increase human capital, through investment in training and education, as an input to private sector productive activity;
3. channel public financial assistance to the private sector to stimulate investment and productive efficiency, thus increasing factor productivity and reducing sectoral costs of production and of capital.

Thus the CSF interventions are designed in order to improve the regional aggregate stock of public infrastructure and human capital, as well as the private capital stock. Providing more and better infrastructure, increasing the quality of the labour force, or providing investment aid to firms, are the mechanisms through which the CSF improves the output, productivity and cost competitiveness of the economy. In a certain sense, these policies create conditions where private firms enjoy the use of additional productive factors, sometimes at no cost to themselves. Alternatively, they may help to make the current private sector inputs that firms are already using available to them at a lower cost, or the general conditions under which firms operate are improved as a consequence. In all these ways, positive externalities may arise out of the CSF interventions.

Recent advances in growth theory have addressed the role of spill-overs or externalities which arise from public investments, for example in infrastructure or in human capital. Furthermore this literature has investigated how technical progress can be affected directly through investment in research and development (R&D). Here too externalities arise when innovations in one firm are adopted elsewhere, i.e., when such innovations have public good qualities.

Two main types of beneficial externalities are likely to enhance the demand-side (or neo-Keynesian) impacts of well designed investment, training and aid policy initiatives. The first type of externality is likely to be associated with the role of improved physical infrastructure and of training in boosting output directly. This works through mechanisms such as attracting productive activities through foreign direct investment, and enhancing the ability of indigenous industries to compete in the international market place. We shall call this an 'output externality' since it is well known that the range of products manufactured in developing countries changes during the process of development, and becomes more complex and technologically advanced.

The second type of externality arises through the increased total or embodied factor productivity likely to be associated with improved infrastructure or a higher level of human capital associated with training and education. We shall call this a 'factor productivity externality'. Of course, a side effect of increased factor productivity is that, in the highly restrictive context of fixed output, labour is shed and unemployment rises. The prospect of such "jobless growth" is particularly serious in economies where the recorded rate of unemployment as well as the rate of hidden unemployment are already high. Thus, the factor productivity externality is a two edged process: industry and market services become more productive and competitive, but labour demand is weakened if output growth remains weakfixed. However, oOn the plus side, however, factor productivity is driven up, real incomes rise, and these effects cause knock-on multiplier and other benefits throughout the economy. Thus, the role of the output externality is more unambiguously beneficial than the factor productivity externality: the higher it is, the faster the period of transitional growth to a higher income plateau.

The elasticities, particularly in relation to infrastructure, can be selected from a review of the extensive international research literature in this area (for full details, see Bradley, Morgenroth and Untiedt, 2002).[103] The international literature suggests that the values for the elasticity of output with respect to increases in infrastructure are likely to be in the region between 5 and 40 per cent, with small regions and countries characterised by values nearer the lower end of the scale (5 to 20 per cent).[104] With respect to human capital, elasticities in the same range also appear reasonable (ESRI, 2002).

How enduring are the beneficial externality elasticities likely to be? The infrastructure deficit in the Objective 1 countries (i.e., those with GDP per head less than 75 percent of the EU average) and in the CEE countries is quite large, and is unlikely to match up to the level pertaining in the more developed EU countries until well after the year 2010. Given this and the fact that there are substantial returns to the elimination of bottlenecks which will take some time to accomplish, it may be quite reasonable to assume that the chosen externality elasticities will capture the benefits properly over the time period for which the simulations are carried out. For the same reasons it is unlikely that diminishing returns will set in for the immediate future.

## Linking the Externality Mechanisms into the HERMIN Model

### *Output Externalities*

The output externalities can be viewed as operating directly through the multinational and indigenous firm location and growth process that is so important in the case of the EU periphery and, more recently, in the CEE countries. This draws directly from the extensive literature surveyed in Bradley, Morgenroth and

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[103] Since research does not always exist for the lagging Objective 1 and CEE countries, we are forced to utilise those for analogous or more advanced economies. However, sensitivity analysis can be carried out over a plausible range of values of the externality elasticities. (see below).

[104] The implications of these externality elasticities will become clearer below when we set out the actual functional relationships that are incorporated into the HERMIN models.

Untiedt (2002). The treatment of the manufacturing sector in HERMIN posits a supply side approach in which the share of the world's output being allocated to, or generated within, a peripheral country or region is determined by measures of domestic and international cost competitiveness (Bradley and Fitz Gerald, 1988).

However, this neglects the fact that many industries will require more than simply an appropriate level of, say, labour costs before they locate in, or grow spontaneously in, the EU periphery. Without an available labour force that is qualified to work in these industries, or without appropriate minimum levels of physical infrastructure, many firms simply may not be able even to consider the periphery as a location for production. Thus, a more realistic framework is one which posits a two stage process in which basic infrastructural and labour force quality dictates the number of industries which could conceivably locate in the periphery, while competitiveness decides how many of the industries which <u>could</u> locate in the periphery actually <u>do</u> locate there.

One simple way of describing this process is to link the growth of infrastructure and the increases in human capital to a modified version of the HERMIN behavioural equation that is used to determine manufacturing sector output *(OT)*. As discussed previously in Chapter 9, we posit a hybrid supply-demand equation of the form:

$$\begin{aligned} log(OT) &= a_1 + a_2 log(OW) + a_3 log(ULCT \,/\, POT) \\ &\quad + a_4 log(FDOT) + a_5 log(POT \,/\, PWORLD) + a_6 t \end{aligned}$$

where *OW* represents external (or world) demand, and *FDOT* represents the influence of domestic absorption. The two remaining terms represent real unit labour costs *(ULCT/POT)* and price competitiveness *(POT/PWORLD)*. To take account of output externalities associated with infrastructure and human capital, the following two terms are added to the above equation:

$$\eta_1 log\,(KGINF_t \,/\, KGINF_0) + \eta_2 log\,(NTRAIN_t \,/\, NTRAIN_0)$$

where output in the manufacturing sector *(OT)* is now directly influenced by any increase in the stock of infrastructure and human capital *(KGINF* and *NTRAIN*, respectively) over and above a baseline value for these stocks ($KGINF_0$ and $NTRAIN_0$, respectively).[105] For the present we ignore any interactions and complementarities that may exist between physical infrastructure and human capital, since so little is yet known about this aspect of the CSF.[106]

Such a modification attempts to capture the notion that a peripheral region or country can now attract a greater share of mobile investment than it otherwise could in the absence of improved infrastructure and human capital. Another, demand side, way of interpreting this externality could be to assume that the CSF may improve

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[105] Thus, if the stock of infrastructure increases by 1 per cent relative to the baseline stock, output in manufacturing *(OT)* is boosted by $\eta_1$ per cent. If the stock of human capital increases by 1 per cent relative to the baseline stock, output in manufacturing *(OT)* is boosted by $\eta_2$ per cent

[106] The possible interaction between physical infrastructure and human capital is potentially of great importance, and is at the centre of the optimality of the CSF design.

the quality of goods produced domestically and thus improve the demand for goods produced by firms already located in the country, whether foreign or indigenous.

*Factor Productivity Externalities*

A factor productivity externality can be associated with improved supply conditions in the economy brought about as a result of investment in human capital and public infrastructure. These can be incorporated into HERMIN by endogenising the "scale" parameter in the CES production function, '*A*', which is now modelled as a function of the stock of public and human capital. Increases in the value of '*A*' imply that for a given amount of inputs a higher level of output is produced.

We can illustrate this schematically in terms of the simple production function:

$$Q = A * f(L, I)$$

where $A$ is the scale parameter, which can be considered to represent the state of technology, and $L$ and $I$ are the labour and investment inputs, respectively. Public infrastructural investment will increase the efficiency of the market services sector by cutting down on the costs of producing transport and other communication services, and by opening up greater opportunities for domestic competition to take place in the provision of non-traded goods. Such cost reductions will have a favourable supply-side effect on the internationally exposed manufacturing sector.

The infrastructure factor productivity externality can be incorporated into the production process in manufacturing and market services as follows:

$$A_t = A_0 (KGINF_t / KGINF_0)^{\eta}$$

where $A_0$ is the original (i.e., pre-CSF) estimated value of the scale parameter and $\eta$ is an unknown externality elasticity that can be assigned different numerical values in the empirical model. The variable *KGINF* is the stock of public infrastructure, computed as an accumulation of real infrastructure investments (using the perpetual inventory method with a specified depreciation rate). The baseline stock of infrastructure, $KGINF_0$, is taken as the stock that would have been there in the absence of any CSF infrastructural investments made during the period under consideration.

Similarly, the CSF Social Fund programmes on education and training can be considered to promote the efficiency of the workforce in both manufacturing and services sectors and can give rise to a human capital externality. Incorporation of externality effects associated with the accumulation of human capital is not as straightforward as in the infrastructure case, since there is no readily available measure of the stock of human capital equivalent to the stock of infrastructure. However, one can estimate a measure of the extra number of trainees funded by the CSF schemes (see below for details). Hence, as a first approximation, one can use the inputs into training as a measure of the unknown outputs, although if the training courses are badly designed and poorly executed, the relationship between training and increased human capital will be tenuous.[107]

Suppose we assume that, prior to the implementation of the CSF, the number of labour force participants trained to a specified level, $NTRAIN_0$, is known. If the ESF element of the CSF is used to train an additional number of people, giving a total of $NTRAIN_t$ trained labour force participants in year *t*, then the scale parameter in the production function can be modified as follows:

$$A_t = A_0 \, (NTRAIN_t \,/\, NTRAIN_0)^{\eta}$$

where $A_0$ is the original estimated value of the scale parameter. In the empirical model, this externality is incorporated into the treatment of both the manufacturing and service sectors.

**Handling CSF Physical Infrastructure Impact Analysis**

The HERMIN model assumes that any CSF-based expenditure on physical infrastructure that is directly financed by EU aid subvention *(IGVCSFEC)* is matched by a domestically financed public expenditure *(IGVCSFDP)* and a domestic privately financed component *(IGVCSFPR)*. Hence, the total public and private NDP infrastructural expenditure *(IGVCSF)* is defined in the model as follows (in current prices):

$$IGVCSF = IGVCSFEC + IGVCSFDP + IGVCSFPR$$

Inside the HERMIN model, these CSF-related expenditures are converted to real terms (by deflating the nominal expenditures by the investment price) and are then added to any existing (non-CSF) real infrastructural investment, determining total real investment in infrastructure *(IGINF)*. Using the perpetual inventory approach, these investments are accumulated into a notional 'stock' of infrastructure *(KGINF)*:

$$KGINF = IGINF + (1\text{-}0.02) * KGINF(\text{-}1)$$

where a 2 per cent rate of stock depreciation is assumed. This accumulated stock is divided by the (exogenous) baseline non-CSF stock $(KGINF_0)$ to give the CSF-related relative improvement in the stock of infrastructure *(KGINFR)*:

$$KGINFR = KGINF \,/\, KGINF_0$$

It is this ratio that enters into the calculation of any externalities associated with improved infrastructure, as described above.

As regards the public finance implications of the CSF, the total cost of the increased public expenditure on infrastructure *(IGVCSF - IGVCSFPR)* is added to the domestic public sector capital expenditure *(GK)*. Any increase in the domestic public sector deficit *(GBOR)* is limited by the extent of EU CSF-related aid subventions *(IGVCSFEC)*. Whether or not the post-CSF public sector deficit rises

[107] The macro output effects of a poorly designed training scheme, whose implementation was measured in terms of inputs, would show up in the form of very low externality elasticities. In other words, the macro benefits would be merely the short-run Keynesian income-expenditure ones.

or falls relative to the no-CSF baseline will depend both on the magnitude of domestic co-financing and the stimulus imparted to the economy by the NDP shock. This differs from country to country as well as from programme to programme.

In the absence of any externality mechanisms, the standard HERMIN model calculates the demand (or Keynesian) effects of the CSF infrastructure programmes, the supply effects being only included to the very limited extent that they are captured by any induced shifts in relative prices. This transitory effect will depend on the size of the policy multipliers, which will be known from the testing results of any specific country HERMIN model.

We can now switch in various externality effects to augment the conventional demand-side impacts of the CSF infrastructure programmes in order to capture likely additional supply-side benefits. In each case, the strength of the externality effect is defined as a fraction of the improvement of the stock of infrastructure over and above the baseline (no-CSF) projected level *(KGINFR),* i.e.,

$$\text{Externality effect} = KGINFR^{\eta}$$

where $\eta$ is the externality elasticity. The way in which the externality elasticity can be approximately calibrated numerically, drawing on the empirical growth theory research literature, was discussed above (see Bradley, Morgenroth and Untiedt, 2002 for full details). In any model-based simulations, the externality effects can be phased in linearly over an extended period, reflecting the implementation stages of the CSF programmes and the fact that benefits from improved infrastructure may only be exploited with a lag by the private sector in terms of increased activity.

Externality effects associated with improved infrastructure are introduced into the following areas of the HERMIN model: the *direct* influence on manufacturing output *(OT)* of improved infrastructure *(KGINF),* i.e. any rise in the stock of infrastructure relative to the no-NDP baseline *(KGINFR)* will be reflected in a rise in output; and total factor productivity *(TFP)* in both the manufacturing and service sectors is increased.

The first type of externality is an unqualified benefit to the economy, and directly enhances its performance in terms of increased manufacturing output for given factor inputs. However, the second type is likely to have a negative down-side, in that labour is shed as total factor productivity improves, unless output can be increased to offset this loss. Inevitably production will become less labour intensive in a way that may differ from the experience of more developed economies in the EU core.

## Handling CSF Human Resources Impact Analysis

The HERMIN model assumes that any expenditure on human resources directly financed through the ESF by the EU *(GTRSFEC)* is matched by a domestically financed public expenditure *(GTRSFDP).* Hence, the total expenditure on human resources *(GTRSF)* is defined in the model as follows (in current prices):

$$GTRSF = GTRSFEC + GTRSFDP$$

As regards the public finance implications for each of the Objective 1 countries, the total cost of the increased expenditure on human resources *(GTRSFEC+GTRSFDP)* is added to public expenditure on income transfers *(GTR)*. However, the increase in the domestic public regional deficit *(GBOR)* is limited by the extent of CSF aid subventions *(GTRSFEC)*.

Since the complex institutional detail of the many ESF human resource training and education programmes cannot be handled in a small macroeconomic model like HERMIN, one needs to simplify drastically. Each trainee or participant in a training course is assumed to be paid an average annual income *(WTRAIN)*, taken to be a fraction of the average industrial wage *(WT)*. Each instructor is assumed to be paid the average annual wage appropriate to the market service sector *(WN)*. We assume an overhead on total wage costs to take account of buildings, equipment, materials, etc *(OVERHD)*, and a trainee-instructor ratio *(TRATIO)*. Hence, total CSF expenditure *(GTRSF)* can be written as follows (in nominal terms):

$$GTRSF = (1+OVERHD) * (SFTRAIN * WTRAIN + LINS * WN)$$

where *SFTRAIN* is the number of trainees being supported and *LINS* is the number of instructors, defined as *SFTRAIN/TRATIO*.[108] This formula is inverted in the HERMIN model and used to estimate the approximate number of extra trainees that can be funded by the CSF for a given total expenditure *GTRSF* on human resources, i.e.,

$$SFTRAIN = (GTRSF/(1+OVERHD)) / (WTRAIN + WN/TRATIO)$$

The wage bill of the CSF programme *(SFWAG)* is as follows:

$$SFWAG = SFTRAIN * WTRAIN + LINS * WN$$

The number of CSF-funded trainees (measured in trainee-years) is accumulated into a 'stock' *(KSFTRAIN)* by means of a perpetual inventory-like formula, with an assumed 'depreciation' rate of 5 per cent:

$$KSFTRAIN = SFTRAIN + (1-0.05) * KSFTRAIN(-1)$$

In order to quantify the increase in the stock of human capital (measured in trainee years), we need to define the initial pre-CSF stock of human capital, $KTRAIN_0$. This is a conceptually difficult challenge, and we are again forced to simplify drastically. We base our measure of human capital on the average number of years of formal education and training that the labour force has achieved prior to the CSF. We can cut through the complex details of the education system and stylise approximate it as follows:

$$KTRAIN_0 = YPLS * FPLS * DPLS + YHS * FHS * DHS$$
$$+ YNUT * FNUT * DNUT + YUT * FUT * DUT$$

where the notation is as follows:

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[108] Even if we were able to obtain full details of the inputs and outputs of the ESF training schemes, the HERMIN-type simplification would still be of use since it "endogenises" the ESF schemes in the macro impact simulations in a way that would be very difficult to do with the ex-post ESF data.

*YPLS* = standardised number of years in primary and lower secondary cycle
*FPLS*= fraction of population with primary and lower secondary cycle education
*DPLS*= "discount" factor for years of primary and lower secondary cycle[109]

*YHS* = standardised number of years higher secondary cycle
*FHS* = fraction of population with higher secondary education
*DHS* = "discount" factor for years of higher secondary cycle

*YNUT* = standardised number of years in non-university tertiary cycle
*FNUT* = fraction of population with non-university tertiary education
*DNUT* = "discount" factor for years of non-university tertiary cycle

*YUT* = standardised number of years in university tertiary cycle
*FUT* = fraction of population with university tertiary cycle
*DUT* = "discount" factor for years university tertiary cycle

The accumulated stock of CSF trainees *(KSFTRAIN)* is added to the exogenous baseline stock of trained workers ($KTRAIN_0$) and is divided by the baseline stock to give the relative improvement in the proportion of trained workers associated with the CSF human resources programmes:

$$KTRNR = (KTRAIN_0 + KSFTRAIN) / KTRAIN_0$$

and it is this ratio *(KTRNR)* that enters into the calculation of externalities associated with improved human resources.

In the absence of any externality mechanisms, the HERMIN model can only calculate the income-expenditure effects of the CSF human resource programmes. These effects are limited in magnitude. In addition, a sizeable fraction of the CSF payments to trainees may simply replace existing unemployment transfers. The

[109] The reason for including a "discount" factor is as follows. Although many studies assume that a single year of primary cycle education adds as much to human capital (and is as valuable a contribution as an input to productive working activity), as one year of university education, this is very unlikely to be true. Adding up the years of education without weighting them is likely to bias the level of human capital upwards. For example, since primary and lower secondary level education is becoming the norm throughout the EU, we might discount these years relative to years of higher secondary, tertiary non-university and tertiary university. If one sets the discount factor to zero, this is equivalent to assuming that primary and lower secondary education is a prerequisite for acquiring human capital, and not a part of productivity-enhancing human capital.

'overhead' element of these programmes (equal to *OVERHD*SFWAG)* is assumed to boost non-wage public consumption directly.

The HERMIN model introduces externality effects to augment the demand-side impacts of the CSF human resource programmes. In each case, the strength of the externality effect is defined as a fraction of the improvement of the stock of 'trained' workers over and above the baseline (no-CSF) projected level, i.e.,

$$\text{Externality effect} = KTRNR^{\eta}$$

here $\eta$ is the externality elasticity. In the model-based simulations, the externality effects can be phased in linearly over an extended period, reflecting the implementation stages of the CSF programmes and the fact that benefits from improved infrastructure may only be exploited with a lag by the private sector in terms of increased activity.

Two types of externality effects associated with human capital are introduced into the HERMIN model:[110]

1. The *direct* influence on manufacturing output (OT) of improved human capital, i.e. any rise in the "stock" of human capital relative to the no-CSF baseline (proxied by *KTRNR*) will be reflected in a rise in output.
2. *Labour embodied* technical change in the manufacturing and service sectors is increased, where a given output can now be produced by less workers or where any increased level of sectoral output can become more skill intensive but less employment intensive.

## HERMIN AND EU COHESION ANALYSIS

### Introduction

The first HERMIN model was developed for Ireland as part of the ex-ante analysis of CSF 1989-93 (Bradley, Fitz Gerald and Kearney, 1992). During the period 1992-1995 HERMIN models were built of the other three Objective 1 countries, Greece, Portugal and Spain (Bradley, Modesto and Sosvilla-Rivero, eds., 1995). The Greek HERMIN model, together with updated versions of all Objective 1 models, are described in ESRI (1997) and ESRI (2002).

In this section we give an overview of how these four models were used in a recently completed ex-post analysis of CSF 1994-99. This was the second CSF for

[110] It is well known that untrained and/or unskilled workers compete in the labour market in a very ineffective way, and are much more likely to end up as long-term unemployed than are skilled/trained workers (Layard, Nickell and Jackman, 1991). We assume that all ESF trainees are in the unskilled or semi-skilled category, and that their temporary removal from the labour force for the duration of their training scheme has almost no effect on wage bargaining behaviour through the Phillips curve 'pressure' effect in the HERMIN wage equation. This assumption is consistent with the stylised facts of the hysteresis in Irish and Portuguese labour markets (Bradley, Whelan and Wright, 1993; Modesto and das Neves, 1993), and is implemented in the HERMIN model by defining a 'corrected' measure (URP) of the unemployment rate (UR) for use in the Phillips curve.

these four countries, and took over from the earlier CSF 1989-93. Complete details are available in ESRI (2002).

We first give some contextual information of the ex-post analysis, and follow with an overview of the results for Ireland. We then give a brief summary of the three other country impacts, and finish with some information on the sensitivity analysis.

**Impact Analysis of CSF 1994-99: Overview**

The CSF 1994-99 ex post impact analysis was executed by means of the following sequence of simulations:

i. A model simulation is carried out, starting in the year 1993 (the year before CSF 94-99 was implemented), and continuing the simulation out to the year 2010, i.e., eleven years after the termination of CSF 94-99;

ii. For the purposes of isolating the separate impacts of CSF 94-99, the carry-over impacts of CSF 89-93 are ignored, as well as the continuation of CSF aid under the current CSF 2000-2006;[111]

iii. The CSF 94-99 policy shocks are then extracted, i.e., the CSF 94-99 expenditures are set at zero and the model re-simulated. No other changes are made., and no attempt is made to design a "substitute" domestically funded public investment programme that would have replaced a "missing" CSF 94-99. This is a very artificial assumption, since in the absence of CSF 94-99 there almost certainly would have been substitute domestically funded public investment programme, albeit smaller in magnitude;

iv. Initially a common set of externality elasticities are assumed for each country HERMIN model, in the middle of the range of values found in a comprehensive survey of the international literature.[112] Ideally one should then use the actual ex-post realised CSF expenditures of CSF 1994-99. But these were not always available for every country in the format required for macro analysis. In the interests of uniformity, the planned CSF expenditure data were used, as contained in the CSF 94-99 treaty documents. While these give a fairly accurate total for the expenditures, they do not always give an accurate picture of the ex-post scheduling of the expenditures.[113]

v. It can reasonably be assumed that, in the absence of such large-scale public policy shocks, the underlying structure of the economies would have changed and that the use of HERMIN models calibrated with CSF-inclusive data is

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[111] In other words, we are examining the ex-post impact of CSF 1994-99 in isolation, i.e., as a single CSF implemented over the years 1994-99, and discontinued thereafter. We return to this point in our concluding section.

[112] We relax this assumption later in a sensitivity analysis, where we take upper and lower bounds, and are in a position to relate our elasticity selections to qualitative information from national ex-post examinations.

[113] This is only an important issue in the case of Greece, where the planned even spread of expenditures over the six years 1994-99 was actually implemented in a very different way. Ex-post, the Greek CSF expenditures were re-programmed to the later years.

invalid. This is the so-called "Lucas critique" of the use of econometric models to analyse policy impacts (Lucas, 1976). However, the HERMIN models contain explicit sub-models of the structural changes that are associated with the operation of the CSF, so the validity of the Lucas critique is weakened.

vi. The "without-CSF" simulation results are subtracted from the "with-CSF" simulation results, and this is used as a measure of the contribution of the CSF.

To assist in the interpretation of the CSF simulation results, it is useful to keep some summary measures in mind. The total size of the CSF in each country relative to its GDP *(GECSFRAT)* is shown in Table 1. The CSF expenditures have been converted into local currencies (being used during the period of operation of CSF 94-99), and the actual GDP outturn is used to calculate the percentage share, *GECSFRAT*. As a share of total GDP, the largest CSFs were those of Greece and Portugal, where the expenditures constituted about 3 percent of GDP per annum. The next largest was that of Ireland, between 1.5 and 1.8 percent of GDP. Spain was the smallest, at about 1.2 percent of GDP.[114]

**Table 1: Total CSF 94-99 Expenditure as Percentage of GDP (*GECSFRAT*)**

| | Greece | Ireland | Portugal | Spain |
|---|---|---|---|---|
| 1993 | 0 | 0 | 0 | 0 |
| 1994 | 3.19 | 1.68 | 3.17 | 1.16 |
| 1995 | 3.05 | 1.75 | 3.03 | 1.15 |
| 1996 | 2.99 | 1.67 | 3.00 | 1.17 |
| 1997 | 2.89 | 1.56 | 2.95 | 1.19 |
| 1998 | 2.90 | 1.50 | 2.96 | 1.22 |
| 1999 | 2.95 | 1.39 | 3.00 | 1.24 |

A measure of the growth in the stock of physical infrastructure relative to the case where there had been no CSF (i.e., the no-CSF baseline), denoted by *KGINFR*, is shown in Table 2. An explanation of how the "stock" of infrastructure is calculated was given in the previous section. A measure of the growth in the "stock" of human capital relative to its non-CSF baseline *(KTRNR)*, is also shown in Table 2. An explanation of how the "stock" of human capital is calculated was also given in the previous section.[115]

Clearly, these two proxies for CSF-induced growth in the stock of physical infrastructure and human capital are very rough and imperfect. For example, in the case of human capital, the Greek system of education – where a high fraction of the work force is educated at tertiary level, and the cycle lasts 11 years, will result in a high baseline measure of human capital. Hence, the CSF-induced changes will

[114] In the case of Spain, only certain regions were designated Objective 1. But our Spanish HERMIN model is for the entire economy, and we treat the CSF "as if" Spain was an Objective 1 country.

[115] It should be noted that the numbers in all subsequent tables show only the magnitude of the public expenditure, i.e., the EU funds and the national co-financing. All private expenditure has been excluded. This means, that the numbers represent a lower bound of impact, since all public expenditure should be additional to the economy.

appear correspondingly smaller. The opposite is the case for Portugal, and Ireland and Spain are intermediate cases.

**Table 2: Percentage Increase in "Stock" of Physical Infrastructure (*KGINFR*) and Stock of Human Capital (*KTRNR*) Relative to the No-CSF Baseline**

| | Greece | | Ireland | | Portugal | | Spain | |
|---|---|---|---|---|---|---|---|---|
| | *KGINFR* | *KTRNR* | *KGINFR* | *KTRNR* | *KGINFR* | *KTRNR* | *KGINFR* | *KTRNR* |
| 1993 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1994 | 1.41 | 1.00 | 1.08 | 1.45 | 3.46 | 3.79 | 1.19 | 0.68 |
| 1995 | 2.70 | 1.88 | 2.25 | 2.85 | 6.33 | 7.16 | 2.26 | 1.35 |
| 1996 | 3.88 | 2.71 | 3.32 | 4.12 | 8.81 | 10.95 | 3.30 | 1.99 |
| 1997 | 4.94 | 3.50 | 4.27 | 5.45 | 11.01 | 14.21 | 4.32 | 2.63 |
| 1998 | 5.99 | 4.07 | 5.12 | 6.55 | 13.23 | 17.41 | 5.38 | 3.27 |
| 1999 | 6.98 | 4.80 | 5.78 | 7.55 | 15.33 | 20.51 | 6.50 | 3.95 |
| 2010 | 4.77 | 2.76 | 2.51 | 4.11 | 8.70 | 11.52 | 4.58 | 2.06 |

## Impact Analysis of CSF 1994-99: Ireland Impact Analysis of CSF 1994-99: Ireland

In Table 3 we show the impact of CSF 94-99 on Irish aggregate real GDP at market prices (as a *percentage change* relative to the no-CSF baseline), and on the unemployment rate (as a *difference* relative to the no-CSF baseline). This simulation captures both the direct demand-side (or Keynesian) impacts as well as additional supply-side impacts that are associated with the improvement in infrastructure and human resources. From the table it is seen that the impact on GDP peaks at just under 3 percent in the year 1999, and in the longer term the impact is just over 1 percent. During the operation of CSF 94-99 the effect is to reduce the rate of unemployment, i.e., an initial one percentage point cut in the unemployment rate, followed by smaller impacts as the productivity impacts of the CSF build up, and a reversal of these cuts after the termination of the CSF beyond 1999.[116]

**Table 3: Ireland: Aggregate CSF 94-99 Impacts on GDP and Unemployment**

| | GDPE | UR |
|---|---|---|
| 1993 | 0 | 0 |
| 1994 | 1.61 | -0.96 |
| 1995 | 2.02 | -1.07 |
| 1996 | 2.17 | -0.92 |
| 1997 | 2.34 | -0.73 |
| 1998 | 2.76 | -0.51 |
| 1999 | 2.83 | -0.35 |
| 2000 | 1.56 | +0.53 |
| 2005 | 1.20 | +0.49 |
| 2010 | 1.00 | +0.40 |

[116] It should be stressed again that the CSF shock being analyzed consists of CSF 94-99 in isolation. The impacts that the model simulates post-1999 would never be observed in practice because CSF 2000-06 will take over, or in the case of Ireland, the domestic funding of CSF 2000-06 is very much larger.

In comparing the sizes of the impacts on the level of GDP for any country, the size of the CSF injection (both EU and domestic public co-finance) must be borne in mind. As a guide we can construct a type of aggregate CSF multiplier:

***Cumulative CSF multiplier => Cumulative % increase in GDP/ Cumulative CSF share in GDP***

This is shown in Table 4 for the years 1994-99, 1994-2002 and 1994-2010 for CSF 94-99. What is striking in this table is that the cumulative CSF 94-99 multipliers are quite large for Ireland compared with the impact multipliers. Clearly the Irish economy responds to the CSF shock in a growth-oriented way, and the high degree of openness facilitates greater transitional growth. This phenomenon has been observed in other research on CSF impacts, to which we will return in our concluding section. (Ederveen et al., 2002b).

**Table 4: Ireland: Synthetic CSF Cumulative "Multiplier" on GDP**

| Period | Cumulative multiplier |
|---|---|
| 1994-1999 | 1.44 |
| 1994-2002 | 1.88 |
| 1994-2010 | 2.83 |

## Impact Analysis of CSF 1994-99: Objective 1

As stated at the start of this section, we have assumed a common set of externality elasticities for all four country HERMIN models. These elasticities are at the middle of the range of values found in a comprehensive survey of the international literature. In addition, the externality mechanisms have been implemented in identical fashion in all four models, as follows:

i. Increases in the stock of physical infrastructure and in the stock of human capital directly increase output in the manufacturing (or mainly traded) sector;

ii. A one percent increases in either stock increases the level of output by an amount equal to the value assumed for the relevant elasticity parameter ($\eta_1$ or $\eta_2$);

iii. Increases in the stock of physical infrastructure and in the stock of human capital are assumed to have no *direct* impacts on output in the market services (or mainly non-traded) sector. To the extent that there are positive externalities, then the model understates the CSF impacts.

iv. Increases in the stock of physical infrastructure boost total factor productivity in a similar fashion in both the manufacturing (mainly traded) sector as well as in the market services (mainly non-traded) sector;

v. Increases in the stock of human capital boost labour-embodied technical progress in both sectors, and thereby boost labour productivity;

vi. All these externality mechanisms operate in addition to the conventional demand-side (or Keynesian) mechanisms that arise only during the actual implementation phase of the CSF, and vanish once the CSF is fully implemented.

Since identical CSF mechanisms as well as identical elasticities are assumed, the simulation outturns can only differ because the underlying model structures have different properties. This will arise fairly naturally through the different sectoral structures in the economies being studied, the differing degrees of openness, the different calibrated parameter values in the HERMIN behavioural equations, etc. (Bradley, Modesto and Sosvilla-Rivero, 1995; ESRI, 1997 and 2002). So, the simulations here only give a partial answer to the question: "Wwhat is the impact of the CSF on an Objective 1 economy?". If the CSFs were implemented in each region in such a way that they were equally effective, then the HERMIN simulations do answer the question. Perhaps the best summary indicator of CSF effectiveness is given by the "cumulative" multiplier presented earlier for each model. These cumulative multipliers are summarised in a single table below for comparative purposes (Table 5).

**Table 5: CSF 94-99: Cumulative Objective 1 Multipliers**

| Period | Greece | Ireland | Portugal | Spain |
|---|---|---|---|---|
| 1994-1999 | 0.67 | 1.44 | 1.12 | 1.07 |
| 1994-2002 | 0.76 | 1.88 | 1.53 | 1.23 |
| 1994-2010 | 1.07 | 2.83 | 2.55 | 1.77 |
| Long Run ranking | 4 | 1 | 2 | 3 |

If we rank the economies in terms of the size of the cumulative multiplier for the extended period 1994-2010 (i.e., including eleven years after CSF 94-99 terminates), then Ireland comes first, with Portugal a close second. Spain is an intermediate case, and Greece comes last in the rankings. In a sense this provides corroboration of the recent research of Ederveen et al. (2002a), who suggest that the effectiveness of Structural Funds depends on what they call "conditioning" variables, and the most important of these is "openness". The Irish economy is the most open in the EU. Portugal is also quite open, relative to its size. Spain is less open, but Greece is the least open.

Factors such as these partially explain the rankings in Table 5. The economic structure of the four Objective 1 economies has been encapsulated in their HERMIN models and serves to condition the effectiveness of the CSF impacts, as measured by the cumulative multipliers. Perhaps the lesson to be drawn from the analysis is that structural change in an economy – involving openness, institutional quality, etc. – is driven by forces beyond the CSF. The CSF may serve to accelerate these changes, but it is the wider challenges of EU membership that probably dominate. We examine this issue below.

## Robustness and Sensitivity Analysis

If we could base our choice of externality elasticities firmly on local country-specific research then we could propose more precise elasticity values for each HERMIN model. Unfortunately we do not have access to such research findings. Indeed, in our research carried out as part of the wider ex-post evaluation of CSF 94-99, we were unable to access any CSF research of a microeconomic nature that would provide solid guidance in the selection of infrastructural and human capital elasticities. We were forced to fall back on the international literature, and make use of findings in a range of countries that have some structural similarities with the Objective 1 economies (Bradley, Morgenroth and Untiedt, 2002).

The international empirical literature, although vast, is somewhat ambiguous about the appropriate magnitude of the externalities. Different researchers use different methodologies, and arrive at different conclusions.[117] Faced with this situation, there are two possible strategies. The first would be to wait until the research results are available in the cohesion countries and to stand aside from any attempt to quantify the likely macroeconomic impacts of the CSF. The second would be to carry out the macroeconomic evaluation exercises with a range of externality elasticities and to exercise judgement on the most appropriate values for each country based on a wide range of information about the situation in each country.

For example, in the case of the Irish CSF, there is a body of evidence that suggests that the ESF training schemes – as implemented by the State Training Agency (FáS), were reasonably well targeted, closely integrated with other economic development policies, and were reasonably effective (ESRI, 1997a; Denny, Harmon and O'Connell, 2000). This might suggest that externality elasticities near the top of the international range might be appropriate. In the case of the Greek CSF, the information that we have on the extensive re-programming of CSF 94-99 might suggest that difficulties may have arisen at the design and implementation stages of many of the Operational Programmes. This might suggest that lower values for the externality elasticities should be used. In both extreme cases, a sensitivity analysis needs to be carried out to explore how the CSF impact changes as the two types of externalities – with respect to physical infrastructure and with respect to human capital - are varied from low to high values. For this exercise, the numbers shown in Table 6 have been used.

**Table 6: Elasticities Used in Simulation Runs**

| | | Factor productivity elasticities | | |
|---|---|---|---|---|
| | | 0.00 | 0.20 | 0.40 |
| Output elasticities | 0.00 | Zero – Zero | | |
| | 0.20 | | Medium – Medium | |
| | 0.40 | | | High - High |

[117] For example, in the case of research on the influence of human capital, see the recent Institute of Fiscal Studies review by Sianesi and Van Reenen (2002) and the study by De la Fuente, 2003.

It should be recalled that in the simulations reported above, the "medium-medium" combination was used throughout the analysis, and the differences between the outcomes was a result of the different underlying macroeconomic structures of the four economies, as captured in their HERMIN models. In the case "zero - zero" elasticities, we effectively only have the conventional Keynesian demand-side effect. Minor neoclassical effects (through shifting relative prices) can arise, but they are dominated by the straightforward Keynesian effects. We can anticipate what the model simulations will produce for this case. While the CSF is being implemented (i.e., while there are positive expenditure streams of CSF investment programmes), there will be demand-side (or Keynesian) impacts. But in the complete absence of "stock" effects (through the improved infrastructure and human capital), these demand-side impacts will rapidly return to zero.

In the case of the "high-high" combination, the supply-side effects become much more relevant, particularly over time as the stocks of physical infrastructure and human capital build up. Compared to the findings taken from the empirical literature, our high elasticities sometimes fall into the middle of the observed scale, but we deliberately adopted a conservative approach. Here we get the demand-side impacts while the CSF is being implemented, and this is accompanied by a gradual build up of supply-side impacts that continue even after the CSF is terminated. Eventually depreciation effects set in and the economy will start converging back towards the original no-CSF baseline level of activity. But this is a long drawn out process, and will continue long after the terminal year of our simulations, namely the year 2010.

It would be possible to extend Table 6 to include asymmetric options (e.g., of the "high-low" variety). But we have little indication from the literature that such options are relevant. The optimum balance between investment in physical infrastructure and human resources is a topic that deserves detailed investigation. A relatively balanced development of physical infrastructure and human resources appears to be the best option and has been adopted in most of the Objective 1 CSFs.

The following set of four tables present the simulation results for the three stylised CSF scenarios, namely a "zero-zero" choice of externality elasticities for physical infrastructure and human capital; a "medium-medium" choice, where both elasticities are assumed to take the values 0.20 (as in the simulations reported earlier for Ireland); and a "high-high" option, where both elasticities are assumed to take the values 0.40, i.e., values that are towards the upper range of most results found in the international literature.

We have already commented on the rather low impacts of CSF 94-99 on the Greek economy. What Table 7 suggests is that the outcome is relatively insensitive to the degree of "optimality" of the design of the CSF.[118] The policy implication is a

[118] In our terminology, the design of a CSF is "optimal" when it is such as to have the maximum positive impact on the development of the economy. In large part, this means that the externality elasticities are at the highest possible values. A CSF is "sub-optimal" when the design and implementation produce a lower impact than possible alternatives. In the context of our present lack of microeconomic research

challenging one. Namely, that a series of structural and institutional changes may be necessary before CSF-type programmes are able to produce significant cohesion impacts of the type that occurred in Ireland and Portugal.

**Table 7: Greece: Zero, Medium and High Elasticities: Impacts on GDP and Unemployment**

| | ZERO-ZERO | | MEDIUM-MEDIUM | | HIGH-HIGH | |
|---|---|---|---|---|---|---|
| | GDPE % dev from base | UR dev from base | GDPE % dev from base | UR dev from base | GDPE % dev from base | UR dev from base |
| 1993 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1994 | 2.00 | -1.42 | 2.01 | -1.38 | 2.03 | -1.34 |
| 1995 | 1.89 | -1.35 | 1.94 | -1.19 | 2.00 | -1.03 |
| 1996 | 1.83 | -1.31 | 1.95 | -0.97 | 2.06 | -0.64 |
| 1997 | 1.71 | -1.27 | 1.90 | -0.68 | 2.10 | -0.09 |
| 1998 | 1.73 | -1.25 | 2.03 | -0.40 | 2.35 | +0.44 |
| 1999 | 1.77 | -1.31 | 2.16 | -0.31 | 2.56 | +0.68 |
| 2002 | 0.21 | -0.09 | 0.50 | +0.78 | 1.15 | +1.65 |
| 2010 | 0.28 | -0.14 | 0.66 | +0.58 | 1.09 | +1.39 |

The case of Ireland (Table 8) is illustrative of the type of rapid growth that can occur if the structure of the economy has been oriented towards competitive growth and active participation in the Single European Market (see ESRI, 1997 for background to this point). The "zero-zero" impacts are the multiplier impacts that tend to accompany investment shocks that are directed mainly at construction and training schemes, i.e., shocks that have rather low leakages out of the economy. Moving from "zero-zero" to "high-high" produces very significant additional boosts to GDP, and suggests that the appropriate elasticities in the Irish case may be at or beyond the upper range of the international research findings. However, high human capital elasticities imply high productivity growth, and the "high-high" scenario has smaller cuts in unemployment than in the "low-low" case. Ireland experienced very high employment growth even in the presence of very high growth in labour productivity. To understand this we would need to move outside the narrow analysis of CSF impacts and consider a wider range of policy initiatives that accompanied the CSF, e.g., policy towards attracting foreign direct investment, the Social Partnership that served to moderate inter-sectoral wage inflation (Nolan et al. (eds.), 2000), and the agglomeration effects that characterised the computer and pharmaceutical sectors (see Bradley, 2002).

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on CSF impacts, the notion of CSF "optimality" is more of ex-post than of ex-ante use. We suggest that the concept is related to the issues of conditionality explored by Ederveen et al., 2002a.

**Table 8: Ireland: Zero, Medium and High Elasticities: Impacts on GDP and Unemployment**

| | ZERO-ZERO | | MEDIUM-MEDIUM | | HIGH-HIGH | |
|---|---|---|---|---|---|---|
| | GDPE % dev from base | UR dev from base | GDPE % dev from base | UR dev from base | GDPE % dev from base | UR dev from base |
| 1993 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1994 | 1.57 | -0.98 | 1.61 | -0.96 | 1.65 | -0.93 |
| 1995 | 1.82 | -1.16 | 2.02 | -1.07 | 2.21 | -0.97 |
| 1996 | 1.74 | -1.12 | 2.17 | -0.92 | 2.61 | -0.71 |
| 1997 | 1.56 | -1.09 | 2.34 | -0.73 | 3.16 | -0.38 |
| 1998 | 1.48 | -1.05 | 2.76 | -0.51 | 4.09 | +0.01 |
| 1999 | 1.33 | -0.99 | 2.83 | -0.35 | 4.40 | +0.29 |
| 2002 | -0.08 | +0.06 | 1.43 | +0.531 | 2.77 | +1.16 |
| 2010 | -0.02 | +0.02 | 1.00 | +0.40 | 2.15 | +0.82 |

The Portuguese case is shown in Table 9, and resembles the Irish case in most of its characteristics. However, the cuts in the unemployment rate that occur in the "zero-zero" scenario end up as significant rises in the unemployment rate in the "high-high" scenario. This suggests that there is a degree of risk in Portugal that the restructuring of the economy away from traditional, low productivity, traditional sectors towards higher productivity modern sectors (or even the modernisation of traditional sectors by adoption of new technologies) may produce periods of "jobless" growth.

Table 10 shows the Spanish case, where there is only modest improvement as one moves from "zero-zero" to "high-high". However, we noted previously that in the Spanish case we are using a national HERMIN model to analyse a CSF that only applies to a subset of regions. A clearer picture may emerge if regional methodologies are developed to examine the Spanish case. With these *caveats* in mind, what our results suggest is that the Spanish CSF may be sub-optimal in the terminology used above.

**Table 9: Portugal: Zero, Medium and High Elasticities: Impacts on GDP and Unemployment**

| | ZERO-ZERO | | MEDIUM-MEDIUM | | HIGH-HIGH | |
|---|---|---|---|---|---|---|
| | GDPE % dev from base | UR dev from base | GDPE % dev from base | UR dev from base | GDPE % dev from base | UR dev from base |
| 1993 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1994 | 2.66 | -2.32 | 2.72 | -2.21 | 2.78 | -2.09 |
| 1995 | 2.55 | -2.18 | 2.78 | -1.76 | 3.00 | -1.35 |
| 1996 | 2.31 | -2.21 | 2.87 | -1.31 | 3.45 | -0.43 |
| 1997 | 2.26 | -2.17 | 3.30 | -0.73 | 4.41 | +0.67 |
| 1998 | 2.42 | -2.29 | 4.04 | -0.16 | 5.83 | +1.92 |
| 1999 | 2.64 | -2.40 | 4.66 | -0.05 | 6.92 | +2.26 |
| 2002 | 0.69 | -0.53 | 2.30 | +1.53 | 4.93 | +3.18 |
| 2010 | 0.31 | -0.27 | 2.06 | +0.82 | 4.16 | +2.11 |

**Table 10: Spain: Zero, Medium and High Elasticities: Impacts on GDP and Unemployment**

| | ZERO-ZERO | | MEDIUM-MEDIUM | | HIGH-HIGH | |
|---|---|---|---|---|---|---|
| | GDPE % dev from base | UR dev from base | GDPE % dev from base | UR dev from base | GDPE % dev from base | UR dev from base |
| 1993 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1994 | 1.10 | -1.05 | 1.10 | -0.98 | 1.11 | -0.91 |
| 1995 | 1.16 | -1.08 | 1.18 | -0.83 | 1.20 | -0.56 |
| 1996 | 1.21 | -1.13 | 1.25 | -0.57 | 1.29 | 0.00 |
| 1997 | 1.26 | -1.16 | 1.32 | -0.19 | 1.38 | +0.84 |
| 1998 | 1.29 | -1.21 | 1.39 | +0.30 | 1.49 | +1.96 |
| 1999 | 1.29 | -1.24 | 1.39 | +0.60 | 1.50 | +2.74 |
| 2002 | 0.08 | -0.02 | 0.40 | +1.18 | 0.11 | +1.75 |
| 2010 | 0.06 | -0.05 | 0.58 | +0.35 | 1.42 | +1.30 |

## THE PRE-ACCESSION NDPS IN ESTONIA

### EU Aid to Estonia: Background

Estonia started receiving EU aid in 1991 after signing the Framework Agreement with the Commission during the initial period of post-communist economic restructuring. The economy experienced a sharp and deep recession in the early years of transition when GDP fell by one-third in the four years between 1990 and 1994. At the same time, the institutional restructuring was on the way, with the most important economic and social reforms being implemented. In 1992, Estonia adopted a Currency board arrangement that brought inflation under control, supported by the balanced budget condition imposed on public financing. Free trade agreements with Finland and Sweden entered into force in 1992, and Free Trade Agreement between Estonia and EU was signed in 1994 abolishing all bilateral trade barriers for industrial products.

The first EU development funds were allocated to Estonia under the extended PHARE programme (Poland Hungary Assistance for Restructuring Economies), initiated by the Commission in 1989). The aid was non-reimbursable, and no consistent programming framework was required. The main recipients of the aid were the Ministry of Economic Affairs, the Ministry of Finance and the Ministry of Agriculture.

Following the 1993 Copenhagen Council's invitation to CEE countries to apply for membership, PHARE support was reoriented and expanded to include infrastructure investments. This development coincided with the resumption of GDP growth and overall macroeconomic stabilisation. Reforms that were implemented in early 1990s provided a favourable economic environment. In 1995–2002 the average growth rate of GDP was over 5% per annum. In comparison to the EU average, GDP per capita in Estonia increased from 32% in 1995 to 37% in 2001. Economic growth depended primarily on the rapid growth in exports to industrialised countries and has been supported by the inflow of FDI mostly of Swedish and Finnish origin

(65%). The share of the EU in Estonian foreign trade has increased gradually: in 2001 over three quarters of Estonia's exports and two thirds of its imports were EU-oriented. During the same period, the importance of agriculture and of the former Soviet-period industries decreased, while rapid development has taken place in a number of new industries and in the service sector.

In 1997 the Luxembourg Council launched the enlargement process under Agenda 2000, and the focus of the EU aid was re-directed at pre-accession. The cornerstone of the post-1997 PHARE was a principle of programming on the basis of the Accession Partnership (AP), the National Programme for the Adoption of the *acquis* (NPAA) and the Regular Reports. Consequently, the institutional importance of the EU aid increased dramatically. The Central Finance and Contracting Unit (CFCU) was established within the Ministry of Finance in autumn 1997 and was responsible for managing the EU PHARE programme.

In 1999, the Commission developed new instruments to support accession preparations. The PHARE programme was re-designed to tackle the issue of economic and social cohesion and institution building, and ISPA and SAPARD programmes were introduced. ISPA (Instrument for Structural Policies for pre-Accession) provides EU financial assistance in the fields of environment and transport infrastructure; SAPARD (Special Assistance Programme for Agricultural and Rural Development) aims at preparing candidate countries' agricultural sectors' for participation in the CAP and the internal market. In contrast to PHARE that by and large has maintained non-reimbursable character with the EU contribution up to 100 per cent, design of ISPA and SAPARD has reflected the framework of Structural Aid to the existing EU member states including a co-financing condition.

Since all three programmes are part of the pre-accession strategy, they aimed at supporting compliance with the *acquis communautaire,* adoption of social and economic structures to the challenges of the accession, reduction of the gap in development level and the EU average as well as preparing the public administration to handle the Structural and Cohesion funds after accession. Although the scale of the pre-accession support was much smaller than the cohesion programmes implemented in the existing member states, the instruments were modelled similarly in order to help candidate countries become familiar with the EU administrative rules and provide experience in applying for assistance from the Cohesion Fund after joining the EU. Thus, all three programmes have acted as a catalyst to accession at the same time supporting projects that are sustainable beyond the date of accession.

In late 1999, Estonia submitted its first National Development Plan 2000–2002 to the European Commission. It was the first step towards preparing Estonia for obtaining and using the structural aid. The document mapped out country's strategy, priorities and programmes for promoting economic and social cohesion on its territory steering all economic support from PHARE programme. Due to the narrow time horizon for preparing and submitting the NDP, the document had no ex-ante evaluation or any assessment of the quantitative impact of the NDP measures.

However, by the end of 2000 the National Development Plan 2001-2004 was ready and the comments on the first version from the European Commission were taken into account. Having Objective 1 dimensions as a model, the NDP defined sectoral and regional priorities. A HERMIN model was developed in order to carry out an *ex-ante* evaluation of this NDP, taking into account the constraints and difficulties arising from the transitional character of the economy (Bradley, Kangur and Kearney, 2001; Bradley, Kangur and Morgenroth, 2001). External qualitative evaluations of the NDP emphasised the need to improve coordination of PHARE, ISPA and SAPARD evolving towards quality standard for the national plans and community support framework documents practiced inside the EU.

Most recently, the Estonian National Development Plan for the Implementation of the EU Structural Funds – NDP 2004-2006 – was submitted to the Commission in March 2003. The quantitative impacts of NDP investments were assessed using a revised version of the Estonian HERMIN model, while a team of external experts prepared a qualitative evaluation. The NDP will serve as a basis for the common activities of Estonia and the EU in promoting Estonia's social and economic development.

## The Estonian NDP 2004-06: Ex ante Impact Analysis

The NDP consists of major public investment programmes aimed at improving the quality of physical infrastructure, human resources (or human capital), as well as providing direct grant aid to the three main productive sectors (manufacturing, market services and agriculture). In this section we describe the impacts of the NDP with the aid of the Estonian HERMIN model.

The context in which we execute this macro-sectoral impact evaluation exercise is as follows:

1. We carry out a model simulation starting in the year 2001, the last year for which we have actual data on the Estonian economy, and three years before NDP 2004-06 is to be implemented. From 2004 to 2006 we use the planned NDP investment expenditures. We assume that the following nine year period will consist of two parts. First, for 2007-2010 the speculative assumption is made that NDP expenditures will be sustained at a similar proportion as in NDP 2004-06, with the increase of EU co-financing up to 3 per cent of nominal GDP. Second, we assume that domestic public and private investment expenditures will remain at their NDP values in real terms after the termination of "second" stylised NDP in 2010.[119] We make a series of other forecasting assumptions on the external environment for Estonia, and the non-NDP Estonian policy environment. We continue the simulation out to the year 2015, i.e., nine years after the termination of original NDP 2004-06 funding commitments
2. We then set the NDP expenditures at zero. No other changes are made, and no attempt is made to design a "substitute" domestically funded public investment

[119] In the case of Estonia, it would be unreasonable to cut off the NDP programmes as soon as 2006.

programme that would have replaced "missing" NDPs. This is a very artificial assumption, since in the absence of NDPs there almost certainly would have been a substitute domestically funded public investment programme, albeit smaller in magnitude. We carry out a second simulation

3. We "extract" the NDP 2004-06 and subsequent NDP policy shocks, by comparing the "with-NDP" simulation and the "without NDP" simulation.
4. We experiment with three versions of the NDP. The first (referred to as the "total" NDP) includes EU, domestic public and domestic private co-finance. The second (referred to as the "public" NDP) only includes EU finance and domestic public co-finance. The third (referred to as the "EU" NDP) only includes the EU finance.

The total size of the NDP relative to GDP is shown in Table 11. The actual NDP stops in 2006; it is assumed to be followed up by another NDP 2007-10, where the proportions of co-financing expenditures are sustained at their NDP 2004-06 level. The NDP expenditures have been calculated in national currency (Kroon). In terms of the size of the investment shock, the "total" NDP is the largest of the three variants, since it includes the EU, the domestic public co-finance and the domestic private co-finance. At its peak in the year 2010 the size of the increased investment is seen to be 5.05 per cent of GDP. The "public" NDP shock is an intermediate case (4.03 per cent of GDP at its peak), and the "EU" NDP is the smallest (3.00 per cent of GDP at its peak).

A measure of the growth in the stock of physical infrastructure relative to the case where there had been no NDP (i.e., the no-NDP baseline), denoted by KGINFR, is shown in Table 12. A measure of the growth in the "stock" of human capital relative to its non-NDP baseline (KTRNR), is also shown in Table 12. Thus, by the year 2010. the stock of infrastructure increases by 36 per cent relative to the no-NDP baseline, and the stock of human capital by 5 per cent, as a result of the "total" NDP shock.

**Table 11: NDP Expenditure Expressed as a Percentage of GDP**

| | Total NDP | Public NDP | EU NDP |
|---|---|---|---|
| 2003 | 0.00 | 0.00 | 0.00 |
| 2004 | 4.46 | 3.95 | 2.94 |
| 2005 | 4.12 | 3.64 | 2.71 |
| 2006 | 3.59 | 3.14 | 2.34 |
| 2007 | 5.05 | 4.03 | 3.00 |
| 2008 | 5.05 | 4.03 | 3.00 |
| 2009 | 5.05 | 4.03 | 3.00 |
| 2010 | 5.05 | 4.03 | 3.00 |

**Table 12: Percentage Increase in "Stock" of Physical Infrastructure (KGINFR) and Stock of Human Capital (KTRNR) Relative to the No-NDP Baseline Stock**

| | Total NDP | | Public NDP | | EU NDP | |
|---|---|---|---|---|---|---|
| | KGINFR | KTRNR | KGINFR | KTRNR | KGINFR | KTRNR |
| 2003 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2004 | 8.54 | 0.88 | 8.54 | 0.88 | 6.41 | 0.67 |
| 2005 | 15.23 | 1.66 | 15.24 | 1.66 | 11.44 | 1.26 |
| 2006 | 19.78 | 2.35 | 19.80 | 2.35 | 14.87 | 1.79 |
| 2007 | 25.73 | 3.19 | 25.76 | 3.19 | 19.35 | 2.44 |
| 2008 | 30.27 | 3.93 | 30.32 | 3.93 | 22.77 | 3.01 |
| 2009 | 33.68 | 4.58 | 33.73 | 4.59 | 25.34 | 3.52 |
| 2010 | 36.14 | 5.16 | 36.20 | 5.17 | 27.20 | 3.97 |

In Table 13 we show the impact of the NDP on aggregate real GDP at market prices (as a *percentage change* relative to the no-NDP baseline), and on the unemployment rate (as a *difference* relative to the no-NDP baseline). This simulation captures both the direct demand-side (or Keynesian) impacts as well as additional supply-side impacts that are associated with the improvement in infrastructure and human resources.

For the "total" NDP the impact on GDP peaks in the year 2010 at 13.5 (i.e., the level of Estonian GDP is likely to be 13.5 per cent higher as a result of the NDP). In the same year, the rate of unemployment is cut by almost 7 percentage points (i.e., if the rate of unemployment had been X percent of the labour force in the no-NDP simulation, it would be (X-7) per cent in the "total" NDP simulation). As we move across Table 13 from the "total", to the "public" and finally to the "EU" NDPs, the effects become more modest. Note that by the year 2015 – by which time the NDP expenditures are assumed to have no extra purely Keynesian impact on Estonian economy, the decrease in unemployment is actually more moderate. However, the reduction in unemployment and accompanying economic growth remain plausible due to increased competitive advantage and sustainable rise in productivity.

**Table 13: Aggregate NDP 2004-2006 Impacts on GDP and Unemployment**

| | Total NDP | | Public NDP | | EU NDP | |
|---|---|---|---|---|---|---|
| | GDPM | UR | GDPM | UR | GDPM | UR |
| 2003 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2004 | 7.29 | -4.73 | 6.67 | -4.29 | 5.02 | -3.23 |
| 2005 | 7.85 | -4.71 | 7.26 | -4.30 | 5.48 | -3.25 |
| 2006 | 8.52 | -4.68 | 7.96 | -4.29 | 6.01 | -3.25 |
| 2007 | 12.93 | -6.88 | 11.60 | -5.97 | 8.79 | -4.54 |
| 2008 | 13.28 | -6.79 | 12.05 | -5.95 | 9.15 | -4.53 |
| 2009 | 13.48 | -6.70 | 12.34 | -5.92 | 9.38 | -4.51 |
| 2010 | 13.52 | -6.56 | 12.47 | -5.83 | 9.48 | -4.44 |
| 2015 | 6.58 | -2.58 | 5.85 | -2.02 | 2.85 | -0.69 |

GDP: Percentage change from no-NDP baseline; UR: Change from no-NDP baseline

## BEYOND THE CSF: THE ROLE OF THE SINGLE MARKET

### Introduction

In previous sections we have made reference to the need to place the impact analysis of the CSF in a wider context that takes account of a range of other EU-related policy changes that were and are occurring at the same time as the CSFs are being implemented. Perhaps the best characterisation of the wider context was set out in the MEANS programme, and is reproduced in Figure 1 (taken from MEANS, 1995).

Up to now, we have been working within a "theory of action", i.e., we have been examining how changes in CSF investment expenditures affect a range of macro measures of cohesion, and GDP in particular. In such analysis, all other external (global) and internal (domestic policy) variations are excluded, as also are all other (non-cohesion) policy objectives. Moving to an "explanatory theory" implies that the full range of non-CSF domestic policies and global factors must be added to the narrow range of strictly CSF measures, insofar as they have "cohesion" as their goal. This generalisation is likely to be very useful in order to be in a position to examine policy synergies (say, between human resources measures and the wider reform of labour market institutions). Finally, moving to a "global theory" adds in a range of other (non-cohesion) objectives to the "explanatory theory". This final generalisation is likely to be of use in evaluating policy trade-offs (say, between expenditures on human resources that will have beneficial supply-side – or efficiency – impacts and expenditure on income support that may be motivated mainly by equity considerations.

One non-CSF policy initiative stands out when we are attempting to evaluate CSF impacts using the narrow "theory of action" framework, namely the Single Market. EU regional policy was reformed in the late 1980s for many reasons, but a key factor was the fear that the poorer, peripheral EU member states would lose out relative to the more prosperous, advanced, core EU member states. The original ex-ante study of the Single Market ducked the issue of core-periphery distributional effects (Cecchini, 1988), but the issue was revisited by the Monti study in 1996-97 (Monti, 1996). In particular, the HERMIN models of the Objective 1 countries were developed to permit the effects of the Single Market to be examined, and compared with the narrow "theory of action" analysis of the CSF.

### Single Market Impacts and the CSF

As part of the *Single Market Review* (Monti, 1996), research was carried out to analyse the likely combined effects of the Single Market and the Structural Funds on the countries of the EU periphery. Since these are very complex and systemic policies, the HERMIN models of these economies were extended and then subjected to 'shocks' designed to capture the essential elements of the Single Market and CSF programmes (ESRI, 1997).

The original Cecchini *ex ante* study of the impact of the Single Market had been based on analysis of the four largest EU economies (Germany, France, Italy and the United Kingdom) plus Belgium and the Netherlands, and the EU-wide results (including Ireland) were then derived by grossing up the results for these six economies (Cecchini, 1988). This presented an inaccurate picture of likely developments in the periphery, however, since developmental processes in the periphery tend to be quite different from those pertaining to the core.

**Figure 1: Policy Modeling and the CSF: The MEANS Classification**

*Theory of Action*

| Effects / Causes | Economic and social cohesion | Other effects |
|---|---|---|
| Structural funds | Theory of action | |
| Other policies and all other external causes | | |

*Explanatory Ttheory*

<table>
<tr><th>Effects / Causes</th><th>Economic and social cohesion</th><th>Other effects</th></tr>
<tr><td>Structural funds</td><td rowspan="2">Explanatory theory</td><td></td></tr>
<tr><td>Other policies and all other external causes</td><td></td></tr>
</table>

*Global Ttheory*

<table>
<tr><th>Effects / Causes</th><th>Economic and social cohesion</th><th>Other effects</th></tr>
<tr><td>Structural funds</td><td rowspan="2" colspan="2">Global theory</td></tr>
<tr><td>Other policies and all other external causes</td></tr>
</table>

For example, a central element in the analysis of the impacts of the SEM on the Irish economy concerned its impact on manufacturing output, which consists of both tradable and non-(internationally)-tradable components, and is determined by a combination of cost-competitiveness and aggregate-demand factors. The greater the tradable component, the larger the impact on output of world demand relative to domestic demand. Among the peripheral economies, Ireland is the most open of the four economies in this regard, and Greece the least open

For the four cohesion economies, the effects of the Single Market on manufacturing fall into different categories. For example, "static" effects are those that arise as various sectors expand and others contract in each country in the wake of EU market integration. To determine which sectors are likely to expand and which contract, use was made of a detailed study of the competitiveness of industrial sectors in each

EU country carried out by the European Commission (O'Malley, 1992). The successful sectors expand through capturing increased foreign market share and the unsuccessful sectors decline through losing home-market share.

The HERMIN-based research suggested that the "static" shock was positive for Ireland, marginally negative for Portugal, moderately negative for Spain and strongly negative for Greece. The reason for this was that Ireland and Portugal have the largest shares of employment and output in the sectors in which these individual countries were expected to benefit from the Single Market, relative to those in the country-specific sectors that were expected to be adversely affected..

For both Spain and Portugal, however, the adverse "static" shocks were more than compensated for by beneficial "locational" effects, by which is meant the increased FDI inflows that these economies have experienced in recent years. These increased inflows can be ascribed either to EU entry or to the Single Market programme. To the extent that the SEM is responsible, the net "static" plus "locational" effects for Ireland, Spain and Portugal were found to be positive. Finally, "growth-dependent" effects arise since, with further trade liberalisation increasing the proportion of internationally tradable relative to non-tradable goods, the periphery economies will be more strongly affected by growth in the EU core than is the case at present. The converse is also the case, and economies like Ireland are now more affected by world recessions than when they were less open to the international economy.[120]

After a full decade of Structural Funds and the Single Market, how have the cohesion countries performed during the 1990s, as the first two CSFs were implemented? In Table 14 we show the convergence experience of these four countries, where it is seen that some quite rapid convergence has taken place in recent years.

**Table 14: Relative GDP per capita in Purchasing Power Parity Terms (EU15 = 100)**

| | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
|---|---|---|---|---|---|---|---|---|---|
| Ireland | 75.7 | 79.0 | 82.2 | 88.5 | 93.8 | 94.5 | 100.7 | 107.1 | 111.0 |
| Spain | 79.8 | 77.8 | 78.4 | 76.4 | 76.9 | 77.6 | 78.3 | 79.2 | 80.2 |
| Greece | 61.2 | 62.5 | 64.4 | 65.2 | 66.3 | 67.6 | 68.3 | 68.1 | 68.7 |
| Portugal | 64.7 | 65.4 | 68.3 | 70.0 | 70.7 | 70.3 | 71.3 | 72.7 | 74.1 |

Source: *European Economy*, No. 66, 1998

Adaptation to the competitive rigors of the Single Market and efficient use of Structural Funds underpin the dramatic convergence of Ireland that coincided with the implementation of the new EU regional policies. One is tempted to suggest that the combination of openness and the use of Structural Funds were the primary forces driving Irish convergence, but of course the full picture is more complex. The many other domestic issues associated with accelerated Irish growth (such as the growth of

[120] The implementation of the Single Market effects in terms of static, locational and growth-dependent processes required complex alterations to the structure of the HERMIN models. The technical details are available in ESRI, 1997, pp. 53-76

human capital, fiscal stabilisation, social partnership, etc.), are treated elsewhere in this volume. Nevertheless, it is the policy of openness and the use of Structural Funds that served to distinguish Ireland from, say, Greece, which had a similar development distance to travel but which has only recently set its wider policy framework in the context of embracing internationalisation. Portugal, on the other hand, is in the process of repeating Irish success. It remains to be seen if these countries can sustain their convergent behaviour in times of recession as well as in times of growth. It also remains to be seen how they will compete with the transition economies of Eastern Europe.

## STRUCTURAL FUND IMPACT ANALYSIS: A DECADE OF LEARNING

### Interpreting the HERMIN-Based CSF Simulations

HERMIN model-based results have to be presented with great care, particularly where there is a high degree of uncertainty over the precise nature of key mechanisms that relate NDP/CSF investment inputs to their anticipated outputs in terms of increased output and productivity. The model simulations have already been described and interpreted. But it is worth highlighting some issues in the results. During the implementation of the CSF, the increased public expenditures generate Keynesian multiplier effects. Within the HERMIN models these transient multiplier effects tend to be larger than those in models such as the Commission's QUEST model. This is mainly due to the fact that HERMIN uses static or backward-looking expectation mechanisms, while QUEST uses model consistent or forward-looking expectation mechanisms. In addition, the HERMIN models make a clear distinction between public investment in building and construction activities (which have small import propensities) and investment in machinery and equipment (which tend to have very high import propensities, particularly in small open economies like Ireland).

However welcome the transient demand-side impacts of the CSF that accompany the implementation stage, it is the longer term enduring impacts that are most important. These have been captured by the externality mechanisms that were described above, and are driven by the CSF-induced increases in the stocks of physical infrastructure and human capital. We have also described how we selected externality elasticities from the international literature and implemented them in the HERMIN models. Initially we used a standard set of elasticities common to all models, and broadly representative of the mid range of international findings but we then carried out a sensitivity analysis for each of the four Objective 1 country models, selecting zero, medium and high elasticity values.

When our numerical results on CSF impacts are interpreted, it is important to understand that the CSF policies that are analyzed in the HERMIN models cannot raise the growth rate of GDP permanently. While the CSF investment expenditures are being made, and the stocks of physical infrastructure and human capital are increasing, the growth rate of GDP does indeed increase above the no-CSF baseline value. However, when the CSF terminates, and the two stocks stabilize at their new (higher) values, the growth rate returns to its baseline value, but the level of GDP remains for a long time at a higher value. Thus, the enduring benefit of the CSF is a semi-permanent higher level of GDP and not a permanent rise in the growth rate.[121]

## Critiques and Alternative Approaches

The macromodel-based approach to CSF impact analysis has recently been criticised in two papers published by the Dutch CPB (Ederveen et al., 2002a and b). They make the perfectly valid point that macro models like HERMIN do not seek to establish if there is a positive impact on the cohesion objective due to CSF policies. Rather, they characterise the model-based research as "imposing" the impacts. But of course this imposition is not arbitrary. It draws on a large and authoritative research literature and uses elasticity values that are consistent with this literature.

The alternative approach suggested by Ederveen et alet al. (2002 a and b) is to set up Barro-type growth regressions (Barro and Sala-i-Martin, 1995) and augment them with CSF variables. Thus, the basic Barro-type regression will have growth of GDP as the dependent variable and the initial level of GDP per head, the domestic savings rate, population growth, etc., as independent variables. They insert the Structural Fund expenditures into such a model and seek to estimate statistically significant and positive coefficients.[122] In general they fail to find any significant Structural Fund effect. But since they examine a wide range of countries, some of which received very little aid, and deal with a time period that stretches from the mid-1960s to the early 1990s, their findings are not surprising.[123] However, when they add a "conditioning" variable (such as openness, institutional quality, corruption index, etc.), their analysis suggests that a few countries like Ireland did benefit from an increased growth rate that was associated with the Structural Funds.

We suggest that this approach suffers from the fact that it posits a model where the only CSF impact looked for is one on the growth rate. In most of the sample of thirteen EU countries and for most of the sample period 1960-95, the regional aid was trivially small, and was very unlikely to affect the growth rate. The HERMIN model posits a less stringent "levels" effect, and draws on the international literature to support it. If the CPB approach were to be restricted to the poorer EU member states, and excluded such high income countries as Denmark, Sweden, the Netherlands, France, etc., then significant effects on growth might reasonably be sought. However, the panel regression technique requires a wide range of countries, which frustrates application of the technique to Objective 1 countries in isolation.

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[121] The stocks on physical infrastructure and human capital eventually decay due to depreciation. See Sianesi and Van Reenen, 2002, for a discussion of "level" versus "growth rate" impacts of investment in human capital.

[122] A pooled cross-section regression is used, with thirteen EU countries in the data set and using seven five-year periods from 1960-65 through 1990-95.

[123] It should be noted that the level of Structural Fund investment aid was very low prior to 1989, and was only expanded massively after that.

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# 11

# THE ROLE OF EX-ANTE EVALUATION IN CEE NATIONAL DEVELOPMENT PLANNING: A CASE STUDY BASED ON POLISH ADMINISTRATIVE EXPERIENCE

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## INTRODUCTION

The economic implosion that occurred after the liberalisation of the economies of Central and Eastern Europe (CEE) was quite unexpected. A better understanding of the distortions that caused a massive fall in activity only emerged after the event, and served to distinguish two different but interrelated phases of transition. The first phase is associated with the initial years of transition and concerns such questions as institution building, privatisation, disorganisation, reallocation and restructuring. Such processes are unique to economies emerging from central planning in that they have only very limited counterparts or analogues in developing liberal market economies.[124] The second phase concerns the later years of transition and assumes that a previously centrally planned economy has gone through a necessary critical mass of institutional and structural reforms which makes it appropriate to apply fairly standard macroeconomic concepts and theories commonly used for analysis and policy planning in market economies.

EU development aid was made available to Poland and the other CEE countries during both phases of transition, but only recently – as Poland moves towards EU membership in June 2004 – has the pace quickened. The design of the Polish National Development Plan 2004-2006 (NDP) represents a step change in the process of preparation for EU membership, and requires that the Polish authorities now participate in the complex procedures of NDP design, ex-ante evaluation, CSF

[124] The approach to the disorganisation stage of transition is documented in Aghion and Blanchard (1994), Blanchard (1997) and Kremer and Blanchard (1997).

treaty negotiation, implementation, monitoring, mid-term and ex-post evaluations that have been a fact of life in the EU Objective 1 regions since the late 1980s.

If it were the case that the EU was making development aid available for the very first time in the context of the 2004 enlargement, rather than fifteen years after the major expansion of such aid in 1989, then the CEE acceding countries would face a daunting task. At a political level, the extent of their institutional change has been massive. At an economic level, the nature of the restructuring has left no corner of the CEE economies untouched. At a business level, whole sectors of industry have shrunk or vanished, while new sectors are arising from the ashes. At a societal level, the upheaval has left in its wake levels of social exclusion and poverty, the alleviation of which will require resources far beyond those now available to the national administrations.

But the countries of the CEE region are in a position to learn from the successes and failures of the lagging EU member stages – Greece, Ireland, Portugal and Spain – whose cohesion challenges differed from those of the CEE countries more in degree rather than in kind. Our purpose in this chapter is to examine the recent Polish experience in designing and evaluating its first major EU-supported NDP and this will involve a critical review of the recently designed Polish NDP both in terms of process and content. But we will inform our discussion by drawing on EU evaluations of the earlier member state CSFs. What is important here is to recognize that both Polish and European Commission expectations arising from the new Polish NDP should be guided by the performance of the previous EU member state aid recipients, and that a certain recognition needs to be made of the more serious cohesion gap that needs to be addressed by most of the CEE states.

This paper is mainly about the nature and use of tools for evaluating the consequences of CSF-type programmes. A wide variety of ex-ante evaluation tools is potentially available for use in monitoring, evaluating and optimizing National Development Plans (NDPs), ranging from the cost-benefit analysis of individual projects at the one extreme to evaluating aggregate impacts of an NDP on the entire national economy at the other. However, previous EU experience suggests that the NDP/CSF process has tended to evolve in a linear sequence that makes only limited use of feedback and learning derived from formal methodologies and ex-ante evaluation techniques.[125] For the candidate states in Central and Eastern Europe, who are presently engaged with NDP 2004-2006, this presents serious challenges to domestic public administrations as well as to DG-REGIO.

The Objective 1 countries and macro regions of the present European Union were in an advantageous position as they approached the design of CSF 2000-2006. The previous two Community Support Frameworks (CSFs) had exposed them to a decade of "learning by doing", and they could draw on a wide range of ex-ante, mid-term and ex-post evaluations. However, the context for the CEE states as they approached the design of NDP 2004-2006 was much less advantageous. In CEE

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[125] For example, the recently completed ex-post evaluation of the CSFs in the eleven Objective 1 countries and regions of the EU was able to draw on very few research findings in the microeconomic area that were based on formal analytical techniques. Only at the macroeconomic level of aggregation was formal model-based research available (DG-REGIO, 2003).

states, the concept of a National Development Plan was sometimes embraced slowly and only with reluctance, since it evoked memories of the central planning experiences of the pre-1989 era that had distorted their economies. The economic background of the CEE area was one of upheaval, change, and uncertainty, and the public finance and balance of payments constraints were often more binding than for the less developed EU states and regions. The learning experience gained from the previous pre-accession structural aid programmes had been limited, particularly as guides towards the preparation for the highly integrated NDP-type exercises. The formal tools of ex-ante evaluation at project, programme and national levels were at best untested in a CEE context, often of questionable reliability, and at worst simply unavailable.[126] Finally, the initial amount of aid – as a proportion of national GDP – was smaller than was the case in the previous EU CSFs.

In this paper it is our intention to take the recently published Polish National Development Plan: 2004-2006 (NDP, 2003) as a case study, and to use it to explore a series of themes in evaluation. We first briefly describe how the main problems and challenges faced by the Polish economic planners were identified as the design of the Polish NDP 2004-2006 moved from inception to completion. In order to provide context, the resulting National Development Plan is then briefly reviewed in the following section.

In the next three sections we examine a nested sequence of increasingly more stringent criteria for the ex-ante evaluation of the NDP design. First, we discuss how the concept of ex-ante appropriateness (or suitability) of the NDP can be examined, i.e., how the barriers to cohesion of the Polish economy were identified and the extent to which NDP-based strategies could be designed to address these structural weaknesses. We then discuss the concept of ex-ante effectiveness, i.e., what efforts can be made to project the effects envisaged or anticipated from the main NDP strategies. Finally, we explain the difficulties faced in addressing the efficiency of the NDP ex-ante, i.e., the achievement of the cohesion objective with the minimum use of resources.

Before concluding, we describe how the new Polish HERMIN macro model was used to provide a first quantification of the top-down impacts of the NDP on the macro economy, and the steps that are in train to improve that initial work. In conclusion, we discuss the steps that are being taken to ensure that the strategic intent of the NDP (i.e., the cohesion objective) is reinforced by learning from the insights obtained from the above aspects of ex-ante evaluations and we illustrate some of the directions in which the national culture of analysis and evaluation in Poland could be further improved.

[126] For an overview of evaluation tools in the case of Ireland, see Mulreany, 2002.

## THE POLISH COHESION CHALLENGE

### The Analytic Approach Taken in the NDP

A description of the economic situation in the recipient country is usually placed as a preamble to its National Development Plan. The purpose is two-fold: first, to document and place on record the extent to which economic performance lags behind the EU norm, and second, to identify any barriers to faster growth and convergence (i.e., to cohesion) that can be addressed later by the policy initiatives contained in the NDP Operational Programmes (or OPs). In the case of the Polish NDP, this amounts to a description of the state of the economy on the eve of EU accession, and prior to the implementation of the NDP.

What were the main aspects of Polish economic performance identified in the NDP overview?[127] In terms of aggregate performance indicators, a crucial issue was that the very rapid GDP growth of first two-thirds of the 1990s had fallen to more modest levels by the latter part of the decade, and slow growth has continued into the new decade. Unemployment, which had declined to 11 per cent of the labour force in 1998, rose sharply and now stands at over 18 per cent, and the agriculture sector contains a considerable degree of further "hidden" unemployment. Underlying these outturns, the sectoral structure of the economy was continually adjusting, with the share of agriculture and industry in GDP falling, and the share of market services rising.

As the economy slowed towards the late 1990s, other imbalances started to emerge. The trade deficit rose as a share of GDP as did the public sector borrowing requirement. The deterioration in the latter had been masked by the inclusion of privatization receipts, but when these receipts collapsed in 2001, the underlying deterioration was more stark. The heavy dependence on the Germany economy clearly exacerbated this deterioration (Table 1). It was Poland's bad luck that Germany had become its dominant trading partner at a time when the German economy was moving towards stagnation.

However, there were also some positive macro developments! For example, the high inflation of the early stages of transition had been tamed. However, the Polish corporate sector emerged from this process in a poorly competitive state. Indeed, the very sector upon which productivity growth depended – the modern high technology sector – was shrinking rather than expanding. This was probably the most disturbing finding in the economic overview, and had serious implications for the design of the NDP and the achievement of cohesion within the EU.

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[127] We focus on the economy and generally pass over the spatial and geographic characteristics. These are very important, but are almost impossible to change other than in the very long term. They could be held to operate more as constraints than as objectives, even over periods longer than a full CSF (e.g., over 7 years).

**Table 1: Export Share and Import Share in 1993 and 2001**

| | Country | 1993 | 2001 |
|---|---|---|---|
| Export Share | Germany | 36.3 | 34.4 |
| | France | 4.2 | 5.4 |
| | Italy | 5.2 | 5.4 |
| | The United Kingdom | 4.3 | 5.0 |
| | The Netherlands | 5.9 | 4.7 |
| | The Czech Republic | 2.4 | 4.0 |
| Import Share | Germany | 28.0 | 24.0 |
| | Russia | 6.8 | 8.8 |
| | Italy | 7.8 | 8.3 |
| | France | 4.2 | 6.8 |
| | The United Kingdom | 5.8 | 4.2 |
| | The Netherlands | 4.5 | 3.6 |

Cutting across the different aspects of the macroeconomic performance, the NDP proceeds to identify a series of actual and potential barriers to faster growth. With respect to the potential drivers of faster growth, these included a relatively low level of human capital in the labour force, particularly at university level; low scientific R&D activity; low penetration of information technology; a recent decline in the rate of fixed investment in the economy. In addition, the social consequences of high unemployment, high long-term unemployment, and poverty also risked becoming barriers to progress and change.

Of course, these issues had been on the Polish policy agenda for some time, and well prior to the NDP process. The 1990s had been a decade of radical change, but the process was unfinished. The transport infrastructure (roads, rail, ports) had evolved, but remained very underdeveloped. The low rate of urbanization, relatively small size of the major cities, and the inadequate housing stock placed barriers on rural-urban migration and the absorption of rural workers into modern industrial and market services employment. Serious environmental problems – in particular, the uncertainty induced by the risk of flooding – remained to be tackled.

It was noted that although there was a degree of regional heterogeneity at the Voivodship level (the ratio of the highest to the lowest GDP per capita was 2.2), the more immediate problem was the generally low level in all regions.[128] However, the identified sectoral imbalances – more agriculture in the poorer regions; more services in the richer regions – suggested that particular care would be needed in designing the regional aspects of the NDP to ensure that those regions with less immediate potential to grow faster would not lose out permanently relative to the regions with a more advantageous structure and geographical location relative to the main EU and CEE markets.

[128] The exception is the Mazowieckie region, which was above 60 per cent of the EU average GDP/capita. But even the Mazowieckie region faces big internal differences, i.e. the city of Warsaw is 120 per cent of the EU average GDP/capita and the subregion Siedleckie is only 26 per cent of the EU average GDP/capita.

## Future NDP-Related Economic Analysis

There is a temptation to regard the above NDP-driven "review" material as a pro forma exercise, required by the EU guidelines, but when it is done, to move on quickly to the design and implementation of the NDP. Given the time constraints placed on the NDP exercise by the tight political time table of accession, as well as the fact that good quantitative research on the Polish economy (and, indeed, in most CEE economies) was not as widely available to policymakers as is normally the case even in the less developed EU countries, it is understandable that attention will switch at the first opportunity to NDP issues.[129] But as NDP designers and evaluators, we feel that it is essential that this "analytic" aspect of the Polish NDP be revisited constantly: when the NDP is codified into a CSF treaty; as the CSF begins to be implemented; and as the policies are reviewed and optimized under guidance from mid-term and ex-post evaluations.

Some important aspects of the NDP-driven analysis of the present Polish economic situation may have been under-emphasised. The complexity of these issues makes this easy to understand why this might be so.[130] The most important aspect relates to the role of the Single Market, as the Polish economy becomes increasingly integrated into the wider EU economy. Previous analysis of the EU "cohesion" states – Greece, Ireland, Portugal and Spain – carried out at the time of the 1996 review by Commissioner Monti of progress in implementing the Single Market, suggested that the long-term benefits of the Single Market could be as large as or greater than the benefits of the CSFs, and that the two policy shocks could be complementary and cumulative (ESRI, 1997). It is important that the NDP-Single Market relationship be continually revisited by Polish policy researchers. Although it is important to examine the impacts of the NDP *sui generis,* it is equally important to recognize the role of the NDP in improving the terms upon which Poland will participate in this enlarged market.

Another under-emphasised aspect relates to trade-offs that exist between some of the competing objectives of the NDP. For example, Poland has a high rate of unemployment, so there is an urgent need to increase employment (i.e., labour demand). However, there is also an urgent need to drive up productivity so that wage rates can rise (thus increasing living standards) without competitiveness being eroded by high unit labour costs.[131] One of the few ways in which both

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[129] Empirical policy research in typical EU states can draw on up to 40 years accumulated data and a vast body of published academic research. The data constraints in Poland place severe restrictions on empirical research, and little of the research carried out prior to liberalization is of any policy relevance. For example, the Polish HERMIN model had to be calibrated using time series made up of eight annual observations! (Bradley and Zaleski, 2002)

[130] There are also simple "bureaucratic" explanations! The different European Commission Directorates General are understandably preoccupied with their own areas of responsibility, But the design and implementation of an NDP – mainly the responsibility of DG Regional Policy – is certain to cross into areas that are the concerns of other DGs. These interconnections and synergies are handled by cross-DG committees, but not always in a completely satisfactory way.

[131] Unit labour costs (ULC) are defined as the wage cost (YW) of producing a unit of real output (Q), i.e., ULC=YW/Q. But the wage bill (YW) is just employment (L) multiplied by the average wage rate (W), so ULC=W/(Q/L), i.e., ULC = W/PROD, where PROD represents productivity. An increase in W drives up ULC. An increase in PROD drives down ULC.

employment and productivity can rise is if there is extensive sectoral restructuring in the economy. For example, if there is a decline in traditional low added-value traditional industrial sectors and a more than compensating growth in modern high productivity industries and their accompanying producer services. This is another key justification of an Operational Programme (OP) that is focused on competitiveness.

The historical growth in Polish GDP per capita (the key cohesion objective) can be decomposed into the growth in productivity and economic dependency as follows:

$$\underbrace{\frac{GDP}{\text{Population}}}_{\text{GDP per capita}} = \underbrace{\frac{GDP}{\text{Employment}}}_{\text{GDP per worker}} \cdot \underbrace{\frac{\text{Employment}}{\text{Population}}}_{\substack{\text{Economic Dependency}\\\text{(inverse)}}}$$

while economic dependency can be further decomposed into an employment rate, a participation rate and an inverse age dependency rate as follows:

$$\underbrace{\frac{\text{Employment}}{\text{Population}}}_{\substack{\text{Economic Dependency}\\\text{(inverse)}}} = \underbrace{\frac{\text{Employment}}{\text{Labour Force}}}_{\substack{\text{Employment}\\\text{Rate}}} \cdot \underbrace{\frac{\text{Labour Force}}{\text{Working Age}}}_{\substack{\text{Participation}\\\text{Rate}}} \cdot \underbrace{\frac{\text{Working Age}}{\text{Population}}}_{\substack{\text{Age Dependency}\\\text{(inverse)}}}$$

Figure 1 shows Polish GDP per capita growth from 1995 to 2001. It also includes the breakdown of GDP per capita growth into contribution from productivity, employment, participation and age dependency respectively. Average living standards have risen since 1995. In 1999 and 2000 strong productivity growth was offset by a fall in employment, so in 1999 the growth in GDP per capita was almost half the growth in productivity. In 2000 growth in GDP per capita was about two thirds of that in productivity. By contrast, from 1995 to 1998 strong growth in productivity was translated directly into strong growth of living standards. Throughout the period gradual changes in the age structure of the population have given a further small contribution to the growth of living standards. In 2001 we observe a significant fall both in productivity growth and GDP per capita growth. Overall the cumulative increase in Polish GDP per worker between 1995 and 2001 was over 33 per cent while the increase in living standards was 2 percentage points less (Table 2). During the period, the lowest GDP per worker growth and GDP per capita growth occurred in 2001. The fall in employment rate from 1999, led to increase the economic dependency of population.

**Figure 1: Decomposition of Growth in GDP per capita**

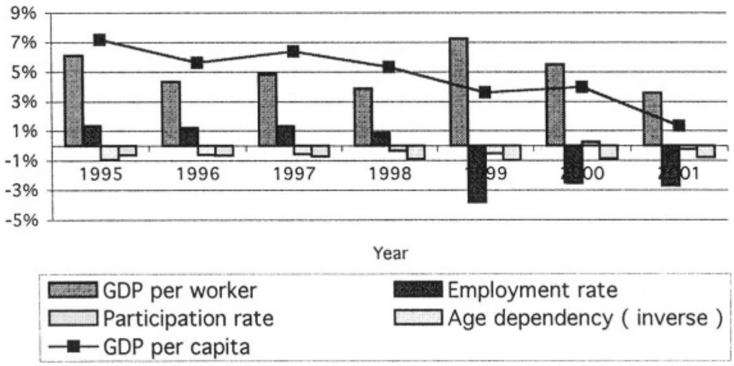


**Table 2: Breakdown of Cumulative Growth in GDP per capita [%]**

| | | GDP per capita | | Economic Dependency | | |
|---|---|---|---|---|---|---|
| Years | GDP per capita | Productivity | Economic Dependency | Employment Rate | Participation | Age Dependency |
| 1995-2001 | 33.44 | 35.44 | -1.76 | -4.33 | -2.93 | 5.49 |

It is not too difficult to make a case that further analysis of the past experience has by no means reached the stage of diminishing returns to policy insight! The object of such analysis is to serve to identify the main requirements of the Polish NDP, and to provide background to the future monitoring and evaluation stages of the process. But there is an additional and entirely complementary need for evidence-based speculation about the potential for future Polish economic performance. At its most basic, there is a need for counter factual analysis where the NDP development aid is assumed not to be available. Only in this way will it be possible to deconstruct how the NDP is likely to impact on the cohesion objective.[132] In other words, we need to be able to separate out improvements arising directly from NDP policy actions from improvements due – say – to a resumption of EU growth or domestic policy reforms – say in labour market institutions – that are relatively unconnected with NDP investment actions.

Medium-term forecasts for the period out to 2006 were presented in the Polish NDP document, and there is a recognition that these are predicated on global economic

[132] It is often suggested that economists are people who worry about whether policies that obviously work in practice can be shown to work in theory (or models)!

developments and internal structural reforms, including fiscal stabilization. The forecast return to annual growth of 6 per cent per year would represent a dramatic turnaround. But it will be necessary to develop the medium-term forecasting methodology and base it on more formal research if these projections are to be operationally useful to NDP analysts, and if they are to command greater credibility. At present they are more indicative or aspirational than strictly scientific. But such projections need to be soundly based on analytical evidence, usually in the form of economic models. Only then could one construct a baseline projection that assumes the absence of the NDP, but with explicit assumptions made about the external environment (Germany, EU accession, etc.) and the domestic policy stance.[133]

The incentive to carry out a better strategic economic analysis of the recent past and likely future is not helped by the insistence by the Commission that a SWOT analysis be used as a key tool to explore economic possibilities and potentials.[134] In a SWOT analysis, the viewpoint is that an understanding of internal positive and negative attributes of an economy in relation to its external environment are central to its success. Even in the domain of business analysis – where it was originally applied – the SWOT technique is almost totally discredited (Whittington, 1993). We have yet to read a SWOT analysis in an NDP that was anything other than a confusing jumble of thoughts, put down in no particular order, and leading to no useful policy insight or conclusion. It is time that this technique was dropped and replaced by more systematic approaches that build on evidence-based research and that yield more policy-relevant insights. In our concluding section we will suggest some alternative frameworks of analysis.

## POLAND'S NATIONAL DEVELOPMENT PLAN, 2004-2006

### Introductory Remarks

The Polish NDP was prepared during the year 2000, and designed for presentation to the Commission by the end of the year. In addition to widespread consultation within Poland, a formal and detailed ex ante evaluation of the documents involved in the preparation of the NDP was carried out under a Twinning contract between the Polish Ministry of Economy and DATAR, a team of French consultants (DATAR, 2002). Additional work was done by a team of Polish experts. Drawing on the ex ante evaluation, the Polish NDP was revised after Copenhagen, and the definitive version was adopted on January 14th, 2003 (NDP, 2003).

The strategic objective of the NDP was defined as follows:

> "To develop a competitive economy based on knowledge and entrepreneurship, capable of harmonized development in the long term that will ensure growth of

[133] We stress that model-based medium-term forecasts are "conditional" on explicit global and policy assumptions, and require the model to be a "good" representation of the structure of the economy. Unconditional forecasts – i.e., assertions that there will be a unique outcome irrespective of global, policy and structural uncertainties – are nonsense! For further details, refer Bradley and Zaleski, 2002).

[134] SWOT is an acronym for Strengths, Weaknesses, Opportunities and Threats.

employment and improvement of social, economic and spatial cohesion as a member of the European Union, at regional and national level".

Generalized national "mission statements" of this kind tend to be aspirational and vague! There is probably not a country in Europe that would not enthusiastically identify with the above statement! But a series of five more focused objectives were then laid out that can be more closely related to explicit and quantifiable Polish government policy goals:

i. Achieving and maintaining high long-term GDP growth;

ii. Increase in employment, in addition to raising the level of education of the work force;

iii. Integration into European networks of transport and information infrastructure;

iv. An increase in the share of high value-added sectors in the economy and development of the technology needed to support the "information society";

v. Participation of all regions and social groups in Poland in the processes of development and modernisation.

It is only when the NDP examines how these five objectives might be attained that the NDP process becomes specific to the needs of the Polish economy. For example, the attainment of objective (i) – long term growth – will require a focus on fiscal stabilization and further restructuring and privatization of the business sector. The current fiscal instability is a serious impediment to Polish growth potential, and policy success here will be crucial in relation to the NDP-type investment programmes, even though they will not be an explicit part of any Operational Programme.

The attainment of objective (ii) – increased employment and education – will require the articulation of a series of active labour market policies, but will call into question the extent to which Poland will be able to evolve the type of Social Partnership models that served to underpin the dramatically improved performance of- say - the Irish labour market and the evolution of competitiveness-friendly wage bargaining institutions (Hardiman, 2002).

The attainment of objective (iii) – infrastructure – is greatly complicated by the physical size of Poland, its dispersed urban structure, and its position as a strategic cross road in trans-European communication networks. By comparison, the Irish or Estonian objectives in this area are much simpler.

The attainment of objective (iv) – structural modernisation – is a need shared with most of the CEE acceding states, but is complicated in the case of Poland by the large size of the agricultural workforce as a share of total employment. The stark economic imperatives here – i.e., the desirability of facilitating rural-urban migration – pose serious social challenges, particularly since the transformation will be forced to take place at a much faster pace than, say, the analogous Irish rural restructuring of the years 1950 – 1970. The industrial and service sector modernizations also pose challenges that are specific to the Polish transition.

The attainment of objective (v) – spatial and social equity – raises very difficult challenges in terms of the possible tradeoffs between economic efficiency and social equity. The experience of the EU cohesion countries has been one of national (or external) cohesion but a degree of regional (or internal) divergence (EC, 2002). The insights provided by economic geographers (Krugman, 1995; Fujita, Krugman and Venables, 1999) and industrial strategists (Porter, 1990; Best, 2001) suggest that the engine of aggregate national growth is regional concentration, and that all regions cannot be winners in this game of agglomeration and specialization. We return to this important issue in our concluding section.

## The Polish NDP 2004-06

In the light of the above five objectives, the Polish NDP was designed and articulated in terms of five key "development axes", as follows:

Axis 1: Support for enterprises' competitiveness: implemented through an Operational Programme (OP) "*Improvement of competitiveness of the economy*".

Axis 2: Development of human resources and employment: implemented through an OP "*Human resources development*".

Axis 3: Creation of conditions to increase the level of investment, promote balanced development and spatial cohesion: implemented through an OP "*Transport – Maritime Economy*", but also including Cohesion Fund interventions in the two areas of "*Transport*" and "*Environment protection*".

Axis 4: Structural adjustment in agriculture and fisheries, and rural development: implemented through two separate OPs, "*Restructuring and modernisation of the food sector and rural development*", and "*Fisheries and fish processing*".

Axis 5: Strengthening of the development potential of the regions and counteraction of marginalization of some area: implemented through an integrated "*Regional Operational Programme*".

The total expenditure on the NDP (Structural Funds, Cohesion Funds, and domestic co-finance) for the three-year period 2004-2006 will amount to 14,891 million euro (at 1999 prices), of which 76.3 per cent (or 11,369 million euro) will be EU funding, with a corresponding domestic co-finance element of 23.7 per cent, Although allocated for the period 2004-06, the actual expenditures will be spread over the longer period 2004-2009, in recognition of start-up and implementation difficulties. Actual expenditures will build up gradually from 2004, will peak in 2007 at about 1.7 of projected GDP, and will taper off by 2010.

The EC funds of 11,369 million euro will be divided into Cohesion Fund resources (32.8 per cent) and Structural Fund resources (67.2 per cent). For the Cohesion Fund element, the domestic co-finance rate falls to about 15 per cent, while the higher domestic co-finance rate of 37.3 per cent applies to the Structural Funds. Within the seven Structural Fund OPs and the single IROP, the allocations of EC funding is as follows:

**Table 3: Allocation of EC Funding**

| Operational Programme | Percentage of EC Structural Funds |
|---|---|
| *Improvement of competitiveness of the economy* | 17.8 |
| *Human resources development* | 17.3 |
| *Transport – Maritime Economy* | 14.4 |
| *Restructuring and modernisation of the food sector and rural development* | 2.4 |
| *Fisheries and fish processing* | 8.6 |
| *Integrated Regional Operational Programme* | 39.2 |
| *Technical assistance* | 0.3 |

## HOW APPROPRIATE IS THE POLISH NDP?

The word "appropriate" is defined as "suitable or proper in the circumstances", and the concept of appropriateness is a fairly minimalist NDP criterion. The policy packages implemented through the NDP are required to be "appropriate" in the sense of being broadly suitable for the identified purposes. What would an "inappropriate" NDP measure look like? A hypothetical example might be if NDP measures in the competitiveness OP were used to prop up by means of subsidies industries that were fundamentally uncompetitive. In the human resources OP, an example might be if "make work" active labour market policies were implemented that had no relevance to the types of job opportunities that were available or that could be created. In the integrated regional OP, an example might be if physical infrastructure projects were implemented in an uncoordinated way that was unrelated to any wider spatial strategy. In the rural development OP, an example might be if the measures degenerated into short-term income support and had no longer term benefits. More broadly, NDP policies would be deemed to be inappropriate where there was no market failure to address.

At the design stage of the NDP the issue of appropriateness can be handled in a "macro" way. The broadly based economic analysis described above pointed to a range of issues that were identified as constraints on cohesion: poor infrastructure, inadequate human capital, rural underdevelopment, regional imbalances, etc. A series of seven OPs were then articulated within the Structural Funds which, together with the infrastructural Cohesion Fund projects, made up the Polish government's policy response to the cohesion challenge. The ex-ante evaluation of the NDP carried out by the French DATAR was used to revise the initial draft NDP, and the resulting package (NDP, 2003) will be codified into a formal CSF treaty for implementation from the year 2004. In parallel, the Ministry of Economy created a Polish team of independent evaluators who cooperated with Ministries, but also with the French evaluator's team and had a substantial impact on the modification of the NDP and SOPs.

But there is clearly another dimension to appropriateness that becomes relevant at the level of detail of the individual measures within each OP. Serious consideration of the rationales for public spending within the context of a CSF were first raised in the mid-term review of the Irish CSF 1994-99 (ESRI, 1997). Four major CSF-related forms of public spending were identified:

i. Spending to provide services which are thought to have a *"public good"* characteristic that would inhibit their optimal provision in the private sector.

ii. Schemes chiefly designed to alter relative prices facing private firms and individuals in order to correct for some externality, e.g., a *corrective* subsidy. These are largely passive grant schemes whose administration is confined to ensuring that they are reaching the target groups and delivering the intended change in relative prices, with care taken to minimize deadweight. Typically, they are open ended in terms of financial commitment.

iii. *Targeted* schemes designed to alter behaviour where private agents are thought to be inadequately informed, or where a specific externality exists. Typically, these require a much more active administration, greater selectivity and considerable value-added in the form of training or advice. Typically, a particular quantum of intervention is envisaged.

iv. *Subsidies* whose chief effect is *redistributional* in character.

The ESRI report concluded that each CSP spending programme should be required to pass the following rigorous test:

> "Does it reduce distortions enough to justify the additional taxation involved? This question needs to be asked even in respect of Structural and Cohesion Funds, as, at the margin, it is possible for the government to substitute a higher rate of domestic co-financing, or additional non-co-financed spending for a shortfall in structural funds. Therefore, by eliminating an unnecessary SF financed measure, the government is ultimately enabled to reallocate funds in such a way as to reduce the overall need for taxation." (ESRI, 1997, p. 77).

The proper identification of the most serious distortions in the Polish economy will require a major commitment to policy research. The benefits of having such knowledge will appear initially in terms of improved design and focus of individual measures within the OPs as they come to be implemented. But further down the line after the Polish NDP is implemented, such knowledge will provide a crucial input into the mid-term evaluation process, as well as into the design stage of any follow-on NDP after 2006.

Returning to the macro (or top-down) perspective, the issue of appropriateness also concerns the inherent "balance" of the investment expenditures under a series of different headings. First, one has to consider the balance between major policy instruments such as physical infrastructure, human capital, or support to the productive sector. For example, there is a tendency to place a high weight on physical infrastructure in NDP planning since it has a durable and easily measurable existence that is reassuring to all policy makers! But it has to be kept in mind that physical infrastructure in only one input into productive activity, even if it is an important one. Equally important, but much more difficult to create and measure, is human capital in the form of improvements in training and education. In both cases there are private and social returns to investment in these areas, but only recently has there been a serious effort made to improve our knowledge of the returns to human capital (de la Fuente, 2003). The balance between the three major policy axes – physical infrastructure, human capital and productive aids – needs further systemic analysis and is still at an early stage in Poland.

A second issue in appropriateness concerns the balance between the key sectors in the economy. For simplicity, these can be regarded as manufacturing, market services, agriculture and the non-market (or public) sector.[135] A series of important issues arise here. For example, the need to re-vitalize rural areas of predominantly agricultural activity must be balanced against an almost inexorable historical experience of economic development that requires the agricultural sector to shrink, both in terms of the share of employment and the share of output. Manufacturing has traditionally been the driving sector in modernisation of agrarian economies, but one of the legacies of central planning in Poland and elsewhere in CEE was that not only was the manufacturing sector grossly inefficient at the time of liberalisation, but it was also paradoxically much too large! But this problem has been largely dealt with during the first phase of CEE transition. The challenge that remains is to build systemic links between the "new" manufacturing sectors and the sophisticated producer services that are required for manufacturing to be internationally competitive. This complex balance needs to be fostered, and we return to the issue in our concluding section.

A third issue concerns the internal regional balance as between the competing attentions of the sixteen Voivoidships. Obviously the whole range of OPs and the Cohesion Fund initiatives will have important regional implications. But the *Integrated Regional Operational Programme (IROP)* is particularly relevant to regional balance, since it will begin to empower the regional authorities to address local challenges with the energy and dynamism that is often a characteristic of local initiatives. We saw above that almost 40 per cent of the EC Structural Funds will be devoted to the IROP, with about one half being spent on regional infrastructure, one quarter on regional human resources and the remaining quarter on local development (a complex mixture of physical, structural and social initiatives). Implementation of the project will take into account a delicate balance between the twin aims of efficiency (which suggests a degree of focus and concentration on regions best poised to take off and eventually to pull the poorer regions along behind them) and equity (which suggests the opposite, i.e., a focus on areas of greatest need, irrespective of growth potential and long-run rates of return).

Finally, there is an issue of "balance" over time. This raises questions about the ability of the Polish authorities to meet start-up deadlines, and to push through the wide range of public sector reforms that will be needed to implement and monitor the NDP. Here, the lessons from the previous EU cohesion countries are a bit mixed (DG REGIO, 2003). In many cases the CSFs in the EU cohesion countries were delivered to tight deadlines, with limited over-runs. But there have been cases where serious "re-programming" was required, suggesting that institutional

[135] These four sectors – manufacturing, market services, agriculture and non-market (or Public) services form the basis of the sectoral disaggregation of the Polish HERMIN model (Bradley and Zaleski, 2002).

capacities needed time to develop the required institutions and skills to make a success of a complex CSF initiative.

## HOW EFFECTIVE IS THE NDP LIKELY TO BE?

The word "effective" can be defined as "successful in producing a desired or intended result". Thus, an inappropriate policy initiative cannot be effective. But policy can be appropriate without necessarily being effective. For example, a policy measure aimed at raising the level of human capital through training might simply be badly implemented or under-resourced and not reach a critical mass of its target population. A policy aimed at developing inter-regional transport systems might be poorly interfaced between regional boundaries or might be unfinished. A policy whose aim is regional socio-economic balance might not be effective if confined strictly to measures appropriate to an NDP, but may require integration with the domestic policies of income re-distribution that form part of the wider priorities of every national or regional government.

What can we infer about likely "effectiveness" of NDP 2004-06 ex-ante? Much work in this area has already been carried out during the ex-ante evaluation exercise by the French Twinning group, DATAR (DATAR, 2002). Purely on the basis of a rigorous and logical critique of initial NDP proposals, possible problems in likely ineffectiveness can be, and were, identified and corrected in the final draft (NDP, 2003). But once the NDP has been approved in principle, the question of effectiveness turns to the future and concerns advance preparation to meet the demands of the mid-term evaluation as well as the design of any follow-on NDP after 2006.

The assessment of effectiveness is based on the extent to which expected effects have been obtained and objectives have been achieved. Effectiveness is usually evaluated by-relating an output, result or impact indicator to a quantified objective. It implies an assessment of performance against the anticipated outputs and results. Ideally one would like to be able to identify a hierarchy of targets in the following sequence:

**[NDP action]**

**-> Direct output achieved**

**-> Intermediate target attained**

**-> Final target attained.**

This sequence of targets can be illustrated by means of the important transport programmes of the NDP:

**[Road construction undertaken]**

**-> Roads completed (km)**

**-> Travel times reduced (minutes)**

**-> Activity boost (GDP, productivity, etc.)**

But even the recently completed ex post evaluation of the CSF 1994-99 programmes in the EU Objective 1 countries and regions concluded that:

> "Such a rigorous assessment of Objective 1 for the 1994-1999 programming period has been largely constrained by a lack of quantified objectives, the limited initial targets – which often focus on outputs – and a diverse, often substantially out-of-date and non-comparable information base for the outputs and results which have been obtained." (DG-REGIO, 2003)

More generally, it is useful to distinguish two approaches to the analysis of effectiveness. The first uses a micro economic (or bottom-up) approach and builds on the kind of analysis of market failure first outlined in the Irish mid-term review of CSF 1994-99 (ESRI, 1997). We will call this approach "micro" effectiveness, and it still at an early stage of development even in the evaluation of the present EU cohesion country CSFs. The second uses a macro economic (or top-down) approach and develops the kind of preliminary analysis contained in the ex ante evaluation of the Polish NDP carried out using the HERMIN model (NDP, 2003, pp. 42-54; Bradley and Zaleski, 2002). We will call this approach "macro" effectiveness, but it has also been commonly – and rather confusingly – referred to as "impact analysis". Further consideration of the "macro" effectiveness and/or impact approach is taken up later in the paper.

The implementation of the "micro" approach to NDP effectiveness will require work at the most disaggregated level of expenditures by measure.[136] The first task might be to classify each expenditure into one of four types:

- Type I: Public good provision
- Type II: Altering relative prices to correct distortion
- Type III: Targeted inducement to alter behaviour
- Type IV: Income redistribution

Within Type III (targeted inducement to alter behaviour), there can be useful sub-classifications:

- Management
- Enterprise strategy
- Skills
- Disadvantaged
- Research and development (R&D)
- Other

These sub-classifications of Type III permit one more easily to make cross-programme assessments to try to ensure that the marginal benefit of like schemes in different programmes is being equalized. For example, variety (a) focuses on the

[136] The remaining part of this section draws on material contained in ESRI (1997), pp. 82-161.

manager, and (b) on the enterprise. In addition, variety (a), designed to ensure that managers have skills of a type which they do not even know they need, is clearly very different from variety (d), composed of measures designed to lift disadvantaged groups out of skills, experience and motivation traps.

Each NDP measure and sub-measure can be assigned to its most plausible type of intervention, although any such assignment is somewhat subjective, as many measures could be assigned to more than one type. The point in assigning measures to a "type" is so one can focus on the very different criteria that should be used to access their performance, as well as the desirability of assigning more or less funding to them. Drawing on the Irish use of this scheme in the CSF 1994-99 mid-term review, the following are the aspects of performance (within a given Type) that are typically relevant:

Type I: Public Goods

i. Is the target area important?

ii. Is this measure contributing to the target; is it excluding other measures that might be more effective?

iii. Is delivery at least cost; could delivery be more competitive?

iv. Is this necessarily a public good or might it be privately provided without subsidy? Is there displacement of private providers?

v. Are there environmental side effects?

Type II: Corrective

i. Is the adjustment to relative prices correct?

ii. Is the externality itself policy-induced, suggesting the possibility of a more direct correction?

iii. Is the budgetary provision in line with current projections of demand?

Type III: Targeted

i. Is the target area important?

ii. Is there a genuine information gap, or specific externality?

iii. Is behaviour changing as intended?

iv. Are the value-added services being delivered in a cost-effective, competitive manner? Is there displacement?

v. How great is deadweight?

vi. Are there environmental or incentive side-effects (including dependency)?

Type IV: Redistribution

i. Does the measure redistribute an appropriate amount to the members of the target group?

ii. Are there training and experience side effects?

iii. Are there other side effects, e.g., environmental?

iv. What is the deadweight (including funds spent exceeding redistribution)?

Of course, this essentially qualitative and subjective approach will need to be tailored to the specific characteristics of the Polish NDP, but many of the categories that were found to be useful in the evaluation of the Irish CSF are also likely to be useful across all the EU cohesion country CSFs as well as the CEE NDPs. Furthermore, when the appropriate "types" of intervention (I – IV) are decided, and the important questions set out within the "types" of intervention, it is possible to use this system as an aid to ranking the measures. To do this requires a scoring system for each major question within each "Type" of intervention, and a weighting system that permits one to sum the scores (see ESRI, 1997, page 140). The eventual composite "rating" for each measure gives some idea of how effective that measure is relative to all other measures.

Needless to say, this approach is dogged by imprecision and subjectivity! But the point is that the eventual composite "rating" of each measure is not as important as the process of analysis and negotiation that is required to arrive at a consensus and assign that "rating". The Irish experience has shown that many interesting and relevant insights can be obtained from the schema, and it was useful in the designation of a range of poorly targeted measures ("sunset") and emerging requirements ("sunrise") in advance of the design of CSF 2000-2006, Although it was developed for use in a mid-term CSF evaluation, it could be of great value in deepening our understanding of the effectiveness of the Polish NDP.

## HOW EFFICIENT IS THE NDP LIKELY TO BE?

The word "efficient" can be defined as "achieving maximum productivity with minimum wasted effort or expense". Although the word "efficient" has many meanings, we use it in the NDP evaluation in a very specific sense in relation to the previous concepts of appropriateness and effectiveness. Considerations of efficiency only arise in cases where policy measures are both appropriate and effective.

Once again, the issue of efficiency has a macro and a micro side. In the case of macro efficiency, one needs to investigate whether the same macro impacts (see next section) could be obtained by less public expenditure, or whether greater macro impacts could be obtained for the same aggregate level of public expenditure, but with a different allocation of resources as between different policy instruments. Based on the use of suitable macro models, it is indeed feasible to carry out such a macro cost-benefit analysis (ESTI, 1994). But the results are not entirely convincing since even in the more advanced EU cohesion countries it is still not possible to design and implement macro models with the required detail and robustness.

Efficiency is more commonly measured at the microeconomic level, using three main techniques (Mulreany (ed.), 2002, pp. 115-132). *Cost effectiveness* aims to choose the most cost-effective way of achieving an objective. This is appropriate only where a measure or project has a single well-defined objective. *Multi-criteria analysis* attempts to assess and score projects against a number of specified criteria. Weights are attached to each criterion, summed and discounted to arrive at a present value of benefits. It is appropriate for projects of a similar type with multiple objectives. *Cost-benefit analysis* attempts to measure the discounted values of all costs and benefits over the lifetime of a project. Shadow prices are used where market prices do not adequately reflect the true value of the resource to society due to distortions or externalities.

In applying these types of microeconomic evaluation tools to NDP or CSF measures, a series of difficult issues arise. For example, the social gain to the creation of – say – 100 jobs is almost never the full wage bill if the net effect is to reduce unemployment by less than 100 jobs. Since this is often the actual outturn, as a result of migration flows and other labour market participation decisions, the "shadow wage rate" used for jobs created should usually be less than the full wage rate. Similar considerations arise due to tax distortions (Honohan, 1996).

In practice, the difficulties in operationalizing either the macro or micro approach to evaluating efficiency means that neither of these approaches can be used widely in the context of NDP evaluation. The main use of micro techniques, and cost-benefit analysis in particular, is confined to major projects which require a high level of public funding. However, a restricted form of multi-criteria analysis was show to be useful in arriving at a qualitative ranking of different measures, and the data requirements for this "heuristic" approach are such that would permit their use in CEE economies.

It is sobering to reflect that the recent ex post evaluation of the CSF 1994-99 programmes in the EU Objective 1 regions was forced to examine the concept of "efficiency" in terms of the very limited measures of "delivery to cost" and "delivery to time". Factors supporting successful timetable delivery included strong political commitment, a commitment that applied even in the absence of Structural Funds, externally imposed deadlines, and strong programme management. Factors underlying failure to meet deadlines included inadequate advance planning, land ownership issues in the case of big infrastructural projects, and poor weather conditions. Only one third of the 60 major projects reviewed were completed within the originally planned timescale, with one third over a year late.

Factors that contributed to exceeding initial budgets included cases where the initial projects were extensively modified during their completion, additional costs due to such factors as unexpected environmental, geological and archaeological issues, inadequate cost planning, and re-prioritization of construction schedules. Approximately two-thirds of all Objective 1 projects ran over budget, with 20 per cent of projects costing over 30 per cent more than originally planned.

Clearly there is much work to be done in the area of the evaluation of efficiency, and not just in the acceding countries! The most promising route would be to designate some key projects for detailed ex ante study using cost-benefit techniques, and to monitor their progress and update the analysis over time.

## BY HOW MUCH IS THE NDP LIKELY TO PROMOTE COHESION?

### Simplifying and Aggregating the CSF Programmes

Before any macroeconomic evaluation of the NDP can take place, the individual investment and other programmes need to be amalgamated into more aggregate economic categories. There are various reasons for this. First, although it is necessary to present the NDP in great administrative detail for the purposes of organisation and implementation, there is less rationale for this detail from an economic impact evaluation perspective. Second, if we aggregate the NDP expenditures into economically meaningful categories, we can make use of research on the impacts of public investment on the performance of the private sector.

The most useful and logical categories for aggregating the NDP are as follows:

i. Investment expenditures on physical infrastructure;

ii. Investment expenditure on human resources;

iii. Expenditures on direct production/investment aid to the private sector (i.e., manufacturing, market services and agriculture).

For each of these economic categories of NDP investment expenditure, there are three possible sources of funding:

i. EU transfers in the form of subventions to the domestic public authorities, as set out in the NDP treaties;

ii. Domestic public sector co-financing, as set out in the NDP treaties;

iii. Domestic private sector co-financing, as set out in the NDP treaties.

The actual data from the Polish NDP is shown in Table 4 below. Although the total expenditure allocated to the NDP by the EU authorities, the Polish government and the Polish private sector are exactly those contained in the NDP, the allocations between the three main economic categories is based on an approximate allocation of the measures to the above three economic categories.

**Table 4: Original Data for the Polish National Development Plan, 2004-2006 (Euro)**

*(Data after EU Summit in Copenhagen, December 12-13, 2002)*

| | EU FINANCING | | | | | | DOMESTIC PUBLIC FINANCING | | | | | | DOMESTIC PRIVATE FINANCING | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
| **IGVCSF** | 103.4 | 523.0 | 1089.8 | 1285.7 | 792.0 | 152.7 | 34.7 | 186.8 | 392.9 | 473.3 | 294.0 | 61.4 | 31.5 | 169.8 | 357.1 | 430.2 | 267.2 | 55.9 |
| **GTRSF** | 63.9 | 232.1 | 455.6 | 460.7 | 264.5 | 13.6 | 26.4 | 97.4 | 191.9 | 195.8 | 113.0 | 6.9 | 14.6 | 76.4 | 159.9 | 190.6 | 117.9 | 23.7 |
| **TRIT** | 13.8 | 74.4 | 156.5 | 188.5 | 117.1 | 24.5 | 4.4 | 23.8 | 50.1 | 60.3 | 37.5 | 7.8 | 18.2 | 98.0 | 206.1 | 248.3 | 154.2 | 32.2 |
| **TRIN** | 13.8 | 74.4 | 156.5 | 188.5 | 117.1 | 24.5 | 4.4 | 23.8 | 50.1 | 60.3 | 37.5 | 7.8 | 18.2 | 98.0 | 206.1 | 248.3 | 154.2 | 32.2 |
| **TRIA** | 17.6 | 94.9 | 199.6 | 240.5 | 149.4 | 31.2 | 5.9 | 31.8 | 66.8 | 80.5 | 50.0 | 10.5 | 19.9 | 107.5 | 226.0 | 272.2 | 169.1 | 35.3 |
| **Total** | **212.6** | **1180.1** | **2439.2** | **2822.9** | **1725.3** | **306.1** | **91.2** | **446.5** | **926.0** | **1080.1** | **662.3** | **121.7** | **169.3** | **910.1** | **1913.0** | **2302.3** | **1429.7** | **297.9** |

Notes:
**IGVCSF**: Investment expenditures on physical infrastructure
**GTRSF**: Investment expenditures of human resources
**TRIT**: Direct aid to the manufacturing sector; **TRIN**: Direct aid to the market services sector; **TRIA**: Direct aid to the agriculture and fishing sector

The Polish NDP contains seven Operational Programmes, as follows:
**SOP 1**: Improvement of economic competitiveness
**SOP 2**: Human resources development
**SOP 3**: Restructuring and modernization of the food sector and rural development
**SOP 4**: Fisheries and fish processing
**SOP 5**: Transport-Maritime economy
**IROP**: *Integrated regional operational programme*
**OPTA**: Technical assistance

In this table we have allocated the investment expenditures from these seven Operational Programmes to the three economic categories: physical infrastructure, human capital, and direct aid to the productive sectors.

## An NDP Impact Quantification Methodology

NDP investment programmes influence the economy through a mixture of supply and demand effects. Short-term demand (or Keynesian) effects arise as a consequence of increases in the expenditure and income policy instruments associated with NDP policy initiatives. Through "multiplier" effects, there will be knock-on changes in all the components of domestic expenditure (e.g., total investment, private consumption, the net trade surplus, etc.) and the components of domestic output and income.

These demand effects are of transitory importance and are not the *raison d'être* of the NDP, but merely a side-effect. Rather, the NDP interventions are intended to influence the long-run supply potential of the economy. These so-called "supply-side" effects arise through policies designed to:

i. increase investment in order to improve physical infrastructure as an input to private sector productive activity;

ii. increase in human capital, due to investment in training, an input to private sector productive activity;

iii. channel public funding assistance to the private sector to stimulate investment, thus increasing factor productivity and reducing sectoral costs of production and of capital.

Thus the NDP interventions are designed in order to improve the aggregate stock of public infrastructure and of human capital, as well as the private capital stock. Providing more and better infrastructure, increasing the quality of the labour force, or providing investment aid to firms, are the mechanisms through which the NDP improves the output, productivity and cost competitiveness of the economy. In a certain sense, these policies create conditions where private firms enjoy the use of additional productive factors at no cost to themselves. Alternatively, they may help to make the current private sector inputs - that firms are already using - available to them at a lower cost, or the general conditions under which firms operate are improved as a consequence. In all these ways, positive externalities may arise out of the NDP interventions.

Recent advances in growth theory have addressed the role of spillovers or externalities which arise from public investments, for example in infrastructure or in human capital. Furthermore this literature has investigated how technical progress can be affected directly through investment in training, research and development. Here too externalities arise when innovations in one firm are adopted elsewhere, i.e. when such innovations have public good qualities.

Two types of beneficial externalities are likely to enhance the mainly demand-side (or neo-Keynesian) impacts of well designed investment, training and aid policy initiatives. The first type of externality is likely to be associated with the role of improved infrastructure and training in boosting output directly. This works through mechanisms such as attracting productive activities through foreign direct investment, and enhancing the ability of indigenous industries to compete in the international market place. We refer to this as an <u>output externality</u> since it is well known that the range of products manufactured in developing countries changes during the process of development, and becomes more complex and technologically advanced.

The second type of externality arises through the increased total or embodied factor productivity likely to be associated with improved infrastructure or a higher level of human capital associated with training and education. We refer to this as a factor productivity externality. Of course, a side effect of increased factor productivity is that, in the restricted context of fixed output, labour is shed.

The prospect of such "jobless growth" is particularly serious in Poland where the recorded rate of unemployment and well as the rate of hidden unemployment is already very high and rising. Thus, the factor productivity externality is a two edged process: industry and market services become more productive and competitive, but labour demand is weakened if output is fixed. However, on the plus side, factor productivity is driven up, real incomes rise, and these effects cause knock-on multiplier and other benefits throughout the economy. Consequently, the role of the output externality is more unambiguously beneficial: the higher it is, the faster the period of transitional growth to a higher income plateau. Taken together, these two externality effects have the potential to produce beneficial impacts in terms of an increased level of economic activity and increased employment.

The elasticities, particularly in relation to infrastructure, have been chosen on the basis of an exhaustive literature review (details of which are available in Bradley, Morgenroth and Untiedt, 2002). The empirical literature suggests that the values for the elasticity of output with respect to increases in infrastructure are likely to be in the region between 5 and 40 per cent, with Poland probably characterised by values nearer the upper end of the scale.[137] With respect to human capital, elasticities in the same range also appear reasonable.

How enduring are the beneficial NDP-related externalities likely to be? The infrastructure deficit in Poland is known to be very large, as documented in the Polish NDP document, and is unlikely to match up to the level pertaining in the more developed EU countries until well after the year 2015. Given this fact, as well as the fact that there are substantial returns to the elimination of bottlenecks which will take some time to accomplish, it is quite reasonable to expect that the chosen externality effects will capture the benefits properly over the time period for which the simulations have been carried out, i.e. 2004-2010. For the same reasons it is unlikely that diminishing returns will set in.

## Simulating the Macroeconomic Impacts of NDP 2004-2006

The impacts of the NDP on a range of macroeconomic and macro-sectoral variables can be evaluated with the aid of the Polish HERMIN model (Bradley and Zaleski, 2002).[138] The methodology has been described in Chapter 9. Basically, we carry

[137] For example, a one per cent rise in the stock of physical infrastructure is assumed to be associated with an $\eta$ per cent rise in manufacturing output, where the elasticity $\eta$ lies between 0.05 and 0.40.

[138] It might be held that, in the presence of such large-scale public policy shocks, the underlying structure of the economy would change and that the use of Polish HERMIN model calibrated with NDP-inclusive data is invalid (the so-called "Lucas critique" of the use of econometric models to

out a "with-NDP" simulation and a "without NDP" simulation, and derive the impacts of the NDP by comparing them.[139] Unless otherwise stated (as in the sensitivity analysis reported later), we assume the following values for the crucial externality elasticities:

(a) Output elasticities (infrastructure and human capital) 0.40

(b) Productivity elasticities (infrastructure and human capital) 0.20

Using the above elasticities, we experiment with three versions of the NDP. The first (referred to as the "total" NDP) includes EU, local public and private co-finance. The second (referred to as the "public" NDP) only includes EU finance and local public co-finance. The third (referred to as the "EU" NDP) only includes the EU finance.

To assist in the interpretation of the CSF simulation results, it is useful to keep some summary measures in mind. The total size of the NDP relative to GDP is shown in Table 5. The NDP expenditures have been calculated in national currency (Zloty). In terms of the size of the investment shock, the "total" NDP is the largest of the three variants, since it includes the EU, the domestic public co-finance and the domestic private co-finance. At its peak in the year 2007 the size of the increased investment is 1.67 per cent of GDP. The "public" NDP shock is an intermediate case (1.16 per cent of GDP at its peak), and the "EU" NDP is the smallest (0.86 per cent of GDP at its peak).

**Table 5: NDP Expenditure Expressed as a Percentage of GDP**

| | Total NDP | Public NDP | EU NDP |
|---|---|---|---|
| 2003 | 0.00 | 0.00 | 0.00 |
| 2004 | 0.18 | 0.13 | 0.10 |
| 2005 | 0.81 | 0.58 | 0.43 |
| 2006 | 1.55 | 1.10 | 0.81 |
| 2007 | 1.67 | 1.16 | 0.86 |
| 2008 | 0.96 | 0.67 | 0.49 |
| 2009 | 0.17 | 0.11 | 0.08 |
| 2010 | 0.15 | 0.10 | 0.07 |

In Table 6 we show the impact of the NDP on aggregate real GDP at market prices (as a percentage change relative to the no-NDP baseline), and on the unemployment rate (as a difference relative to the no-NDP baseline).[140] This simulation captures both the direct demand-side (or Keynesian) impacts as well as additional supply-side impacts that are associated with the improvement in infrastructure and human resources.

analyse policy impacts). However, the Polish HERMIN model contains explicit sub-models of the structural changes that are associated with the operation of the NDP, so the validity of the Lucas critique is weakened.

139 We note that the "payments" NDP data are used, and not the "commitments". Hence, the expenditures for NDP 2004-06 extend into the following three years, i.e. 2007, 2008 and 2009. After the year 2009, the NDP expenditures were projected unchanged at their 2009 nominal values.

140 Sensitivity analysis is not reported here, but is available in Bradley and Zaleski, 2002.

**Table 6: Aggregate NDP Impacts on GDP and Unemployment**

| | Total NDP | | Public NDP | | EU NDP | |
|---|---|---|---|---|---|---|
| | GDPM | UR | GDPM | UR | GDPM | UR |
| 2003 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2004 | 0.22 | -0.14 | 0.17 | -0.10 | 0.12 | -0.08 |
| 2005 | 1.13 | -0.71 | 0.83 | -0.51 | 0.60 | -0.37 |
| 2006 | 2.51 | -1.48 | 1.83 | -1.05 | 1.32 | -0.76 |
| 2007 | 3.33 | -1.77 | 2.43 | -1.25 | 1.74 | -0.90 |
| 2008 | 2.83 | -1.15 | 2.10 | -0.81 | 1.48 | -0.56 |
| 2009 | 1.56 | -0.27 | 1.20 | -0.18 | 0.82 | -0.10 |
| 2010 | 1.22 | -0.05 | 0.95 | -0.02 | 0.63 | 0.02 |

**GDP: Percentage change from no-NDP baseline; UR: Change from no-NDP baseline**

For the "total" NDP the impact on GDP peaks in the year 2007 at 3.33 (i.e. the level of Polish GDP is likely to be 3.33 per cent higher as a result of the NDP). In the same year, the rate of unemployment is cut by almost 2 percentage points (i.e. if the rate of unemployment had been X percent of the labour force in the no-NDP simulation, it would be (X-1.77) per cent in the "total" NDP simulation). As we move across Table 6 from the "total", to the "public" and finally to the "EU" NDPs, the effects become more modest. Note that by the year 2010 – by which time the NDP expenditures are assumed to be frozen at their low 2009 values, the fall in the level of unemployment is very much reduced. This comes about due to the induced rise in productivity that is associated with the efficiency-enhancing effects of the NDP programmes. However, it should be remembered that the only policy alteration that we introduce into the model is the NDP investment programmes. In reality, other changes will accompany the NDP, e.g. the restructuring of the Polish economy and its opening to increased trade within the single European market. So, the above results need to be interpreted carefully as representing only one element of the impact of EU entry on the Polish economy.[141]

In Table 7 we decompose the "total" NDP impacts for manufacturing. We have already noted the increase in the level of output and employment. But in Table 7 we also see that the level of productivity (LPRT) increases steadily, and peaks at a rise of 1.32 per cent in the year 2008. In the absence of any other positive shock (i.e., over and above the NDP), this is likely to diminish the employment increase over time.

[141] See ESRI (1997) for an account of the combined analysis of NDP and Single Market impacts for Greece, Ireland, Portugal and Spain.

**Table 7: Total NDP Impacts on Manufacturing Sector: (% Change over "no-NDP" Baseline)**

| | OT | LT | LPRT | IT |
|---|---|---|---|---|
| 2003 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2004 | 0.26 | 0.25 | 0.02 | 0.66 |
| 2005 | 1.44 | 1.31 | 0.13 | 3.40 |
| 2006 | 3.42 | 2.96 | 0.45 | 7.16 |
| 2007 | 5.05 | 4.09 | 0.92 | 9.03 |
| 2008 | 5.10 | 3.73 | 1.32 | 6.96 |
| 2009 | 3.65 | 2.34 | 1.28 | 3.45 |
| 2010 | 3.25 | 1.96 | 1.26 | 3.02 |

OT denotes output in manufacturing; LT denotes manufacturing employment; LPRT denotes labour productivity; IT denotes manufacturing investment.

In Table 8 we show the changes in the public sector borrowing requirement, the national debt and the net trade surplus, all expressed as a percentage of GDP. It is of interest to note that the "total" NDP relaxes the Polish borrowing requirement (by 0.80 per cent of GDP in the year 2007 relative to the no-NDP baseline), causes a fall in the national debt (by 2.85 per cent of GDP in 2008 relative to the no-NDP baseline), but causes a rise in the net trade deficit (by 0.63 in 2007 relative to the no-NDP baseline). The small but beneficial impact on the public sector borrowing requirement (expressed as a percentage of GDP) is caused by the fact that much of the NDP financing comes in the form of either a grant from the EU or in the form of private sector financing. The induced boost to the economy helps finance the Polish public sector co-finance out of increased tax revenue in the context of fixed tax rates.

**Table 8: Total NDP Impacts on Public Sector Deficit (GBORR) and Net Trade Surplus (NTSVR) (Percentage of GDP, Deviation from Baseline)[142]**

| | GBORR | RDEBT | NTSVR |
|---|---|---|---|
| 2003 | 0.00 | 0.00 | 0.00 |
| 2004 | -0.05 | -0.15 | -0.07 |
| 2005 | -0.25 | -0.79 | -0.31 |
| 2006 | -0.58 | -1.87 | -0.59 |
| 2007 | -0.80 | -2.74 | -0.63 |
| 2008 | -0.72 | -2.85 | -0.35 |
| 2009 | -0.43 | -2.45 | -0.06 |
| 2010 | -0.25 | -2.35 | 0.02 |

The analysis described above makes the following very artificial assumptions:

1. The NDP 2004-06 operates in isolation from all other policy and external influences;

[142] Note: A "+" sign indicates a deterioration (or rise) in the borrowing requirement (GBORR) but an improvement (or rise) in the net trade surplus (NTSVR), both expressed as a percentage of GDP.

2. The NDP is a "once-off" event, and will be wound down and discontinued by the year 2009;
3. There will be no further EU-aided NDPs after NDP 2004-06.

In the light of the experiences of the poorer (so called cohesion) states of the EU (Greece, Ireland and Portugal), it seems very likely that a new and expanded Polish NDP will be negotiated during the years 2005-06, and will be implemented for an extended period after 2006. For example, the first EU Community Support Framework (CSF) covered the period 1989-93. An expanded CSF was then designed that covered the years 1994-99. The present EU CSF covers the period 2000-2006.

If, as is very likely, a new and enlarged NDP will operate within Poland for an extended period after 2006, then it is desirable to anticipate these events in a counterfactual simulation, rather than designing strategy in a context that assumes there will be no future NDPs after 2006. To initiate discussion about these matters, we have carried out the following additional model simulation;

1. We assume that there will be a new NDP after the year 2006, which will subsume the programmes of NDP 2004-06 for the years after 2006;
2. We assume that this new NDP will operate over a seven year time horizon, for the period 2007-2013 at least;
3. We assume that the ability of the Polish economy to absorb and co-finance EU aid will be improved, and that the limit of NDP funding (EU, domestic public and domestic private) will rise to 2.5 per cent of GDP.[143]
4. Given the extent to which Polish GDP per capital is likely to lag behind that of the EU average, even after the year 2013, consistently we make the further assumption that NDP expenditures of approximately 2.5 per cent of the value of GDP in the year 2013 will continue beyond the year 2013, to the terminal date of our model simulations, namely the year 2015.[144]

Compared to the previous analysis of NDP 2004-2006 – where we phased out the investment expenditures after 2006, the impacts are now considerably greater. Table 9 implies that in the case of the "total" NDP, the impact is to raise the level of Polish GDP by over 9 per cent above the baseline (no-NDP) level. The reduction in the level of unemployment are equally strong at about 3 percentage points.

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[143] The share of total NDP expenditure in the Polish NDP 2004-06 peaked at 1.67 per cent of GDP in the year 2007 and falls to below 0.2 per cent by 2009.

[144] The alternative assumption, namely that NDP 2007-13 terminates EU aid would also appear to be very artificial. The EU cohesion countries (Greece, Ireland and Portugal) will have received EU aid for 16 years (starting from 1989) when the present programme period (2000-06) terminates. If Poland only starts to receive significant NDP aid in the year 2004, and is to receive it for a period comparable to the EU cohesion countries, then this would take us to the year 2020.

**Table 9: Aggregate NDP Impacts on GDP* and Unemployment (UR**)**

*Assumes Annual Funding for 2007-2015 Continues at 2,5 per cent of GDP*

| | Total NDP | | Public NDP | | EU NDP | |
|---|---|---|---|---|---|---|
| | GDPM | UR | GDPM | UR | GDPM | UR |
| 2003 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| 2004 | 0,22 | -0,14 | 0,17 | -0,10 | 0,12 | -0,08 |
| 2005 | 1,13 | -0,71 | 0,83 | -0,51 | 0,60 | -0,37 |
| 2006 | 2,51 | -1,48 | 1,83 | -1,05 | 1,32 | -0,76 |
| 2007 | 4,57 | -2,52 | 3,33 | -1,79 | 2,39 | -1,29 |
| 2008 | 5,66 | -2,73 | 4,16 | -1,92 | 2,97 | -1,37 |
| 2009 | 6,30 | -2,80 | 4,67 | -1,98 | 3,31 | -1,39 |
| 2010 | 6,85 | -2,84 | 5,10 | -2,00 | 3,59 | -1,38 |
| 2011 | 7,43 | -2,88 | 5,56 | -2,02 | 3,89 | -1,38 |
| 2012 | 8,04 | -2,95 | 6,03 | -2,06 | 4,20 | -1,38 |
| 2013 | 8,67 | -3,02 | 6,53 | -2,11 | 4,53 | -1,39 |
| 2014 | 8,99 | -2,88 | 6,81 | -2,01 | 4,70 | -1,29 |
| 2015 | 9,22 | -2,70 | 7,02 | -1,87 | 4,82 | -1,16 |

*GDP: Percentage change from no-NDP baseline; **UR: Change from no-NDP baseline

These results can be placed in context as follows. If we assumed that the Polish economy were to grow at roughly the EU average growth rate over the period 2003-2015, in the absence of NDP aid, then Poland would make no progress towards the cohesion objective. If that were the case, then in the presence of NDP aid for the period 2004-2006 (the planned NDP programme) and for the period 2007-2013 (our hypothetical continuation NDP), then Poland could reduce the gap between its living standards and those of the EU (as measured by GDP per capita) by between 7 and 9 percentage points.

The cohesion progress suggested by Table 9 could be thought of as a worst case scenario. In practice, there are likely to be many other changes in the structure of the Polish economy (e.g., agricultural reforms, industrial strategy, increased inward foreign direct investment) as well as the policy environment (fiscal reforms, labour market developments, the Single European Market, Economic and Monetary Union, etc.) that are likely to add significantly to the achievement of the cohesion objective. The broadest lesson to be drawn from this experimental NDP impact analysis is that structural change in an economy – involving openness, institutional quality, etc. – is driven by the NDP interventions, but also by wider domestic and international forces. The NDP will serve to accelerate these changes, but it is the wider challenges of EU membership that will probably dominate in promoting cohesion.

## SUGGESTIONS FOR FUTURE POLISH NDP EVALUATION RESEARCH

### Further Development of National Modelling Research

We have shown how the first version of the new Polish HERMIN macromodel was applied to provide initial analysis of the likely impacts of the Polish National Development Plan for the period 2004-06. However, this, or any other model, has many other potential uses that would serve to contribute to and deepen NDP impact analysis:

i. As an input to the development of national medium-term forecasts (i.e. 5-year time horizons) as part of a rolling forward-looking review and evaluation of Poland's economic prospects as it joins the EU;

ii. As an input into monitoring and evaluation of fiscal balances over the medium term and consequences for the domestic co-financing of EU Structural Funds;

iii. As a tool for the examination of the likely consequences of the Single European Market on Poland, in terms of the impact on prices, wages, competition, and the evolution and restructuring of Polish manufacturing and market services;

iv. As a tool for the examination of the design and likely impacts of alternative types of industrial strategy and their consequences for cohesion (Barry, Bradley, Kejak and Vavra, 2003).

With respect to the evolution of the national Polish HERMIN model, there are some priority areas for future improvement.

Further disaggregation of the manufacturing sector is needed in order to reflect the main groups of industrial sectors in Poland: e.g.

i. <u>capital intensive traditional sectors:</u> coal, steel, cement, ship-building, chemicals, etc.

ii. <u>modern sectors:</u> e.g., electronics, Pharmaceuticals, etc., where FDI will play a major role

iii. <u>traditional labour-intensive sectors:</u> e.g., clothing, food products, wood products, etc.

These types of industrial sub-sectors have very different properties, and disaggregation will provide an improved accuracy in modeling and policy-relevant analysis.

The agriculture sector in HERMIN is treated currently in a rudimentary way. The economic forces that will operate within Polish agriculture are likely to be very different from those operating within manufacturing and market services. Consequently, there is a need to develop a more detailed sub-model or satellite model of the agriculture sector in order to chart its transformation within the reformed CAP of the EU.

It appears that Poland may experience fiscal constraints over the next few years during which the need to reduce the public sector borrowing requirement is likely to be of central concern to policy makers. Consequently, it will be necessary to improve the public sector in HERMIN, paying particular attention to accurate treatment of revenues and expenditures, as well as the manner in which increased taxation and/or reduced public expenditures are likely to impact on the performance of the private sector of the economy.

Finally, work will need to continue on the NDP analysis in order to improve and augment the range of mechanisms contained in the model that relate NDP investment activities to restructuring and enhanced economic performance. In particular, the concepts of aggregate "physical infrastructure" and aggregate "human capital" need to be disaggregated. For example, in the case of physical infrastructure, consideration needs to be given to the different impacts of roads, rail, telecommunications, ports, airports, etc.

With respect to the improvements (broadening/deepening) of the national Polish HERMIN model, a key objective should be to carry out further work only where it is likely to lead to improved policy analysis and policy advice. Consideration should be given to the preparation of a formalized medium-term review of the Polish economy where the insights from the Polish HERMIN model or other models could be used as an essential input into a coherent and evidence-based examination of the current economic situation and the likely prospects over a five-year time horizon.[145]

## Further Development of Regional Research

Even if the national HERMIN model is improved (broadened/deepened), it will remain only of limited use in addressing the challenges facing Polish policy-makers as they attempt to design policies to tackle regional economic problems and inequalities. There is an urgent need to provide a regional modeling framework that will function as a complement to the national HERMIN model and other national models that already exist. An initial programme of work on regional policy analysis and modeling could be structured along the following broad lines:

i. An obvious level of spatial disaggregation within this new model is the 16 regions;

ii. A broad-ranging review of the present state of regional socio-economic and business data in Poland should be carried out, and gaps in regional data should be identified;

iii. A database of regional data should be constructed and the database used to prepare a brief review of the key characteristics of the regions that will serve to identify the main regional policy challenges;

iv. A draft regional modeling framework should be designed, in parallel with the above review of data, with emphasis on the level of disaggregation within each region that will be necessary in order to provide the desired policy insights;

v. An evaluation needs to be made into whether the construction of a regional modeling framework of the appropriate type is likely to be successful in light of the data constraints identified in (i) above.

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145 The ESRI has published a biennial *Medium-term Review* of the Irish economy since the year 1987, based on an extended HERMIN-type model. This has proved to be a very influential exercise and provides independent and authoritative inputs into policy-making by the Irish government as well as business strategy reviews by the business sector.

vi. Assuming that the data gaps could be overcome in a pragmatic fashion, the research should then focus on a range of central themes of regional policy, such as the following:

   a. The ways in which national policy actions (in the areas of taxation, expenditure - including redistribution - and monetary policy) feed downwards to the regional economies and influence their performance;

   b. The nature of the policy autonomy currently available to regional administrations, and how this can be used to boost economic performance;

   c. Other actions available – or potentially available - to regional policy makers – in the public and the private sectors – that might act to boost economic performance.

   d. The interactions of regions and the synergies generated by inter-regional co-operation and spill-overs.

   e. Reverse feedback from the regional economies to the national economy and the identification of possible constraints that this might impose on national policy autonomy.

## Wider Frameworks for Polish Strategic Analysis

### *Economic and Business Perspectives on Industrial Strategy*

Business policy research tends to be focused on the performance of individual firms or groups of firms. Economic policy research, on the other hand, tends to be directed at issues and challenges that arise at the level of regions, nations or even groupings of nations such as the EU. This simple but profound distinction lies at the heart of the tensions that can arise between a mainly firm-based perspective of business researchers and a mainly regional/national-based perspective of economists, particularly in matters concerning the design and execution of industrial strategy.

At the risk of over simplification, one might stylize economic theories as being useful for the study of how a "representative" firm is likely to behave when subjected to changes in the wider external policy environment. Business research frameworks, on the other hand, tend to be focused on the analysis of the consequences of management actions that are intended to improve the prospects of a "specific" firm within a given (usually fixed) external policy environment.

In policy-related research on business strategy it is common for knowledge and research insights to be systematized into explanatory frameworks. Such frameworks usually stop well short of being testable paradigms in any scientific sense, but often take the form of taxonomies of useful and revealing facts and insights. Influential examples include Raymond Vernon's Product Life Cycle (PLC) framework explaining the sequential nature of the different stages of industrialization, trade and foreign direct investment (Vernon, 1966); Michael Porter's diamond of the competitive advantage, which shows how policy can be used to create national advantage even in situations where initial factor and other endowments are unfavorable (Porter, 1990); and Michael Best's capability and innovation perspective – the Capability Triad – which points to the need for synchronized advances on many fronts if dynamic growth is to occur (Best, 2000).

## Porter's Diamond of Competitiveness Framework

Raymond Vernon had set out to explain why the US was a leader in so many advanced goods. His PLC framework provided a dynamic theory of trade and outward FDI in a context where the US dominated the design of advanced products. Michael Porter set out to address a series of wider questions:

> "Why (do) firms from a particular nation establish leadership in particular new industries? What happens when demand originates simultaneously in different nations? Why is innovation continuous in many national industries and not a once-and-for-all event followed by inevitable standardization of technology as the product cycle theory implies? ... How can we explain why some nations' firms are able to sustain advantage in an industry and others are not?" (Porter, 1990, p. 17)

His answers identify four broad attributes (the competitiveness "diamond") that shape the environment in which national firms compete (Figure 2), with an ancillary role played by governments and by chance. *Factor conditions* refer to the availability and quality of the factors of production such as skilled labour, infrastructure, etc. *Demand conditions* refer to the nature of local and external demand for the industry's product or service, where local demand can play a vital role in encouraging product innovation and improvement. *Related and supporting industries* refer to the presence or absence of supplier industries and related industries that are also internationally competitive. *Firm strategy, structure and rivalry* refer to the national conditions governing how companies are created, organized, and managed.

Although the diamond itself is not a dynamic system, Porter suggested that there were different stages of competitive development during which different elements of the diamond came into play (Figure 3).

At the early stages, competitive development is driven by factor conditions, and draws on low cost labour and/or abundant natural resources. The next stage is investment driven, and draws from factor conditions, demand conditions as well as firm strategy, structure and rivalry (i.e., from three of the four diamond elements. In the next stage, competitiveness is innovation driven, and draws systematically from the entire diamond.

**Figure 2: Porter's Diamond of Competitive Advantage (Porter, 1990)**

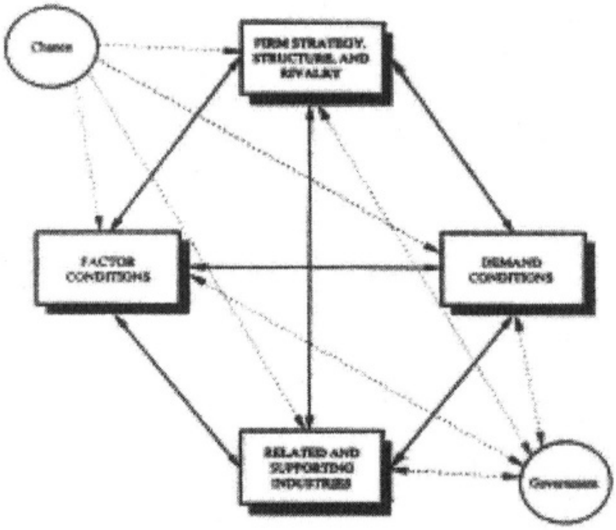
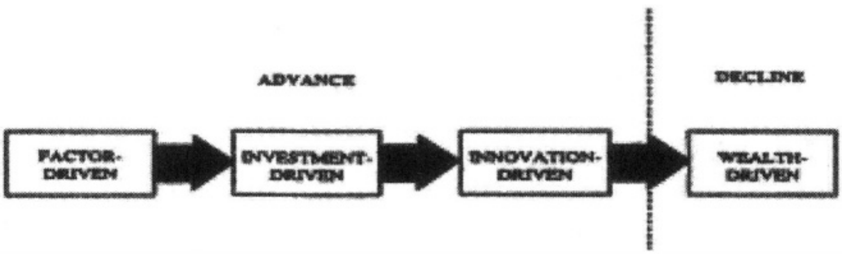



**Figure 3: Porter's Stages of Competitive Development (Porter, 1990)**




Using Porter's four-stage development process, one can classify a range of national development strategies as shown in Table 10.

Porter's main contribution to explaining the nature of competitive advantage lies in the emphasis he places on the interactions between the four elements of competitiveness and the detailed study of individual successful nations, regions and industries that illustrate these interactions at work. In particular, his approach has strong implications for the design and execution of national industrial policy (Porter, 1990, chapter 12), and provides a useful checklist of what types of policy intervention are likely to improve the individual elements of the diamond as well as their interaction.

**Table 10: Porter's Stages of National Competitive Development**

| Key Driver | Source of Competitive Advantage | Country Examples |
|---|---|---|
| Factor conditions | Basic factors of production (e.g., natural resources, lower skilled labour) | South Korea, Singapore and Ireland (before 1980s)<br>Poland today? |
| Investment | Capital equipment, transfer of technology | Japan (during 1960s)<br>South Korea (during 1980s)<br>Ireland (after 1980s)<br>Poland after EU membership and NDP? |
| Innovation | All four elements of Porter's "diamond" | Germany, Sweden (post-war)<br>Japan (since 1970s)<br>Italy (since early 1970s)<br>Ireland (post 2000) |
| Wealth | Erosion of competitive advantage | UK (post-war)<br>USA, Switzerland, Sweden (since 1980s) |

Source: Kotler *et al*, 1997 (adapted)

Sectoral clustering, with its accompanying agglomeration effects, are crucial in generating sustained growth. One can define an industrial cluster as a group of industrial segments that share positive vertical and horizontal linkages. Porter's diamond-based framework places great stress on the importance of clusters of related and supporting industries in driving national competitiveness through the spill-over benefits of user-producer contacts and information exchange. In some cases – usually in larger developed economies like the USA, Japan and Germany – clusters start up due to historical chance. However, in economies like Ireland and Poland, cluster formation has to be carefully fostered by policy makers and the promotional agencies.

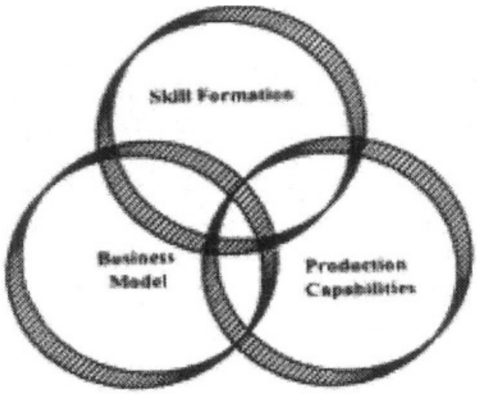
Porter's competitive framework - the current business strategy orthodoxy throughout most of the developed and developing world - suggests that a country like Poland could implement a strategy in a sequence of separate stages: factor driven; investment driven; and innovation driven (Figure 3 above). In the case of Ireland, the first stage lasted almost 25 years, from the late 1950s to the mid 1980s, and was "factor" driven, based on policies of low rates of corporation tax, low wages, and subsidized capital formation. The second stage has lasted from the late 1970s to the late 1990s, during which there has been massive public and private investment in plant, infrastructure and human capital, co-funded through EU regional aid from 1989 onwards. Policy-makers are now seeking to shift to Porter's third (innovation driven) stage. But this has exposed some of the limitations of an industrial strategy that came to be based largely on foreign direct investment. Poland has come to this process much later, and careful consideration needs to be given to how it can exploit the various stages of development.

### *Best's Capability Triad*

A recent framework to emerge from a business research perspective is the "capability triad" of Michael Best. What Best offers in his capabilities and innovation perspective - henceforth, the capability triad - is a new and sophisticated strategic framework for the development of industrial policy. The grounds for this synthesis were laid in Best's earlier book on *The New Competition,* which was directed more at the limitations of the conventional neoclassical theory of the firm than at the dominant business taxonomies and frameworks (Best, 1990). His latest book, *The New Competitive Advantage* (Best, 2001), uses it to explain the revival of the Massachusetts Route 128 technology complex and the rise of the electronics industry in Malaysia.

Best's capability triad is based on the interaction of three core elements: a business model, production capabilities and skill formation (Figure 4). The *business model* element of the triad describes how entrepreneurial firms grow, based on the creation of new firms through technology diversification, inter-firm networks based on open systems, and regional specialization based on technological capabilities. The *production capabilities* element of the triad integrates ideas from operations management and operations strategy into a logical system of production system models that drive home the lesson that competitive strategy and productive systems are bound together. The *skill formation* element of the triad, in addition to providing a vital direct input into production, is what serves to enhance the synergistic interaction of the first two elements: the business model and production capabilities.

**Figure 4: Best's Capability Triad (Best, 2000)**




Perhaps the most daunting aspect of the capability triad is that it treats the scope for public policy as being almost completely and seamlessly blended into the detailed mechanics of change processes that occur within private firms. In this framework, as well as in Porter's diamond, public policy and private entrepreneurial actions do not operate in isolation from each other, but need to become mutually reinforcing. Only in one element of the capability triad - skill formation - is there some scope for a partially separable and transparent role for public policy, namely, to ensure that the right mix of education and skills is produced to accommodate the changing demands of the economy as it develops. Even here, the links between public and private activity are crucial.

The most important policy implication to emerge from Best's capability triad framework is that any overall programs of change in the area of industrial policy require the close integration of the change programs in each of the elements of the triad:

> 'Rapid growth involves coordinated organizational changes in each of three domains: the business model, production capabilities, and skill formation. ... The three domains are not separable and additive components of growth, but mutually interdependent sub-systems of a single developmental process. ... No one of the three elements of the Capability Triad can contribute to growth independently of mutual adjustment processes involving all three elements" (Best, 2000, p.2).

In a sense, Best's framework requires a type of "critical mass" of change in each element of the triad before growth can take off. Porter, on the other hand, had suggested that the elements of his diamond could be picked off one by one, leading to a sequential process of growth, as illustrated in Figure 3 above. Although Best's framework requires a degree of sophistication and co-ordination for policy makers that is more demanding than Porter's framework, it appears to be more soundly based on a close integration of insights from economics and business and does not suffer as much from the "big economy" perspective of much of Porter's work.

*Summary on Industrial Strategy Frameworks*

One must approach these three policy frameworks with an understanding of their historical origins and their necessary simplifications. Unlike scientific theories, where a single wrong prediction can cause rejection and replacement by a new theory that encompasses old and new observations, these three frameworks simply look at industrial development issues from different perspectives, and place emphasis on different factors. Vernon's Product Life Cycle (PLC) stresses the primacy of the country that provides the source of FDI, and the dependency of the host countries. This had more universal acceptance in the 1950s and 1960s than it does today, but it continues to apply to economies like Ireland, Portugal, Greece, as well as the newly liberalized transition economies of Central and Eastern Europe. The Porter diamond explains the development process in a world that consists of many relatively large and developed economies, and takes up where the PLC leaves off. But it continues to insist that sustained development is crucially dependent on the domestic market, and cannot be based simply on supply chain linkages to the global economy. Finally, the capability triad of Best selects a very different set of factors that it asserts are the primary causes of development, and further requires simultaneous advances in all three. Each of these three frameworks probably operate in overlapping ways, with differing degrees of emphasis at different times.

Conceptual frameworks and policy design, implementation and renewal usually evolve in parallel with each other. Frameworks are rather like maps that tell you where you are, where you need to go, and the direction that you must take in order to get there. Policy design and implementation deal with the messy business of gathering resources, making pragmatic choices, overcoming obstacles, and bringing the team along with you to your ultimate goal. To confuse these separate but interrelated elements of strategy, or to emphasize one at the expense of the other, will almost certainly lead to problems. At the risk of oversimplification of what are very complex issues, the intelligent combination of economic policy and business strategy can generate huge synergies in terms of rapid national growth and convergence.

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# 12

# NORMATIVE AND POSITIVE PROBLEMS OF REGIONAL POLICIES*

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## INTRODUCTION

If one looks at the yearly budget of the European Union (EU), one finds that the second largest budget share is devoted to regional policies. Only the common agricultural policy has a larger quantitative weight. At first sight it is also quite obvious why regional policy plays such a prominent role in today's Europe: there are massive and very persistent disparities between regions in the EU-15. People in the richest areas of the EU-15 have an average real purchasing power more than 4 times higher than in certain parts of Greece or Portugal. Regional unemployment rates in the EU-15 range from about 1 % in Aland (FIN) to roughly 30 % in Calabria (IT). But regional differences are by no means restricted to disparities between the single EU member states. They are nearly equally large within single countries, with North vs. South Italy and West vs. East Germany being only the most prominent examples. These intra- and international regional differences have proven to be very stubborn, and real convergence has been largely absent in the EU in the recent decades, with Ireland being the notable exception.

In view of such dramatic disparities it is very understandable that the European Commission feels obliged to 'do something', i.e. try to reduce the level of spatial inequities within the integrated economic area through political interventions. The available funds to reach this goal are quite substantial. More than 30 billion € are spent every year on regional policy. This figure will almost certainly not decrease over the next years, as the accession countries from Eastern Europe are ready to join the EU soon and bring with them a dramatic increase of regional inequities within the European community.

In this chapter, we want to analyse what modern economic theory has to say about the pervasiveness of regional policy in general, and about the particular manner in which European regional policies are conducted. The theoretical framework that we mostly relate to embraces the new trade, growth and location theories like endogenous growth theory (Romer, 1986, 1990; Grossman/Helpman, 1991) or new

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economic geography (Krugman, 1991; Krugman/Venables, 1995; Venables, 1996; Fujita/Krugman/Venables, 1999). These theoretical frameworks are at the core of regional policies, since their basic implications underpin the anxiety that free market mechanisms alone might not bring about regional convergence like neoclassical theories imply. On the contrary, through cumulative causation mechanisms, inequalities and 'core-periphery-divides' can become more pronounced over time in these models.

But can these models serve as a justification for regional policy interventions? This is the first question we ask, and it is by nature a normative perspective. Do the theoretical models that describe why there can be regional disparities within an integrated economic area imply that these disparities are a bad thing? Do those models imply that a more equitable resource allocation is preferable over an uneven distribution of economic activity across space?

The second perspective we adopt is then a purely positive one. If the political goal is more territorial equity, no matter if the goal makes sense or not, are the particular policies currently in use well suited to reach this goal? The European Commission has defined some areas of priority in which regional policies are operating. These are infrastructure investments in economically lagging regions, the development of human resources and education subsidies for people living in poor regions, and direct subsidies to firms operating in the economic periphery. We put emphasis on the first two and analyse if policy interventions in these areas can indeed counteract regional divergence. In particular with respect to education oriented regional policies we will come to quite surprising and unexpected conclusions.

The rest of this paper is organised as follows. We first look more closely at the existing regional disparities within the EU-15. Then we describe the working of European regional policies more closely. In the following sections, attention is shifted towards economic theory. We first briefly introduce the main ideas of modern 'divergence theories' and contrast them with conventional neoclassical frameworks. We analyse the normative question of whether the divergence theories indeed justify regional policies in general. We then shift attention to the positive perspective and asks if European regional policies are well suited to reach the self defined goals. Finally, we draw so conclusions.

## REGIONAL DISPARITIES WITHIN THE EUROPEAN UNION: AN OVERVIEW

The most prominent (but surely problematic) measure of regional economic disparities, also of central importance for the conduct of regional policy, is the GDP per capita level of NUTS2-regions within the EU, measured in purchasing power standards.[146] The spatial structure of this important economic variable reveals the striking differences that exist among regions, both within and across member

[146] The statistical office of the European commission, Eurostat, has developed a division scheme called the 'Nomenclature of Statistical Territorial Units' (= NUTS). Herein, four levels of gradation are distinguished: the level NUTS0 is identical with the 15 current member countries of the European union. Below this, there are 77 subordinate NUTS1, 211 NUTS2 and 1031 NUTS3 in the EU.

states.[147] The regional distribution of GDP per capita follows a clear spatial pattern: the rich regions are located roughly in the middle of the continent, in the so-called 'European Banana' ranging from Southern UK over Benelux, East France and West Germany up to Northern Italy. Surrounding the economic core belt is a group of regions with medium per capita incomes, e.g. North-West Germany, Northern UK, Scandinavia as well as large parts of France. The economically lagging parts of Europe are all at the outside borders of EU-15. Most notably these are southern Italy, East Germany, the Burgenland (AT), Greece and nearly all of Spain and Portugal. Together this group is eligible for structural funding from the EU Commission under 'objective 1' until at least 2006.

This picture of regional divisions is complemented by other important measures of economic activity. For example, regional unemployment rates closely resemble the 'core-periphery' structure of regional GDP per capita. Low unemployment is centred around the rich regions in the 'European Banana'. Similarly, all areas with mass unemployment belong to the poor peripheral parts of EU-15, the so called 'objective 1'-regions. Most medium income regions also belong to the group with intermediate unemployment rates. Thus, the membership of a single region in one of the three 'clubs' (Banana, objective 1, intermediate) seems to be a more reliable indicator for the regional unemployment rate than the pure assignment to one or the other EU member state. This is supported by Overman and Puga (2002), who find that 'the unemployment outcomes of individual regions are much closer to the outcomes of their neighbors, than to the average outcomes of other regions within the same Member State'. This 'neighboring effect' leads them to conclude that there is truly a spatial dimension of unemployment within the EU-15. The relation between income per capita and the unemployment rate is surely not one-on-one, as some counterexamples are at hand: Portugal entirely consists of poor regions, but unemployment is low by European standards. Greek unemployment is also not as high as one might expect given its GDP figures. One might therefore put it this way: belonging to the 'objective 1'-group is a necessary, but not a sufficient condition for exhibiting extreme regional unemployment rates of above 15 per cent or so. Nevertheless, the average unemployment rate for all 'objective 1'-regions is markedly higher than the EU-15 average (15.8 vs. 9.7 for 1999). And thus the general conclusion, that regions with high GDP per capita have low unemployment rates and vice versa, seems hardly disputable.

The rough grouping scheme of EU-regions can also be applied to other economic measures. It almost always tends to be the case that the most favourable characteristics are found in the rich economic core belt of the EU. The 'Banana'-regions, for example, tended to have higher employment growth over the period 1975-1998 (Martin/Tyler, 2000), high waves of inward migration, a relatively high skilled workforce and high levels of innovative activity measured by the number of patent applications per million inhabitants (EU Cohesion report, 2001). On the other hand, the most unfavourable conditions with respect to all these indicators are

[147] We do not report maps of the regional dimension of economic activity in the EU-15 in this paper. However, useful documentation and visualization material is available from the EU-Commuission under www.inforegio.org

usually found among the 'objective 1' regions, with the 'intermediate' group ranging in between the two extremes.

An important question is how the regional disparities have evolved over time. One instructive way to address this question is to look at the (weighted) standard deviation of relative income levels. This is done in table 1 for the European Union as a whole, as well as for all EU member countries that consist of more than one NUTS2 region.

**Table 1: Disparities in GDP per Head by Region within EU-Member States, 1989-1999**

*(Weighted Standard Deviation of Index EU-15 = 100)*

| Member State | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| B | 24.7 | 25.1 | 25.1 | 26 | 27.1 | 25.9 | 40.1 | 40.8 | 40.7 | 40.8 | 39.4 |
| D | | | 38.6 | 35.8 | 32.4 | 31.3 | 25.8 | 25.4 | 25.2 | 25.4 | 25.4 |
| excl. New Länder | 21 | 21.8 | 22.7 | 23 | 22.8 | 23.4 | | | | | |
| EL | 6.5 | 6.3 | 6.1 | 6.6 | 7.6 | 7.8 | 10.4 | 10.2 | 9.5 | 9.5 | 9.7 |
| E | 14.9 | 14.9 | 16 | 15.9 | 15.2 | 15.9 | 16.8 | 17.2 | 17.8 | 18 | 18.9 |
| F | 28.6 | 28.9 | 29.9 | 28.9 | 29.9 | 30.8 | 28.3 | 28.2 | 27.6 | 27 | 27.2 |
| IRL | | | | | | | 13.8 | 13.5 | 16.7 | 16.6 | 17.4 |
| I | 25.8 | 24.8 | 24.7 | 24.9 | 24.7 | 25.5 | 28.5 | 28.6 | 27.7 | 28.1 | 27.7 |
| NL | 10.6 | 10.6 | 11.8 | 11.3 | 11.5 | 10.8 | 13.4 | 14.3 | 15.4 | 16.1 | 16.2 |
| A | 27 | 27.5 | 28.6 | 28.7 | 30.3 | 28.1 | 25.5 | 24.9 | 23.8 | 22.3 | 22.4 |
| P | 17.7 | 13.5 | 15 | 13.6 | 14.3 | 13.8 | 16 | 16.5 | 18.2 | 19.1 | 19.1 |
| FIN | 17.7 | 17.9 | 17.7 | 15.4 | 17 | 17.1 | 19.5 | 20.9 | 20.8 | 23.9 | 24.2 |
| S | 10.9 | 10.8 | 12 | 10.9 | 12.8 | 11 | 13.1 | 14 | 16.2 | 17 | 16.4 |
| UK | 20.7 | 20.2 | 19.2 | 19.6 | 20.6 | 18.3 | 31.5 | 31.6 | 34 | 35.6 | 34.2 |
| EU (15) - by region | | | 29.4 | 28.6 | 27.7 | 27.5 | 28.7 | 28.5 | 28.6 | 29 | 28.4 |
| excl. New Länder | 26.4 | 26.5 | 26.4 | 26.5 | 26.3 | 26.5 | | | | | |
| EU (15) - by member state | | | 13.1 | 13.2 | 12.5 | 12.7 | 12.4 | 11.9 | 11.5 | 11.5 | 10.8 |
| excl. New Länder | 15.3 | 15.4 | 15.5 | 15.6 | 14.6 | 14.6 | | | | | |

Source: Eurostat; European Commission, DGRegio.

Regional income dispersion across EU-15 in 1999 is approximately on the same level as in 1992 (28.4 vs. 28.6). There have been no strong signs of regional convergence within the EU over the last decade, particularly not since 1995. Matters are different if one looks at income dispersion across nations. The standard deviation has been more or less constantly declining since 1992. Especially if one considers the last five years, it looks as if there has been a process of national income convergence parallel with a persistence of regional income disparities.

This at first sight puzzling development can be understood by looking at what has happened within the single EU member states. Table 1 indicates that the economic dispersion across German, French, Italian, Greek, Austrian and Belgian regions remained roughly the same or was only slightly declining since 1995. In the same time period, however, there has been strong regional income divergence in some countries, namely in Spain, Portugal, Ireland, the Netherlands, Finland, Sweden and the UK. This divergence process specifically occurred because the large and economically most advanced regions in these countries grew significantly faster than the poorest areas. For example, the two largest Spanish NUTS2 regions, Catalu_a and Communidad de Madrid, caught up substantially with the rest of the European community, whereas Andalucia or Extremadura exhibited no such process. Since the large central regions have a higher weight for aggregate figures, their economic progress led to a closing national income gap relative to the EU-average. This convergence at the country level, however, was accompanied by a process of stronger regional differentiation within some countries. This view is supported by various authors, such as Gianetti (2002), Esteban (2000), Magrini (1999), Martin (1998), Fagerberg/Verspagen (1996), or Neven/Gouyette (1995).

Regional unemployment rates were subject to an even clearer trend of regional divergence. Support for this view can be found e.g. in the EU Cohesion report (2001), Overman/Puga (2002), Epifani (1999), or OECD (2000) where it is shown that 'variation in regional unemployment rates increased in many countries during the 1970s and early 1980s. [...] This variation generally remained stable or increased between 1985 and 1997' (p. 32).

To sum up, it seems safe to conclude that economic activity follows a very clear spatial pattern. In particular, national boundaries seem not to be too important for this grouping scheme. These regional divisions remained stable or by some measures even increased over the last decade(s). Real convergence across European regions was largely absent. The situation was rather characterised by the persistence of existing disparities or even a slight trend towards regional divergence with parallel convergence of national economies.

## THE WORKING OF EUROPEAN REGIONAL POLICIES

The European Commission has a very particular strategy to its conduct of regional policy, summarized in the Second Cohesion Report (EU Commission, 2001:117)

> 'The Treaty [of the European Community], by making explicit the aim of reducing disparities in economic development, implicitly requires that EU policies, and cohesion measures in particular, should influence factor endowment and resource allocation and, in turn, promote economic growth. More specifically, cohesion policies are aimed at increasing investment to achieve higher growth and are not specifically concerned either with expanding consumption directly or with redistribution of income.'

Thus, Brussels does not satisfy itself with the redistribution of income, but rather tries to explicitly influence the spatial resource allocation in order to reduce agglomeration. The available funds to reach this goal are substantial. In the time period 2002-2006, an amount of 213 billion € is available for cohesion policy, from which 64% are used for interventions under 'objective 1', as we have already mentioned. Since EU-funding is only available as an additional source of financing for specific projects, the true amount of resources transferred to the periphery is actually understated by the above number, as typically national governments contribute financial resources. Eligible areas for 'objective 1'-funding are NUTS II-regions with a GDP per capita below 75% of the community's average. In total, a remarkable 22% of the total EU-population are covered under this objective.[148]

Structural interventions in these regions have three broad priorities. About 35% of structural funds under 'objective 1' are spent on the improvement of infrastructure with a special focus on interregional transportation networks. Direct subsidies to firms located in the periphery are of decreasing importance, but also still amount to 35%. The remaining share is spent to promote education, with a special emphasis on promoting skills compatible with the 'information society' and with new technologies (Guersent, 2001). The short- and medium-run goals of regional policies can roughly be described as trying to enhance the regional productivity level and thereby foster investment and growth in the recipient areas. In view of mobile factors of production, the Commission is trying to guide factors to settle, or respectively to remain in the periphery.

Funding opportunities also exist for regions that do not match the 'objective 1'-criterion. This concerns 'objective 2'-funding that is designed for regions with structural adjustment problems, and that makes up for 11,5% of all resources spent for regional policy. 'Objective 3' (12.3%) is specifically concerned with the development of human resources, and in principal all European regions are eligible to apply for project funding. All these measures are financed through the European structural funds EFRE, ESF, FIAF and EAGF. The objectives 2 and 3, however, as well as the community initiatives INTERREG, URBAN, LEADER and EQUAL, are of minor quantitative importance compared to the most powerful measure of regional policy, the 'objective 1'-funding.

## REGIONAL CONVERGENCE AND DIVERGENCE THEORIES

We now turn to economic theory and ask what sort of economic model might motivate the conduct of regional policy. If policymakers in Brussels have a model in mind, it is most definitely not a straight neoclassical one. It is well known that the basic implication of this strand of economic theory is regional convergence as the consequence of free markets. This core result arises for example in the seminal growth theory of Solow (1956) that implies income level convergence even for closed economies without any trade or factor movements. Once the model allows for trade in goods (the factor price equalization theorem of the Heckscher/Ohlin-model) or for factor movements, the convergence predictions get even stronger. According to neoclassical economics, the European Commission consequently would not have to do anything to achieve regional cohesion, except maybe to wait long enough. Empirical studies like Barro (1991) or Sala-i-Martin (1996) have pointed to the fact that the speed of convergence might actually be very low and that the catching-up of the poorest regions might take several decades. One might therefore interpret regional policy as a step to promote the speed of convergence. But apart from the fact that neoclassical economists are quite sceptical if this strategy can be

[148] This illustrates how pronounced regional differences are within the EU. If an identical policy would be conducted in the US, the eligible regions would only make up for 2% of the American population (Puga, 2001).

successful,[149] there is clear indication that EU policymakers are not strongly influenced by the neoclassical convergence hypothesis. This can be verified e.g. by looking at an important core document for European regional policies, the Delors-report:

> 'Historical experience suggests [...] that in the absence of countervailing policies, the overall impact [of more economic integration] on peripheral regions could be negative. Transport costs and economies of scale would tend to favour a shift in economic activity away from less developed regions, especially if they were at the periphery of the Community, to the highly developed areas at its centre. The economic and monetary union would have to encourage and guide structural adjustment which would help poorer regions to catch up with the wealthier ones.' (Delors, 1989, S. 22)

Policymakers have the perception that regional cohesion can only be achieved through policy interventions, and that free market mechanisms alone would probably lead to a strengthening of disparities and core-periphery-divides. With this view, Brussels subscribes to a different strand in the economics literature, namely to the class of regional divergence theories. This literature exists already for a long time, at latest since Myrdal (1957). But it recently has had a revival through contributions in growth theory and economic geography that we will now briefly discuss.

The motivation behind the renewed interest in regional divergence theories is of course the failure of neoclassical economics to explain the extreme persistence of regional disparities and the lack of convergence, in particular for such differences that exist within the same country, where impediments like institutional and language barriers are largely absent. The fundamental difference to neoclassical approaches from a theoretical point of view has been that traditional assumptions like perfect competition and constant returns to scale have been overcome. Due to advances in the theoretical field of industrial organization (the Dixit-Stiglitz-model), economists working in growth, trade and location theory were increasingly able to use models with monopolistically competitive markets and localised increasing returns to scale from concentration of economic activity.

## Endogenous Growth Theory

The new growth theory (Romer, 1986; Romer, 1990; Grossman/Helpman, 1991) views growth as a phenomenon of innovation and technological and structural change. Contrary to the old growth theories, technological progress is no longer seen as something that is 'falling from the sky', but rather as the result of specific (and mostly private) R&D-investments. The innovators must thus firstly have rents in order to finance these investments, and secondly they must be able to extract temporary monopoly profits in the case of a successful innovation. Both these requirements illustrate why a model set-up with monopolistic competition is much

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[149] Sala-i-Martin (1996), for example, find a ubiquitous speed of convergence among European regions that does not significantly depend on the magnitude of structural interventions. Thus, according to this study convergence has not been sponsored by regional policy.

more appropriate than one with perfect competition and zero profits if one thinks about these Schumpetrian processes.

In spatial terms, the temporary monopoly rents accrue in the location where the innovation has been made. The newly created technological knowledge spills only imperfectly into other regions. If this logic is then combined with a tendency of increasing returns, it follows that innovation activities will reveal a high tendency towards spatial concentration. This concentration will perpetuate growth in those regions where the innovative research centres are located, and the diffusion of this growth into other regions will be imperfect. Because of that, the centre regions again have more resources available to invest in further, and even more sophisticated R&D. Growth and agglomeration then might end up in a cumulative causation mechanism, since they are two mutually reinforcing processes. This logic has recently been analysed in a regional context by Martin/Ottaviano (2001). Using a two-region model they show that industrial centres reveal a higher growth rate than peripheral areas due to their high innovative activity. This higher growth enables the centre to invest even more heavily in R&D and to reinforce and strengthen its advantaged position. The consequence of this cumulative logic is a divergent trend of regional per capita GDP. This view is supported by Audretsch/Feldman (1996) who show that in the US the geographical structures of innovation and production are quite similar, but that the innovation sector is stronger concentrated. The same is true for the EU, where there is also a heavy spatial concentration of innovation in only a few European NUTSII-regions (EU-Commission, 2001).

## New Economic Geography

New Economic Geography heavily rests on two essential assumptions: firstly, there are economies of scale in production through the existence of fixed costs for the implementation of new plants. And secondly, it is assumed that there exist transportation costs for final goods.

If firms are constrained and can not easily open up plants everywhere, they have an incentive to locate close to large markets in order to economize on transportation costs.[150] But markets are large, where many firms and thus many workers (=consumers) are located. Similarly, customers also like to be close to the firms, because consumer prices are not blown up by transportation costs. This illustrates that centripetal tendencies are beneficial to both firms and workers and they might develop in a cumulative causation mechanism. Another similar motive for spatial concentration is the size of the local factor markets. Both workers and employers are interested in 'thick' markets for specialized inputs and skills, because of search and matching considerations (Krugman, 1991b; Venables, 1996).

Of course there are not only centripetal, but also centrifugal forces. Prominent examples of the latter are congestion costs in urban centers, like higher costs-of-living (Suedekum, 2001) and housing scarcity (Helpman, 1998). If parts of the workforce are inevitably tied to peripheral locations, their demand for final goods

[150] Transportation costs are relevant for the firm even if they are fully rolled over on prices, simply because demand and thereby profits will drop if prices are increased by transportation costs.

also acts as a centrifugal force, because it is costly to satisfy their demand through exports from the core.

If centripetal forces dominate over centrifugal ones on balance, the models of new economic geography predict that a 'core-periphery-structure' of economic activity develops endogenously, either through labor migration or through the relocation of firms.

In sum, both the new growth theory and new economic geography provide rationale why there are endogenous economic mechanisms that push for spatial concentration of economic activity in only a few regions within an integrated economic area.

## NORMATIVE PROBLEMS OF REGIONAL POLICY

The above citation from the Delors report clarifies that regional policy is strongly influenced by the predictions of the type of models we have just discussed. Previously we have shown that it is the explicit aim of European regional policy to reduce the degree of agglomeration through policy interventions.

But is this objective well justified? Does the theoretical literature, which explains why regional divergence might occur in market economies, also imply that there is a need for policymakers to reduce the level of spatial inequities? Many authors have pointed out that this is not the case. If the EU-Commission thinks that the new divergence theories with increasing returns, localised spillovers etc. are an appropriate description of reality, it is unclear why it should try to offset or hinder agglomeration.

If increasing returns are at work, spatial concentration is efficient since production costs are saved on aggregate (Boldrin/Canova, 2001; Martin, 1999; Fujita/Thisse, 1996). Moreover, if agglomeration and growth tend to be mutually reinforcing processes, then an asymmetric distribution of economic activity also tends to increase aggregate growth (Martin/Ottaviano, 2001). This argument is not only a theoretical construct. For example, Quah (1997) has shown that there is a positive correlation between the degree of agglomeration and the aggregate growth rate among European cohesion countries. According to this study, countries like Portugal and Spain that exhibited the fastest aggregate growth on the national level over the recent decade at the same time experienced a divergent trend of regional income levels. Greece on the other hand had roughly stable relative income levels of its single regions, but also a smaller aggregate growth rate.

Thus, if we only look at the sector in which increasing returns to scale are present, regional policy should allow for agglomeration or even subsidize it, and subsequently redistribute the gains through income transfers. If the explicit aim, however, is the reduction of agglomeration, EU regional policies end up in a trade-off between efficiency and regional equity (Martin, 1999), as the interventions that retain production in the periphery invoke efficiency losses at the pan-European level.

In theoretical terms it would only be justifiable to carry out the EU type of regional policy if the markets would generate over-agglomeration. In most of the theoretical literature that usually works with imperfect competition, the possibility of market failures is eminent, because the location decisions of mobile agents (firms or workers) imposes pecuniary externalities on others, specifically on the immobile ones. These external effects, however, are not taken into account by the mobile agents, who base their location decision only on private considerations. The market outcome and the socially desirable optimum with respect to the spatial structure of economic activity might therefore differ. It is, however, by no means clear that the socially optimal allocation necessarily would imply a lower degree of agglomeration than the market level.

Consider the following thought experiment: there is an economy consisting of two regions (1 and 2). Both regions are populated by an immobile workforce of equal size. In addition, there are high skilled workers H who are regionally mobile. Initially these H workers are also equally split among the two regions. High skilled workers have an incentive to pool in only one region in order to exploit scale economies. Their location decision also affects the utility level of the low skilled workers through technological complementarities. The private geographical solution in this economy is easy to determine. Since there is nothing that prevents high skilled labour from concentrating in only one region, they will all pool, say, in region 1. There will thus be a relocation of H/2 workers from region 2 to 1 starting from the initial allocation. Immobile workers in region 1 enjoy positive externalities because of additional linkage effects and complementarities. Workers in region 2, however, suffer from the human capital emigration through negative feedback effects. But the fact that the immobile workers from region 2 suffer from negative externalities (better: from a reduction of positive externalities) does not necessarily imply that there is a need for policy interventions that retain parts of the high skilled workers in region 2. The negative impacts in region 2 must be contrasted with the additional positive externalities that arise in region 1. If the consolidated utility gains for high and low skilled workers in region 1 are greater than the utility losses in region 2, the migration of high skilled labour to and the agglomeration in region 1 is welfare-improving according to the Kaldor/Hicks-criterion. This means that individuals in region 2 could in principle be compensated by income transfers from region 1, and still there would be a net welfare gain from agglomeration.

Whether complete agglomeration of high skilled labour is efficient in this mini-economy will heavily depend on the properties of the utility functions of the individuals. Hence, if the market solution is characterised by too much agglomeration, too little agglomeration, or if the market outcome also is the social optimum cannot be said with certainty. Whether a reduction of agglomeration can be welfare improving depends very much on the particular model under consideration. A few authors have made explicit welfare analysis in the context of agglomeration models. For example, in Helpman's (1998) model, the market outcome is characterised by a degree of agglomeration that is either socially optimal or too low. Ottaviano/Thisse (2002) on the other hand present a model where policymakers can improve welfare through a reduction of spatial inequities.

The theoretical debate on the economic pervasiveness of regional policy from this welfare point of view is thus not settled. However, it appears as if the conventional result that there is no convincing case for a reduction of agglomeration below the market level is the more robust one and less dependent on very special model constructions. Perhaps many authors would agree that it is really equity or political considerations on which the very existence of regional policies is grounded, not the attempt of policymakers to maximize a social welfare function through reallocating production factors.

## POSITIVE PROBLEMS OF REGIONAL POLICY

The political goal, the reduction of spatial inequities, has therefore to be taken for granted, no matter if there is a good economic reason for it or not. However, the list of problems of regional policy has not yet come to an end. There exist additional pitfalls from a positive point of view. The particular policies that are currently at use, which aim to achieve a lower degree of agglomeration, might actually lead to more spatial concentration and inequity. If this is so, regional policies fail judged on the basis of their own agenda.

### Infrastructure Policies

In various papers, Martin (2000, 1999, 1998) and Martin/Rogers (1995) have shown that in particular infrastructure policies can, through secondary market adjustments, effectively lead to results exactly opposite to their intentions. Improvements of interregional transportation facilities in economically lagging regions imply lower transaction and travelling costs. This is thought to benefit the periphery in terms of a better accessibility, a more vital participation in central markets etc. Alas, it can turn out that the reduction of spatial transaction costs actually fuels further relocation of production factors away from the periphery and into the already highly developed centres.

Theoretical rationale for this result can be gathered from various models in the field of 'new economic geography'. In particular Krugman/Venables (1995) show that the spatial effects from lower transportation costs, which they use as a proxy for globalisation, but which may also be thought of as resulting from regional policy interventions, are very ambiguous. If the level of transportation costs is rather high to begin with, a reduction to intermediate levels in their model leads to more income divergence. It is cheaper to rely on exports from the centre to serve demand in peripheral markets, and the exploitation of agglomeration advantages is more important for mobile economic agents. Later, if transportation costs have fallen further, the relative position of the periphery can recover, since a greater weight is put on the lower factor costs of the economically lagging regions.

The question if lower spatial transaction costs lead to more or to less agglomeration is thus an empirical matter. Some interesting results have occurred in the literature. For example, Faini (1983) has argued that the infrastructure improvements between Northern and Southern Italy in the 1950s have led to a de-industrialisation of the Mezzogiorno, as many firms found it now profitable to shift production to the more efficient northern regions. Combes/Lafourcade (2001) report a similar finding for the case of France: the reduction in spatial transaction costs that was estimated to amount to 38% between 1978 and 1993 led to a higher concentration of production and employment. In view of these findings, it seems questionable if infrastructure oriented regional policies are actually ‘delivering’.

## Education Policies

More recently, Suedekum (2002) has made a similar point with respect to education oriented regional policy. Also this type of intervention might suffer from deficiencies and hidden pitfalls that can lead to a deviation of actual and intended effects. Put more drastically, education subsidies paid to individuals in economically lagging regions might actually hurt instead of help the economic periphery.

The underlying logic hinges on the interrelation of an individual’s skill level and her geographical mobility. It is well established empirically that skilled workers tend to be more mobile than unskilled workers (Gianetti, 2001; Hunt, 2000; Mauro/Spilimbergo, 1999). One simple theoretical rationale for this stylised fact is that the agglomeration wage premium is higher for skilled than for unskilled labour, whereas approximately identical mobility costs accrue to all types of workers. Now consider the role of regional policies designed to promote the skills of individuals in the poor regions. Through enhancing the individual skills, some recipients might cross a threshold level of qualification beyond which emigration out of the peripheral regions pays off. This emigration then negatively affects those who remain in the periphery.

The framework used in the theoretical analysis is a two-region OLG-model with heterogeneous agents who endogenously decide on education. One region, which is initially smaller and poorer, is labelled an ‘objective 1’-area that receives education subsidies financed through taxes from the rich central region. When they are young, agents are tied to their location of birth, where they engage in education. Before old age, when education investments pay off privately and socially, agents might decide to migrate to the centre. Labour mobility is subject to migration costs that have to be borne regardless of an individual’s embodied level of human capital. A cut-off level of ability is derived beyond which emigration pays off. The lower is this critical level, i.e. the higher is the ‘human capital flight’, the more harmful it is for all individuals left behind in the periphery. This is so because the technology is characterised by localized increasing returns and imperfect competition. The location decision of agents thus affects other individuals through (pecuniary) externalities.

The central point of Suedekum (2002) is to show that an increase in education subsidies reduces the critical cut-off level of ability and makes emigration more attractive. This will lead to an increased human capital flight, which is harmful to all those individuals in the economic periphery whose individual ability does not exceed the critical emigration level. The regional policy has thus failed, since the individuals in the periphery are even worse off after the political intervention than they were before. The most fatal result is that regions suffer more, the lower is their initial income level compared to the centre. This is because agents are more prone to emigration to begin with.

Note that this analysis is purely positive in nature and only points to a hidden pitfall of education policies that are used to sponsor regional convergence. The implications for the pervasiveness of education subsidies can be totally different if the goal is to maximize overall national income, i.e. the sum of incomes of the two regions. But if the political goal is to achieve territorial equity, education policies might suffer from the mobility of their recipients. The basic reason is that a subsidy to individuals in poor regions does not guarantee that the recipients will remain in their home area after the end of the training period. The private and social returns to education can also be realized elsewhere, i.e. in the rich central regions that lure with its better economic prospects. Regional policy only delivers a closing income gap if the recipient group for subsidies is chosen such that training does not increase emigration.

This can be achieved through a differentiation between recipients in the peripheral region. More specifically, it can be shown in the theoretical model that it would be optimal to subsidize the education of individuals precisely up to the point where they just remain below the critical threshold level of qualification. An application of this result is that education subsidies should only be paid to relatively low skilled workers who have a low propensity to mobility. This is a very stark implication. A cynical interpretation would actually be that policymakers in poor regions should abstain from supporting clever students and providing good education, because the talented recipients will then leave the region after the education period.

Probably most economists concerned with development and regional economics would give exactly the opposite policy advice, i.e. that human capital should be developed and skills should be promoted in order to unravel a growth take-off. However, these prescriptions might sometimes neglect secondary effects than stem from the presence of labour mobility. Moreover, the point of Suedekum (2002) is simply to demonstrate how hidden trade-offs can emerge if policymakers pursue one particular and questionable goal, namely regional equity. The basic underlying logic is also known from other contexts. For example, any firm will face a similar trade-off if it provides non-specific human capital to its workers. If workers can acquire general skills at the expense of the firm,[151] they also become more attractive to other employers. Any firm therefore has to consider that more training of its incumbent workforce also can lead to a higher probability of quits (e.g. Booth/Zoega, 1999). Considerations with a similar spirit are even known from development economics. Haque/Kim (1995) e.g. show that emigration of high skilled labor is harmful to developing countries, and that national governments might therefore have little interest in providing higher education in order to reduce the human capital flight. Bhagwati (1976) has even proposed a 'brain drain tax' for developing countries based on a similar reasoning.

[151] In perfect markets, a firm would not pay for general human capital, but only for the provision of firm-specific skills. In reality, however, it is hardly possible to distinguish general and specific human capital.

## CONCLUSION

This paper has highlighted some problematic aspects of regional policies in the European Union. From a theoretical point of view, regional policies are argued to lack a convincing economic justification. The modern regional divergence theories that explain the emergence of regional divergence typically do not imply that core-periphery structures are inefficient. There is no rationale that agglomeration should be reduced by public policy. On the contrary, many of these models ask for more instead of less agglomeration, since increasing returns to scale can only be exploited through spatial concentration.

In addition to these normative theoretical considerations, there are also problems of regional policy from a positive point of view. Some types of regional policy can actually lead to more agglomeration and more inequities instead of less. Put differently, regional policies might fail judged on the basis of their own agenda. This is because of secondary adjustments and hidden trade-offs that play a role both for infrastructure and for education oriented policies.

As far as theoretical economics can inspire policymaking in the EU, which has to obey to a very complex system of political pressures and constraints, two main suggestions arise for potential improvements of regional policies.

Firstly, the Commission should reconsider if the primary goal of regional policy should be the reduction of agglomeration and the elimination of differences in output per head as measured by GDP. Against the background of the new divergence theories, there is nothing to be said against fiscal transfers that compensate the periphery for negative externalities stemming from centripetal economic tendencies. But the commission should abstain from discretionary interventions in spatial resource allocation, as these invoke efficiency losses at the aggregate level through a sub-optimal exploitation of scale economies.

Secondly, we need to analyse more deeply to see if the particular policies conducted by the EU Commission indeed deliver what they promise. Even though the political goal of more territorial equity might be questionable to begin with, it is surely problematic if large scale projects are financed that run counter to the political intentions. Money spent on such purposes surely could be reallocated to more productive uses.

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# 13

# FISCAL TRANSFER MECHANISMS AND ASYMMETRIC SHOCKS IN EMU

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## INTRODUCTION

Some Euro-critics imply that the European Economic and Monetary Union (EMU) will not be a success in the long run because it is not able to handle economic shocks, which affect only some of the member countries or even only regions in these countries. In this paper we ask which fiscal adjustment mechanisms are suitable to absorb such asymmetric shocks. After some introductory notes on the probability of asymmetric shocks, we then discuss whether there are any market-based instruments available, followed by a test of further potential shock absorbers. We then analyse the role of automatic stabilizers, possible stabilizing effects of the EU budget, repercussions of EU structural and cohesion policies, and finally possibilities of a European financial compensation. In addition to these automatic institutional mechanisms, discretionary possibilities of the absorption of asymmetric shocks, especially both national fiscal policies and discretionary transfers from the EU budget ('stabilizing fund') will also be examined. Related considerations on a regionally based approach to absorb asymmetric shocks are examined, and we conclude with an outlook on further research.

How likely are asymmetric shocks within a common European monetary policy? If their importance is small, it could be asked, why one should think about fiscal policy at all? It is clear that exchange rate fluctuations within the Euro area do not exist any more as an independent source of asymmetric shocks (Belke, Gros, 2001). One of the remaining concerns about the EMU is however, that the 'one-size-fits-all' monetary policy cannot measure up to a heterogeneous currency area such as EMU12. The assumption of some studies published before the introduction of the Euro, that the national economies of the Euro area are homogeneous entities on their own, seems not to be justifiable (Dornbusch, Favero, Giavazzi, 1999).[152] The general fear about high costs of a common monetary policy for a heterogeneous currency area is based on two aspects. First, the alignment of the common monetary policy could be non-optimal for the members of EMU, as they move in different phases of the economic cycle. Second, the common monetary policy could evolve different effects in countries and regions, which show different structures of financial

* The authors want to thank Nilgün Terzibas for technical assistance and helpful comments.

[152] See for a current systematic overview Belke, Eppendorfer, Heine, 2002.

markets and the real economy. Both issues were analyzed in studies with the following results (Belke, Gros, 1998; Belke, Eppendorfer, Heine, 2002; Belke, 1999; Belke, Kösters, 2000).

Growth rates and output gaps of most of the EMU member countries as well as the dynamic profile of *economic cycles* have become so *similar* in the run-up to EMU, that it is difficult to argue that there are still important differences between national economic cycles.[153] One part of the remaining long-run differences of the growth rates is desirable in any case to enable poor member countries to converge. Furthermore, Frankel and Rose (1998) and other authors show that less exchange rate volatility leads to an increase of (intra-industrial) foreign trade and could be accompanied by a greater synchronization of economic cycles (Rose, 1998: 59; for empirical evidence Belke, Heine, 2001).

Asymmetric shocks could still arise from *different effects of a common monetary policy.* This could be traced back to differences of financial market structures and the real economy structural characteristics of the member states. First, we want to dwell on differences in financial market structures within the Euro area. As *qualitative differences* actually become visible *in regard to financial market structures* across EMU (the role of banks, the amount of consumer indebtedness, whether the borrowing is charged with fixed or variable interest rates etc.), many authors conclude that there should be also *differences in monetary transmission mechanism* (Mojon, 2000). The emphasis on differences between the national financial market structures as the main reason for future differential effects of a common policy is difficult to understand, as the financial market structures have converged since the introduction of the Euro (for details Belke, Eppendorfer, Heine, 2002).

Moreover, this convergence will take place noticeable faster than changes in the national structure of the real sector. Angeloni, Dedola (1999) comment as follows:

> '…EMU is likely to induce structural changes in areas that are crucial for determining the size and speed of monetary policy transmission … these changes will go in the direction of reducing any differences in the transmission mechanisms…' (Angeloni, Dedola, 1999: 11).

The second main argument for different effects to parts of the Euro area caused by a common monetary policy is *differences in real economy structures.* This reason is more important than differences in the structure of financial markets. As the differences of real economic structures *between regions* within member states prove *as important as* between member states, *the EMU does not add anything essential to the alleged problem of a unified monetary policy.* As this problem obviously existed long before the start of EMU as well as other problems of the Euro area, e.g. the sclerosis in European labour markets, regional effects of common monetary policy cannot be an argument as a matter of principle against the EMU, because regions, i.e. areas with high labor mobility, are obviously smaller than nations.

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[153] See as early sources (already available at the creation of the EMU) Christodoulakis, Dimelis, Kollintzas, 1995; Fatás, 1997; Rose, 1998.

Countries are not just homogeneous unities (Rose, 1998: 58; Belke, 1998). The essence of the above considerations is that a high likelihood of asymmetric shocks cannot be well founded broadly and without some restrictions. If there are any, then these are shocks which were already relevant at the regional level within the nations before the creation of EMU. From this it follows directly that the creation of EMU does not force to rethink about the sense of national fiscal policy. We should have a closer look at *the regional dimension of asymmetric shocks* because of the importance of this implication.

The arguments in the literature, including some publications of the authors, showed that it is very important to differentiate more precisely between the *regional* and the *national* dimension of asymmetric shocks than many political authorities (e.g. the European Parliament) do, when examining the need for financial adjustment mechanisms.[154] This places emphasis on the importance of a disaggregated analysis (Forni, Reichlin, 1997: 14 et seq.), and includes at the same time some clear implications for a suggestion for EU shock adjustment instruments or for a possible fiscal transfer mechanism.

According to Belke, Gros (1998) it is very *unlikely* that one of the sufficiently diversified Euro area countries will be affected by a *nationwide shock which is independent from policy.* The ability to vary national exchange rates or to practice country-specific monetary policy in order to absorb such shocks is of little value. A main reason for asymmetric shocks could, however, be the noticeable differences between the national wage bargaining procedures. But this depends – at least partly – on the current institutional shape of monetary and fiscal policy. Wage bargaining regimes could be formed that increase employment under a common monetary policy. At the beginning of EMU great hopes were centered on this. But the Euro has disappointed in this respect so far. Anyway, wages can be adjusted by the private sector, if they are not suitable for EMU (Gros, Thygesen, 1998: 278). Therefore, a need for mechanisms exists within the Euro area to combat the impact of asymmetric shocks on relative income, relative employment and relative growth. The latter could even become more serious in EMU. The capital mobility as a 'shock absorber' is not free of charge (Belke, Gros, 1998: 282).

As mentioned above, one should not rely on monetary policy – even if discretionary – as a stabilization instrument. In addition, monetary policy may be ineffective when it is caught in a liquidity trap and fiscal policy can more easily be targeted in a desirable way than monetary policy. As often emphasized in the context of the theory of optimal currency areas, *members* of a common currency should have efficient mechanisms to be able to adapt sufficiently to asymmetric shocks. These mechanisms are generally divided into two categories: market-based adjustment mechanisms and institutional mechanisms of official intervention, under mainly fiscal transfers (Begg et al., 1998: 11). In what follows, possible shock absorbers will be discussed.

[154] See presented report of Metten (1998) and Forni, Reichlin, 1997.

## MARKET-BASED MECHANISMS OF ADJUSTMENT

It would not be necessary to rethink about national fiscal policy after the start of EMU, if there are enough market-based adjustment mechanisms. What market-based shock absorbers does the Euro area possess? How far do they go? It is often argued that *international labor mobility* as a market-based mechanism becomes a key parameter in case the exchange rate is not available any more as an adjustment mechanism. But it is an empirical matter of fact that the international mobility of labor is rather small in the Euro area in comparison to the USA.[155] But we have to differentiate carefully here. First, Greenwood (1975, 1985) is able to reject the hypothesis that the amount of regional unemployment explains the interregional migration pattern in the USA. Second, there are no examinations of how the single currency eased labor mobility within the USA. Third, job-related mobility will be more important for the working of EMU in future than geographic mobility (Patterson, Amati, 1998: 20). Fourth, the result of smaller labor mobility in Euro area does not mean an additional problem for EMU because there has been as well small interregional labor mobility in small-sized 'monetary unions' (that corresponded to separate EU economies) before the start of EMU. International labor mobility within Europe has risen to an extent that is similar to interregional migration within the member countries (Gros, Thygesen, 1998: 284 et sq.; Obstfeld, Peri, 1998; Patterson, Amati, 1998: 41 et seq.). The problems of the existing monetary unions like Germany, Italy, Spain and Belgium were hardly affected by the start of EMU, though interregional mobility within the Euro area was very modest.

Another important question for the extent of interregional migration is whether EMU provides sufficient incentives to reduce some of the rigidities of relative prices and wages that exist in the EU. Indeed, more *flexibility of relative regional prices and wages* would be desirable even compared with relative international prices[156]. There are no consistent conclusions in the literature about the impact of EMU on the probability of labor market reforms (Belke, Kamp, 1999; Calmfors, 2001; Grüner, Hefeker, 1999; Rose, 1998). Even almost four years after the beginning of EMU, EU labor markets seem not be flexible enough to facilitate greater job mobility and to absorb shocks in a more efficient way than before. But, the effectiveness of exchange rate flexibility as an alternative adjustment mechanism has been strongly disputed for decades.[157] Therefore, the loss of intra-European exchange rate flexibility does not absolutely require any additional application of national fiscal policy.

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[155] See the study of Blanchard, Katz (1992) and, based on the same methodology, Decressin, Fatás (1995). Some later studies seem to confirm these results. Eichengreen (1993) shows that the elasticity of interregional labour migration as regards internal wages and employment differentials is smaller in Great Britain and Italy than it is in USA. According to results of Pelagidis (1996) based on Eurostat data, migration averages less than one per cent of total population within EU compared to about three per cent in USA in 1995.

[156] This is strongly emphasised by Obstfeld, Peri (1998); Fatás (1998).

[157] For relevant literature see Belke, Gros, 2001; Gros, Thygesen, 1998: 223 et sqq. Obstfeld is e.g. in doubt whether depreciations are the most effective mechanism to stabilise asymmetric shocks in regard to real wage rigidity.

After the discussion of market-based mechanisms to absorb asymmetric shocks we now address to the question of which institutional fiscal adjustment mechanisms are available within the Euro area.

## AUTOMATIC INSTITUTIONAL ADJUSTMENT MECHANISMS

### Automatic Stabilizers

The so-called automatic stabilizers result from the consideration that the tax burden declines for employees, consumers and enterprises in a cyclical upturn, and public revenue decreases accordingly. Furthermore, the expenditures for unemployment compensation rise automatically with increasing unemployment without special governmental decisions. The stabilizers also operate in a boom, but in the opposite direction. This causes a smoothing of the disposable income of private households over time.

Why is it not possible that the automatic stabilizers are admitted to the shock absorbing instruments, which are available in a significant range in the member countries? Calculations of Gros, Thygesen (1998) show clearly, that automatic stabilizers, which are constantly emphasized in the report of Metten (1998) to the European Parliament, can explain only a small part of the variability of fiscal policy within the EU economies (Gros, Thygesen, 1998: 356 et seq.). Therefore, the criticism of the fiscal policy framework in the EU formulated in that parliamentary report - that they would not give sufficient scope to the automatic stabilizers - seems to be over-emphasized. Moreover, Mélitz (1997) and other authors indicate that automatic stabilizers are not relevant in reality. In a sample of 19 OECD countries (EU countries included) public expenditures proved to be pro-cyclical over the last decades. Important increases of deficits often occurred when national income grew above average.

The current international evidence suggests that temporarily limited transfers represent a 'fiscal insurance' for temporary asymmetric shocks. However, the range of the actual insurance or stabilizing effect in comparison to the pure reallocation effect is not really high.[158] Besides, the misgiving can be negated that the automatic stabilizers could jeopardize the three per cent-limit of the deficit criterion of the Treaty[159]. Different calculations (as Giorno et al., 1995; commission of the EC, 1997) show that a country with an almost balanced budget (deficit under one per cent of GNP) can let automatic stabilizers operate during a 'normal' economic situation without breaking the criteria of the EU fiscal rules. Moreover, it is very clear that the business cycle is not the main determinant of a budget deficit. Thus, empirical research does not confirm that automatic stabilizers reduce output volatility to a significant degree. Moreover, the automatic stabilizers become less important because they are positively related to the share of government expenditure in GDP and member countries have already reduced and aim to reduce this share in

[158] See for a systematic literature overview Kletzer, von Hagen, 2000: 5 et sqq.
[159] Treaty establishing the European Community.

the long run. The unweighted average[160] of the EU countries decreased from 45.0 per cent in 1994 to 41.7 per cent in 2002 (OECD, 2002).

According to von Hagen and Mundschenk (2002), automatic stabilizers do not dispose of the problem of the strategic interaction of the fiscal policies among each other as well as of monetary and fiscal policy. Accordingly, they should not be the only means of fiscal policy (e.g. to combat asymmetric shocks). Thus, a *coordination of fiscal policies* is necessary in the short or middle terms. A reduction of fiscal policy on the control of automatic stabilizers would destabilize the macroeconomic production and imply

> '…that countries will compete for aggressiveness of optimal automatic stabilizers due to the implied reaction of monetary policy' (von Hagen and Mundschenk, 2002: 13).

For the sake of completeness, two further automatically operating institutional adjustment mechanisms can be mentioned:

a) *Stabilizing effects of the EU-budget.* There is a consensus that the current EU budget is far away from supplying automatic transfers as high as the 'federal budget' in the USA. Besides the small volume of the EU budget, there is another reason because the EU budget does not have stability effects: Revenues are hardly dependent on the economic situation.

b) *EU structural aid.* Acceleration or deceleration of payments (even by a technical point of view) is impossible because of the way Structural Funds are organized at present. This instrument aims primarily at long-term growth. These instruments of fiscal policy are therefore not suitable mechanisms to combat asymmetric shocks.

## European System of Fiscal Equalization

As a significant increase of the European Commission budget seems not to be political enforceable, alternatively, an intra-European fiscal transfer system (similar to the German financial compensation among the 'Länder') for macroeconomic stabilization could become an issue in the case of asymmetric shocks. The automatic and non-discretionary character of such a system would increase the credibility of the promise to pay transfers to the regions which are affected by asymmetric shocks (Kletzer and von Hagen, 2000: 2). However, various problems arise for a series of different reasons (Caesar, 2001). Firstly, the idea of a supranational stabilizing competence of the EU runs against the wishes of nation states. But even if this idea were accepted, coordination of the national stabilizing policies could perhaps be more efficient than placing this under the responsibility of the community.[161] Furthermore, some economists fear that such a stabilizing mechanism at the European level can combat only the symptoms of macroeconomic problems by financing existing imbalances. The consequence of that would be the absence of incentives, as necessary structural adjustment processes on goods and labor markets

[160] Government spending, excluding interest payments, as a percentage of GDP in the EU countries.
[161] See implementations in chapter six.

would be delayed or even prevented, and the dependence on transfer payments would not decline.[162] After all, a European system of fiscal equalization would have to be based on regions and not at the level of member states to absorb (regional) asymmetric shocks, as the authors show in previous studies. Yet, there has to be reflections to install a regional based transfer system based on clear rules for the compensation mechanism (particularly on the selection of the criteria, as well as on the restriction of the equalization volume to prevent 'moral hazard'), the political enforceability, and the actual realization.

From the point of view of Belke and Gros (1998) there is not necessarily a need for a newly designed mechanism to absorb asymmetric shocks. Given a formal mechanism with rules for financing, the extent of the transfers etc. could be used regularly in experience and thus raise 'moral hazard', insofar that countries would take more risks (Fatás, 1998: 252; for more details Belke and Gros, 1998).

## DISCRETIONARY INSTITUTIONAL ADJUSTMENT MECHANISMS

Potential key instruments for adjustment to asymmetric shocks are discretionary national fiscal policies and discretionary transfers from the EU budget.

### National Fiscal Policy

On the basis of the analysis in the previous two sections, ( in particular the balancing effects of the EU budget, and the possibility of an Intra-European fiscal transfer system) it can be stated that national fiscal policy is – until now – the only remaining policy instrument available to combat effectively asymmetric shocks. Therefore a coordination of European fiscal policies becomes necessary. The Ecofin Council[163] shall undertake this coordination task according to Article 99 of the Treaty. To combat asymmetric shocks an over-strong legal restriction would in principle not be adequate.

The question of limits for national fiscal policy involves the question of the fiscal rules in the EU. They are determined mainly by the provisions in the Treaty on the excessive deficit procedure (Article 104) and by the Stability and Growth Pact, which is embodied in a resolution of the European Council[164] and two regulations of the Ecofin Council[165]. The main rules are as follows (EEAG, 2003):

*The Treaty sets a deficit ceiling of three per cent for the ratio of government deficit to GDP. Larger deficits are considered 'excessive' unless 'the excess over the reference value is only exceptional and temporary and the ratio remains close to the*

[162] For basic considerations see Persson, Tabellini, 1996.
[163] The Council of the European Union made up of the economics and finance ministers of the member states.
[164] Resolution of the Amsterdam European Council (16 June 1997). The European Council consists of the heads of state or government of the EU countries and the president of the European Commission.
[165] 1) 'Council Regulation (EC) No 1466/97 of 7 July 1997 on the strengthening of the surveillance of budgetary positions and the surveillance and coordination of economic policies' and 2) 'Council Regulation (EC) No 1467/97 of 7 July 1997 on speeding up and clarifying the implementation of the excessive deficit procedure'.

*reference value'. According to the Stability and Growth Pact, the exceptionality condition can refer either to 'an unusual event outside the control of the Member State in question which has a major impact on the financial position of the general government' or to an 'abrupt cyclical downturn'*[166]*. The formal decision on whether or not a deficit should be considered 'excessive' is taken by the Ecofin Council, acting on a recommendation from the Commission. If a member state does not take corrective action to eliminate an 'excessive deficit', as recommended by the Council, it will be required to pay an annual interest-free deposit of 0.2-0.5 per cent of GDP. If the 'excessive deficit' persists, this deposit will be converted into a fine, which is distributed among the other member states.*

*The Treaty stipulates another rule: 60 per cent for the ratio of government debt to GDP. If it exceeds this, the debt ratio should be decreasing 'at a satisfactory pace'. Formally, no escape clause is associated with this stipulation, but there are no monetary sanctions in the case of violations.*

*According to the Stability and Growth Pact, countries should aim for a medium-term budgetary position of 'close to balance or in surplus'. EMU member states have to submit standardized stability programmes and non-EMU member states similar convergence programmes specifying budget targets. These programmes form the basis for the regular monitoring of the fiscal performance of individual countries by the Council, acting on recommendation of the Commission. In the case of a 'significant divergence' of budgetary outcomes from targets, the Council can issue an early warning to a member state.*

Though national fiscal policy is theoretically a flexible instrument, in reality it is far less flexible due to the lagged possibility of reaction. Anyhow, the question is appropriate whether there should be, or has to be limits to national fiscal policy in a currency union. The supporters reason that control of national demand using fiscal policy instruments causes spillover effects to other countries, and the effect on domestic demand could be positive, the effect to the demand in the other EU countries could be even negative with high interest-rate elasticity of demand. Secondly, it is feared that the central bank in a monetary union could come under pressure because of a high deficit or high public debt. In this case the central bank has to insure low interest rates to reduce the interest payment burden of the state. Thirdly, national fiscal policy is normally short-term in its objectives on (national) voters' interests. Cutting public spending in support of other EU countries where demand is too high is likely to meet with opposition even in a good economic situation. The instrument of national fiscal policy is exposed to extreme political pressure – as empirical investigations on national political cycles show. Ireland is a good example. The overheating of Irish economy in the run-up to and even after the beginning of the EMU urgently required activities from the fiscal side (Gros et al., 2002: chapter three). Thus, the aim to avoid high budget deficits is desirable for various reasons. It is, however, arguable whether the reference values of Article 104 of the Treaty are reasonable for all EU member states in equal measure.

[166] An annual fall of real GDP of more than two per cent should automatically be considered as 'abrupt' and a fall of between 0.75 and two per cent could be considered to be so after a discretionary judgement by the Council.

Does this restriction of flexibility to combat asymmetric shocks using discretionary national fiscal policy now mean a reduction of efficiency? Do the EU's fiscal rules thus contain restrictions for fiscal policy? Considering the number of stages of the sanction mechanism and considering the number and the composition of the institutions involved, it is easy to determine that there will be delays of one year or more until legally binding decisions are made by the Ecofin Council. The fiscal policy framework in the EU thus limits in its current form the fiscal-political scope of the national government, but is equipped with a sanction mechanism which is only partially effective. The decision of the European Council in early 2002 not to follow the Commission's recommendation to give Portugal and Germany early warnings for their failure to meet their budget targets, after heavy lobbying on the part of these countries, has seriously undermined the credibility of the fiscal rules. The reason for the recent economic-policy debate on changes in the Stability and Growth Pact is the current budgetary problems of some member states. Portugal breached the three-per cent-of-GDP deficit ceiling in 2001 and 2002. Germany breached it in 2002, and may also do so in 2003. France and Italy have abandoned their commitments to earlier agreed budget objectives and there is a clear threat that they may violate the deficit ceiling, too.

Von Hagen (2002) concludes that a revision of the Stability and Growth Pact is necessary to increase its effectiveness. The revision should contain two issues: On the one hand, the national governments should get better scope for their short-term fiscal measures. On the other hand, the monitoring of the national budget discipline needs to be strengthened; an institution, which is independent from the council and the national governments, should check the budgetary position of the Euro area countries and decide. Von Hagen suggests a 'Council for budget stability' or the European Central Bank for this purpose.

Uhlig (2002) pleads for a strengthening of the Stability and Growth Pact, too. He explains it by the need to prevent free rider behavior of national governments. Suppose inflation to a function of the government deficit that causes a demand effect. The central bank reacts with a rise in interest rates because of the increase in inflation. Thus, a deficit in one country can lead to increasing interest rates in all the other countries in a monetary union. A country does not internalize completely the impact of own fiscal measures on other countries of the monetary union.

The claim of tightening the Stability and Growth Pact is, however, relativized by a survey by Gros et al. (2002). They assert that the positive effect of discretionary fiscal policy for stabilizing the economic situation is very restricted in the face of short-term demand shocks. Since the seventies the effectiveness of fiscal policy has been diminished permanently as an instrument of aggregate demand management. An increase in public spending has only a small impact on the level of the total aggregate demand. This can be explained as private demand decreases due to the anticipated higher tax and interest burden in the course of increasing public spending (the so-called 'expansionary fiscal contraction hypothesis' of Giavazzi and Pagano, 1990). Consequently, the temptation to co-ordinate national fiscal policy in the Euro area more strongly than hitherto should be resisted. Also, the creation of a new organization to control and co-ordinate demand policy at European level seems of less value against this background.

Recapitulating, a change of the Stability and Growth Pact – if at all – should only be done to strengthen its provisions. What does the current design of the Stability and Growth Pact mean for the discretionary budget policy of the EU member states? As long as any asymmetric shocks are only temporary, there should be no problem for national fiscal policy because short-term deficits could be financed through the capital market. However, if long run asymmetries occur between European countries or regions, the aid of the European Union becomes necessary. As already discussed previously, we reject a fiscal transfer system between the EU member countries. In contrast, transfers from the EU budget in individual cases would come into question, which do not equal income levels but shall be a sort of insurance against regional-specific shocks. This possibility will be discussed briefly in what follows. Permanent disparities could however not be financed for good. Equalization by changing real wages or migration has to take place.

## EU Budget Transfers

The second discretionary instrument could perhaps play a certain role for the absorption of asymmetric shocks from a strictly technical point of view (in contrast to a public choice view, which emphasizes the incentive problems of the application of such an instrument). Idiosyncratic transfers to regions could take place in the case of specific shocks (1) as payments in cash according to a particular distribution key, (2) as transfers that are connected to particular projects or (3) as loans or subsidies, which are processed by the European Investment Bank. Thus, the financing can be realized from a technical point of view directly from tax revenue or by government borrowing.[167] Let us consider the so-called 'stabilizing fund' according to Article 100 para. 2 of the Treaty as one alternative among the above-named possibilities. The wording of Article 100 para. 2 of the Treaty[168] is quoted here for illustration:

> 'Where a Member State is in difficulties or is seriously threatened with severe difficulties caused by natural disasters or exceptional occurrences beyond its control, the Council, acting by a qualified majority on a proposal from the Commission, may grant, under certain conditions, Community financial assistance to the Member State concerned. The President of the Council shall inform the European Parliament of the decision taken.'

What characteristics should a European stabilizing fund have? The answer is implicitly contained in the previous analysis. There, a national aligned fund was considered with great skepticism. Particularly, it should be difficult to create a mechanism, which does not lead to 'moral hazard'. Furthermore, it is doubtful if such a mechanism is necessary because serious exogenous shocks are rather rare and regional specific incidents. Kletzer and von Hagen (2000) conclude that stabilizing of regional consumption is to be preferred to stabilizing employment, as this requires smaller transfer volumes than stabilizing regional employment, since consumption is less responsive to temporary shocks than employment. Another

[167] See Belke and Gros, 1998; Courchene, 1993; Vaubel, 1992 for public choice-theoretical problems of this solution.
[168] As amended by the Treaty of Nice.

important result of Kletzer and von Hagen is that transfer payments to governments are more likely to encourage labor-market reforms, while paying transfers directly to households is more likely to discourage governments from undertaking such reforms (Kletzer and von Hagen, 2000). A comparison with the 'stabilizing fund' of the Treaty shows, that with this instrument both parts of the results of Kletzer and von Hagen are accommodated: In principle the focus lies on inter-governmental transfers, which are referred rather to the extension of consumption than to the level of unemployment as a result of asymmetric shocks.

## A REGIONAL APPROACH TO ABSORB ASYMMETRIC SHOCKS

De Nardis, Goglio and Malgarini (1996) found that specialization in Europe is stronger at the regional than at the national level. We should therefore consider Europe as composed of regions, rather than of nations. European economic regions extend beyond national political borders because most European countries consist of several regions. Considering this, it is possible to identify groups of economic regions which are characterized by related industrial specialization, independent of the nation to which each region actually belongs. Particular combinations of sectoral specialization in manufacturing could characterize these different groups of regions.[169] This is because regional diversification cushions the net effects of differentiated sectoral shocks on the economy, thereby reducing the risks of *national* instability.

As just stated, the regional dimension of asymmetric shocks is very important. Thus, we should have a closer look at the principle of subsidiarity when considering mechanisms to absorb asymmetric shocks. This principle is one of the key concepts in political decision-making in the EU. It stipulates that public sector decisions and problem resolution should be kept at the lowest layer of government that is appropriate for that specific task. The theory of fiscal federalism provides further considerations to specify subsidiarity, such as policy spillovers and public goods. This theory about the allocation of tasks to different levels of government has been conducted from the basic viewpoint of efficiency. Subsidiarity can, however, also be considered from a different economic viewpoint that combines the functioning of the political and economic systems, the so-called political economy approach. Both theories have to be considered to come to a decision on the appropriate level of government intervention – union, national, regional, local.

According to these approaches, could there be a role for stabilization policy based on a regional level? Frey (1997) provides us with some well-founded answers. He discusses the concept of (fiscal) federalism and adds the idea of the so-called FOCJ. These are units of functional, overlapping, competing jurisdictions, which could be the basis for a system of fiscal transfers. Similar regions that are affected by an asymmetric shock could syndicate and get financial aid for this specific shock. These 'syndicates' would be newly formed out of different regions in case of a new

[169] De Nardis, Goglio and Malgarini (1996) propose the following distinguished sectors: 1) minerals and metals, 2) non-metallic minerals, 3) chemicals, 4) mechanical products, 5) wood and paper, 6) textile, shoes, clothing, 7) transportation equipment, 8) food, drink, tobacco, 9) other products.

asymmetric shock – independent from national borders. After a regional group is formed, it becomes an economic entity. It encompasses several regions, which are specialized in the same way, and united in a strategic coalition to realize their common economic goals. The regional group becomes an independent unit, which can enter in negotiations with interest groups or national government officials. A first step in this direction could be the creation of the 'Eurodistrict Strasbourg/Kehl' at the French-German border. This pilot scheme of a Eurodistrict will be provided with a common administration, common political bodies and elections and new models of taxation.

Further research especially in this range is necessary and will be a main field of research of the authors.

## SUMMARY AND OUTLOOK

In this paper the suitability and sense of fiscal transfer mechanisms in the Euro area to absorb asymmetric shocks were discussed. The authors conclude that *automatic stabilizers* do not mean any hazard for the compliance with the Stability and Growth Pact, but do not evolve enough stabilizing effects because of the small volume, as well. *Automatic transfers by the EU budget* also cannot combat effectively asymmetric shocks because of the small volume compared to the necessary amount. A mechanism often discussed is an *Infra-European fiscal transfer system.* This should however aim at regions and not at the level of member countries to be able to confront (regional) asymmetric shocks.

Finally, mainly discretionary adjustment mechanisms to asymmetric shocks are relevant. As long as the asymmetric shocks that appear are only *temporary,* the stabilizing task is to be taken over from *national fiscal policy.* Short-term deficits could be financed through the capital market. Hereby, the fiscal rules limit national fiscal policy in a reasonable manner. There is no need for a reform (at all events a strengthening, particularly of the sanction mechanism). A stronger co-ordination of national fiscal policies is also to be rejected because there is no significant influence of fiscal policy on inflation (Gros et al., 2002).

However, if *long running asymmetries* occur between European countries, the authors suggest *EU budget transfers* in individual cases, which are a sort of insurance against regional-specific shocks. In addition, we examined what characteristics a 'stabilizing fund' should have and what implications this would have. However, permanent disparities could not be financed forever. Equalization by changing real wages or migration has to take place.

In previous work the authors come to the conclusion that, from an economic point of view, country-based mechanisms make little sense because of the regional character of asymmetric shocks in the Euro area and the decreasing importance of asymmetric shocks (as endogenous criterion of optimal currency areas) despite a common monetary policy. We conclude that regional shocks should be absorbed using a different set of instruments, which need to be reinforced accordingly. These are a higher degree of intra-national and international labor mobility, a higher degree of interregional price flexibility and a more carefully tailored use of fiscal policy to correct regional imbalances. But all mechanisms and measures to combat asymmetric shocks in the Euro area (or in the EU) have to some extent considerable negative impacts in spite of their stabilizing aim, e.g. because of a small stabilizing efficiency of the 'fiscal insurance'. The economics of fiscal federalism give us recommendations, particularly in view of the distribution of the competence for tasks, expenses, and revenues, which create allocatively efficient results of governmental combat against asymmetric shocks. More specifically, financial transfers to absorb asymmetric shocks make sense in general. However, this should be realized by the regional authority that includes the beneficiaries of the shock absorption. Normally, this applies to the national level and in future probably to an increasing degree also the European level.

In spite of this conclusion, the analysis, which is made in this paper based on the theory of optimal currency area and the New Political Economy, refers to *the risks ofcentralization.* The permanent discussions between the European commission and the member states about a reorganization of the financial relations display an obvious *skepticism* against a wide shift of fiscal competences to EU level, a *decreasing willingness for consensus,* and the *emphasis of national and party-political self-interest* at the expense of the European integration process and reasonable economic solutions. Both raises hopes, first for the *European Convention*[170], which discusses among other things the division of competence between member states and the Union and democratic legitimacy of the Union, and second, for the *intergovernmental conference* in 2004 which will also deal with the scope of responsibilities of the European Union and the member countries according to the principle of subsidiarity.

The *future research efforts* will face the demanding task to measure the different statements on the most suitable degree of centralization and on the extent of built-in flexibility for the fiscal absorption of asymmetric shocks. Regional based empirical work about the effectiveness of discretionary fiscal policy to stabilize asymmetric shocks, which has been omitted so far because of insufficient data, could be path breaking in future.

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[170] Inaugural meeting at 28 February 2002; scheduled end of consultations in June 2003.

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