PROGRESS IN INTERNATIONAL BUSINESS RESEARCH

VOLUME 1

GABRIEL R. G. BENITO
HENRICH R. GREVE
Editors

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Torben Pedersen, Copenhagen Business School

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SERIES EDITORS' PREFACE

This new book series is an outlet for research reflecting the progress of the international business field. Mainly the book series will contain high quality papers from the annual conference of the European International Business Academy, EIBA.

Each EIBA conference includes a considerable number of interesting manuscripts containing novel, important ideas, and/or data material. Considerable effort and energy is spent on writing, reviewing and revising the manuscripts for the conference, but for various reasons some of the best manuscripts may never get published in a high-quality journal. With this new serial we intend to encourage the authors of these manuscripts to make their research accessible to a wide range of audience.

The serial will encompass empirical as well as conceptual research spanning the broad range of international business topics. No preference will be given to any particular theoretical and/or methodological perspective. Although the serial will be broad in scope each volume may focus on particular topics or themes. Each volume can be organised around the theme of the annual conference and can include keynote speeches, panel presentations etc. as well as some of the best papers from the conference.

Typically, the annual volume of this series will be edited by the organizer/s of the yearly EIBA conference, as she/he will be responsible for organizing the review process for the conference. The initial selection of appropriate manuscripts can therefore be based on the outcome of the reviewing process for the annual conference.

The target audience of the serial is first and foremost scholars in international business and related fields such as strategic management, marketing, economics, and organization studies, but the serial also aims to reach policy-makers and the business community.

The aim of the serial is to have an impact on the development of the field of international business by publishing interesting, high quality papers and research ideas that for different reasons might not reach the usual publication outlets.

It is with great pleasure we here can introduce the first volume of the serial Progress in International Business Research, edited by Professors Gabriel R. G. Benito and Henrich R. Greve.

Ulf Andersson
Uppsala University

Torben Pedersen
Copenhagen Business School

INTRODUCTION

The articles in this first volume of *Progress in International Business Research* are selected among the papers presented at the 31st European International Business Academy (EIBA) Annual Conference, which was held in Oslo, Norway, in December 2005. The conference, which was organized by BI Norwegian School of Management, was one of the best-attended EIBA conferences ever with more than 350 participants and 220 papers presented in competitive, workshop, and poster sessions. All papers presented at the conference went through a round of double-blind review. The authors of some of the best papers presented at the conference, based on the assessments made by the reviewers, were invited to submit their manuscripts for consideration for the inaugural volume of *Progress in International Business Research*. Acceptance for publication was based on the outcome of an additional round of reviews, which, predictably, led to further revision of the manuscripts that eventually made it into the volume.

The first three chapters of the volume are based on the speeches delivered by the keynote panelists at the conference, Jean-François Hennart, Witold J. Henisz, and Anand Swaminathan, who presented their views on "Research Programs in International Business". Their thought-provoking keynotes gave the conference the best imaginable start and were instrumental in making it a great conference. We are very pleased that Professors Hennart, Henisz, and Swaminathan agreed to write up their addresses to be published in this volume.

The subsequent chapters in the volume are regular research articles that address important topics in international business. Castellani and Zanfei examine heterogeneity in the spillovers from multinationals and the ability of local firms to capture such spillovers, showing that multinationals with longer tenure in Italy produced greater spillovers, while domestic firms engaged in exports benefited more from a foreign presence. Arvanitis and Hollenstein use the OLI framework to investigate why firms invest in foreign research and development. Drawing on a panel data set of Swiss firms, they find that ownership (firm-specific) and internationalization advantages are influential, but location advantages are not. Asmussen addresses a fundamental issue in organizing multinational businesses through his theoretical

analysis of local responsiveness–global integration trade-offs, finding that there can be potential synergies between the two when the business has economies of scope and markets have local taste variations. Vapola and Seppälä analyze the effects of global alliance participation on the subscriber growth and revenue per subscriber of mobile telephone operators, and show that participation in the i-mode alliance increased subscriber growth, but not the revenue growth per subscriber. Fryges analyzes how German and UK technology firms changed overseas sales modes, finding a lack of support for a life cycle model but clear effects of having intangible assets on switches to a more controlling sales mode. Sajasalo conducts an empirical analysis of 15 years of competitive moves by the three largest Finnish forest product firms, finding that although these firms differed in specific strategies, all three firms increased their international commitment in three distinct stages of indirect, organic, and acquisitive expansion.

The chapters thus show a continued interest in the topic of internationalization and international competition that define international business as a field of inquiry, but also that international business research has numerous points of contact with economic and strategy research. The economic effects of spillovers and localization are shared interests of international business and regional economics, while the consequences of business diversification, alliance participation, control, and competitive dynamics are important issues in strategy research. Along with much work published in journals on international business, the chapters in this volume have interest for a broad set of scholars in economics and management.

We thank the reviewers for their thorough, insightful, and promptly delivered reports on the manuscripts. They greatly contributed to the quality of this volume, and made our tasks as guest editors easy. A list of the first and second round reviewers of the papers in this volume is provided, but our thanks extend to all reviewers for the 31st EIBA Annual Conference.

Gabriel R. G. Benito and Henrich R. Greve
BI Norwegian School of Management

A RETROSPECTIVE VIEW ON MY RESEARCH PROGRAM IN INTERNATIONAL BUSINESS

Jean-François Hennart

1. INTRODUCTION

Attempts by scholars to describe ex post how they have built their research stream and to draw lessons for others are bound to be subject to two types of biases: an ex-post rationalization bias and a survival bias. The ex-post rationalization bias means that the lucky breaks, the snap decisions, and the odd mistakes that are the stuff of any career tend to be reinterpreted as clear and prescient strategies. Drawing lessons from such accounts is also subject to a survival bias: for any scholar who has made the same choices as I have made, there are, maybe, hundreds who have fared much worse than me, and hence are not being asked to outline their research strategies. With these two caveats in mind, let me describe in broad strokes how I developed my research program.

In retrospect, I think I can say that my research career has been built around two major intellectual investments. In the 1970s, I made substantial investments in the development of a theory of international business institutions. In the 1990s, I invested into the construction of a database of Japanese manufacturing investments in the United States. I have kept up both investments, and they have reinforced each other.

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2. DEVELOPING A 'COMPARATIVE INSTITUTIONAL' THEORY OF PRIVATE INTERNATIONAL ECONOMIC INSTITUTIONS

2.1. Genesis and Characteristics of the Theory

I did my undergraduate studies in France in the 1960s. This was a period of radical changes. The wholesale purchase of French family firms by American multinational enterprises (MNEs) was causing widespread alarm and considerable controversy about the reasons for such acquisitions and the ability of French firms to resist the onslaught (Servan-Schreiber, 1968). This controversy was in my head when I came in 1969 to the United States to do a PhD in economics at the University of Maryland. When the time came to choose a dissertation topic, I decided to find out, once and for all, what was the net impact of MNEs on the welfare of host countries.

I started, therefore, to search the literature for a solid theory on which to base my analysis. I was quite disappointed. In spite of countless Sundays spent in overheated McKeldin library, I came empty-handed. Economics did not have a theory of the size of domestic firms, let alone international ones. The 'theory of the firm' in microeconomics predicted the optimal volume of production, but had basically nothing to say on which activities a firm should undertake and why. It said very little on how many stages of the value chain the firm ought to undertake, or whether or not it should be involved in multiplant operations. With the exception of Coase's (1937) tautology that agents chose firms over markets when the cost of internal organization was lower than that of using markets, a statement which did not bring us very far, and of complicated and thoroughly unconvincing theories of vertical integration based on variable input proportions, microeconomics was silent when it came to domestic vertical and horizontal integration.

The explanations I was given by my international trade professors for the existence of MNEs were even less satisfactory. Trade theorists had reduced the MNE phenomenon to the financial transactions that appeared in the capital account of a country's balance of payments. These flows occur when MNEs transfer funds from their home country to their controlled foreign affiliates and were, according to trade theorists, explained by international differences in the rate of return on capital. One obvious question with this explanation would have been why such investments were made by manufacturing and service firms, and not by banks or mutual funds, and why investors sought often full ownership rather than small stakes to better

diversify their holdings. In 1960s, Stephen Hymer had raised these questions, and provided some answers, but his work was poorly known, his manuscripts having been rejected by the main economic journals while MIT, his alma mater, refused to publish his thesis on the ground that the argument was 'too simple and straightforward' (Kindleberger, 1976).

While traditional trade theorists were analyzing foreign direct investment (FDI) as flows of capital between countries, Hymer had shifted the analysis to the industry level, and saw FDI as an attempt by firms to avoid competition and to exploit monopoly power (Hymer, 1976). Firms invested abroad – and hence became MNEs – to reduce existing or potential competition. This viewpoint was later adopted by Caves (1971) and Kindleberger (1969) for whom the reason MNEs expanded abroad was to exploit their 'monopolistic advantages.'

I was not satisfied with Hymer's explanation, because it did not seem to explain many types of investment made my MNEs, vertical backward and forward investments as well as horizontal ones in competitive industries such as hotels, fast food, and car rental. I therefore started to look for alternative explanations, and turned to property rights theory (e.g., Alchian & Demsetz, 1972), agency theory (e.g., Jensen & Meckling, 1976), and the new institutional economics (e.g., North & Thomas, 1973). My primary inspiration was, however, a short piece by McManus (1972). Out of these elements I fashioned a 'comparative institutional' theory of the MNE and of its alternatives. That theory was already taking shape when I came across Williamson's (1975) book, which encouraged me to continue developing an economics-based theory of institutional choice based on comparative efficiency, in other words a 'transaction-cost' theory of the MNE.

In 1977, after having worked four years on the manuscript, I defended my thesis, under the direction of Mancur Olson, who had supported me throughout the years with encouragements, sound criticism, and wise advice (Hennart, 1977). I immediately sent the manuscript to the University of Chicago Press, which, after sitting on it for more than a year, rejected it, on the basis of the reviewer's recommendation that ''the book be sent to a lesser publisher, if any can be found,'' a deliciously ambiguous sentence that has remained graved in my memory. A revised manuscript was finally published by the University of Michigan Press in 1982 (Hennart, 1982). By that time, Buckley and Casson's (1976) theory of the MNE, further elaborated and disseminated by Rugman (1981), had obtained considerable notoriety and had become, under the name of 'internalization theory,' the leading theory of the MNE. Dunning (1988) had paired it with a location component to develop his 'eclectic' theory of FDI.

While some scholars give Williamson credit for developing the transaction cost theory of the MNE, this is not the case. In fact Williamson's (1975) book is silent on the MNE, and his 1985 book makes reference to Buckley and Casson (1976) and to Hennart and Wilkins (1983), a manuscript developing my theory and supporting it with business history evidence that Mira Wilkins and I had submitted to the *Journal of Economic Literature*.

Because Buckley and Casson (1976), Williamson (1975), and my thesis (1977) were basically developed independently, they are, in spite of core similarities, substantially different. The core similarities are that (i) all three theories look at the MNE as one of many potential institutions set up to organize international interdependencies; (ii) they all assume that human agents are opportunistic and boundedly rational; (iii) they all argue that agents choose institutions that maximize the gains that can be derived from the transaction, and that the rents obtained when organizing the transaction by a given institution depend on the specific characteristics of the transaction.

The differences have mostly to do with the specific reasons why firms can be superior to markets. Perhaps the biggest difference between my version of the determinants of the choice of economic institutions and that of Williamson is that, in contrast to Williamson, I do not see firms as some kind of second best to be used only when markets fail. Williamson, for example, writes that

> because internal organization experiences added bureaucratic costs, the firm is usefully thought as the organization of last resort: try markets, try hybrids (long term contractual relations into which security features have been crafted) and resort to firms when all else fails (comparatively). (Williamson, 1999, p. 1091)

This idea that firms are inherently inferior to markets because they are burdened with bureaucratic costs and lack the "high-power incentives" of markets is also behind Williamson's argument of 'selective intervention.' That argument states that firms can never be as efficient as markets because they are unable to fully replicate the 'high-powered incentives' of markets (Williamson, 1985, pp. 135–138). This, of course, supposes that firms would want to use the same incentives as markets. In fact, my position has been that it is only because firms use a fundamentally different mechanism than markets that they can, in some cases, be more efficient than them.

In my view, there are only two generic control mechanisms which are 'mixed and matched' in a variety of economic institutions. Organizing economic activities requires to inform parties about the potential rents available (information costs), to strike a bargain on the contribution and rewards of each (bargaining costs), and to enforce the terms of the bargain (enforcement

costs). To achieve these tasks, one can directly control output, and hence indirectly control behavior, the solution used by the price system. The alternative, which I call hierarchy, is to directly control behavior, and hence indirectly control output. No system is per se better than the other: it all depends on the relative efficiency, for a given transaction, of observing and directing behavior compared to that of measuring output and letting agents be informed by market prices (Hennart, 1977, 1982). Since no system is a priori more efficient than the other, the whole issue of "selective intervention" is a red herring because it assumes that firms are inferior to markets because they cannot fully replicate them. In fact, firms deliberately choose to replace the so-called high-powered incentives of markets (i.e., output controls) by behavior controls.[1] One could just as well say that for transactions that are more efficiently organized through behavior control, markets can never be as efficient as firms because they can never fully replicate their incentives.

It is also interesting to note that the dimensions which, for Williamson, are expected to affect the governance of transactions are only those that lead to market failure. For Williamson, there are three main dimensions which determine whether a transaction will be organized in firms or markets, asset specificity, uncertainty, and frequency. Asset specificity affects the efficiency of market transactions, since it reduces the number of potential buyers and sellers, and in the presence of uncertainty, leads to contractual difficulties. But this factor affects the efficiency of organizing transactions through the price system. No argument is made as to whether it also increases or decreases the efficiency of using hierarchy. High asset specificity in the presence of uncertainty is likely to lead to market failure, but it does not ipso facto guarantee firm success! Both markets and firms could fail. So in my thesis, I took great care to also identify the environmental factors that led to firm failure (Hennart, 1977, 1982).

Over the years, Williamson's exposition of his theory has become increasingly focused on enforcement costs. Enforcement costs are increased in the presence of asset specificity. This has led some authors to write that horizontal investments by MNEs are driven by asset specificity. It is, however, difficult to see exactly what is meant by this, and why the exchange of some type of knowledge is characterized by asset specificity while that of other is not, and can be effected through licensing. Instead, it is much more intuitively appealing to argue that horizontal investments in knowledge are driven by information asymmetries between sellers and buyers of knowledge which cannot be remedied by the patent system (Hennart, 1982, 2000). While asset specificity is powerful in explaining international vertical investments (Stuckey, 1983; Hennart, 1988a), it does not provide as good an

explanation for international horizontal investments that result from the exchange of knowledge and goodwill across borders.

Lastly, as shown in the preceding citation, Williamson and his followers seem to think of hybrids as a third alternative to firms and markets. This creates considerable confusion as to what is meant by firms and markets. This confusion comes, in my view, from a failure to distinguish between organizing methods (the price system and hierarchy) and institutions (market, firms, and contracts). I have argued that institutions make use of both organizing methods, prices and hierarchy, but that markets primarily rely on the price system, and firms primarily on hierarchy. Because the exclusive use of a single organizing method generally results in increasing costs for a given level of control, institutions typically use a mix of both prices and hierarchy. In large bureaucratic firms hierarchy predominates, though such firms still make some use of price incentives such as stock options. Markets make mostly use of price incentives but also rely on behavioral rules. Contracts can be defined as institutions with a more equal mix of price and behavior constraints and hence are truly hybrids (Hennart, 1993). Franchising, for example, subjects independent entrepreneurs – franchisees – to rules that constrain their behavior (the so-called QSC guidelines) but most of their income is linked to their output, so they are also subject to output constraints. I believe that a distinction between the two basic organizing methods on one hand, and the specific institutions on the other, some of which are legally defined as firms and others as contracts, goes a long way in clarifying what has been up to now a very confused debate.

Probably the main difference between Buckley and Casson's (1976) and Rugman's (1981) versions of the internalization theory of the MNE and mine is also on the reason why taking a transaction from the market to the firm can, in some cases, increase the rents that can be obtained from the transaction.[2] Buckley, Casson, and Rugman have argued that firms can be more efficient than markets because they can replace failing external markets by more efficient internal ones (Casson, 1981, p. 18; Buckley, 1983, p. 45; Rugman, 1981, p. 28). As I have argued elsewhere, replacing external by internal prices (i.e., external by internal output constraints) is not in itself a solution, because it recreates the problems the firm is seeking to alleviate. Instead the reduction of the costs of using output constraints can only be obtained by loosening the connection between output and reward, that is, by replacing output by behavior constraints (Hennart, 1986). However, output incentives are often reintroduced in firms as a way to reduce the unwanted consequences of an excessive reliance on behavior constraints (Hennart, 1993).

2.2. Applications of the Theory

Having developed this comparative institutional theory of the MNE and of its alternatives, I naturally used it to explain phenomena which I thought were not well explained in the literature. Some of the phenomena I looked at are equity joint ventures, countertrade contracts, and pre-1914 FDI.

The mid-1980s witnessed a phenomenal increase in the number of equity joint ventures, if not in their frequency. Most existing theories (e.g., Harrigan, 1985) were then providing neither necessary nor sufficient conditions for the existence of joint ventures: they argued that joint ventures were used to combine complementary assets, but so were licensing, franchising, and other contracts! My idea was that two sets of conditions were necessary for equity joint ventures to emerge: (i) the assets held by both parties had to be costly to transact on markets; in that case it made sense to reward the partners contributing to the venture from the ex-post profits of the venture. On the other hand, if the market for the asset was relatively efficient, the contractual solution of rewarding parties based on an ex-ante definition of their contribution was superior; (ii) the alternative of internal expansion and mergers/acquisitions was more costly (Hennart, 1988b). I used this theory to explain, inter alia, (i) the circumstances under which an MNE would decide to enter a foreign market through equity joint ventures rather than through wholly owned affiliates (Hennart, 1988b, 1991); (ii) the causes of the main structural problems of joint ventures and what could be done about it (Hennart & Zeng, 2005).

A second application I made of my theory was to countertrade. Most scholars looking at countertrade had argued that this type of international trade contract was caused by lack of foreign exchange. However, my examination of countertrade contracts showed that most of them were not barters, but instead involved the use of money; they were in fact reciprocal money-for-goods transactions. I argued that these contracts were using reciprocal commitments to increase their enforceability (Hennart, 1989) and hypothesized that the need for such contracts would be higher when the alternative of FDI was precluded by host governments. A subsequent empirical investigation showed that a country's propensity to engage in countertrade was positively correlated to its credit rating, thus casting doubt on the hypothesis that countertrade was caused by a country's shortage of foreign exchange. It was also positively correlated to the barriers it imposed on incoming FDI, thus suggesting that countertrade was a contractual substitute to FDI (Hennart & Anderson, 1993).

Business historians studying pre-1914 FDI have been surprised to find that perhaps half of such investments do not look at all like what would be predicted by the internalization and eclectic theories of the MNE (Corley, 1998, p. 137). Such theories argue that firms expand abroad to exploit the firm-specific knowledge advantages they have accumulated through their domestic operations. Pre-1914 FDI was instead undertaken by literally thousands of what Wilkins (1988) has called 'free-standing firms.' These firms were registered in the major capital-exporting countries of the time, the UK, France, Belgium, and the Netherlands. They only had a small office in their country of registration, their manufacturing, extractive, or service activities being exclusively located in foreign countries, where they were running utilities and railroads, plantations, mines, and manufacturing plants. Hence it is difficult to see how they could have exploited abroad firm-specific advantages developed at home, and in fact in some cases the technology they were using overseas was radically different from that used by domestic firms at home (Hennart, 1998). In a series of articles and book chapters, I have shown that this apparent puzzle can be solved when one realizes that MNEs do not internalize advantages, as posited by proponents of internalization and eclectic theories of the MNE, but instead markets (including, but not exclusively, markets for technological advantages). While students of the MNE have spent considerable time studying how MNEs internalize the market for knowledge, they have neglected that for financial capital. In my view, the rise, and eventual decline, of free-standing firms can be explained by their internalization of markets for financial capital (Hennart, 1994a, 1994b, 1998).

3. BUILDING A DATABASE OF JAPANESE MANUFACTURING PLANTS IN THE UNITED STATES

The second major investment I have made is to build a database of Japanese manufacturing plants in the United States. I was eager to see whether my theory was empirically supported, but such testing required data at the firm and affiliate level, which, as is often the case in international business research, was not available off-the-shelf from secondary sources. My theory of the MNEs posited that MNEs (including Japanese MNEs) would invest abroad to internalize the market for their product or process innovations. One possible operationalization of a firm's stock of innovations was their investment in research and development (R&D). I knew that Japanese firms

were required to provide information to the Japanese ministry of finance that included data on their R&D and advertising expenditures. One day, browsing through the Lippincott Library at the Wharton School, I came across a listing for 1985 of all Japanese affiliates abroad. When I saw that the number of such manufacturing affiliates in the United States was large enough to provide sufficient degrees of freedom, I decided to concentrate on Japanese investments in the United States. The US was then one of the few countries which did not restrict incoming FDI and which had an efficient market for firms. There were, therefore, no real constraints on the mode of entry, with Japanese MNEs free to choose whether to enter through greenfield or acquisition, and with wholly owned affiliates or joint ventures. In contrast to UK affiliates in the US which seem to be mostly full acquisitions, Japanese affiliates in the US were somewhat evenly distributed between wholly owned affiliates and joint ventures, and between greenfields and acquisitions. Lastly, concentrating on investments in the United States made it possible to link to the fine-grained industry data that is available in the US. This, plus other data sources I uncovered later, made it possible to empirically test my theory of the determinants of FDI at the firm/product level (Hennart & Park, 1994). I was also able to test my theory of international joint ventures (Hennart, 1991) and to explore the determinants of the choice between internal (greenfield entries) and external expansion (acquisitions) (Hennart & Park, 1993). Naturally, concentrating on Japanese data has also involved considerable investment in learning about the Japanese context, but this investment has also given me a much broader viewpoint about MNEs and their potential strategies.

I made three initial decisions when I started the database: (i) restrict it to manufacturing; (ii) focus on plants rather than on subsidiaries; and (iii) choose the stake taken by the Japanese parent in a US plant as the unit of analysis. The decision to focus on plants rather than on subsidiaries, while it made data collection much more time intensive, proved ultimately to be the right one. Most corporate documents (such as Annual Reports) provide information on the firm's subsidiaries. But this information is treacherous, because it relates to administrative units. Changes in the name or the existence of administrative units may have very little to do with the subjacent economic activities of the parent in the host country. A typical case is that of the Japanese firm Sekisui Chemical, which acquired two US firms before 1980, Voltek in 1969 and Eslon Thermoplastics in 1978. Subsequent to this acquisition the two acquired affiliates were administratively merged into Sekisui America. There were no changes to the plants. Researchers relying on information on administrative units could have concluded that both

Voltek and Eslon had been sold or liquidated, and a new affiliate, Sekisui America set up, when in fact this is not the case.

Focusing on plants made it also relatively easier to identify both the existence and the form of exit. Firms typically do not report exits. To infer exits from the failure to be listed in the parent's annual report is very risky for the reason mentioned above. By contrast, a plant has a physical footprint that is somewhat easier to trace.

I started the database to allow empirical tests of the theory of FDI and of that of market entry. The dependent variables in these papers were whether or not entry took place (as of 1985) and the form taken by entry (whether a full or a partial stake, and whether a greenfield or an acquisition entry). I then got interested in empirically verifying the often made statements that international joint ventures were particularly unstable and that their instability was due to conflicts between the parents (Harrigan, 1988), and that they were entered into to steal the knowledge contributed by the partner, with US firms joint venturing with Japanese firms particularly at risk (Reich & Mankin, 1986). To test these propositions required a longitudinal database, so we traced down to 1991 all the Japanese plants that were manufacturing in the United States in 1980. We found that, after controlling for economic conditions in the United States and the mode of entry, affiliates which were partially owned by their Japanese parents were indeed more likely to have exited than wholly owned ones, but the difference in longevity was not due to a higher rate of liquidations for joint ventures than for wholly owned affiliates, as had been asserted, but instead to the fact that joint ventures had a higher probability of being sold. To the extent that sale, in contrast to liquidation, does not necessarily imply failure, Japanese joint ventures over the 1980–1991 were not more likely to fail than Japanese wholly owned affiliates, thus casting doubt on the idea that conflicts between parents were causing high joint venture mortality (Hennart, Kim, & Zeng, 1998). Likewise, we found no evidence that Japanese MNEs were engaged in a learning race to capture the knowledge contributed to the joint venture by their US partners (Hennart, Roehl, & Zietlow, 1999).

We also found that while we could identify the factors that led Japanese firms to sell their affiliates, it was more difficult to explain why their affiliates went bankrupt. Part of the reason was the small number of observations. The 1980–1991 period was one of sharp economic growth in Japan, and as a result the mortality rate of Japanese manufacturing affiliates in the United States was rather low. I am now updating the database to the year 2000, which will drastically increase the number of affiliate bankruptcies and liquidations, and make it possible to perform a large-scale study of the

determinants of this type of exits, as well as compare both the rate and the timing of exits of Japanese affiliates with those of a sample of Norwegian, Dutch, Danish, Finnish and Dutch ones.

4. CONCLUSIONS

What are in my view the ingredients of a coherent, cumulative, and influential research program? I think any good researcher has to make substantial investments in theory development and in data collection. Theory is what makes you see contradictions or gaps in previous research, and what allows you to come with creative answers. But to master any theory one has to repeatedly apply it to new areas, and in the process add to it. Another sure way to come up with original thoughts is to roam around the disciplines, borrowing ideas from one field and applying them in another. Databases are also important. As shown by the major advances to the field of international business made by Raymond Vernon and his colleagues, the answers to many important questions in international business and elsewhere require the systematic collection of relevant data. While the investment may be significant, the rate of return is high.

The second ingredient of a productive research career is a healthy disrespect for accepted truths. A considerable number of accepted truths in international business have no factual or logical basis (cf. our earlier discussion of countertrade and free-standing firms; see also Harzing, 2002). A doubting attitude is key to being the first to develop a new outlook or to prick established theoretical balloons. But this is a high-risk endeavor. Original and creative thoughts are good deeds that rarely go unpunished. On the other hand, path-breaking articles are the ones that get eventually cited.

The last ingredient is relevance. Too often academic research occurs in close circuit, with scholars discussing and refining the constructions of other scholars which have been elaborated in complete ignorance of reality. To me, theoretical tools and databases should be used to answer questions that are seen as important by a wide circle of people.

NOTES

1. High-powered incentives is a misnomer. The price system exerts high-powered incentives on output, but low-powered incentives on behavior; the opposite is true of the hierarchical method of organization.

2. Contrary to what has been asserted by some (e.g., Zajac & Olsen, 1993) transaction cost theory is not about minimizing transaction costs but instead about maximizing the rents derived from organizing the interdependence.

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RESEARCH PROGRAMS IN INTERNATIONAL BUSINESS

Witold Jerzy Henisz

1. INTRODUCTION

I believe that the construction of a research program in international business requires careful attention to the scope of a scholar's research question, the decomposability of that question into component elements that span disciplines, methods and contexts topped off with a certain irrational perseverance. As I lay out the case for more scholars to pursue similar programs, I note that my advice should be tempered by the early stage of my own research program (my PhD was received only nine years ago), the high risk nature of the path I chose to follow (more on this below) and the heterogeneity in training (i.e., experience, skill sets, beliefs) and environmental conditions (i.e., institutional, peer network and personal) which influences each of us as scholars as much as the organizations that we study.

2. THE SCOPE OF THE QUESTION

What topic is broad enough to consume an international business scholar for 10 or more years? Such a topic must tap into personal interest and motivation but also extend beyond into the external community who should find it both of practical importance and outside the boundaries of discipline-based research. Without personal interest and motivation, the scholar is left

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with instrumental research and lacks the passion to climb out of the inevitable abysses that occur when data does not allow for or fails to comply with the testing of current theoretical insights. Without an external community, the scholar loses the constructive but challenging interactions that take the research from the plateau at the edge of the abyss to the summits far beyond. For research programs in international business, a field defined by the study of economic transactions that cross-organizational and national borders, that external community should necessarily include economists, sociologists, political scientists and psychologists. Lacking important inputs in any of these domains leaves one at grave risk of re-labeling rather than discovering or of failing to capture an important character of the output of individuals with heterogeneous beliefs and experiences working within teams that vary in their functional and geographic composition as well as governance in organizations that vary in their resources and experiences that span national boundaries defined by political, social and economic institutions.

In my own research, the motivating question has been *What is the relationship between the foreign investment decisions of multinational corporations and the political and social environments in which they operate?* This line of inquiry captures my own personal interests as evidenced by my own predoctoral studies in economics, political science and international relations as well as my work experience in Washington, DC at the Group of 30, as a consultant to the World Bank and the Conference Board and at the International Monetary Fund. The current allocation of my limited free time to scanning academic publications from scholars in multiple disciplines to the more leisurely reading of current developments in international political economy in *The Economist*, *Financial Times*, *Foreign Affairs*, *Foreign Policy*, Eurasia Group reports and other business press help to convince me that it is not time yet to shift gears. I have tried to craft links to external academic and policy communities through presenting my research in multiple professional conferences (American Economics Association, Academy of International Business, Academy of Management, American Political Science Association, American Sociological Association, European Group for Organizational Studies, European International Business Academy, International Studies Association, International Society for the New Institutional Economics) and publishing in outlets of interest to scholars in international business (*Journal of International Business Studies*), management (*Academy of Management Review*, *Academy of Management Journal*, *Administrative Science Quarterly*, *Organization Science*, *Strategic Management Journal and Strategic Organization*), international studies (*International Organization and International*

Studies Quarterly) and sociology (*American Sociological Review*). While many referees and discussants are quick to highlight that I am not an insider and that I cite too broadly for their tastes, some are persuaded that the insights gained by studying multinational activity at the intersection of their domain and others' merits scanning and broad-based discussion.

3. DECOMPOSIBILITY OF THE QUESTION

Dependent and independent variables. Any question that can capture your interest and that of an external community for a decade or more in the field of international business must be broken down into constituent elements before progress can be made in research. There are myriad organizational actors (e.g., employees, managers, teams, subsidiaries, firms, clusters, industries, regions, nations, multilateral bodies, economic systems, …), actions (e.g., employment, effort, coordination, compensation, learning, implementation, productivity, spillovers, (dis)investment, diversification, profitability, growth, relative market share, competition, development, …) and environmental characteristics (e.g., suppliers, buyers, complementors, (potential) competitors, voters, media, government officials, nongovernmental actors, intergovernmental actors, …). The decomposition of these complex relationships into constituent components in which variation in other elements is held constant or left for future research provides some potential for incremental progress in unpacking the larger relationship and maintaining momentum in a career where time horizons are of shorter durations than research programs.

In my own research,[1] I have broken my research to date into four overlapping and related components.

- While scholars in new institutional economics have long argued that the structure of political institutions can have strong effects on economic outcomes and scholars in mainstream economics increasingly accept this argument, empirical progress in demonstrating this linkage was limited for some time by an atheoretical approach to measuring those political institutions. While theoretical arguments increasingly focused on the checks and balances present in a country's political institutions as a primary determinant of investment and growth, researchers relied on measures that were orthogonal to this construct or subject to severe coding biases. In my dissertation research, I used spatial modeling tools developed in positive political theory to construct a new cross-national time-varying measure of

the constraints faced by political actors in altering the policy environment. I used cross-national panel data to show that such political constraints are associated with reduced variability in policies, higher investment and higher economic growth.

- A stable policy environment may be preferred on average, but change is periodically needed and, more frequently, requested. A second segment of my research incorporates insights from interest-group theories of politics that allow the relative strength of economic and political actors seeking to influence the policymaking process to influence cross-national variation in policy outcomes.
- A third segment of research draws on the strategic management literature to explain variance in the observed effect of the political environment on multinational firms' choices about entry, entry mode and entry type. I further demonstrate that multinational firms, particularly those with extensive experience in the host country or politically risky countries in general, do not treat the political environment as an exogenous constraint but, rather, actively seek to influence policy outcomes so as to minimize inimical policy change and promote favorable policy change.
- Finally, my current research begins to address the influence that multinational firms and the political actors that represent them have on policy innovations and institutional change in the countries in which they invest. In the coming years, I plan to extend this analysis to identify short-term influence strategies that generate sustainable policy innovations and institutional change, rather than a political backlash against the long-term interests of multinational firms.

Interdisciplinary. As I highlighted in my discussion of the appropriate scope of questions for a research program, I do not believe that successful international business scholarship can or should aspire to discipline-based status. We are necessarily drawing from the disciplines of economics, political science, sociology and psychology. In that arbitrage lies tremendous opportunity for importing new data, new methods and new theory to long-standing questions in international business. In some ways, our field may be sidetracked in the search for new "big questions" rather than adopting new techniques for answering the old ones more convincingly.

Interdisciplinary scholarship also poses, however, substantial challenges. It is far easier to graft than to integrate (i.e., to add a parameter to an economic model and claim to have captured the role of political institutions or to add a variable measuring some aspect of beliefs in a country and claim to have captured the role of cultural heterogeneity). Furthermore, even

successful integration is rarely rewarded. One could conclude from the one-sided nature of cross-citations of disciplinary journals and the *Journal of International Business Studies* that we are failing at the process of integration (see Table 1). It is far harder to reach such a conclusion from a review of the one-sided nature of cross-citations of the work of some of our most prominent interdisciplinary scholars (see Table 2). Here, I offer a cautionary note. To succeed with a research program in international business you must possess a thick skin. For you will have to reach out again and again to discipline-based communities that will rarely reach out to you and will, more often, seek to replicate international business research findings with their own labels. This trend will not change and those of us who cannot be satisfied without recognition as discipline-based scholars will be forever unrequited.

My own journey has taken me into development economics, the political economy of policy reform, international political economy, social movement theory and institutional theory. Each of these excursions has been illuminating and I carry some of these insights with me into my own work. I have largely abandoned the ephemeral goal of being recognized as contributing back to these disciplines but I am now ready to embrace the role of being stuck in between them. For without the insights of these more insular fields, my own quest to address questions at the heart of my own research program would be stymied. My primary audience is and will remain scholars and practitioners who seek to explain and enhance the performance of the foreign investment decisions of multinational firms.

An alternate approach espoused to varying degrees by my copanelists (Jean-Francois Hennart and Anand Swaminathan) is to focus on a single theoretical paradigm than can be applied to multiple contexts in international business or for which international business can offer a useful context among others. The success of their own research programs attests to the heterogeneity of paths that one may follow with regard to theoretical orientation. I can attest to the stimulation of finding complementary as well as contradictory arguments across theoretical paradigms that generate deeper insights and empirical challenges. I can also attest to the frustration of lacking a theoretical home as I have been variously mislabeled as a transaction cost economist, an institutional theorist, a social movement theorist or a political institutionalist by those who prefer to identify scholarship by a set of shared assumptions rather than by a phenomena which requires a basic set of assumptions that are accepted in many theoretical paradigms but not widely invoked jointly. Lacking a theoretical home is not merely an inconvenience or a source of personal isolation. Being stuck in between

Table 1. Analysis of the Distribution of the Citations to/in *Journal of International Business Studies*, 1999–2004.

	Number of Times Articles Published in Year below in Journals on Left Cited Articles Previously Published in *Journal of International Business Studies*							Number of times articles previously published in journals on left were cited in *Journal of International Business Studies* in year below						
	1999	2000	2001	2002	2003	2004	Total	1999	2000	2001	2002	2003	2004	Total
Management	93	197	139	182	117	118	846	284	299	227	358	n/a	432	1600
Academy of Management Journal	0	101	45	16	16	14	192	57	59	62	83	n/a	90	351
Academy of Management Review	11	19	2	26	19	7	84	58	68	44	73	n/a	69	312
Administrative Science Quarterly	0	0	7	2	0	3	12	43	28	22	36	n/a	33	162
Management Science	5	0	0	2	2	4	13	22	17	15	28	n/a	27	109
Strategic Management Journal	73	63	76	93	60	71	436	85	116	71	119	n/a	156	547
Organization Science	4	14	9	43	20	19	109	19	11	13	19	n/a	57	119
Economics	0	3	0	0	2	11	16	31	27	40	15	n/a	45	158
Journal of International Economics	0	3	0	0	2	9	14	2	5	7	3	n/a	7	24
American Economic Review	0	0	0	0	0	2	2	16	13	11	7	n/a	13	60
Journal of Political Economy	0	0	0	0	0	0	0	4	4	9	0	n/a	11	28

Quarterly Journal of Economics	0	0	0	0	0	0	0	9	5	13	5	n/a	14	46
Finance	0	0	0	0	0	6	6	0	16	25	15	n/a	24	80
Journal of Finance	0	0	0	0	0	0	0	0	11	14	10	n/a	18	53
Journal of Financial Economics	0	0	0	0	0	6	6	0	5	11	5	n/a	6	27
Marketing	0	0	14	12	6	0	32	82	89	43	82	n/a	39	335
Journal of Marketing	0	0	5	12	6	0	23	50	64	28	46	n/a	23	211
Journal of Marketing Research	0	0	9	0	0	0	9	32	25	15	36	n/a	16	124
Sociology	0	0	0	0	0	0	0	22	18	15	19	n/a	14	88
American Sociological Review	0	0	0	0	0	0	0	7	11	7	9	n/a	6	40
American Journal of Sociology	0	0	0	0	0	0	0	15	7	8	10	n/a	8	48
Political Science	0	0	0	0	2	0	2	0	0	7	4	n/a	4	15
American Political Science Review	0	0	0	0	0	0	0	0	0	0	2	n/a	0	2
American Journal of Political Science	0	0	0	0	0	0	0	0	0	0	0	n/a	0	0
International Organization	0	0	0	0	2	0	2	0	0	7	2	n/a	4	13

Table 2. Analysis of the Distribution of the Citations to/in Works of Interdisciplinary International Business Scholars.

	Peter Buckley	John Dunning	Stephen Kobrin	Bruce Kogut	John Stopford	Total
Total	1233	1802	556	2657	587	6835
Journal of International Business Studies	15.09%	11.27%	19.06%	9.15%	16.01%	12.17%
Management	9.41%	5.38%	11.15%	24.01%	15.16%	14.66%
Academy of Management Journal	2.03%	1.11%	2.34%	3.35%	2.73%	2.38%
Academy of Management Review	1.46%	0.72%	1.62%	2.71%	1.36%	1.76%
Administrative Science Quarterly	0.16%	0.28%	0.36%	1.24%	1.02%	0.70%
Management Science	0.41%	0.00%	0.72%	2.56%	1.02%	1.21%
Strategic Management Journal	4.38%	3.11%	5.40%	10.16%	7.84%	6.67%
Organization Science	0.97%	0.17%	0.72%	3.99%	1.19%	1.93%
Economics	0.73%	1.17%	0.00%	0.30%	0.00%	0.56%
Journal of International Economics	0.57%	0.78%	0.00%	0.11%	0.00%	0.35%
American Economic Review	0.16%	0.22%	0.00%	0.19%	0.00%	0.16%
Journal of Political Economy	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Quarterly Journal of Economics	0.00%	0.17%	0.00%	0.00%	0.00%	0.04%
Finance	0.00%	0.17%	0.00%	0.15%	0.34%	0.13%
Journal of Finance	0.00%	0.17%	0.00%	0.08%	0.34%	0.10%
Journal of Financial Economics	0.00%	0.00%	0.00%	0.08%	0.00%	0.03%
Marketing	0.41%	0.11%	0.54%	0.56%	0.68%	0.42%
Journal of Marketing	0.41%	0.11%	0.54%	0.56%	0.68%	0.42%
Journal of Marketing Research	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Sociology	0.00%	0.00%	0.36%	0.34%	0.34%	0.19%
American Sociological Review	0.00%	0.00%	0.36%	0.19%	0.00%	0.10%
American Journal of Sociology	0.00%	0.00%	0.00%	0.15%	0.34%	0.09%
Political Science	0.00%	0.33%	1.98%	0.00%	0.68%	0.31%
American Political Science Review	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
American Journal of Political Science	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
International Organization	0.00%	0.33%	1.98%	0.00%	0.68%	0.31%
Other journals not listed here	74.37%	81.58%	66.91%	65.49%	66.78%	71.56%

leaves you at the peril of referees and letter writers who perceive you as an (potentially hostile) outsider. Are there enough of us in this perilous state to support each other or enough scholars who are tolerant of this approach to provide the support we need to survive? Sadly, I feel that this remains an open question.

Multi-method and multi-context. Given the complexity of the relationships examined within the field of international business and the data limitations we encounter as we seek to untangle that complexity, I have become an increasingly strong advocate of a multimethod approach by individual scholars. Dividing one's time across some subset of methods including pure theory, case studies, comparative case analysis, experimental methods, survey design and archival research will likely generate higher returns than a narrower approach wedded to one of these methods. Each method offers its own unique strengths and weaknesses particularly with regards to generalizability, the identification of boundary conditions and the underlying theoretical mechanisms at work. Given my advocacy for a phenomenon-based as opposed to theoretically oriented research program, it seems important to shed light on that phenomenon using multiple methods in the recognition that no one answer will be fully accurate or complete but that a broad-based inquiry can overcome the gaps inherent in a narrower approach. If, by contrast, one's concern was to shed light on the generalizability of a theoretical paradigm, your approach might differ substantively in this regard.

My own research has progressed through two cycles of exploratory interviews, theoretical integration and large-n empirical testing. The first path began with a series of interviews with New Zealand policymakers and managers reflecting upon the adoption of the dramatic 1984 neo-liberal reform program. Their insights that the reform only became credible when it became so unpopular that the voters changed their electoral rules to insure that no subsequent government would have as much power (i.e., they shifted from a Westminster style first-past-the-post system to a German-style proportional representation with minimum threshold) and, ironically, insured that no future government could undo the reforms. These anecdotes led me to the work of early scholars in positive political theory for insights into how to construct measures of political structure that were so simple that they could be applied in any country context. I then applied this new measure to country-, industry- and firm-level outcomes using theoretical insights from development economics and transaction cost economics.

In the second wave, my co-author Bennet Zelner and I interviewed more than 300 managers in electricity generation and telecommunications services

in 14 countries. These interviews led us into institutional theory and social movement theory for an understanding of how to model legitimate reforms and opposition to reforms perceived as illegitimate. Our first empirical piece from this research is now published and we are working on several follow-up large-n empirical as well as practitioner oriented pieces.

4. IRRATIONAL PERSEVERANCE

How should one respond when conventional wisdom in well-established theoretical paradigms is challenged by the extension of that theory across national borders? Or when the data to appropriately test theory does not exist or when the methods to confront datasets with multi-level inter-temporal error structures are still in their infancy? One solution is to retreat from the field of international business to other fields or disciplines where these same three challenges are not as certain to jointly arise on a regular basis. A second solution is to ignore these problems and build walls around international business claiming that it cannot be judged by the same standards as other field in which such challenges do not jointly present themselves so regularly. A third solution of which I am a strong advocate is to view conflicts, gaps in data and methods as opportunities to develop new integrative theory, targeted metrics and apply the latest methodological advances from other disciplines.

This is not the most pleasant or natural path to follow. I doubt that I would have chosen it myself were it not from my advisor, Oliver E. Williamson who would accept nothing else and my peers in the doctoral program at the Haas School of Business who reinforced that norm in every doctoral student seminar. It would have been easier to use off the shelf data on political institutions or on the activity of multinational firms. Even after I felt that my theoretical arguments and empirical evidence were in place, Oliver, Bennet Zelner, Patrick Moreton and others subjected me to many humbling interactions that forced me to go deeper into the underlying mechanisms, consider alternate explanations, test for potential econometric pitfalls, identify compelling corroborating stories from current headlines and achieve a level of scholarship that I try to replicate in my own work going forward and that of the few graduate students who will put up with me.

Research programs in international business are challenging in multiple dimensions but among the greatest challenge we face is the need to be stretched so thin across disciplines, methods and contexts and yet be strong enough to respond to challenges from the outside. It is always tempting to

ignore the challenge or draw in from our outreach. I strongly believe that such actions would be counterproductive and a frank honesty about what is required: a desire or enthusiasm for doing research in the messy middle of disciplinary strongholds has the greatest chance of continuing to attract the right junior scholars into our circle. Together we can continue to generate exciting times for international business research.

NOTES

1. For more information on the individual publications summarized here, see http://www-management.wharton.upenn.edu/henisz/.

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THEORETICAL RESEARCH PROGRAMS IN INTERNATIONAL BUSINESS

Anand Swaminathan

1. INTRODUCTION

Much of the discussion about the state of research in international business focuses on past and potential research topics (Werner, 2002; Buckley, 2002). There has also been a lot of agonizing over the survival of international business as a distinct field of research (Toyne & Nigh, 1997, pp. 27–110; Shenkar, 2004). As an outsider to the field, I am less concerned about the boundaries of the field as long as the theoretical issues it raises are addressed in various disciplines in the social sciences and management (see Buckley, 2002, Footnote 3 for a similar sentiment from an insider). In order to achieve this goal, it is necessary to develop theoretical research programs in international business that are sustained until the full potential of the theories are realized. In this essay I will briefly describe the essential features of a theoretical research program, provide contrasting examples of thriving and moribund research programs, and identify some challenges to developing theoretical research programs in international business.

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2. THEORETICAL RESEARCH PROGRAMS

Lakatos (1968, 1970a) proposed a methodology of theoretical research programs to evaluate scientific theories. In his methodology, research programs have a commonly accepted *hard core* that is not called into question. This *hard core* is allied to a *positive heuristic* which "defines problems, outlines the construction of a belt of auxiliary hypotheses, foresees anomalies and turns them victoriously into examples, all according to a preconceived plan" (Lakatos, 1970b, p. 99). The positive heuristic thus suggests the sorts of problems that scientists within a research program should focus on. Lakatos argues that entire research programs rather than individual theories need to be evaluated for their significance. The growth and decline of theoretical research programs are captured in terms of progressive and degenerating *problemshifts*. Progressive problemshifts imply that the research program makes empirical predictions that are not predicted by other research programs. The existence of a hard core allows scientists to ignore anomalies until the research program starts losing momentum. Research programs lose momentum and experience a degenerating problemshift when they offer only post-hoc explanations of empirical facts predicted by a competing research program. Lakatos's methodology of scientific research programs allows for multiple research programs that compete with each other to predict novel empirical facts. The vitality of a research program is based not on its state at a particular point in time, but on its evolution over time. Below I provide two examples of theoretical research programs in international business. The first, on the boundaries of the multinational enterprise (MNE), has been quite successful in generating novel empirical predictions. The second, on the evolution of MNE organizational structure, has not yielded insights of similar quality.

3. INTERNALIZATION THEORY AND THE BOUNDARIES OF THE MNE: A THRIVING RESEARCH PROGRAM

Buckley and Casson (1976) draw upon the work of Coase (1937) and Williamson (1975) to argue that MNE's grow by internalizing transactions that are subject to external market failure. The level of transactions costs in internal and external markets can be used to predict the rate and mode of growth of a firm. Internalization theory has been the foundation of numerous studies of modes of entry into foreign countries. The choice between

exporting, establishing a greenfield operation and acquiring a host country firm is modeled as a function of transaction costs involved in implementing each choice with the expectation that the mode chosen will be one that has the lowest transaction costs. From its *hard core* in transaction costs economics, this research program has been successful at explaining additional outcomes and predicting novel facts. First, it has led to predictions about the appropriate forms of control systems. On the one hand, Rugman (1981, p. 28) argued that transfer prices between MNE sub-units create efficient internal markets that replace external markets. Hennart (1986, 1991), on the other, suggests that the coordination benefits of internalization for MNEs derive not from market-like transfer prices but from their internal organizational hierarchy. Still others (Ouchi, 1979; Hedlund, 1986, 1993) have shown that in addition to the constraints on behavior imposed by formal hierarchy, socialization processes plays an important role, especially in firms where output is difficult to measure. Second, MNEs in knowledge-based and technology-intensive industries face a choice between licensing their technology to host country firms and introducing new technologies to host countries themselves. Internalization is the optimal solution when the threat of opportunism is high and it is costly to monitor licensees. Third, the increasing prevalence of inter-organizational relationships such as alliances (Contractor & Lorange, 1988), including joint ventures, has also been addressed by transaction costs economists and internalization theorists as a hybrid organizational form, that includes features of both markets and hierarchies (Williamson, 1991; Hennart, 1993; Buckley & Casson, 1998, pp. 31–36).

4. STRUCTURAL CONTINGENCY THEORY AND THE STRUCTURAL EVOLUTION OF MNES: A STAGNANT RESEARCH PROGRAM

A second approach to MNE organization focused on the development of its internal organizational structure over time. This research program has it roots in two streams of research, business histories of large firms and structural contingency theory. The first is based on research in business history beginning with Chandler's (1962) classic account of the evolution of large organizations from a functional to a divisional structure. Wilkins (1970, 1974) described the organizational changes made by American firms as they expanded abroad. Similar work was done on MNEs originating in the UK (Channon, 1973) among other home countries (see, e.g., Dyas & Thanheiser, 1976 on the evolution of French and German MNEs). These historical

accounts provided rich descriptions of the changes in MNE strategy and structure over time. Structural contingency theory helped provide a rationale for these changes. Lawrence and Lorsch (1967) showed that firms had to differentiate themselves internally so that they could adapt to heterogeneity in the environments faced by their sub-units. Once the firm was internally differentiated in its structure, integrating mechanisms had to be put in place to coordinate the activities of the various sub-units. These ideas were applied by Stopford and Wells (1972) in their study of the internal structure of MNEs. Using case study evidence, they argued that the type of structure adopted by an MNE depends on its scope of activities. If it has little product and geographic scope it will likely use an international division. If the MNE has great product scope and little geographic scope, it will adopt a product division structure. Finally, if the MNE has great geographic scope and little product scope it is likely to adopt a country division structure. Despite these ideas being in circulation for over three decades, few tests, if any, of these propositions have been conducted. I suspect that is partly due to the fact that the *hard core* of this research program, structural contingency theory, fell into disfavor in the late 1970s due to concerns about falsifiability (Schoonhoven, 1981) and a lack of discipline about the contingencies that affected firm behavior and outcomes (see, e.g., Hofer, 1975, pp. 799–806 for propositions that specify seven-way interactions among the variables that are claimed to affect firm performance). Contingency theory gave way to the organization theories that dominate current research; transaction costs economics, institutional theory, organizational ecology, and social network theory/economic sociology. Ghoshal and Bartlett (1990) tried to reinvigorate research on MNE structure by conceptualizing it as an internal network of links between sub-units. Though this reconceptualization has yielded empirical predictions that could be applied to any large firm and its sub-units, much of the empirical research has been conducted in the context of MNEs. However, the original emphasis of Stopford and Wells (1972) on the evolution of MNE structure seems to have been lost with the use of cross-sectional research designs.

5. CHALLENGES FOR DEVELOPING THEORETICAL RESEARCH PROGRAMS IN INTERNATIONAL BUSINESS

In conclusion, I draw attention to two challenges to developing theoretical research programs in international business. The first is a choice between

engaging in theory-driven versus phenomena-driven research. In a recent review of the state of international business research, Buckley (2002, p. 369) considers one of its historical strengths to be its ability to explain "real changes in the world economy." His concern is that there are no more such "big questions" that require explanation. While phenomena-driven research allows one to take advantage of naturally occurring changes in the world economy, it runs the risk of favoring ad hoc explanations that are soon forgotten because they have no excess empirical content – they do not make new predictions beyond the phenomena under consideration. Theoretical research programs tend to be cumulative, new research questions emerge as old ones are answered.

The second challenge arises as a hazard of emphasizing the uniqueness of the objects under study in international business research. For instance, a common refrain nowadays is that the business environment is so different in China that we need entirely new theories to explain organizational behavior and outcomes. I am acutely aware that the overwhelming majority of theories in international business are of US origin (Shenkar, 2004, p. 166). However, this is not an adequate reason to abandon these established theories. One of the hallmarks of a theoretical research program with a progressive problemshift is that it explains the phenomena better than rival theoretical programs. My preferred approach would be to exhaust the predictive power of existing theories before developing new ones for each country environment.

Finally, theoretical research programs thrive when they are driven by a community of scholars who accept the *hard core* of the program, and agree about the positive heuristic, the next set of research questions to focus upon.

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MULTINATIONAL FIRMS AND PRODUCTIVITY SPILLOVERS: THE ROLE OF FIRMS' HETEROGENEITY

Davide Castellani and Antonello Zanfei

ABSTRACT

This paper examines how heterogeneity across firms affects spillovers from multinationals. Using data on firms active in Italy in 1993–2000, it is shown that not every multinational firm is a good source of externality and not every domestic firm is equally well placed to benefit from multinational activity. Positive spillovers to domestic companies are associated with the presence of R&D intensive foreign affiliates and of subsidiaries that have long been established in Italy. Among Italian firms, exporters benefit significantly more from foreign presence than non-internationalised companies. However, the latter seem to benefit from the activities of domestic-owned multinationals. These results are consistent with the idea that outward and inward FDIs might have complementary effects. Policies should thus be designed to take this complementarity into account.

1. INTRODUCTION

Most recent works on external effects of multinationals on domestic firms do not find any sound evidence of positive intra-industry spillovers

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(see Gorg & Greenaway, 2004 for a survey). The main theoretical explanation for these results is that negative competition effects tend to outweigh positive externalities from the activities of foreign multinationals active in the same industry in the host country. In fact, it is generally acknowledged that multinational firms have strong incentives to prevent information leakages and are most likely to refrain from transferring knowledge to their competitors in the foreign markets where they are active. Furthermore, they may well push domestic firms out of the market by stealing their market share and forcing them to produce at higher unit costs. Altogether, these negative competition effects are usually expected to more than compensate other positive effects, such as technology transfer through imitation and demonstration, human capital mobility and demand for local inputs.

However, a closer look at the empirical evidence reveals that positive horizontal spillovers from foreign affiliates (FA) of multinational firms to host country firms do occur under specific circumstances. In particular, a large literature has been focusing on the role of technology gaps and absorptive capacity in facilitating such positive externalities. In a nutshell, the technology gap hypothesis posits that in order for a knowledge transfer to occur, the foreign firm should have something to 'teach' and domestic firms should have something to 'learn'.[1] Following the seminal contribution by Findlay (1978), a number of studies suggest that a high productivity gap between foreign and domestic firms is a good indicator for such a condition to hold. In other words, if domestic firms are far away from the technological frontier of the foreign multinationals, there is a good chance of catching up and the potential for positive externality is likely to exceed the negative competition effect. The absorptive capacity hypothesis, emphasised by Cantwell (1989) and subsequent works in the international production literature, complements this view by postulating that for a knowledge transfer to occur the beneficiary must be willing and capable to learn. Despite a high spillover potential, domestic firms might not be able to benefit if they do not accumulate absorptive capacity. From the theoretical point of view this is a function of the stock of knowledge of each firm, and empirical works have usually identified this capacity with the level of productivity, human capital, R&D investment or revealed technology advantages of host country firms. One important implication of combining these two hypotheses is that multinational presence is most likely to generate spillovers to the local economy when foreign technological leaders co-exist with domestic firms with strong technical competencies and hence a high absorptive capacity.[2]

In this paper we build on this literature by arguing, more generally, that not every foreign firm is a good source of externality and not every domestic firm is equally well placed to benefit from the presence of multinationals. The idea is that the extent to which spillover opportunities arise and can be appropriated by domestic firms depends on the characteristics of both the foreign affiliates and the domestic firms. In other words, we focus on how various aspects of firms' heterogeneity affect spillovers from multinational firms.[3]

First, we investigate the role of *heterogeneity of foreign affiliates*, with special attention to their R&D intensity, their propensity to establish technological cooperative agreements, and the length of their presence in the host country. Second, we address the role of *heterogeneity of domestic firms* in allowing productivity spillovers, by arguing that their degree of international involvement is a key characteristic that affects both their ability to benefit from the presence of multinational firms in their sector and the intensity of competition. Third, we address the issue of *heterogeneity across multinationals* and its implications for spillovers to domestic firms. In particular, we consider whether the expansion of domestic multinationals in their home market affects productivity of other domestic firms, and compare this effect with spillovers from foreign multinationals. The literature on spillovers from multinational firms has analysed the impact of foreign firms in host countries. However, domestic multinational firms in their home country can be as productive as affiliates of foreign multinationals (in the same country), but exhibit a higher propensity to cooperate with local counterparts, as they are significantly more embedded in their local context. From this perspective, the expansion of domestic multinationals can be a more effective source of spillovers than the increase in the foreign share of domestic activity.

The three issues briefly sketched above have been investigated using data from a sample of Italian manufacturing firms over the 1993–2000 period. Results suggest that foreign firms carrying out R&D activities and firms that have been established in the host country for a longer period of time provide larger external effects to domestic firms. Furthermore, we provide evidence consistent with the idea that Italian exporters benefit more than other firms from an expansion of the activities of foreign multinationals in the country. However, this result does not hold when we look at the impact of the growth of Italian multinationals on other domestic firms. In fact, an increase in domestic activities of Italian parent companies (PC) benefits more non-internationalised firms than exporters or other multinationals.

This paper is organised as follows. In Section 2, we review the theoretical rationales to the idea that heterogeneity of foreign affiliates matters for spillovers, while in Section 3, we address the role of heterogeneity of

domestic firms focussing on the degree of international involvement, and in Section 4, we discuss externalities from domestic multinationals. In Sections 5 and 6 we describe the sample and econometric specification. Section 7 reports the results from our empirical investigation and Section 8 concludes.

2. HETEROGENEITY OF FOREIGN FIRMS

In this section, we pursue the idea that firms are heterogenous and not every foreign affiliate provides the same knowledge opportunities for domestic firms. In particular, we put forward the idea that some characteristics of foreign firms affect the likelihood of intra-industry spillovers to domestic firms. Our focus is on three key aspects which differentiate across foreign affiliates: the extent of R&D activities, the propensity to establish technological cooperation and the length of time since establishment in the host of country.

2.1. The Role of R&D Activities of Foreign Affiliates

To the extent that externalities from foreign to domestic firms stem from the transfer of knowledge from the former to the latter, one might expect larger spillovers in knowledge-intensive industries. More generally, sectors that rely on technologies incorporating more codified and less appropriable knowledge will offer more opportunities for knowledge externalities (Malerba, 2005). Among others, Sembenelli and Siotis (2002) addressed this issue by looking at spillovers in R&D- and non-R&D-intensive industries in their sample of Spanish firms and find that positive spillovers occur only in the former case. This result is consistent with the idea that R&D-intensive industries offer more opportunities for knowledge transfer from foreign to domestic firms. Similarly, in a sample of Argentinean firms, Marin and Bell (2004) find positive effects from the activity of multinationals only in the industries where foreign affiliates were significantly involved in innovative activities. However, inter-firm differences within the same industry can be relevant, so looking at differences across sectors might miss an important part of the story. More specifically, within the same industry, we may find affiliates which carry out knowledge-intensive activities at different degrees. In this line of thought, we focus on the contribution of firm-specific R&D activities of foreign affiliates to spillovers in the host country.

Traditional views on multinational firms highlight that the core activities are centralized in the home countries and knowledge and competences

developed by the headquarters and then eventually transferred to foreign affiliates for exploitation in the foreign markets (Patel & Pavitt, 2000; Benito, Grogaard, & Narula, 2003). However, an increasing share of innovative activities of multinational firms is carried out on a global scale (see Narula & Zanfei, 2005; Unctad, 2005 for a review). This process can substantially affect potential spillovers from multinational firms on the host economy. First, when foreign affiliates carry out R&D activities, they bring in the host country not only technologies developed by the multinational firm elsewhere, but also they produce new knowledge which will be incorporated in product and processes sold in the host country and abroad. This provides an opportunity for imitation and learning that can favour technology transfer to domestic firms. Second, R&D activities might require inputs or induce technological cooperation with domestic counterparts, where knowledge transfer between the subsidiary and domestic firms can be much more intense, than in the case of supply of less knowledge-intensive intermediate goods. Furthermore, while the supply of inputs is likely to involve firms operating in different sectors, R&D cooperation can occur also among competitors in the same industry. This is the case of horizontal technological cooperation occurring at the pre-competitive stage. Third, the extent of pecuniary externalities through the labour market can be rather large, when R&D activities are involved. In fact, in these cases multinational firms determine a demand for qualified scientists and engineers and offer an incentive to local universities to supply such resources, which become available also for other domestic companies. Furthermore, R&D labs can give rise to spin offs or worker mobility to domestic firms. All in all, we can expect that the contribution of a scientist or a qualified engineer to domestic firms is higher than in the case of mobility of less-qualified workers. In other words, the extent of both technological and pecuniary externalities can be expected to be substantially higher when knowledge-intensive activities are carried out by multinational firms and this can determine a more significant increase in domestic firms' productivity.

Considerable efforts have been devoted to studying the characteristics of the process of internationalisation of R&D and large evidence has been provided on the direct effect on the host economy determined by the different propensity to innovate of foreign- and domestic-owned firms (see Castellani & Zanfei, 2006a for a review). However, very limited evidence has focused so far on the indirect impact of such innovative activities on the local economy. Holm, Malberg, and Sölvell (2003) find that competences of subsidiaries of foreign multinationals in Sweden favour local development by attracting other investors, while Todo and Miyamoto (2002) investigate the impact of R&D activities in foreign-owned firms as a condition

favouring intra-industry productivity spillovers in a sample of Indonesian firms. They find a positive impact only for the activities of multinational firms carrying out R&D in Indonesia.

2.2. The Role of Cooperation of Foreign Affiliates

Inter-firm linkages are an important channel through which spillovers may occur. There is a long tradition of studies on this issue, dating back to Hirschman (1958) and Lall (1978) and recently revived by Rodriguez-Clare (1996) and Markusen and Venables (1999). By entering a foreign country in sectors producing final goods, multinationals can be expected to expand demand for intermediate goods and hence create positive externalities for local suppliers (backward linkages), whereas by entering upstream sectors they may generate opportunities for local user firms and for providers of goods and services in downstream industries (forward linkages). This view has led a number of scholars to assume that linkages will translate mostly or exclusively into vertical, intersectoral spillovers (Smarzynska-Javorcik, 2004). However, this is only a part of the story. First, theory suggests that backward and forward linkages should have an impact on horizontal spillovers as well (Alfaro & Rodriguez-Clare, 2004). The idea is that by expanding demand for goods and services, multinationals will enhance the specialisation and efficiency of local firms in upstream and downstream sectors, but this will also create a pecuniary externality to multinationals as well as to other firms, including immediate competitors, which will be able to source better inputs at lower prices. Second, backward and forward linkages are only part of a wider range of possible types of inter-firm cooperative agreements. In fact, multinational activities may well favour the development of supply contracts or licensing agreements along the vertical chain, but they will also set-up a large number and variety of linkages with both local suppliers and competitors, ranging from joint ventures, strategic alliances and other non-equity type of collaborative agreements (Hagedoorn, 2002). This is the case, for example, of R&D cooperation, in joint product development, co-design and standard setting. Through this type of ventures, knowledge transfer is explicit and can flow from the multinational to the local firm and vice versa. When firms set-up horizontal agreements they often combine complementary but dissimilar resources (Richardson, 1972). Within these ventures some knowledge can be lost and transferred to the counterparts, but this loss is 'compensated' by the access to complementary assets that enrich the firm's knowledge base (Teece, 1992). From

this perspective, foreign affiliates involved in technological cooperation can be an important source of technology transfer both to their counterparts and to other firms in the host country. Therefore, one may well expect that an increase in the share of foreign firms involved in cooperative ventures in the host country determine higher potential for externalities benefited from domestic firms.

2.3. The Role of the Length of Establishment of Foreign Affiliates

The length of time since establishment in a given country is a good proxy for the acquaintance of a foreign firm in a host economy. As time goes by, multinationals get involved with the economic environment as well with social norms and business practices. This better knowledge of the local context can increase experience of local contexts and reduce both external and internal uncertainty related to foreign operations (Castellani & Zanfei, 2004). On the one hand experience helps reaching a better understanding of the dynamics of the external environment, such as the volatility of demand, technological opportunities and institutional conditions. This in turn will enable multinational firms to better evaluate opportunities stemming from the local context. In particular, as foreign affiliates get more acquainted with the host economy, they will improve their ability to select and interact with local counterparts (Andersson, Bjorkman, & Forsgren, 2005). On the other, experience is likely to reduce behavioural uncertainty associated with economic transactions.[4] In fact, firms which have a long history in a given host country are more likely to be able to build trust out of their relations with local counterparts, hence diminishing the risk of opportunistic behaviour. To the extent that trust is an immaterial asset which is generated through past interactions and paves the way to further collaboration (Bureth, Wolff, & Zanfei, 1997; Lyons & Mehta, 1997), it can also affect the willingness to transfer knowledge to domestic firms, or at least we can think that multinationals would be relatively less worried about information leakages in favour of their local counterparts.

3. HETEROGENEITY OF DOMESTIC FIRMS: THE ROLE OF INTERNATIONAL INVOLVEMENT

In the previous section, we have argued that the extent of spillovers on domestic firms might differ according to characteristics of foreign firms. In

particular, we have claimed that foreign firms should have something to transfer and be willing to transfer it to domestic firms. We further maintained that these conditions are more likely to be met when foreign subsidiaries carry out some R&D, are more established in the foreign country and cooperate with local firms. Here we will look at the other side of the coin and argue that domestic firms are also heterogeneous and different firms get different benefits from foreign presence. This section connects to the hypothesis that some absorptive capacity is required to grasp the benefits of foreign presence, but will also highlight that competition effects are likely to differ across domestic firms. Absorptive capacity is most often identified as a function of R&D investments and technical efficiency of firms, which are assumed to provide guidance in the search and use of external knowledge sources (Cohen & Levinthal, 1989; Rosenberg, 1990). While this certainly captures a fundamental feature of firms' ability to absorb knowledge, we shall here emphasise the role of domestic firms' degree of internationalisation as a factor that can per se affect their accumulation of competencies and their ability to take advantage from multinational presence. In particular, we shall test whether exporters and domestic multinationals, which, as shown by a growing literature, are more productive and more innovative, benefit more from foreign presence than non-internationalised firms. There are several reasons why the degree of internationalisation can be expected to be associated with firms' absorptive capacity. First, internationalised firms are most likely to be highly innovative and productive. As stressed by theoretical and empirical works, more productive and innovative firms tend to self-select into export and international production, and that their international involvement can in turn offer learning opportunities, which turn out increasing productivity and innovation in the internationalised firms (Helpman, Meliz, & Yeaple, 2004; Barba Navaretti & Castellani, 2004; Tybout, 2003). In particular, it has been shown that this determines a hierarchy in productivity, investments in R&D and propensity to innovate between firms with different involvement in international activities. There is growing evidence that multinational firms outperform exporters, which in turn do better than non-internationalised firms (Girma, Kneller, & Pisu, 2005; Castellani & Zanfei, 2006b; Criscuolo, Haskel, & Slaughter, 2004). This result suggests that the degree of internationalisation can be interpreted as a synthetic indicator of the productive and innovatory capacity of a firm, which in turn is a good proxy for absorptive capacity. Second, internationalised firms have higher opportunities of interacting with foreign markets, hence developing a specific ability to access external knowledge. Both exporters and multinational firms have some experience

in dealing with foreign counterparts, such as buyers, distributors, suppliers and competitors, in host countries. A simple example, which fits rather well the Italian case that we will discuss later, regards the use of the English language. In a country where the share of workers mastering foreign languages is relatively low, firms which are most likely be able to overcome the linguistic barrier, such as exporters and multinationals, are in a much easier position to interact with (and benefit from) foreign-owned firms. This will allow them not only to access knowledge located abroad, through contact with buyers, suppliers and competitors, but also to establish relationships with foreign multinationals or benefit from pecuniary externalities in their home country. For example, we can expect that exporters can benefit more from externalities stemming from labour mobility from multinationals to domestic firms, as the international experience of a worker moving from a multinational firm will likely be more valuable to internationalised firm rather than to an inward oriented one.

The degree of internationalisation as a measure of absorptive capacity has been used elsewhere in the literature. For example, Barrios and Strobl (2002) found that Spanish exporters benefit more from foreign multinationals than non-exporting firms. Here we make a step further, and we distinguish not only exporters from purely domestic firms, but we also identify firms controlling foreign production. As we showed elsewhere for the case of Italy (Castellani & Zanfei, 2006b), the latter category of firms outperforms, on average, exporters and other domestic firms in the same sector, suggesting that multinationals have the higher absorptive capacity.

Although there are reasons to expect that absorptive capacity increases with the degree of internationalisation, it is not obvious that multinationals will reap higher benefits from inward FDIs than exporters. In fact, there are at least two aspects which need to be taken into account. On the one hand, the empirical evidence highlights that the effect of absorptive capacity can be non-linear (Girma, 2005): it is important to accumulate internal capacity up to a threshold in order to absorb external knowledge. For example, one does not need to hire the top engineers to be able to combine a novel discovery in existing machinery. In other words, while production of new knowledge and breakthrough discoveries require a wide range of capabilities and substantial investments, the use of such knowledge requires much more basic capabilities. Therefore, investing in absorptive capacity above the required threshold may not be very productive: at the margin, further accumulation of absorptive capacity will not increase the benefits from foreign presence. In this respect, the higher innovative capabilities and organisational capacities of multinational firms relative to exporters might not

provide additional ability to reap spillovers from foreign multinationals. On the other hand, competition effects might also play a different role in the case of domestic multinationals. In fact, foreign multinationals might perceive them as competing more directly in international markets so they can have a stronger incentive to prevent information leakages. This argument is consistent with theories of FDI in oligopolistic markets showing that firms can choose to invest in the home country of a competitor to deter the reciprocal investment in their home country. In other words, FDI can be the result of an exchange of threats between oligopolists from different countries (Graham, 1990; Knickerbocker, 1973; Smith, 1987; Sanna-Randaccio, 2002).

The actual impact of the degree of internationalisation of domestic firms on spillovers will then depend on the interplay of the two factors we have highlighted, namely the (positive) absorptive capacity effect, and the (negative) competition effect.

4. HETEROGENEITY ACROSS MULTINATIONALS: SPILLOVERS FROM DOMESTIC PARENT COMPANIES

So far we have addressed the impact of foreign firms in host countries. One of the main reasons why one should care about this effect is that foreign affiliates of multinational firms bring in host countries a bundle of tangible and intangible assets, which can contribute directly and through spillovers to innovation and productivity in the host country. Empirical evidence has been finding that foreign affiliates of multinationals tend to outperform domestic firms, supporting the idea that expanding the activity of foreign-owned firms (i.e., attracting inward FDIs) will raise the average productivity and innovation in the economy, while less robust evidence has been provided on the spillover effect of foreign multinationals on host country firms (Barba Navaretti & Venables, 2004). Meanwhile a growing literature has also been discussing the role of multinationality as opposed to foreignness in explaining differences in productivity and innovation. In particular, domestic multinationals share many characteristics of foreign-owned firms in given country and can be at least as productive, innovative and prone to invest in R&D (Criscuolo & Martin, 2003; Pfaffermayer & Bellak, 2002; Frenz & Ietto Gillies, 2004; Castellani & Zanfei, 2005). From this perspective, one could view domestic firms going abroad as a further source of externality for other domestic firms. When addressing spillover effects from

domestic multinationals to other domestic firms, one needs to take into account that in this case, the focus of the analysis is on PC, rather than on FA. The different position a firm occupies in the organisational structure of multinational groups may per se affect the amount of knowledge it gains access to. As we have mentioned already, it is widely acknowledged that the core activities and capabilities, such as R&D, strategic management and finance, are largely concentrated in PCs. This geographic and organisational concentration of innovative activities, which tends to persist in spite of the increasing internationalisation of R&D, is the result of powerful agglomeration forces, combined with the costs of codifying and transmitting knowledge (Jaffe & Adams, 1996; Castellani & Zanfei, 2006a). R&D and knowledge generation are the main sources of proprietary advantages of multinational firms and only part of these technological, managerial and organisational capabilities are transferred to FAs abroad in order to allow them to overcome the cost of doing business abroad and to face competition of other local and multinational firms in host countries. In principle, one may thus expect domestic PCs to have more knowledge to transfer than FAs. The dominant role of PCs in this respect is partially compensated by the fact that FAs can indeed accumulate further knowledge and capabilities through local R&D activities, learning and though external linkages with host country counterparts. Overall, the relative position between PCs and FAs cannot be expected to change significantly, though: in spite of the growing role of the latter in technological accumulation and knowledge absorption, the former are likely to keep a stronger grasp on technology (Siler, Wang, & Liu, 2003). In fact, domestic PCs can also absorb external knowledge available locally, and it will eventually gain access to foreign knowledge through their foreign subsidiaries' reverse technology transfer.

How effective will technology transfer be vis-à-vis local counterparts? Conflicting forces might determine the overall extent of knowledge transfer of domestic multinationals. On the one hand, they can be expected to be more rooted in the home economy. Domestic multinationals do not need to overcome cultural and linguistic barriers, which on the contrary can hinder the relationships of foreign-owned firms with the domestic economy (Buckley & Carter, 2004). By contrast, in many instances foreign multinationals are perceived as 'invaders' by other domestic firms and this could make cooperation and knowledge transfer more difficult. The perception that foreign firms are more 'footloose' than domestic ones, or in other words, that they can move their establishments abroad when it becomes less convenient to produce in a given host country, may nourish the fear that it is too risky to rely on these firms for long-term plans. For instance, this can

happen both to firms that have to adopt a new client-specific organisational routine and to institutions that have to commit to building railways or pipelines to serve a specific plant. This sort of mistrust can thus reduce the potential externalities from foreign firms and increase the relative advantage of domestic multinationals.

On the other hand, competition effects may play a different role in the case of foreign versus domestic multinationals. Domestic multinationals are competing with domestic exporters in the international market. Think at two Italian shoemakers, one that delocalises some stages of production abroad, and the other that controls only national plants. Say that they both sell in the US market. In our view the first is a multinational firm and the second is an exporter. However, in the US market their products will be both perceived as Made in Italy and the two firms will be competing very hard to differentiate and gain international market shares, presumably at the expenses of the other Italian competitor. In the light of such a tough competition, we can expect that the two firms will place a considerable effort in preventing information leakages that could advantage their competitor. FAs are less likely to consider local exporters as direct competitors outside the host country: provided that they both are active in the same foreign markets, their product will be perceived as more different (and eventually trade barriers might have different intensity) given their country of origin is not the same.

5. SAMPLE AND DATA

The empirical analysis presented in this paper is based on a dataset resulting from the intersection of two different sources: the Second Community Innovation Survey (CIS2) and European Linkages and Ownership Structure (ELIOS). The former is a survey based on a common questionnaire administered by Eurostat to firms from all European countries, which aims at assessing various aspects of firms' innovative behaviour and performances. Subject to a confidentiality agreement, we were allowed to access micro data for Italy from the survey carried out in 1997 and covering innovation occurring in 1994–1996.[5] Innovation data were complemented with ownership, multinationality and economic performance data from ELIOS dataset developed by the University of Urbino, Italy, which combines information from Dun & Bradstreet's *Who Owns Whom* and Bureau Van Dijck's *Amadeus*. For each firm we were able to ascertain, from *Who Owns Whom*, whether at 1997 their ultimate parent was an Italian or foreign company.

This allowed us to distinguish between affiliates of foreign multinationals in Italy and domestic-owned firms. Among the latter group, the information, drawn from *Who Owns Whom*, on whether each firm controlled foreign subsidiaries, allowed us to define firms which are parent companies of Italian multinationals at 1997. Finally, from the CIS we were able to identify firms with positive exports in the period 1994–1996. From *Amadeus* we could gather data on value added, number of employees, tangible fixed capital (net of depreciation) and cost of materials for up to 8 years (from 1993 to 2000), which we used to compute firm-level total factor productivity, using the Levinshon and Petrin (2003) semi-parametric methodology.[6] Unfortunately, both the information from *Who Owns Whom*, and from CIS2 are available for one moment in time, while productivity could be estimated for up to 8 years (1993–2000) for each firm. In order to exploit all the information available, we made the assumption that firms which were identified as exporters in 1994–1996 and those who where foreign-owned or parent companies in 1997 remained in the same status over the period 1993–2000.

The sample resulting from the intersection of these two sources comprises a 634 firms with manufacturing plants in Italy,[7] out of which 187 are Italian affiliates of foreign multinationals (FA), and the remaining 447 are domestic-owned firms. Among the latter group, we have 36 firms serving only the domestic market (OD), 205 firms serving foreign markets *only* though exports (EXP) and 206 parent companies of Italian multinationals (PC).[8] In Table 1, we illustrate some basic characteristics of our sample firms. It is worth noting that foreign affiliates tend to invest more in R&D than domestic-owned firms and have higher propensity to engage in technological cooperation with international counterparts, but they tend to be relatively younger.[9] In the next sections, we will address how these characteristics of foreign-owned firms affect productivity spillovers that they eventually determine on domestic firms. Table 1 also shows that significant differences exist among domestic-owned firms. In particular, there seems to be a hierarchy in productivity, R&D intensity and propensity to engage in technological cooperation, with uni-national firms underperforming the internationalised firms, and the parent companies of domestic multinationals reaching the highest level of economic and innovative performance. Firms internationalised only through exports stand at an intermediate level in this hierarchy. This supports our view that the degree of internationalisation may proxy for a firm's degree of absorptive capacity and thus affects the extent to which domestic firms can benefit from the activities of multinationals. Furthermore, this highlights that parent companies of domestic

Table 1. Distribution of the Sample by Type of Firms and Basic Statistics at 1996.

	Number of Firms	%	TFP (Mean)	Age (Mean)	Number of Employees (Mean)	R&D/Sales (Mean) (%)	Share of Firms Cooperating with Counterparts Abroad (%)	Share of Firms Cooperating with Counterparts in Italy (%)
Foreign-owned firms (FA)	187	29	5.7	29	709	3.0	26.2	20.9
Domestic-owned firm of which	447	71	6.6	31	821	2.5	18.3	20.8
Domestic parent companies (PC)	206	32	7.8	34	1320	2.8	23.8	25.2
Exporting-only firms (EXP)	205	32	5.8	26	371	2.5	15.6	18.0
Other domestic firms (OD)	36	6	3.7	36	530	1.3	2.8	11.1
Total	634	100	6.3	30	788	2.7	20.7	20.8

Source: CIS-Elios dataset.

multinationals can be even more productive than foreign affiliates and exhibit a higher propensity to engage in technological cooperation with counterparts in Italy. This reinforces our motivation for investigating whether this type of firms can be a source of externality for domestic firms.

6. ECONOMETRIC SPECIFICATION

As it is customary in the literature on productivity spillovers from multinational firms, we specify an augmented production function, which will be estimated only on a sample of domestic-owned firms.

$$\log(Y_{ijt}) = \alpha_j \log(K_{it}) + \beta_j \log(L_{it}) + \gamma_j \log(M_{it}) + \log(A_{ijt}) \tag{1}$$

where $\log(A_{ijt})$ is specified as

$$\log(A_{it}) = \delta_1 \log F_{jt} + \phi \, log \, D_{jt} + \eta_i + \varepsilon_{it} \tag{2}$$

The subscript j on the parameters associated with each physical input (capital, labour and materials) indicates that we estimate the production functions sector by sector, allowing the input elasticities to vary across 14 2-digit sectors.[10] Following most of the recent literature estimating productivity spillovers from multinational firms (see, e.g., Smarzynska Javorcik, 2004), we estimate the production function parameters using Levinshon and Petrin (2003) modification of the Olley and Pakes (1996) semi-parametric method.

The residual of this production function, $\log(A_{ijt})$ (i.e., firm's i total factor productivity, TFP) is modelled as a function of foreign ($F_{jt} = \sum_{i \in j} FA_i \times K_{ijt}$) and domestic ($D_{jt} = \sum_{i \in j}(1 - FA_i)K_{ijt}$) activities in the sector (j) where firm i operates and a firm-specific fixed effect.[11]

To test for the impact the various characteristics of foreign multinationals on spillovers, we identify different sources of externalities, by adding to the general foreign externality term (F) specific sources of externalities stemming from foreign affiliates involved in R&D and technological cooperation and allowing for a different impact of the activities of affiliates according to the number of years they have been active in Italy.

In particular, to account for the role of R&D activities of foreign multinationals, we augment domestic firms productivity by an externality term where foreign capital is weighted by each foreign firms' R&D intensity (obtained from CIS2). In other words, we modify (2) to obtain

$$\log(A_{it}) = \delta_1 \log F_{jt} + \delta_2 \log F_{jt}^{RD} + \phi \log D_{jt} + \eta_i + \varepsilon_{it} \tag{3}$$

where $F_{jt}^{RD} = \sum_{i \in j} FA_i \times K_{ijt} \times RD_i$ and RD denotes the R&D intensity of firm i. Therefore in Eq. (3), δ_1 captures the external effect on Italian-owned firms of affiliates of foreign multinationals not carrying out any R&D activity in Italy. The coefficient δ_2 captures the additional externality stemming from firms carrying out R&D in Italy. In particular, δ_2 measures the effect of a percentage increase of capital stock in foreign affiliates weighted by each affiliate's R&D intensity. In other words, a positive sign of δ_2 indicates that increases in the stock of capital of R&D intensive affiliates have a larger impact on domestic firms' productivity than the same increase in firms with lower (or null) R&D intensity.

The hypothesis that foreign firms involved in technological cooperation have a higher spillover potential, is tested by estimating a further modification of Eq. (2), where we add to the sectoral measure of foreign capital, two additional sources of externality associated with the activities of foreign firms which set-up technological cooperation with counterparts located in Italy and abroad. To this end, we estimate

$$\log(A_{it}) = \delta_1 \log F_{jt} + \delta_3 \log F_{jt}^{CON} + \delta_4 \log F_{jt}^{COI} + \phi \ \log D_{jt} + \eta_i + \varepsilon_{it} \quad (4)$$

where $F_{jt}^{COI} = \sum_{i \in j} FA_i \times K_{ijt} \times COI_i$ and $F_{jt}^{CON} = \sum_{i \in j} FA_i \times K_{ijt} \times CON_i$ and COI and CON are indicators which take value 1 if a firm i set up technological cooperation with international and national counterparts, respectively. In these cases, δ_1 captures the impact on domestic firms' productivity of foreign firms not involved in any cooperation, while δ_2 measure the additional effect associated with foreign firms involved in technological cooperation (δ_3 and δ_4 obviously distinguish the impact of firms involved in national versus international cooperation).

The impact of the length of time since establishment in Italy is investigated introducing a measure of foreign-owned capital in each sector weighted by the age of each foreign firm. In other words, we modify Eq. (2) in the following way

$$\log(A_{it}) = \delta_1 \log F_{jt} + \delta_5 \log F_{jt}^{AGE} + \phi \ \log D_{jt} + \eta_i + \varepsilon_{it} \quad (5)$$

where $F_{jt}^{AGE} = \sum_{i \in j} FOR_i \times K_{ijt} \times AGE_{it}$ and AGE denotes the number of years since establishment in Italy of each foreign affiliate. The idea is that δ_5 estimates the effect of an increase in capital of the older foreign firms on productivity of domestic firms. More precisely, a positive sign will indicate that a percentage increase in foreign-owned capital in a sector will have a larger impact on domestic firms productivity, if it is determined by an

increase of aged subsidiaries than if it is accounted for by recently established subsidiaries.

The role of the degree of internationalisation as a factor affecting the ability to capture FDI spillovers has been estimated by modifying Eq. (2) as follows

$$\log(A_{it}) = \delta_1 \log F_{jt} + \delta_2(\log F_{jt} \times EXP_i) + \delta_3(\log F_{jt} \times PC_i) + \phi \log D_{it} + \eta_i + \varepsilon_{it} \quad (6)$$

where EXP and PC are binary indicators taking value 1 in the case firms internationalised only through exports and are parent companies of Italian multinationals, i.e., firms controlling subsidiaries abroad, respectively. In Eq. (6) δ_1 indicates the externality benefited by the baseline category (non-exporting firms), while δ_2 and δ_3 measures the additional impact of foreign presence on exporters and multinational firms.

A further source of externality can be isolated by splitting the effects from the activities at home of parent companies of domestic multinationals (DM), from any effect stemming from other Italian firms different from a PC (OD).

$$\log(A_{it}) = \delta_1 \log F_{jt} + \delta_2 \log DM_{jt} + \phi \log OD_{jt} + \eta_i + \varepsilon_{it} \quad (7)$$

where $DM_{jt} = \sum_{i \in j} PC_i \times K_{ijt}$ and $OD_{jt} = \sum_{i \in j}(1 - PC_i) \times (1 - FA_i) \times K_{ijt}$

7. RESULTS

From column (1) of Table 2 we would conclude that foreign multinationals do not have any significant effect on productivity of Italian firms in the same sector. However, once we allow for different effects according to the characteristics of foreign-owned firms results change substantially. From column (2), we gather that an increase in the capital stock in more R&D-intensive foreign firms have a positive impact on domestic firms' productivity, while an increase in the activity of foreign firms with limited or no-R&D activities have no significant effect. In other words, these results are consistent with the idea that, within sectors, foreign firms carrying out R&D in Italy provide a higher spillover potential for the host economy than non-R&D-intensive affiliates. Similarly, column (3) investigate the role of technological cooperation of foreign multinationals. Results seem to suggest that foreign firms involved in technological cooperation with local firms have a positive effect on productivity of domestic firms, but this effect turns out to be rather

Table 2. Heterogeneity in Foreign Firms and Productivity Spillovers, 1993–2000 (Fixed Effect Estimation).

Dependent Variable: Log(TFP)[a]	(1)	(2)	(3)	(4)	(5)
$\text{Log}(F_{jt})$	0.023	−0.023	0.033	−0.015	−0.035
	(0.023)	(0.028)	(0.025)	(0.028)	(0.032)
$\text{Log}(F_{jt}^{RD})$		0.098***			0.118***
		(0.035)			(0.041)
$\text{Log}(F_{jt}^{CON})$			0.035		0.005
			(0.025)		(0.026)
$\text{Log}(F_{jt}^{COI})$			−0.040		−0.052*
			(0.027)		(0.028)
$\text{Log}(F_{jt}^{AGE})$				0.074**	0.058*
				(0.031)	(0.034)
$\text{Log}(D_{jt})$	−0.045	−0.045	−0.047	−0.046	−0.054*
	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)
Constant	1.917***	1.682***	1.882***	1.238*	1.336**
	(0.606)	(0.611)	(0.616)	(0.669)	(0.670)
Year dummies	Yes	Yes	Yes	Yes	Yes
Observations	3576	3576	3576	3576	3576
Number of firms	447	447	447	447	447

Note: Standard errors in brackets.
[a]Obtained as the residual of a Cobb–Douglas production function, estimated sector-by-sector using Levinshon and Petrin (2003) semi-parametric method.
*$p<0.1$.
**$p<0.05$.
***$p<0.01$.

imprecisely estimated, so that it is not statistically different from zero at the conventional confidence levels.

Results reported in column (4) of Table 2 support the hypothesis that spillovers from foreign affiliates established for a longer period of time are larger. This supports the idea that as subsidiaries take roots into a foreign context, they become more willing to share their knowledge with trustful counterparts, or at least they might be less worried by information leakages which might benefit domestic firms. However, the length of time since establishment in Italy is also likely to be associated with greater involvement in technological collaboration and with higher R&D intensity. In fact, as multinationals become more acquainted with the local context, they improve their ability to scan for local partners, and might increase the extent of cooperation (Bureth et al., 1997; Andersson et al., 2005). Furthermore, the internationalisation of R&D usually follows the establishment of

production or commercial activities, but this process requires time (Dunning, 1993). Thus, it is likely that older subsidiaries show a higher propensity towards R&D. In this perspective, the various externality terms that we have used to capture the effect of R&D, cooperation and age might have been biased by the fact the three aspects are correlated. To control for this problem, in column (5) we introduce the various sources of externalities jointly. Results do not change significantly and confirm that foreign presence is likely to determine larger spillovers, the higher is the share of affiliates carrying out R&D and the more rooted are these subsidiaries in the host country.[12]

The role of international involvement of Italian firms in affecting their ability to benefit from foreign multinationals is investigated in Table 3. In column (1) of this table, we report the results of the estimation of Eq. (7) on the sample of Italian firms illustrated in the previous section, which suggest that the degree of internationalisation indeed affects the capacity to benefit from foreign multinationals. In fact, the coefficients on the interaction between log(F) and the two binary indicators taking value equal to 1 for firms internationalised only through exports (EXP) and for parent companies of domestic multinationals (PC), estimate the differential externality from the activity of foreign-owned firms accruing to the two type of firms, relative to the baseline category (domestic uni-national firms). The non-interacted terms (log(F)) captures the effect of foreign multinationals on Italian uni-national firms. Therefore, an increase in activities of foreign multinationals in Italy appears to have no significant effect on productivity of domestic uni-national firms in the same industry, while the effect of the same increase in foreign-owned capital is 11.9% higher in the case of exporters than for non-exporting firms.[13] The externality benefited by parent company domestic multinationals is 7.3% higher than in the case of purely domestic firms, but this difference is not significant at the conventional levels. These results are consistent with the fact that absorptive capacity can have a non-linear effect and that higher competition between foreign affiliates and domestic multinationals might prevent knowledge transfer. However, one needs to notice that difference in the elasticity of productivity to foreign capital between exporters and domestic multinationals (0.073–0.119) is very small and rather imprecisely estimated, so that we cannot reject the hypothesis that the two externalities are equal in magnitude.[14]

As concerns the impact of Italian multinationals on productivity of domestic firms, results in column (2) of Table 3 suggest that neither foreign nor domestic multinationals cause any spillover to domestic firms. However, a composition effect is at play here. In fact, if we allow heterogeneity of the

Table 3. Heterogeneity in Foreign and Domestic Firms and Productivity Spillovers, 1993–2000 (Fixed Effect Estimation).

Dependent Variable: Log(TFP)[a]	(1)	(2)	(3)
Log(F_{jt})	−0.062	−0.005	−0.051
	(0.061)	(0.024)	(0.061)
(EXP) × Log(F_{jt})	0.119*		0.081
	(0.068)		(0.068)
(PC) × Log(F_{jt})	0.073		0.026
	(0.068)		(0.069)
Log(DM_{jt})		0.027	0.116*
		(0.025)	(0.062)
(EXP) × Log(DM_{jt})			−0.121*
			(0.066)
(PC) × Log(DM_{jt})			−0.071
			(0.066)
Log(D_{jt})	−0.044		
	(0.033)		
Log(OD_{jt})		−0.253***	−0.247***
		(0.049)	(0.049)
Constant	1.860***	4.517***	4.392***
	(0.606)	(0.816)	(0.820)
Year dummies	Yes	Yes	Yes
Observations	3576	3576	3576
Number of firms	447	447	447

Notes: EXP and PC are binary indicators taking value = 1 when firm i is internationalised only through exports and is a parent company of an Italian multinational, respectively. Coefficients on the non-interacted log(F) and log(DM) estimate external effects on domestic uni-national firms (the baseline category). Interacted terms estimate the differential externalities on EXP and PC relative to the baseline.
Standard errors in brackets.
[a]Obtained as the residual of a Cobb–Douglas production function, estimated sector-by-sector using Levinshon and Petrin (2003) semi-parametric method.
*$p<0.1$.
***$p<0.01$.

domestic firms, by estimating different externality effects accruing to exporters, multinationals and non-internationalised firms, we obtain interesting insights. In particular, on the one hand results in column (3) broadly confirm the finding presented in the previous section that foreign multinationals have a positive impact on productivity of Italian exporters, although the estimated coefficient drops slightly and falls outside the confidence intervals at the conventional levels. On the other hand, it appears that

domestic multinationals have a positive impact on non-internationalised domestic firms (as shown by the fact that the coefficient of the non-interacted log(DM) is positive and significant in column (3)); while the effect on exporters and other multinationals is not significant.[15] One way to interpret these results is to stress that exporters have the adequate absorptive capacity to benefit from FA, and the competition effect is not as strong as it is with domestic multinationals.[16] Conversely, non-internationalised Italian firms may lack the adequate absorptive capacity to learn from the foreign firm, but they could benefit from the expansion of Italian multinationals. In fact, these are more rooted in the home economy and should be associated with relatively lower barriers to learning (such as the linguistic obstacles illustrated above) than foreign affiliates.

In sum, foreign and domestic multinationals appear to have complementary effects on the Italian economy. An expansion of foreign firms' activity in Italy seems to benefit home exporters, while an increase in home activities of Italian multinationals would benefit other national firms. A word of caution is required in interpreting these results. When addressing the issue of the home effects for Italian multinationals one should address the role of an increase in foreign activities on productivity in non-internationalised firms at home, rather than the effect of an increase in home activities of domestic multinationals. In fact, an increase in foreign activities may well deplete the home economy by moving production and employment abroad, causing a negative externality for the rest of the economy. However, other works in this line of analysis provide some evidence that firms investing abroad increase their productivity and output at home and do not decrease employment. Or at least they do so less than non internationalised firms (Barba Navaretti & Castellani, 2004).

8. CONCLUDING REMARKS

In this paper, we have investigated the role of firms' heterogeneity in favouring horizontal spillovers from multinational firms on domestic-owned firms' productivity. In particular, we have addressed the role of the characteristics of foreign and domestic firms as well as heterogeneity across multinationals. On the one hand, we have focused on the importance that the affiliates of foreign multinationals carry out knowledge-intensive activities increasing the potential spillover and on the role of the length of establishment and cooperation with local firms as condition favouring the willingness to transfer knowledge to host country firms in the same sector.

Results from a sample of Italian firms over the period 1994–2000 suggest that while no intra-industry spillovers show up in the aggregate, domestic firms seem to benefit from the activity of specific groups of foreign multinationals, which appear to be those carrying out R&D and the more established ones. On the other, we extended the analysis by addressing the impact of heterogeneity across and within multinationals on productivity spillovers. In particular, we identified parent companies of domestic multinationals as a further source of externalities and compared the impact of foreign affiliates in host countries with the effect of the activities of parent companies on their home countries. Results suggest that this distinction can have important implications for policy towards multinationals, but highlights also the crucial role that heterogeneity in (domestic) beneficiary firms can play. In fact, we estimated the intra-industry productivity spillover from parent companies and foreign affiliates on Italian exporters, parent companies and non-internationalised firms and find that the former have a positive impact on purely domestic firms, while the latter have an impact on exporters. The differential effect can be explained by the different types of absorptive capacity required to benefit from domestic and foreign multinationals, and by the different degree of competition between Italian firms, domestic parent companies and foreign affiliates. The policy message that can be derived from these results is that there are potential complementarities between policies directed towards Italian outward investors and policies to attract foreign investors in Italy. The former seem to have a larger effect on non-internationalised firms, while the latter have a more significant externality on productivity of exporters.

An important extension of the analysis would concern the conditions enhancing the presence of both foreign- and domestic-owned multinationals in a given host location. In fact, while our results suggest that the two types of multinationals might generate complementary spillover effects, their co-existence in the same industry and within the same country might generate several problems that have been emphasised in the literature, like market stealing and human capital drain. Therefore, it is not enough to combine the attraction and selection of foreign investments with incentives for local firms to become themselves multinationals. A variety of other policies are also needed at the national and regional levels, ranging from antitrust to the creation of high-quality infrastructures, from firm- and plant-level training to after care measures. Examining how these policies should be designed in order to favour a fruitful co-existence of foreign and domestic multinationals is a relevant and largely unexplored area for future research.

NOTES

1. Among others, see Castellani and Zanfei (2003, 2006a) and Blomstrom and Kokko (2003) or Barba Navaretti and Venables (2004) for recent reviews.

2. In their study of R&D investment strategies of 345 multinationals with the greatest patenting activities in Europe between 1988 and 1996, Le Bas and Sierra (2002) have shown that in 35% of the examined cases foreign firms with RTAs in a given technological class are active in countries whose firms also exhibit RTAs in the same class. These cases give rise to 47% of total patents examined. The authors identify this circumstance as "strategic asset augmenting" (p. 594), wherein learning processes are enhanced through the interaction between innovative multinationals and local firms active in dynamic contexts. Their emphasis is on advantages stemming to multinationals from the adoption of these strategies. From our perspective, it is important to observe that under such circumstances spillovers to local economies are also likely to be enhanced.

3. See Castellani and Zanfei (2006a) for a more comprehensive analysis of how and why multinational firms differ in the cross-border creation, transfer and diffusion of technology, and of the effects that these differences have on productivity and innovation in the economic systems in which they are active.

4. As suggested by Robertson and Gatignon (1998, p. 520), behavioural uncertainty concerns the difficulty of observing and measuring the adherence of contracting parties to the terms of a given arrangement.

5. We thank Giulio Perani from the Italian National Statistical Office for allowing us access the data.

6. Value added and materials have been deflated using 2-digits GDP deflators, while the capital stock, computed from the book value of tangible fixed capital net of depreciation, have been deflated using price indices for investments in machinery and equipment obtained from the Italian National Statistical Office (ISTAT). The LP methodology has been applied to each 2-digit industry, thus assuming sector-specific production functions. Details on the LP method and on its implementation in Stata, can be found in Levinshon, Petrin, and Poi (2004).

7. The overall sample resulting from the intersection includes 1,114 firms, but for the purpose of this study, we required firms to have a complete time series on economic and financial data from 1993 to 2000 and this left us with a considerably lower number of firms.

8. We use a rather broad definition of parent companies, including both firms controlling production plants abroad and those controlling only sales affiliates. As we have shown elsewhere (Castellani & Zanfei, 2006a, Chapter 3) this distinction can make a difference in terms of productivity and innovation so extending our analysis of spillovers from this different type of parent company is in our research agenda. As well, we plan to distinguish domestic firms according to the fact that they belong to a multinational group, even if they are not the parent company (see Castellani & Zanfei, 2006a, Chapter 4 for an illustration of how this distinction can be associated with different productivity and innovation patterns).

9. The age of each firm has been computed using the information on the year of establishment available in *Amadeus*, while the R&D intensity and the propensity to engage in technological collaboration have been derived from the CIS2. In

particular, the variable concerning technological collaboration have been constructed from a series a questions asking *Did your enterprise have any cooperation agreement on technological innovation activities with X in 1994–96?* with *X* being: other firms within the same group, competitors, clients, suppliers, consultants, universities and other research centres; and cooperation agreements on technological innovation defined as "the active participation in R&D or other activities with other firms and institutions aimed at obtaining some technological innovation". For each of the above questions, the firm was allowed to indicate whether their counterparts were located in Italy, in other EU countries, in the US, in Japan, in other countries. None of the answers were mutually exclusive. Given the relatively low number of cooperating firms, we preferred not to exploit all the information available and construct two binary indicators, grouping the firms according to whether they reported cooperation with at least one type of counterpart, but distinguishing engagement in cooperation within Italy from the international collaborations. Thus, every firm can be cooperating both with counterparts in Italy and abroad, and actually 60% of firms reporting some engagement in technological cooperation actually do it both at the national and international level.

10. Allowing for sector-specific production function is important not only for an unbiased estimation of TFP, but also because estimating an economy-wide production function would bias the estimated external effect from foreign presence. In particular, imposing common input elasticities for all firms will result in an overestimation of productivity for firms and sectors that have higher returns to inputs. For example, if in a given sector the "true" return is higher than one estimated on the whole economy, an increase in input use in that sector will determine a growth in output higher than one would expect from the estimated (economy-wide) production function, and this difference will then wrongly be considered productivity gain. To the extent that foreign presence is positively correlated with sectoral returns to scale (i.e., multinationals are attracted to higher return to scale industries) the estimated external effect will likely be biased upward (see Castellani & Zanfei 2006a, Chapter 5, for a more formal discussion).

11. We choose to use fixed capital as the proxy for the activities of multinational firms, which we aggregate at the sectoral level. *FA* is a binary indicator, taking value equal to 1 in the case of foreign affiliates of multinational firms and zero elsewhere.

12. We tested for the sensitiveness of these results by running regressions for different time periods. In particular, there could be problems related to the fact that the cooperation and R&D variables refer to the period 1994–1996, while we estimate the effect of sectoral activity of foreign firms on the productivity of domestic firms starting at 1993. If we move the period up from 1993 to 1996, point estimates remain virtually unchanged, but they get more imprecisely estimated as we reduce the number of years. However, $\log({F_{jt}}^{RD})$ and $\log({F_{jt}}^{AGE})$ remain significantly different from zero in most specifications.

13. The overall externality accruing to exporters, which is the sum of the coefficients on $\log(F)$ and $EXP \times \log(F)$, is positive and significant, as confirmed by a value of the *F*-statistics equal to 3.18 ($p = 0.074$).

14. A test of the hypothesis that the coefficient on the interaction $EXP \times \log(F)$ and on the interaction $PC \times \log(F)$ are equal in magnitude yields an *F*-statistics of 1.69 ($p = 0.185$).

15. To see this, we have to recall that the estimated spillovers on exporters and domestic multinationals are given by the sum of the parameter on the non-interacted term (log(*DM*)) and the coefficient of appropriate interaction term. In both cases, an *F*-test cannot reject the hypothesis that the sum is different from zero.

16. Extending the example about shoemakers, the degree of competition between the Italian affiliate of a US multinational, say Nike, and an Italian exporter, say Lotto, can be lower than the one between two Italian producers.

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DETERMINANTS OF SWISS FIRMS' R&D ACTIVITIES AT FOREIGN LOCATIONS: AN EMPIRICAL ANALYSIS BASED ON FIRM-LEVEL DATA

Spyros Arvanitis and Heinz Hollenstein

ABSTRACT

Using the OLI paradigm we explain econometrically why a firm invests in foreign R&D, and, if it does, which factors determine the level of foreign R&D outlays. In both cases, O- and I-advantages are the main drivers, whereas L-disadvantages of the Swiss location do not play any role. A descriptive analysis shows that market-seeking is the most important motive for performing R&D abroad. Knowledge-seeking and (human) resource-seeking are of intermediate importance, whereas efficiency-seeking objectives are hardly relevant. The findings of both the econometric and the descriptive analysis imply that foreign and domestic R&D are complements rather than substitutes.

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1. INTRODUCTION

In the last 20 years internationalisation of Swiss firms strongly increased. In a first phase, this process pertained in particular to distribution and manufacturing activities, meanwhile it increasingly covers R&D as well. This holds true not only in terms of the funds invested abroad (in 1996 for the first time Swiss foreign R&D expenditures were higher than domestic ones),[1] but also for the number of firms performing foreign R&D (Arvanitis, Hollenstein, Marmet, & Sydow, 2005). Similar trends are observed in other countries (Veugelers et al., 2005; Narula & Zanfei, 2005).

As a reaction to these developments, there is increasing concern in the public opinion in Switzerland that foreign R&D activities may substitute for domestic ones ("relocation of R&D"), thereby reducing the growth potential of the economy ("substitution hypothesis"). However, it is also argued that internationalisation of R&D is a means to supporting production and sales activities in important foreign markets as well as to tapping into the world-wide pool of knowledge. In this view, foreign R&D is complementing and augmenting the domestic knowledge base, given that the transfer of knowledge to the (domestic) headquarters works sufficiently well ("complementarity hypothesis"). In this case, the internationalisation of R&D is considered as a "natural" further step in the ongoing process of globalisation.

Against this background, we investigate econometrically the factors determining R&D activities of Swiss firms at foreign locations: Why does a firm invest in foreign R&D at all, and, if it does, which factors explain the amount of its R&D expenditures? Moreover, in the frame of a descriptive analysis, we aim at identifying the importance of several motives for investing in R&D at foreign locations. In doing so, we are able to differentiate certain aspects of the econometric analysis. Finally, using the results of the two previous steps we evaluate the relative merits of the competing hypotheses with respect to the relationship between foreign and domestic R&D (substitution vs. complementarity).[2]

In order to investigate these topics, we use firm-level data stemming from two waves of the Swiss Innovation Survey (1999, 2002), which is based on a sample stratified by 18 manufacturing industries and three industry-specific firm-size classes.

The econometric investigation of the determinants of foreign R&D is based on the well-known OLI paradigm (see Dunning, 1993, 2000). Taking this framework as a point of reference, we explain in a first model the probability of a firm to invest in R&D at foreign locations. To this end, we apply two estimation procedures using the data for the two cross-sections of

1999 and 2002, that is a probit model based on pooled data as well as a "random-effect" probit model based on panel data (unbalanced panel). In a second model, we determine the extent of foreign R&D expenditures, given the decision to perform or not perform R&D at foreign locations. In this case, a Heckman selection model is an appropriate estimation procedure. By and large, we use in both models the same set of explanatory variables. In this way, we are able to test whether the basic decision "foreign presence yes/no" and the subsequent choice of the extent of foreign R&D are determined by the same variables.

The descriptive analysis of the motives of foreign R&D is based on the firms' assessment of the importance of seven "pull" and "push" factors that may induce foreign R&D. These are grouped into four categories representing different theoretical approaches (Dunning, 2000): cost-reducing/efficiency-seeking and resource-seeking motives (neo-classical theory), market-seeking motives (product cycle model) as well as asset-seeking/knowledge-seeking motives (evolutionary economics) representing a more dynamic, strategy-oriented view of international investment. The analysis of the motives of foreign R&D is a way of differentiating the O- and L-part of the econometric investigation.

Based on the results of the econometric and the descriptive analysis we are in a position to assess whether foreign and domestic R&D are complements or substitutes. In case of the econometric investigation, the "complementarity hypothesis" holds true if O-advantages turn out to be the dominant factors determining foreign R&D activities. The "substitution hypothesis" is supported, if we find that L-advantages outweigh O-advantages as explanatory variables. I-advantages are not related to the two hypotheses in a straightforward way; however, they certainly do not support the "substitution hypothesis". According to the descriptive analysis of the motives of investing in foreign R&D, the "substitution hypothesis" is adequate if cost-reducing/efficiency-seeking motives are dominating. Conversely, if market-seeking motives and/or asset-seeking/knowledge-seeking motives (given the technology transfer to the domestic headquarter works sufficiently well) are prevalent, foreign and domestic R&D are complements. Finally, the results for "resource-seeking" motives (in the present context: "ample supply of R&D personnel abroad") are inconclusive since they may represent cost-reducing/efficiency-seeking motives (lower wages) as well as asset-seeking/knowledge-seeking strategies (access to exclusive knowledge in specific fields of technology). In sum, we think that an overall assessment of the two competing hypotheses is quite reliable as it is based on two different approaches.

To date, there is only little evidence regarding the home-country effect of foreign investment in R&D (see the reviews of Blomstrom & Kokko, 1998; Veugelers et al., 2005). This paper adds to previous empirical work in several respects. Firstly, the analysis covers not only large MNEs (as most other studies do), but also small- and medium-sized firms. Secondly, we conduct the analysis of foreign R&D at the firm level using a large-scale database. To our knowledge, there are only few firm-level studies that are based on large samples and econometric analyses (e.g., Odagiri & Yasuda, 1996; Andersson, 1998).[3] Industry-level analyses, primarily based on patent data, are dominating (see the review of Veugelers et al., 2005). Thirdly, we analyse the topic based on an econometric model that covers the most important aspects of the broadly based OLI paradigm. Fourthly, we explain, on the one hand, the decision to perform foreign R&D or to renounce to do so, on the other, the choice of the extent of foreign R&D expenditures taking account of a potential sample selection bias. To our knowledge, only the already mentioned paper of Andersson (1998) is dealing in this way with the matter.[4] Finally, since we combine two approaches, i.e., an econometric modelling based on the OLI paradigm and a descriptive analysis of the motives of foreign R&D, we are in a good position to reliably assess the controversial issue of whether foreign and domestic R&D are substitutes or complements.

The set-up of the paper is as follows. In Section 2, we shortly describe the database. Section 3 is devoted to the theoretical framework. In Section 4, we present the specification of the empirical model and the results from the econometric analysis. These are complemented and differentiated by means of the descriptive analysis of the pattern of motives for performing foreign R&D (Section 5). Based on the results of the previous two sections, we assess whether foreign and domestic R&D are complements or substitutes (Section 6). Finally, we summarise the main findings and draw some conclusions.

2. THEORETICAL FRAMEWORK

There are basically three strands of theory to explaining international investments of firms. The classical theory of international trade stresses the factor endowment of an economy and implies that a firm's international investments follow the comparative advantages of different locations (see, e.g., Mundell, 1957). According to the "new trade theory", firms exhibit specific capabilities (technology, marketing, etc.) that can be exploited at home as well as at foreign locations independently from the economic

attractiveness of different countries (see, e.g., Helpman, 1984; Ethier, 1986). Transaction cost theory, finally, hypothesises that a firm tends to engage in FDI whenever the costs of setting up and running a transnational hierarchical or network organisation are lower than those arising from external market transactions (see, e.g., Buckley & Casson, 1985). In addition to these basic theoretical approaches, there is a whole number of partial hypotheses explaining specific aspects of internationalisation, which are rooted in different "sub-disciplines" of economics such as industrial organisation, management sciences, evolutionary economics, economic geography or finance (see Dunning, 2000).

It dates back to the 1970s that Dunning hypothesised that no single approach is able to fully explain a firm's international activity. Therefore, he proposed as framework of analysis an eclectic theory of international production, the "OLI paradigm". In his understanding, it covers the most important theories in a way that it is more than just a sum of the constituent hypotheses. Originally developed to explain international production (Dunning, 1988, 1993), its most recent version can be applied to foreign R&D as well (Dunning, 2000; see also Cantwell & Narula, 2001).

This extended version of the OLI paradigm stresses more explicitly the strategic aspects of internationalisation based on the "dynamic capability view of the firm" (Teece & Pisano, 1998). In this concept, a firm not only invests abroad in order to increase its efficiency (efficiency-seeking motives) or to get access to resources (resource-oriented motives) or to exploit at foreign locations the assets produced at home (market-oriented motives), but it also locates some activities abroad in order to complement and enrich domestic assets by tapping into the worldwide pool of knowledge (asset-seeking motives representing an "asset augmenting" R&D strategy). This extension, which explicitly accounts for firm strategies designed for acquiring foreign knowledge and technology, qualifies the OLI paradigm as a comprehensive approach for explaining the internationalisation of manufacturing, R&D and other business functions. The extension of the OLI paradigm did not require a change of its basic structure (Dunning, 2000).

This extended view of the OLI paradigm serves as theoretical framework of the empirical analysis presented in this paper. Let us shortly recall the basic elements of this approach. It distinguishes three groups of variables that explain international engagements of a firm: "ownership-specific" advantages (O), "location-specific" advantages (L) and "internalising advantages" (I). In accordance with the "dynamic capability view of the firm", O-advantages refer to firm-specific capabilities and assets that make an MNE superior to local competitors irrespective of general location

characteristics. Such advantages arise from the availability of firm-specific (mostly intangible) assets and capabilities such as human and knowledge capital, property rights as well as specific intangibles related to marketing, organisation, learning, management, governance and trust, finance, experience with foreign markets, etc. (see Teece & Pisano, 1998). L-advantages represent potential gains a firm can realise by optimising its activities along the value chain across locations. In the present context, this type of advantage primarily roots in differences among locations with respect to factors favouring or impeding knowledge creation and use (costs of R&D inputs, R&D-related taxes and subsidies, innovation-related regulatory framework, etc.). I-advantages can be realised through M&A activities or by forming R&D co-operations and alliances as means to internalising market transactions. In this way, transaction costs on the imperfect markets for knowledge and technology may be reduced, appropriability problems mitigated, access to knowledge sources facilitated, etc.

As already mentioned, O- and L-advantages are closely related to specific motives and strategies of foreign R&D activities. Market-seeking motives reflect O-advantages. In case of this type of motives, which is stressed by the product-cycle model of international trade and investment (Vernon, 1966), foreign R&D is a means to support local production and sales, primarily by modifying products according to local market needs, based on ownership-specific assets created by the firm at home (“asset exploiting” strategy). Asset-seeking motives, which in the case of R&D activities are more or less equivalent to knowledge-seeking motives, are particularly emphasised in the literature dealing with “technology sourcing” (see, among many others, Cantwell, 1995; Kuemmerle, 1999; Patel & Vega, 1999; Frost, 2001; Le Bas & Sierra, 2002). In this case, the domestically available ownership-specific competencies of a firm are complemented and augmented by assets created by R&D at foreign locations[5] that offer specific knowledge and a high potential for profiting from knowledge spillovers due to geographical proximity to universities and innovative firms.[6] Such “asset augmenting” R&D strategies also reflect O-advantages. In contrast, the more traditional cost-reducing/efficiency-seeking and resource-seeking motives, which are related to the neo-classical theory of international trade and investment (see, e.g., Mundell, 1957), reflect L-advantages. In the present context, since resources primarily refer to the availability of R&D personnel, resource-seeking motives also may be an element of an “asset-augmenting” strategy (access to specific incorporated knowledge). Therefore, resource-seeking motives may also reflect, to some extent, O-advantages.

3. DATA

The firm data used in this investigation stem from two waves of the Swiss Innovation Survey conducted in 1999 and 2002, respectively. The survey is based on a sample (firms with at least five employees) stratified by 18 manufacturing industries and three industry-specific firm-size classes, with full coverage of large firms. The questionnaire was sent out to 3,113 firms in 1999 and 3,052 in 2002. We got responses from 1,049 firms in the first wave (34%) and 1,361 (45%) in the second one. The response rates are quite satisfactory given the very demanding questionnaire.[7] The structure of the data set in terms of firm size and industry affiliation is similar to that of the underlying sample. For obvious reasons, the present analysis only refers to R&D performing companies. Item non-response, which is a problem arising in any complex survey, further reduced the number of observations we could use in model estimation. The final sample obtained from pooling the data of two waves contains 1,137 firms, including 145 companies that perform R&D at foreign locations and reported the amount of R&D invested abroad. The sample structure by industry affiliation and firm size is shown in Table A1 of the appendix.

The available data are, to a high extent, qualitative in nature. Some of them are measured on a nominal (e.g., patenting yes/no, R&D co-operation yes/no, etc.) and others on an ordinal scale (e.g., intensity measure for innovation inputs, obstacles to innovation). The ordinal variables, measured on a 5-point Likert scale, throughout are transformed into dummy variables, with the value 1 representing the scores 4 or 5 and 0 standing for the scores 1–3.

4. ECONOMETRIC ANALYSIS: MODEL SPECIFICATION AND RESULTS

4.1. Model A

4.1.1. Specification and Estimation Procedure

Dependent Variable and Estimation Procedure. In model A, the dependent variable is a dichotomous measure taking the values 1 and 0 (R&D at foreign locations yes/no). The estimation is based on data from two waves of the Swiss Innovation Survey (1999, 2002). We applied two estimation

procedures. Firstly, by simply pooling the data and inserting a time dummy we performed a pooled probit estimation. Secondly, we considered random-effects to take account of heterogeneity and estimated a random effect probit model.

Explanatory Variables. In the following, we specify the explanatory variables with the OLI paradigm serving as theoretical guideline (see Section 3). In addition to O-, L- and I-variables, we take account of a firm's market environment and a set of control variables such as firm age, ownership of the firm, sector affiliation, etc. Table 1 shows the specification and measurement of the explanatory variables as well as the expected signs. The correlation matrix of these variables is shown in the appendix (Table A2).

A first group of variables represents O-advantages that are expected to be positively related to performing foreign R&D. Since we deal with R&D activities, we (mainly) focus on knowledge-related O-advantages; other factors such as brand names, specific managerial skills, organisational capabilities are not explicitly taken into account. Firstly, we use measures related to innovation input and output. On the input side, we include a variable representing the intensity of product-related development activities (DPD). At an explorative stage, we also used an analogous measure related to research input that showed no significant effect when inserted alone in the estimation equation. However, we had to drop it from our model because of strong multi-collinearity with the variable DPD. In case of innovation output, we employ a measure for patenting activity (PAT). This variable captures, on the one hand, the outcome of R&D investment (and other types of innovation expenditures); on the other, patents are property rights that reflect a genuine form of ownership advantages.

A second group of O-variables is related to a firm's use of external knowledge that directly enhances the internal knowledge base. In this way, we capture a firm's capacity to absorb external knowledge; this may strongly increase a firm's benefits from investing in foreign R&D (knowledge and technology transfer between foreign and domestic R&D units is more "profitable" if absorptive capacity of the headquarter firm is high). We expected that universities/research institutions and – if a firm is a member of a company group – the parent company and/or sister companies are the most valuable external knowledge sources. However, the variable measuring the intensity of the use of university-related know-how had to be dropped from the specification again because of its disturbing influence on other variables. Therefore, "knowledge from other group members" (GROUP) is the variable capturing the intensity of the use of external knowledge.

Table 1. Specification of the Explanatory Variables.

Variable	Description	Expected Sign	
		Model A	Model B
O-Advantages			
Innovation input/output			
DPD	Intensity of product-related development input (Dummy variable based on a 5-point intensity scale: value 1 for scores 4 or 5, otherwise 0)	+	
PAT	Patenting (yes/no; dummy variable)	+	+
External knowledge (Dummy variable based on a 5-point intensity scale: value 1 for scores 4 or 5, otherwise 0)			
GROUP	Knowledge flows from other companies of the group	+	+
Other O-variabes			
LQL	Logarithm of labour productivity (value added per employee)	+	+
LEXP	Logarithm of sales share of exports (%)	+	+
I-Advantages			
RDCOOP	Firm involved in R&D co-operations (yes/no; dummy variable)	+	+
Firm size			
L, L^2	Number of employees and its square	±	
S, S^2	Sales and its square		±
L-Disadvantages (of home location)			
Obstacles to innovation as disadvantage of Switzerland as a location for R&D (Dummy variables based on a 5-point intensity scale: value 1 for scores 4 or 5, otherwise 0)			
O1	High taxation	+	+
O2	Insufficient supply of R&D personnel	+	+
O3	Insufficient supply of qualified manpower in general	+	+

Table 1. (*Continued*)

Variable	Description	Expected Sign	
		Model A	Model B
O4	Problems of acceptance of new technologies	+	+
O5	Excessive regulation of the domestic product market	+	+
O6	Restrictive access of foreigners to the domestic labour market	+	+
O7	Strict environmental regulations	+	+
O8	Strict regulation of land use and building as well as intricate administrative processes in order to comply with those regulations	+	+
O9	Insufficient public support of private R&D	+	+
Market conditions			
Intensity of competition on the firm's principal markets (Dummy variables based on a 5-point intensity scale: value 1 for scores 4 or 5, otherwise 0)			
IPC	Intensity of price competition	+	
INPC	Intensity of non-price competition	+	
Number of competitors on the firm's principal markets (Three dummy variables based on the number of principal competitors on the product market; reference group: firms with more than 50 competitors)			
	5 or less; 6–15; 16–50 competitors	+	
Control variables			
FOR	Foreign-owned firm (yes/no; dummy variable)	−	
LAGE	Logarithm of firm age (time elapsed since the foundation of the firm)	+	
High-tech manufacturing	Pharmaceuticals, chemicals, plastics, non-electrical machinery, vehicles, electrical machinery, electronics, instruments (reference group: other manufacturing industries)	+	+
Year 2002	Dummy variable for the year 2002 (reference group: year 1999)	±	±

We also included the (logarithm of) labour productivity (LQL), which is used as a proxy for O-advantages that cannot be explicitly taken into account due to a lack of data (e.g., firm-specific skills in technology management, learning capacity, access to finance, etc.). We also envisaged capturing human capital representing a firm's endowment with firm-specific embodied knowledge. However, exploration showed that the use of this variable "disturbed" the impact of the productivity variable, so we decided to keep only LQL.

Finally, the (logarithm of) sales share of exports (LEXP) is included as an O-variable to capture a firm's experience in doing international business, which, according to the "stages view of internationalisation" (Johanson & Vahlne, 1977), raises the probability of investing at foreign locations. In many cases, going international starts with setting up distribution facilities, whereas R&D activities usually are the final step of this process.[8]

As already mentioned, I-advantages reflect the internalising of market transactions as a means to reduce transaction costs. In the present context, such cost may primarily stem from high risks involved in imperfect markets for knowledge and technology (e.g., problems of access to (tacit) knowledge or appropriability problems, etc.). At the empirical level, I-advantages are difficult to measure. Since co-operation in R&D is a frequently used means for internalising knowledge-related market transactions, we use the dummy variable "R&D co-operation yes/no" (RDCOOP) as a proxy for I-advantages.

Firm size captures some (size-related) factors not explicitly included in the model due to a lack of data. Some of them reflect O-advantages, while others are related to I-advantages. For example, large firms are in a better position than smaller ones with regard to international marketing and distribution, access to finance, risk-bearing capacity, etc. (O-advantages).[9] Large firms also are superior to small ones in terms of factors related to I-advantages such as international innovation management (an important instrument for internalising the outcome of foreign R&D activities). Firm size is measured by the number of employees (L); to allow for scale effects, we also include the quadratic term of L.

We use information on the relevance of nine obstacles to innovation in Switzerland (assessment of the firms on a 5-point scale) as proxies for L-disadvantages. We hypothesise that a high relevance of a certain obstacle to innovation in Switzerland is an incentive for Swiss firms to invest in foreign R&D. The nine variables representing obstacles to innovation (O1 up to O9) capture a whole range of (potential) weaknesses of Switzerland as a location for performing R&D (see Table 1). Some of them represent the

regulatory framework (taxation, regulation of the domestic product markets, regulation of environment protection or land use), others are related to labour supply (shortage of R&D and other highly qualified personnel, entry barriers for foreigners on the Swiss labour market); further hindrances taken account of are "acceptance to the use of new technology" and "low level of public support for private R&D".

A further set of variables characterises a firm's market environment. We assume that a firm's decision to perform foreign R&D is not independent of the market environment in which it operates. However, the impact of the intensity of price and non-price competition (IPC, INPC) is not straightforward. It may be the case that a very competitive market environment forces firms to move nearer to the customer, what may induce market-seeking (sales-supporting) R&D activities (positive sign). Since there are many other strategies to react to an increase of the intensity of competition, the presumed positive effect may be small. In addition to (direct measures of) the intensity of competition, we take account of market structure, which is measured by three dummy variables based on the number of principal competitors (5 or less, 6–15, 16–50 competitors, with more than 50 competitors as reference group). We hypothesise that firms operating in oligopolistic markets, either as a large enterprise among other multinational "global players" or as a SME in a "niche" of highly specialised products, are more likely to perform foreign R&D. Since markets characterised by a large number of competitors are the reference category, we expect a positive sign of the three dummies, with the highest absolute value of the coefficient to be expected in case of the lowest numbers of competitors (up to 5 competitors).

Finally, we control for some (general) firm characteristics that may have an impact on the decision to engage in foreign R&D. Firstly, it may be the case that foreign-owned firms (FOR) are less likely to perform foreign R&D, since they often operate, in the first instance, for the Swiss market (negative sign). Secondly, one may expect that older firms are more likely to perform R&D at foreign locations than younger ones because they had more time to expand to foreign markets in general (what is helpful for the internationalisation of several business functions) or specifically in R&D; therefore, we insert (the logarithm of) firm age as another explanatory variable. Thirdly, we add a sector dummy to control for industry effects as well as for a (potential) omitted variable bias; it takes the value 1, if a firm belongs to the high-tech sector, and 0 otherwise. We expect that high-tech firms are more inclined to engage in foreign R&D than low-tech companies.

4.1.2. Results

The results obtained from estimating model A are presented in Table 2. Column 1 shows the findings for the probit estimation with a time dummy (year 2002). The results of a reduced model after dropping the L-variables with insignificant coefficients are presented in column 2. Column 3 contains the results of the random effect probit estimation, column 4 those of the respective reduced model.

The two types of estimates yield practically the same results. The model fit is satisfactory since a value of 0.21 for the pseudo R^2 (see columns 1 and 2) is quite high in case of a large number of observations ($N = 1{,}137$).

An inspection of the model estimates shows that all variables representing O-advantages are positive and statistically significant. The evidence for innovation input and output is somewhat weaker than for the other O-variables. The use of external knowledge stemming from other companies of the same group seems to be a strong incentive to locate R&D abroad; this result may indicate that group-internal knowledge flows are well managed, what is an advantage when it comes to an internationalisation of R&D. Export orientation (international business experience) is highly relevant as a factor inducing foreign R&D; this finding is in line with the "stages view of internationalisation". Moreover, labour productivity that captures several not explicitly specified O-advantages (some of them mentioned in the previous sub-section) is a highly important explanatory variable. The same holds for firm size, which captures, in a similar way as the variable "labour productivity", some unspecified (size-dependent) O-advantages and also is related to I-advantages: we find strong evidence for a positive linear size effect and a negative quadratic term (decreasing scale effect). "R&D cooperation yes/no", used as a proxy for I-advantages, is highly significant and shows the expected positive sign.

We could hardly find any evidence for L-disadvantages: only one of the nine variables representing a disadvantage of Switzerland as a location for R&D activities (obstacles to innovation) is statistically significant ("excessive regulation of domestic product markets").[10]

Among the variables describing a firm's market environment (intensity of price and non-price competition, market structure), only the first one is statistically significant; intensive price competition seems to push firms to move nearer to the customer inducing market-seeking R&D activities. Finally, neither foreign ownership nor firm age and sector affiliation turn out to be relevant determinants of foreign R&D.

The model estimates clearly show that O-advantages are the main drivers of an engagement in R&D at foreign locations; I-advantages seem to play an

Table 2. Model A: Determinants of R&D at Foreign Locations 1999–2002.

Explanatory Variables	Dependent Variable: R&D at Foreign Locations (Yes/No)			
	Pooled probit	Pooled probit	Probit random effects	Probit random effects
O-Advantages				
DPD	0.191*	0.204*	0.254*	0.275*
	(0.109)	(0.108)	(0.149)	(0.149)
PAT	0.190*	0.181*	0.223	0.211
	(0.114)	(0.109)	(0.154)	(0.154)
GROUP	0.453***	0.460***	0.581***	0.595***
	(0.120)	(0.120)	(0.167)	(0.169)
LQL	0.366***	0.349***	0.495***	0.482***
	(0.137)	(0.137)	(0.185)	(0.186)
LEXP	0.211***	0.207***	0.276***	0.276***
	(0.044)	(0.043)	(0.066)	(0.066)
I-Advantages/firm size				
RDCOOP	0.621***	0.634***	0.792***	0.818***
	(0.109)	(0.109)	(0.171)	(0.173)
L	3.2E−04***	3.0E−04**	4.0E−04**	3.9E−04**
	(1.2E−04)	(1.2E−04)	(1.9E−04)	(1.9E−04)
L2	−2.2E−08**	−2.1E−08**	−2.8E−08)*	−2.7E−08*
	(1.0^{E}–08)	(1.0^{E}–08)	(1.6E−08)	(1.6E−08)
L-Disadvantages				
Innovation obstacles				
O1	0.033		−0.039	
	(0.187)		(0.253)	
O2	0.034		0.029	
	(0.131)		(0.165)	
O3	0.118		0.121	
	(0.142)		(0.185)	
O4	0.060		0.085	
	(0.154)		(0.214)	
O5	0.102**	0.120**	0.133*	0.154**
	(0.052)	(0.051)	(0.076)	(0.072)
O6	−0.001		−0.013	
	(0.163)		(0.233)	
O7	0.222		0.295	
	(0.193)		(0.277)	
O8	−0.187		−0.210	
	(0.185)		(0.267)	
O9	0.025		0.043	
	(0.184)		(0.255)	

Table 2. (*Continued*)

Explanatory Variables	Dependent Variable: R&D at Foreign Locations (Yes/No)			
	Pooled probit	Pooled probit	Probit random effects	Probit random effects
Market conditions				
IPC	0.238**	0.250**	0.310*	0.325*
	(0.118)	(0.118)	(0.171)	(0.173)
INPC	−0.051	−0.046	−0.048	−0.045
	(0.109)	(0.109)	(0.144)	(0.144)
Number of competitors				
5 or less	0.015	0.013	−0.029	−0.031
	(0.192)	(0.192)	(0.257)	(0.258)
6–15	−0.027	−0.030	−0.119	−0.122
	(0.182)	(0.182)	(0.244)	(0.245)
16–50	0.138	0.135	0.139	0.138
	(0.210)	(0.209)	(0.286)	(0.288)
Control variables				
FOR	0.017	0.010	0.052	0.047
	(0.139)	(0.137)	(0.186)	(0.187)
LAGE	0.001	−0.004	0.005	0.001
	(0.065)	(0.065)	(0.088)	(0.088)
High-tech manufacturing	0.058	0.065	0.100	0.107
	(0.120)	(0.118)	(0.164)	(0.165)
Year 2002	0.111	0.110		
	(0.110)	(0.109)		
Constant	−7.163***	−6.931***	−9.443***	−9.311***
	(1.675)	(1.666)	(2.413)	(2.429)
N	1137	1137	1137	1137
Pseudo R^2	0.215	0.213		
Wald χ^2 (17)	200***	184***	49***	47***
τ			0.429***	0.442***

Note: τ, share of variance that can be traced back to heterogeneity; heteroskedasticity–robust standard errors in brackets (White procedure).
***Statistical significance at 1% test.
**Statistical significance at 5% test.
*Statistical significance at 10% test.

important role as well. These results largely confirm an earlier cross-section analysis based on data for 1996 (see Arvanitis & Hollenstein, 2001). In particular, we get the same results with respect to the three components of the OLI paradigm (strong impact of O- and I-advantages, with no influence of L-disadvantages), with only minor differences regarding the individual variables.[11]

Odagiri and Yasuda (1996) got similar results for Japanese firms as far as O-advantages are concerned; however, a comparison with respect to I- and L-advantages is not feasible, since these categories of variables are not specified in their model.

4.2. Model B

4.2.1. Specification and Estimation Procedure

Dependent Variable and Estimation Procedure. In model B, the dependent variable is the logarithm of foreign R&D expenditures. For obvious reasons, we could only use the information on firms that perform R&D at foreign locations. Consequently, we had to take into account a potential sample selection bias through the application of a procedure introduced by Heckman (1976) (Heckman selection model; maximum likelihood estimator). The selection equation (active vs. non-active in foreign R&D) was based on model A (only statistically significant variables).

Explanatory Variables. The specification of the explanatory part of model B is a somewhat simplified version of that used in model A. Among the O-variables, we had to drop the innovation input variable DPD because of high multi-collinearity with the variable PAT. The sales share of exports was also excluded since experience in international business is important for deciding whether R&D activities should be extended to foreign locations, but presumably is not relevant any more when the amount of foreign R&D has to be determined. There is no difference between model A and B as far as I-advantages (''R&D co-operation yes/no'') and L-advantages (obstacles to innovation) are concerned. Whereas firm size was measured by employment in model A, we now use sales (S) since the dependent variable (i.e., the extent of foreign R&D expenditures) is measured in nominal terms. Moreover, the variables representing the market environment and those controlling for firm age and foreign ownership were dropped right from the beginning as being irrelevant for the explanation of the level of R&D performed in foreign locations.

4.2.2. Results

The results obtained from estimating model B are presented in Table 3. The first two columns show the two equations of the Heckman model (selection equation in column 1, intensity equation in column 2). The correlation

Table 3. Model B: Determinants of R&D Expenditures at Foreign Locations 1999–2002.

Explanatory Variables	R&D at Foreign Locations (Yes/No)	Log (R&D) Expenditures at Foreign Locations				
	Selection equation	Intensity equation		Pooled OLS		OLS random effects
O-Advantages						
DPD	0.195*					
	(0.114)					
PAT	0.240**	1.010***	1.083***	0.887***	0.856***	0.850***
	(0.119)	(0.368)	(0.376)	(0.337)	(0.325)	(0.320)
GROUP	0.471***	0.550	0.670*	0.457	0.501*	0.490*
	(0.115)	(0.347)	(0.352)	(0.295)	(0.291)	(0.293)
LQL	0.266*	0.670*	0.721*	0.630	0.587	0.570*
	(0.141)	(0.387)	(0.388)	(0.417)	(0.394)	(0.348)
LEXP	0.284***					
	(0.049)					
I-Advantages/firm size						
RDCOOP	0.502***	0.812**	0.848**	0.662*	0.592	0.559*
	(0.115)	(0.393)	(0.391)	(0.375)	(0.367)	(0.286)
S		2.9E−09***	2.9E−09***	2.9E−09***	2.9E−09***	2.9E−9***
		(0.6E−09)	(0.6E−9)	(0.6E−09)	(0.8E−09)	(0.6E−9)
S2		−2.3E−19***	−2.4E−19***	−2.3E−19***	−2.5E−19***	−2.5E−19***
		(0.9E−19)	(0.9E−19)	(0.9E−19)	(0.8E−19)	(0.9E−19)
L	2.5E−04*					
	(1.4E−04)					
L2	−1.6E−08					
	(1.2E−08)					

Table 3. (*Continued*)

Explanatory Variables	R&D at Foreign Locations (Yes/No)	Log (R&D) Expenditures at Foreign Locations		
	Selection equation	Intensity equation	Pooled OLS	OLS random effects
L-Disadvantages				
Innovation obstacles				
O1		0.033	0.011	
		(0.536)	(0.643)	
O2		−0.160	−0.236	
		(0.321)	(0.322)	
O3		0.230	0.231	
		(0.373)	(0.411)	
O4		−0.451	−0.455	
		(0.412)	(0.326)	
O5	0.096*	−0.224	−0.183	
	(0.056)	(0.164)	(0.172)	
O6		−0.225	−0.177	
		(0.481)	(0.577)	
O7		−0.024	−0.162	
		(0.610)	(0.576)	
O8		−0.382	−0.287	
		(0.622)	(0.540)	
O9		0.179	0.009	
		(0.521)	(0.471)	

Market conditions						
IPC	0.287**					
	(0.138)					
Control variables						
High-tech	manufacturing	0.051	0.663*	0.728**	0.790**	0.805**
	0.801**					
(0.122)	(0.361)	(0.362)	(0.379)	(0.371)	(0.347)	
Year 2002	0.184	0.213	0.258	0.150	0.15	
	(0.117)	(0.325)	(0.331)	(0.355)	(0.354)	
Constant	−6.363***	1.964	0.341	2.745	2.831	3.169
	(1.676)	(5.230)	(5.241)	(4.887)	(4.669)	(4.114)
N	1137		1137	145	145	145
N (uncensored)	145		145			
R^2				0.544	0.556	
ρ	0.072		0.217			
LR Test of $\rho = 0$	0.04		0.36			
R^2 Overall						0.555
Wald χ^2 (7)						77***
τ						0.376

Note: One-step Heckman selection model (maximum likelihood estimation); ρ, correlation coefficient; τ, share of variance that can be traced back to heterogeneity.

***Statistical significance at 1% test level.

**Statistical significance at 5% test level.

*Statistical significance at 10% test level.

coefficient ρ indicating the strength of the correlation between the selection equation and the equation for foreign R&D expenditures is small and statistically insignificant; hence, there is no evidence for a sample selection bias. The same holds for the reduced model, where the L-variables which were not significant in the full model, were dropped (column 3). Since there is no evidence for a selection bias, we also estimated OLS models based on pooled data with a time dummy (full model in column 4, reduced model in column 5) and an OLS random effect model (column 6, reduced model). The pattern of explanation for the intensity equation (which is the essence of model B) is more or less the same for all estimation procedures and sets of explanatory variables (full vs. reduced model). Therefore, we comment the results on the whole.

The general pattern of the estimates of model B does not differ very much from those for model A. O-advantages remain the most important category of variables explaining foreign R&D activity. I-advantages as measured by the variable RDCOOP again are highly relevant. Moreover, we find that L-disadvantages contribute to the explanation of foreign R&D activity even less than in model A, where at least one of the nine obstacles to innovation was statistically significant. Also with respect to firm size we obtain quite similar results as in model A. In contrast to model A, sector affiliation matters: high-tech firms invest much more in foreign R&D than other manufacturing companies.

To sum up, we find that a relatively small number of variables suffice to explain rather well the extent of foreign R&D investments (satisfactory model fit). Some of these variables represent explicitly specified O-advantages (science-related property rights; group-internal knowledge transfer) and I-advantages (R&D co-operation). At least as important, if not more influential are some structural variables (firm size, sector affiliation) or not explicitly specified O-advantages as measured by labour productivity. We conclude that the main players in the internationalisation of R&D are large, highly productive, science-based, high-tech firms that are strongly embedded in intra-group knowledge flows and are capable to internalise the risks involved in imperfect technology markets.

5. MOTIVES OF FOREIGN R&D ACTIVITIES

In this section, we present the results of a descriptive analysis of the importance of several (categories of) motives of foreign R&D as assessed by

Table 4. Motives for Performing R&D at Foreign Locations 2002.

Motive	Firm Size (Number of Employees)			All Firms
	5–99	100–499	500 and more	
Motives 1–7				
1. Supporting local production and sales	33.3	41.8	66.7	47.2
2. Geographical proximity to leading edge universities	29.4	21.8	25.0	25.4
3. Geographical proximity to innovative firms (local networks of excellence)	52.9	20.0	33.3	35.4
4. Transfer of knowledge/ technology to the Swiss headquarter	29.4	16.4	29.2	25.0
5. Lower R&D costs	37.3	23.6	16.7	25.8
6. Higher government support for R&D investments	15.7	12.7	4.2	10.8
7. Ample supply of R&D personnel	41.2	32.7	37.5	37.1
Group of motives (averages)				
Market-seeking (1)	33.3	41.8	66.7	47.2
Knowledge/asset-seeking (2, 3, 4)	37.2	19.4	29.2	28.6
Cost-reducing/efficiency-seeking (5, 6)	26.5	18.2	10.5	18.4
Resource-seeking (7)	41.2	32.7	37.5	37.1

Note: Manufacturing firms ($N = 130$).
Share of firms assessing a specific motive as important (value 4 or 5 on a 5-point Likert scale) as a percentage of firms with foreign R&D.
Source: Swiss Innovation Survey (2002).

the firms' themselves. As can be seen from Table 4, we distinguished seven potential motives of foreign R&D whose importance the firms that perform foreign R&D had to assess.[12] The seven motives are grouped into the four categories distinguished in the literature (see Section 2): market-seeking, asset-seeking/knowledge-seeking, cost-reducing/efficiency-seeking and resource-seeking motives. The two proximity-related motives (items 2 and 3) and the transfer of knowledge to the headquarter (item 4) reflect different aspects of the asset-seeking/knowledge-seeking motive; two further single motives, lower R&D costs (item 5) and higher government support for R&D

at foreign locations (item 6), refer to two different dimensions of the cost-reducing/efficiency-seeking motive. The individual items are aggregated to categories of motives by taking the mean of the corresponding percentages (see lower part of Table 4).

It turns out that market-seeking (item 1) and resource-seeking motives (item 7) are the most important drivers of foreign R&D. Knowledge-seeking motives (items 2–4) are of intermediate relevance; however, one element of this category, i.e., ''geographical proximity to innovative firms (networks)'' belongs to the most important motives. Efficiency-seeking motives (items 5 and 6) are less important than the other three categories; this holds true in particular for item 6 (''higher government support for R&D investments'').

The pattern of motives quite strongly differs by firm size, with that of large firms being particularly relevant, since they dominate in quantitative terms R&D investment flows to foreign locations. The table shows that market seeking is by far the most important motive in this firm size class; resource-seeking and knowledge-seeking motives come next, whereas efficiency-seeking motives seem to be almost irrelevant. The results for medium-sized firms apparently hardly differ from the overall pattern, with the exception of knowledge-seeking motives that are of low importance. In case of small firms, market-seeking motives are clearly less important than for the other two size classes. On the other hand, efficiency-seeking motives are more important for small firms than for medium-sized and, in particular, for large firms.

From the pattern of motives we draw the following conclusions. Firstly, the low importance of cost-reducing/efficiency-seeking motives (in particular in case of large firms) is in line with the econometric analysis according to which L-disadvantages do not influence the level of foreign R&D investments. Secondly, since market-seeking motives (in particular in case of large firms) definitely are more important than other motives, we conclude that ''asset-exploiting'' R&D strategies are most prevalent. ''Asset-augmenting'' strategies, though increasingly becoming important (see Section 3), are less relevant, in particular, in case of medium-sized enterprises. Thirdly, to the extent that resource-seeking motives (''ample supply of R&D personnel'' at foreign locations) are related to asset-seeking/knowledge-seeking motives (i.e. facilitating the access to specific knowledge in certain technological fields), ''asset-augmenting'' strategies are more important than it looks at first glance. The same holds true to the extent that resource-oriented motives (R&D personnel) are related to cost-reducing/efficiency-seeking motives; in this case, L-disadvantages (R&D labour costs) may be more relevant than suggested above.

6. ARE FOREIGN AND DOMESTIC R&D ACTIVITIES SUBSTITUTES OR COMPLEMENTS?

According to the econometric analysis O- and I-advantages are the main drivers of foreign R&D activities, whereas there is hardly any evidence of L-disadvantages. These results support the "complementarity hypothesis". The analysis of the motives of foreign R&D investments confirms the results of the econometric investigation. Cost-reducing/efficiency-seeking motives are quite rare, what corresponds to the result of the irrelevance of L-disadvantages. On the other hand, market-oriented motives ("asset-exploiting" strategies) are the most prominent ones, what is in line with O-advantages being the main drivers of foreign R&D. The fact that knowledge-seeking motives reflecting "asset-augmenting" strategies are quite relevant as well, at least more important than cost-reducing/efficiency-seeking motives, is again in line with the dominance of O-advantages as drivers of foreign R&D activities.

In sum, there is evidence for the "complementarity hypothesis", whereas we cannot find any evidence for the "substitution hypothesis". In view of these clear results, we are justified to expect that an extended analysis based on time series information, i.e., the evolution of foreign and domestic R&D investment, would lead to the same conclusions.

How do our results compare with those of other investigations? As already mentioned, there are two further studies based on Swiss data that support the present findings (Arvanitis & Hollenstein, 2001; Hollenstein, 2005). There is some more evidence confirming our conclusions from four cross-country studies, in which Switzerland is included. Three of them are based on the analysis of patent data of MNEs: Patel and Vega (1999), who investigated the relative importance of several R&D strategies, conclude that in the Swiss case "asset exploiting" and "asset augmenting" are the dominant strategies, whereas there are hardly any Swiss MNEs characterised by "(pure) technology sourcing" (i.e., sourcing combined with a weak, domestic knowledge base). According to this study, "asset augmenting" is by far the most important strategy. Le Bas and Sierra (2002), who used the same approach but had a broader database at their disposal, also concluded that "asset exploiting" and "asset augmenting" are much more relevant than other strategies for Swiss MNEs; in contrast to Patel and Vega (1999), the two strategies are found to be of about the same importance. Cantwell and Janne (1999), who looked at the ranking of countries in terms of technological performance in selected industry groups, obtained the same result. Particularly, they found that "asset-augmenting" strategies are dominating

in the Swiss chemical and pharmaceutical industry, whereas "asset exploiting" is characteristic for the Swiss metal and machinery sector (and probably the rest of the manufacturing sector). Since the shares of Swiss foreign R&D expenditures are almost the same for the two industry groups, we conclude that both strategies are of similar importance. Driffield and Love (2005) show that firms investing in the UK, in the first instance those from technologically leading countries (USA, Switzerland, Sweden), benefit from the host country's knowledge base, in particular in case of investments in spatial clusters of R&D-intensive firms; in other words, "asset-augmenting" strategies positively impact on the knowledge base of the home country.[13]

7. SUMMARY AND CONCLUSIONS

The econometric analysis of the factors determining a firm's investment in foreign R&D is based on the well-known OLI paradigm. It turned out that "ownership-specific" advantages (O) and "internalising" advantages (I) as well as the related variable "firm size" are the most prominent factors determining the decision to be involved or not involved in foreign R&D (Model A). In contrast, we hardly found any evidence for "location-specific" advantages (L). We got quite similar results in explaining the *extent* of R&D investments at foreign locations (Model B). O-advantages remain the most important category of explanatory variables. I-advantages and firm size are highly relevant as well. L-advantages did even less contribute to the explanation of foreign R&D than in case of model A. Science-based high-tech firms invested significantly more in foreign R&D than other firms, whereas the basic decision to perform foreign R&D is independent of a firm's sector affiliation.

The descriptive analysis confirmed the basic findings of the econometric investigation. It turned out that market seeking, which is based on O-advantages and points to "asset-exploiting" R&D strategies, is the leading motive for performing foreign R&D. This is particularly the case for large firms, which dominate foreign R&D investment in quantitative terms. The resource-seeking motives (making use of an ample supply of R&D personnel), which, on the one hand, reflect efforts to reduce costs, on the other, knowledge-seeking motives (access to knowledge in specific technological fields), is the second most important motive for investing in R&D. Quite important are also asset-seeking/knowledge-seeking motives, which represent "asset-augmenting" R&D strategies building on O-advantages. Least

relevant are cost-reducing/efficiency-seeking motives, what is in line with the econometric analysis that yielded no evidence for disadvantages of Switzerland as a location for performing R&D. The results imply that "asset exploiting" R&D strategies are more prevalent than "asset-seeking" strategies.

The results of both approaches support the hypothesis of foreign and domestic R&D being complements.

NOTES

1. Such a high degree of internationalisation of R&D is quite exceptional (see Benito, Grogaard, & Narula, 2003).

2. In this paper we do not deal with the intra-firm organisation of international R&D, i.e., the different roles headquarters and affiliates play in foreign R&D. This aspect is dealt with, for example, by Pearce (1999) or Manolopoulos, Papanastassiou, and Pearce (2005).

3. At firm level, much of the research is characterised by small survey-based samples. Many of the studies are primarily descriptive and/or subject to simple statistical examination (e.g., Florida, 1997; Kuemmerle, 1999; Granstrand, 1999).

4. Odagiri and Yasuda (1996) estimated the "yes/no-equation" at the company level (probit), whereas the equation explaining the level of foreign R&D expenditures is estimated at the industry-area level (tobit). The two aspects are thus not jointly estimated and there is no correction for a selectivity bias.

5. In principle, the development of these competencies would be possible at home as well; however, it would take more time and resources as knowledge production is path-dependent (Criscuolo, Narula, & Verspagen, 2005).

6. The importance of geographical proximity giving rise to knowledge spillovers (externalities) has been stressed in the "innovation literature" many years ago (see Jaffe, Trajtenberg, & Henderson, 1993). The relevance of this aspect is clearly shown in recent econometric studies (e.g., Cantwell & Piscitello, 2005a, b).

7. The two questionnaires can be downloaded from www.kof.ethz.ch.

8. However, there is evidence for some weakening of the stepwise process of internationalisation; in particular, in case of (small- and medium-sized) high-tech and knowledge-intensive firms; see the review of the literature based on the "network perspective of internationalisation" (Coviello & McAuley, 1999) and the "born global" approach (Rialp, Rialp, & Knight, 2005).

9. According to Buckley (1989), restrictions with respect to risk bearing and management capacity as well as to information and access to finance are the most important factors impeding SMEs to become active at a foreign location. This hypothesis has been confirmed for the Swiss case in Hollenstein (2005).

10. The expected positive impact of innovation obstacles may be smaller than one would expect at first glance since engaging in foreign R&D involves various costs (e.g., co-ordination costs, costs of accessing the foreign location, etc.); therefore, a firm may stay at home even if the obstacles to innovation are high (Gassmann & von Zedtwitz, 1999; Grünfeld & Sanna-Randaccio, 2005).

11. We found basically the same pattern of explanation in a study dealing with alternative internationalisation strategies, the most "developed" one including foreign R&D (Hollenstein, 2005).

12. For obvious reasons we do not have such information for firms that are not engaged in foreign R&D.

13. The evidence of recent studies for other countries is mixed (Veugelers et al., 2005). A main message is that the spillovers to the home country crucially depend on the type of R&D activity performed by foreign affiliates; a high "research content" of foreign R&D might be particularly beneficial to the home country (Iwasa & Odagiri, 2004). Further, economies characterised by a large absorptive capacity profit most from R&D activities at foreign locations.

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APPENDIX

Table A1. Composition of the Data Set by Industry and Firm-Size Class.

	Number of Observations: Firms with *Domestic* R&D Activities	Percentage	Number of Observations: Firms with *Foreign* R&D Activities	Percentage
Industry				
Food, beverage, tobacco	94	8.3	6	4.1
Textiles	38	3.3	5	3.3
Clothing, leather	13	1.2	2	1.6
Wood processing	34	3.0	2	1.2
Paper	26	2.3	2	1.2
Printing	40	3.5	3	2.1
Chemicals	96	8.4	18	12.3
Plastics, rubber	59	5.2	8	5.8
Glass, stone, clay	37	3.3	4	2.5
Metal	21	1.8	1	0.8
Metalworking	124	10.9	16	10.7
Machinery	234	20.6	42	29.2
Electrical machinery	62	5.4	8	5.3
Electronics, instruments	134	11.8	23	15.6
Watches	46	4.0	3	2.1
Vehicles	17	1.5	1	0.8
Other manufacturing	47	4.1	2	1.2
Energy	15	1.3	0	0.0
Firm size				
5–19 Employees	170	14.9	10	6.6
20–49 Employees	220	19.3	18	12.8
50–99 Employees	219	19.2	25	17.3
100–199 Employees	235	20.7	32	22.2
200–499 Employees	190	16.7	28	19.3
500–999 employees	65	5.7	17	11.9
1,000 Employees and more	39	3.4	14	9.9
Year 1999	504	44.3	69	47.8
Year 2002	633	55.7	76	52.2
Total	1137	100	145	100

Source: Swiss Innovation Survey (1999, 2002).

Table A2. Correlation Matrix of the Explanatory Variables.

	DPD	PAT	GROUP	LQL	LEXP	RD-COOP	O1	O2	O3	O4	O5	O6	O7	O8	O9	IPC	INPC	1–5 Compet-itors	6–15 Compet-itors	16–50 Compet-itors	FOR
PAT	0.21																				
GROUP	0.06	0.09																			
LQL	0.09	0.08	0.16																		
LEXP	0.19	0.33	0.14	0.13																	
RDCOOP	0.13	0.23	0.12	0.14	0.18																
O1	−0.03	−0.06	−0.06	−0.07	−0.11	−0.06															
O2	0.12	0.08	0.05	0.00	0.08	0.09	0.08														
O3	0.03	0.01	0.00	−0.06	−0.04	0.03	0.11	0.30													
O4	0.09	0.08	0.00	−0.01	−0.01	0.05	0.10	0.15	0.08												
O5	−0.03	−0.08	−0.02	−0.02	−0.14	−0.06	0.26	0.08	0.15	0.14											
O6	0.05	0.07	0.07	0.02	0.03	0.07	0.26	0.22	0.12	0.11	0.21										
O7	−0.02	−0.10	0.03	0.00	−0.14	0.04	0.25	0.10	0.15	0.10	0.25	0.23									
O8	−0.02	−0.09	0.02	0.00	−0.17	0.03	0.24	0.11	0.19	0.11	0.24	0.27	0.58								
O9	0.04	0.02	0.02	−0.06	0.01	0.03	0.22	0.16	0.11	0.14	0.23	0.27	0.22	0.02							
IPC	0.02	0.04	0.04	0.01	−0.02	0.06	0.01	0.03	0.03	0.06	−0.01	0.03	0.06	0.05	0.01						
INPC	0.13	0.01	0.06	0.09	0.10	0.02	0.02	0.06	0.00	0.01	−0.02	0.04	0.00	−0.02	−0.02	−0.02					
5 or less Competitors	0.06	0.07	0.04	0.07	0.05	−0.01	−0.04	0.00	−0.01	−0.03	0.00	0.04	−0.07	−0.06	−0.01	−0.10	−0.05				
6–15 Competitors	0.00	0.04	0.03	0.02	0.06	0.04	−0.04	−0.01	0.00	0.01	−0.07	−0.03	0.01	0.00	−0.03	0.04	0.02	−0.60			
16–50 Competitors	−0.04	−0.06	−0.01	−0.05	−0.04	0.00	0.04	−0.02	−0.01	0.02	0.04	−0.01	0.04	0.04	0.05	0.05	0.01	−0.23	−0.37		
FOR	0.05	0.07	0.33	0.17	0.23	0.06	−0.11	0.03	−0.03	−0.05	−0.05	0.03	−0.07	−0.06	−0.03	−0.01	0.08	0.05	0.06	−0.07	
LAGE	−0.08	0.03	0.04	0.03	−0.07	0.09	−0.04	−0.02	−0.03	−0.04	−0.04	−0.02	−0.01	0.00	−0.06	0.07	−0.06	−0.10	0.08	0.04	−0.10

THE BEST OF BOTH WORLDS OR BETWEEN TWO CHAIRS? FORMALIZING THE INTEGRATION–RESPONSIVENESS TRADE-OFF

Christian Geisler Asmussen

ABSTRACT

This paper develops a formal model of the integration–responsiveness (IR) framework in order to assess its performance implications. The model shows that there is a trade-off between global integration and local responsiveness, but that – under certain conditions – firms can obtain a large proportion of both types of benefits simultaneously. Such a strategy of dual objectives is optimal when both integration and responsiveness pressures are above a certain level; when integration benefits are caused by economies of scope rather than economies of scale; and when local tastes rather than national standards are the source of responsiveness benefits. Market heterogeneity reduces the performance of the firm, but does not make local responsiveness more attractive as often assumed in the literature.

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1. INTRODUCTION

The integration–responsiveness (IR) framework has become a normative cornerstone of international business research, taking the many complex determinants of performance and distilling them into their key dimensions in a simple, yet, powerful way (Prahalad & Doz, 1987; Bartlett & Ghoshal, 1989; Devinney, Midgley, & Venaik, 2000). Local responsiveness is the means by which each subsidiary achieves fit with its geographical environment, whereas global integration allows multinational corporations (MNCs) to leverage international synergies – each construct clearly suggesting a strong link to performance. At the same time, the IR framework has offered positive value to researchers, as much contemporary research on international strategy and structure includes the environmental pressures of the industry or the international strategy of the firm as explanatory variables. This is clearly a testimony to the fundamental nature of the dimensions identified by the IR grid and the way that they manifest themselves at all levels in the MNC – from strategy to structure, from R&D to HRM.

The extant theories of global integration and local responsiveness (Porter, 1986; Prahalad & Doz, 1987; Bartlett & Ghoshal, 1989) are extensively grounded in case studies, and indeed owe much of their insight to this empirical base. However, it has turned out to be surprisingly difficult to establish performance implications of the framework in *confirmatory* analysis. Relatively, few studies have attempted to derive and test hypotheses about the way that firms' achieved integration and responsiveness affect performance, and those who have come up with mixed results. It has been suggested that one reason for this may be the lack of theoretical specification in the original conceptual models (Roth & Morrison, 1990; Devinney et al., 2000; Venaik, Midgley, & Devinney, 2004, 2005). Ironically, the richness of the theoretical constructs of the IR framework makes them difficult to measure, and the complexity of the framework intertwines cause and effect. For example, it is not clear to what degree integration and responsiveness are variables chosen by the firm, and to what degree they are imposed upon it by exogenous constraints (Venaik et al., 2004). This in turn leads to conceptual and empirical ambiguity as to whether integration and responsiveness are really independent or interrelated choice variables. The pioneering work of Devinney et al. (2000) in modeling the IR framework implies that there may be *trade-offs* inherent in the choices of integration and responsiveness. To take a concrete example, local responsiveness requires adaptation of products, which should to some extent inhibit the integration benefits of production economies of scale. However, almost all

previous research presents the two objectives as orthogonal dimensions, implicitly suggesting that they can be chosen independently of one another.

This paper proposes to address these challenges by deriving a formal model based on the IR framework. A formal model is well suited to analyze the "organic complexity" (Buckley & Casson, 2001) contained in optimization of a series of interrelated choices. It is explicit in its assumptions and transparent in its causality and can therefore potentially disentangle complex interrelationships, such as those between firm and industry, and between integration and responsiveness. While a formal model of the IR framework can never replace the rich system description of the existing models, it can single out aspects of that system and show its mechanics in a more operational way. This paper explores the nature of the IR trade-off on the functional/task level, questioning to what extent integration and responsiveness remain two independent dimensions as we move toward the individual choice variable, and to what extent the IR grid eventually collapses into one dimension with integration and responsiveness at opposite extremes. In other words, it is possible to pursue "*both* integration and responsiveness" simultaneously for *the same* function or task? Conceptualizing such a dual objectives strategy – on the choice-variable level – is a focal task of this paper. The primary means of achieving this task is by exploring the comparative statics of some of the "pressures" for integration and responsiveness: economies of scale and scope, local tastes, local standards, and market heterogeneity. It turns out that these pressures, when formalized in a model governed by economic logic, have complex effects that often diverge from the effects hypothesized in the existing conceptual IR frameworks.

The rest of this paper is structured as follows. Section 2 surveys the theoretical and empirical work dealing with integration, responsiveness, and performance. Section 3 contains a general-function model of integration and responsiveness, giving a formal interpretation of the two forces and the strategy of the firm and showing how these determine its performance. Section 4 explores a parameterized special case of the general model. Finally, Section 5 summarizes the results, draws implications for further research, and concludes.

2. THE IR LITERATURE

The IR grid can be traced back to Lawrence and Lorsch's (1967) seminal theory of differentiation and integration between organizational subunits. This theory was subsequently adopted by international management

scholars (Fayerweather, 1969; Doz, Bartlett, & Prahalad, 1981; Bartlett, 1986; Porter, 1986; Prahalad & Doz, 1987; Bartlett & Ghoshal, 1987a, 1987b, 1989; Bartlett, Ghoshal, & Birkinshaw, 2004) who generally argued for the existence of three types of strategies available to MNCs.[1] A *locally responsive* strategy is characterized by sensitivity to host governments and local customer preferences, product differentiation, subsidiary autonomy, and geographically dispersed activities. A *globally integrated* strategy, on the other hand, aims at rationalization and cost efficiency through global economies of scale, which in turn are obtained by product standardization and geographical concentration of activities. It, therefore, requires centralized decision-making, which also facilitates strategic coordination against global competitors and customers. Finally and most importantly, the IR grid contains a strategy oriented at being *both* locally responsive and globally integrated at the same time. Doz et al. (1981) describe how firms can pursue these dual objectives by institutionalizing conflict resolution between product and area managers.

The three strategies and the labels used by different authors are mapped in the well-known IR grid of Fig. 1. The IR grid operates on two levels. At one level it characterizes the environment of the firm, often operationalized at the industry level, by the ''drivers'' or ''forces'' or ''pressures'' for integration and responsiveness. At another level it describes the strategy of the firm in terms of achieved integration and responsiveness.

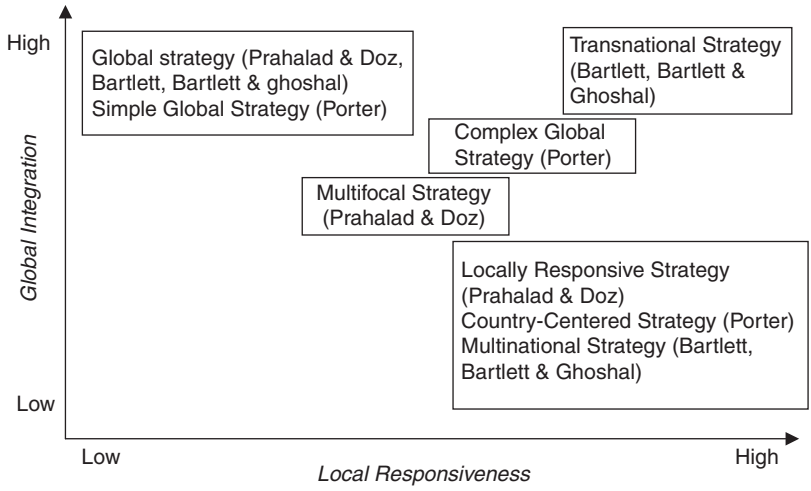

Fig. 1. Strategies in the Integration–Responsiveness Grid.

The theoretical IR literature contains some subtle but important contradictions and ambiguities which have profound implications for the attractiveness of the three strategies in the grid. First, are integration and responsiveness to be combined or traded-off against one another? As the figure shows, the multifocal strategy of Prahalad and Doz (1987) is in the middle of the grid, implying that there is some kind of trade-off between integration and responsiveness since it sacrifices some of both. Conversely, the transnational strategy of Bartlett and Ghoshal (1989) is positioned in the top-right corner, apparently combining the full degree of integration and responsiveness. Porter (1986) does not plot the strategies graphically, but he seems to take a position somewhere in between these two interpretations. Second, some authors differ as to their dynamic analysis of the IR grid. Prahalad and Doz (1987) have firms and industries moving in several directions within the grid, whereas Bartlett and Ghoshal (1989) hypothesize a movement going primarily northeast, simultaneously increasing integration and responsiveness pressures over time. This suggests that more and more firms should find it attractive to combine integration and responsiveness.

2.1. IR Strategy and Performance: The Evidence

Ultimately, of course, this is an empirical question, and several studies have used data to map the performance of firms pursuing different positions in the IR grid.[2] Roth and Morrison (1990) examined the strategies, perceived integration and responsiveness pressures, and performance of 147 firms in different industries identified as global. They found some support for the Prahalad and Doz (1987) typology, identifying three distinct clusters of firms corresponding roughly to the three strategies described above. However, the performance of the three clusters was not significantly different. Seventy-seven firms from the same sample were later used to test Porter's (1986) typology (Morrison & Roth, 1993), and again no performance differences were found. One reason for these results could be the fact that the performance of each strategy was averaged across a number of industries, concealing whether certain strategies were superior in certain industries. But Johnson (1995) replicated the result within one single industry, the US construction equipment industry. Three types of industries were identified based on MNC perceptions of integration and responsiveness pressures, but firms in all three types of industries showed the same level of performance.

One explanation for these results could be that, according to a contingency view of the IR grid, it is not the strategy of the firm in isolation or the

industry in which it operates, but the *fit* between these two variables that determine performance. The most direct evidence of this was provided by Ghoshal and Nohria (1993), who examined the fit between environment and organizational structure, as defined by the IR grid, and the relationship between fit and performance. Of the 41 companies in their sample, 41% had a structure that conformed to their environments,[3] and these firms outperformed the firms without such fit. Still, as pointed out in their paper, the sample was small (for instance, only four firms were transnational in a transnational environment) and the classifications rather crude (based on arbitrary cut-off points on a few indicators). Also, while integration and responsiveness were presented as independent dimensions in the paper, the measurement of the two variables actually implied co-dependency.[4]

Where the above studies presented integration and responsiveness as two independent dimensions, Johansson and Yip (1994) operationalized them as two opposites of a scale. They analyzed a sample of 36 US and Japanese firms concluding that performance increased toward the global end of such a scale. Even though the most globally integrated firms clearly sacrificed some responsiveness benefits (their managers complained about too much centralization), these firms still performed better than firms with a moderate degree of globalization. This suggests that maximizing global integration was better than trying to achieve a mix of integration and responsiveness benefits.

One of the few empirical studies to explicitly confront the interrelationship between integration and responsiveness benefits was provided recently by Venaik et al. (2005). They hypothesized a positive relationship between inter-unit learning (an integration benefit (IB)) and subsidiary marketing innovation (a responsive benefit (RB)), which would mean that MNCs should strive for both objectives. However, they found no support for this hypothesis, concluding that the complementarities between integration and responsiveness may be canceled out by the trade-offs inherent in the pursuit of the two objectives.

To sum up, the scarce evidence is quite mixed as to the typology suggested by the IR grid and the performance implications of this typology. In particular, it is not clear *when*, if ever, firms that try to combine integration and responsiveness are more successful than firms specializing in one or the other dimension. Also, and closely related to this, it remains an open question how much – if any – integration must be sacrificed to obtain responsiveness, and vice versa. To compound these problems, there is little consensus as to what the defining characteristics of each type of industry or firm in the IR grid is, or how it should be measured. This is actually not a problem of empirical methodology but rather a result of the lack of specification in the theoretical

literature on which these studies are based: the content of each strategy is described in very general terms (Roth & Morrison, 1990) and hence it is not obvious how the theoretical constructs should be measured. We now turn to a formal model that may be able to remedy some of these problems.

3. A GENERAL MODEL OF INTEGRATION AND RESPONSIVENESS

A model of integration and responsiveness should be unambiguous in its distinction between IR pressures and achieved IR benefits (Venaik et al., 2004). In this paper, saying that there are high integration (responsiveness) *pressures* merely means that a highly integrated (responsive) firm would perform significantly better than a nonintegrated (responsive) firm would under the same circumstances. Conversely, saying that such pressures are low means that the relevant dimension has a low performance impact. Integration and responsiveness *benefits*, on the other hand, are the additional profits that may or may not be realized by a given firm at a given point in time. This means that the pressures are exogenous to the model – they are properties of the profit function of the firm – whereas the corresponding benefits are endogenous as they result from the choices of the firm (i.e., the chosen position in the IR grid).[5]

The approach used here has several advantages. First, it relates managerial choice and exogenous factors to the performance of the firm and therefore serves as a useful starting point for a formal model. Second, it does not require the strong assumption that firms are able to maximize profits, although it shows us what it would potentially take to do so. Third and related to this, it is compatible with a situation where firms with different strategies survive in the same industry. This may happen either because they are constrained by their administrative heritage, they are unable to identify optimal strategies due to bounded rationality, market selection forces are too weak to root out the inefficient strategies, or because these strategies result in approximately the same performance; or as a result of a combination of all of these explanations.

Based on this definition of integration and responsiveness benefits, we can be more precise in our definition of the three types of strategies implied by the IR grid and identified in the introduction. In the model presented below, a globally integrated or simply *integrated* strategy is a strategy that maximizes global integration benefits, and a locally responsive or simply *responsive* strategy is one that maximizes local responsiveness benefits. Finally,

a dual objectives or simply *dual* strategy maximizes both (the sum of integration and responsiveness benefits). To give these definitions meaning, we begin by narrowing down what exactly integration and responsiveness benefits are. Real firms do not choose integration and responsiveness by the turn of a dial; rather, they make a number of strategic choices in different markets – choices that in combination determine the degree of integration and responsiveness of the firm. Three important questions therefore remain: (1) what are the means of obtaining integration and responsiveness benefits? (2) what are the underlying sources of these benefits? and (3) how do they in combination determine performance?

3.1. Local Responsiveness

As described in the literature, local responsiveness benefits accrue to the extent that the MNC adapts its choices to local conditions in each of the markets it serves. The choice variables most often considered in this context are product attributes, advertising campaigns, and distribution channel policies, which may all be designed on a country-by-country basis to reflect differing tastes and institutional conditions. However, all the choice variables of the local subsidiary can potentially benefit from local responsiveness, not only by increased demand but also through cost reductions, local learning, and innovation. To formalize this notion, assume that the firm must make a certain strategic choice once for each of its subsidiaries, determining the strategy vector s, consisting of the local strategy s_i in each country i where it operates. Responsiveness benefits are then realized by adapting this strategy to the unique characteristics of country i.

What are the underlying sources of local responsiveness benefits? To see this, let the profit function of the MNC be defined as the sum of earnings in all countries and denoted $\pi = \sum_i \pi_i$. The subsidiary profit functions π_i represent profit earned in country i as a result of the strategy chosen in that country, s_i. If these subsidiary profit functions were similar or identical, there would be little value in differentiating the strategies of the firm across countries and responsiveness benefits would consequently be low – there would be no differences to adapt to. When there are subsidiary profit-function heterogeneities, however, there may be responsiveness benefits. These heterogeneities may be caused by all the factors listed in the IR literature: differences in customer needs, culture, distribution channel infrastructure, input markets, and government restrictions. Such differences call for a differentiated approach to product development, pricing, advertising,

channel policy, procurement, and HRM practices to name only a few strategic variables. Let r_i denote the strategy that would be completely locally adapted to country i, henceforth termed the *locally required strategy*. This could be the product attributes or the advertising content preferred by local consumers, for example. The degree of *market heterogeneity* can then be defined as the locally required strategies' average deviation from their mean ($\bar{r}$), computed in the following way[6]

$$x = \frac{\sum_i |r_i - \bar{r}|}{n} \tag{1}$$

When the actual strategies of the firm, s_i, are not the same as the locally required strategies, r_i, performance suffers. For instance, the more the firm's products or marketing diverges from local customer preferences, the lower the demand. This lack of local responsiveness will be called the *maladaptation* in a given subsidiary, defined as $\alpha_i \equiv |s_i - r_i|$. The subsidiary profit function can be written[7] $\pi_i = f(\alpha_i)$, where $d\pi_i/d\alpha_i < 0$ reflects the negative impact of maladaptation on performance. At this point, we are only considering the strategic effects of maladaptation on performance; in a later section, assumptions about organizational costs (e.g., coordination and control costs) will be added.

The firm's average level of maladaptation is

$$\alpha = \frac{\sum_i \alpha_i}{n} = \frac{\sum_i |s_i - r_i|}{n} \tag{2}$$

Maximizing responsiveness benefits can only be achieved by setting $\alpha_i = 0 \Leftrightarrow s_i = r_i$ for all countries i, thus obtaining $\alpha = 0$. The most obvious way to do this would be through a *decentralized* structure, where the authority to set s_i resides with the country manager. The ability to identify r_i requires local knowledge, which is generated by the subsidiary (Doz, 1986; Roth, Schweiger, & Morrison, 1991) and may be imperfectly transferable due to its tacit nature. Hence, letting each country manager select a local strategy independently is likely to lead to the highest degree of local responsiveness.

3.2. Global Integration

The common denominator of global integration benefits is scale and scope economies. This is easiest to see by considering the choice variable of product

design. The integrated firm can deliver the same product worldwide for higher production volume and thereby lower unit cost – an integration benefit that the responsive firm would not achieve to the same extent with its differentiated products. The important point here is that economies of scale are in fact only an intermediary variable: the underlying means of realizing these integration benefits is a standardization of the choice variable across countries.

Again, the source of integration benefits can be modeled as a property of the profit function of the MNC. With global-scale economies, the unit cost of products sold in country i depends not only on the strategy pursued in country i, but also on the strategies of other subsidiaries – in particular, whether or not those other subsidiaries sell the same product or a locally adapted one. These subsidiary profit function *interdependencies* are the real source of integration benefits (without them there would be no reason to coordinate the strategies of the firm). Economies of scale in production are only one potential source of subsidiary interdependencies. These could also arise in advertising: if the same brands and the same advertising campaigns are used in all countries, brand spillover effects will tend to be reinforcing (Takeuchi & Porter, 1986). Or they could be found in R&D: if subsidiaries do related research, they may be able to realize economies of scope and transfer innovations among themselves. In fact, any choice variable of the subsidiary could potentially contain interdependencies, including procurement, pricing, channel policy, HRM practices, etc.[8]

Generally, the more similar the country-level strategies of the firm's subsidiaries, the larger integration benefits are achieved in each subsidiary. The subsidiary profit function should therefore be rewritten to reflect this $\pi_i = f(\alpha_i, \sigma)$, where σ is the *divergence* of the firm' strategies, defined as the subsidiary-level strategies' average deviation from their mean ($\bar{s}$)

$$\sigma = \frac{\sum_i |s_i - \bar{s}|}{n} \tag{3}$$

The higher the divergence, the lower integration benefits are realized and hence the lower the performance of each subsidiary, so $\partial\pi_i/\partial\sigma < 0$ (and, as before, $\partial\pi_i/\partial\alpha_i < 0$). We have seen that the responsive strategy lets its strategies diverge as much as the market conditions themselves do: $s_i = r_i$ for all $i \Leftrightarrow \sigma = \left(\sum_i |r_i - \bar{r}|\right)/n \equiv x$. The integrated strategy, on the other hand, exhausts the gains from integration only when it sets $\sigma = 0 \Leftrightarrow s_i = s_j$ for any countries i and j served by the firm. This clearly requires significant coordination of and control over local strategies, which is commonly believed to be best facilitated by a *centralized* structure (Edström & Galbraith,

1977; Jones & Hill, 1988; Roth et al., 1991). In the context of this model, this would require the functional manager, who presumably knows less about the locally required strategy in each country than the country managers do, but more about the functional interdependencies across borders, to retain authority over s_i for all countries.

3.3. The Dual Strategy

We know now that responsiveness benefits are achieved by setting $s_i = r_i$ and hence $\sigma = x$, and that integration benefits are achieved by setting $s_i = s_j$ and hence $\sigma = 0$. But how, then, does the dual strategy obtain *both* integration and responsiveness for a given choice variable? This seems like a logical impossibility, since $\sigma = x$ obviously rules out $\sigma = 0$ and vice versa, unless $x = 0$. The conclusion must therefore be that we cannot achieve both (full) integration and responsiveness simultaneously; there is a trade-off between the two variables. Indeed, this is not entirely surprising. As long as the locally required strategies r_i differ across countries, it is impossible to simultaneously eliminate maladaptation and divergence. However, if there are diminishing returns to integration and/or responsiveness, it is in fact possible to realize a higher sum of benefits than those obtained by the extreme strategies – by choosing the *optimal* position on the trade-off between integration and responsiveness, i.e., setting diversity somewhere between 0 and x. The dual strategy will now be developed in this optimal trade-off interpretation.

To facilitate the analysis of the dual strategy, assume that the firm is operating in two countries. We need two countries in order to be able to talk meaningfully about integration and responsiveness, but more than two subsidiaries will only complicate the analysis without adding significantly to the qualitative results. It can then be shown (see Appendix A) that for any given level of divergence chosen by the firm, the following equation always holds

$$\alpha + \sigma = x \tag{4}$$

This simple equation summarizes the trade-off between global integration and local responsiveness. It tells us that the maladaptation and the divergence of the firm's strategies always have to add up to a constant – the degree of market heterogeneity. Hence, market differences are the direct cause of the IR trade-off: to the extent that markets differ, we must sacrifice either integration or responsiveness or a combination of the two. Another way to interpret Eq. (4) is that, for a given x, divergence and maladaptation are inversely related. This is illustrated in Fig. 2.

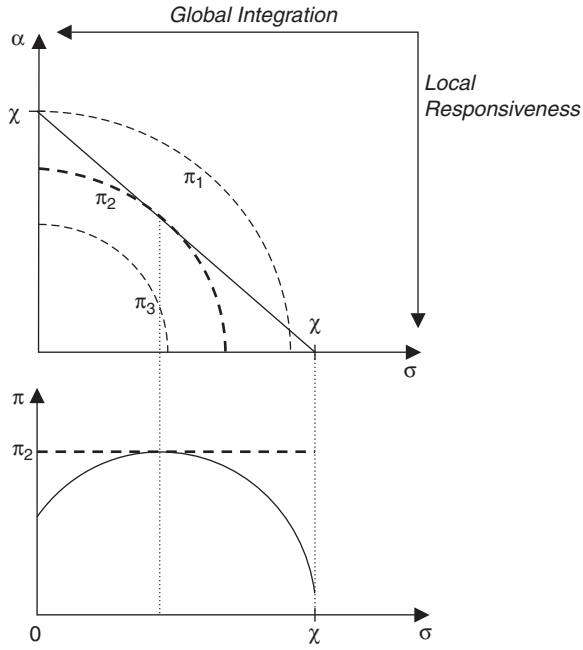

Fig. 2. The Optimal Integration–Responsiveness Trade-Off.

The diagonal frontier drawn in the first panel describes the feasible strategy set, i.e., the potential combinations of maladaptation, α, and divergence, σ, that the firm can achieve. Equivalently, as suggested by the opposing axes, the figure can be seen as an "inverted IR grid" describing potential combinations of integration and responsiveness. The concept of a frontier of possible positions in the IR grid is not new (see, e.g., Devinney et al., 2000), but this frontier is different because it is endogenous, determined within the model by x. The closer the firm gets to the origin, the higher profits it earns, as illustrated by the dotted isoprofit curves (with $\pi_1 < \pi_2 < \pi_3$), and the highest attainable profit for this firm is π_2. As such, the frontier has more in common with the budget line known from microeconomic choice theory. The second panel in the figure is a mapping of the profit of the firm on different positions on the frontier.

We already know that the integrated strategy selects the leftmost endpoint of the frontier, ($\sigma = 0$), and that the responsive strategy selects the other endpoint ($\sigma = x$). The advantage of the dual strategy, then, is that sometimes we get higher performance somewhere in between those two endpoints. If

there exists an interior solution to the optimization problem, as is the case in the figure, the dual strategy is superior to the two other strategies; otherwise it coincides with one of them. Generally, there can only be an interior solution if the isoprofit curves are concave to the origin (first panel), or, equivalently, the profit function is concave upwards (second panel). This would be the case if small degrees of maladaptation and divergence are relatively harmless while large levels are punished severely. Section 4 will give a more specific economic interpretation of this condition.

Where the responsive strategy requires country managers to be in control, and the integrated strategy empowers functional managers, we must have some form of shared control for the dual strategy to work. We need the country manager's knowledge of the local environment as much as the functional manager's knowledge of the task-specific interdependencies across subsidiaries as both are taken into account in the optimization problem described above. This is why a *matrix* structure is seen as one way for MNCs to combine integration and responsiveness (Stopford & Wells, 1972; Doz et al., 1981; Prahalad & Doz, 1987). The decision-maker of the dual strategy reports to both country and functional managers and tries to reconcile their conflicting objectives by seeking an ideal compromise between integration and responsiveness. Often such compromise requires significant negotiation or intermediation by higher-level managers. It follows from this that the dual strategy is likely to have unique challenges compared to the two unidimensional strategies. The negotiation process in the matrix structure will be costly and unpredictable, and searching for the optimal trade-off more difficult and time-consuming, and hence more costly, than standardizing global strategies or delegating decisions to local markets. This also means that some degree of suboptimization (deviation from the optimal value of σ) is likely to be incurred at any point in time.

The idea that it is costly to combine integration and responsiveness is widely recognized in the literature. Prahalad and Doz (1987) mention the many problems associated with running a multifocal or matrix organization. In discussing the transnational strategy, Bartlett (1986) contrasts its strategic advantage – which is what Fig. 2 depicts – with its administrative disadvantage. For these reasons, it is natural to assume that the dual strategy incurs an administrative performance penalty (denoted D) compared to the two unidimensional strategies, consisting of information costs, bargaining costs, deliberation costs, and residual suboptimization costs. This is not to say that the two other structures do not incur administrative costs, but only that the dual structure is *more* costly, the difference being captured by D.

3.3.1. The Impact of Market Heterogeneity

Fig. 2 can be used to analyze the comparative statics of the market heterogeneity parameter x. In the IR literature, market differences are often included as a key driver of local responsiveness (Bartlett & Ghoshal, 1989). Indeed, casual reasoning would seem to confirm this: the larger the differences between the markets of the firm, the better we would expect the responsive strategy, which leverages these differences, to perform. However, this model shows that market heterogeneity – while being a necessary condition for the existence of the IR trade-off – does not have such an effect.

On the one hand, it is true that a firm that tries to integrate its strategies across a set of highly diverse environments will sacrifice local fit. An increase in x corresponds to shifting the frontier away from the origin, and this moves the integrated strategy ($\sigma = 0$, $\alpha = x$) onto lower isoprofit curves. On the other, the figure shows that an increase in x *also* decreases the performance of the responsive strategy ($\sigma = x$, $\alpha = 0$). Mirroring the above argument, a firm that tries to respond to a set of highly diverse environments will sacrifice economies of scale and scope because its strategies diverge more. As a result of this, we cannot a priori say anything about the effect of market heterogeneity – it depends on the marginal costs of maladaptation and divergence. If the isoprofit curves in Fig. 2 are relatively flat, an increase in x will favor the responsive strategy; but if they are relatively steep it will actually favor the integrated strategy. As an example of the latter case, suppose that for a certain product, advertising is expensive to localize but plays a minor role in determining demand. In that case, the marginal costs of deviating from locally adapted advertising are probably small compared to the cost savings, and hence high market heterogeneity would tend to favor the integrated strategy.

3.3.2. The Performance of the MNC

The performance of the three considered strategies can be summed up as follows, where the first argument of the profit function is divergence and the second is maladaptation.

Locally Responsive Strategy

$$\pi^{R} = \pi(x, 0) \tag{5}$$

Globally Integrated Strategy

$$\pi^{I} = \pi(0, x) \tag{6}$$

Dual Objectives Strategy

$$\begin{aligned}\pi^{\mathrm{D}} &= \max_{\alpha\geq 0,\sigma\geq 0} \pi(\sigma,\alpha) - D \quad s.t. \quad \alpha+\sigma = x \\ &= \max_{0\leq\sigma\leq x} \pi(\sigma, x-\sigma) - D \end{aligned} \tag{7}$$

If $D = 0$, π^{R} and π^{I} are fixed points in the range of the function maximized by π^{D}, so $\pi^{\mathrm{D}} \geq \pi^{\mathrm{R}}$ and $\pi^{\mathrm{D}} \geq \pi^{\mathrm{I}}$. This is the strategic advantage of the dual strategy: it is a middle-of-the-road solution where the costs of extreme divergence and extreme maladaptation are avoided. In that sense, it is better than "between two chairs" but not quite as good as "the best of both worlds," because some integration and responsiveness benefits are sacrificed in the optimal trade-off position, where we have positive α and σ. Furthermore, when we add the administrative disadvantage $D > 0$, the strategic advantage of the dual solution has to be above a certain threshold before it is optimal to pursue.

This leaves us with the question: What are the conditions under which the dual strategy is sufficiently superior compared to the two unidimensional ones? We have seen in Fig. 2 that its superiority is determined by the shape of the isoprofit or profit curves, but what are the determinants of these curves? At the present level of abstraction this question cannot be answered, because the model contains no independent variables except x: all other information about the resources and the environment of the firm is subsumed in the general-form subsidiary profit functions. To deduce more comparative-static implications, it is therefore useful to consider a parameterized special case of the model.

4. A PARAMETERIZED SPECIAL CASE

Assume that a firm operating in two countries sells a product that is horizontally differentiated, so that a position s_i in a product attribute space must be chosen for each market. Product positioning is hence the focal choice variable in this example, being the variable discussed most often in the IR literature (Prahalad & Doz, 1987). Apart from the assumption that $r_1 < r_2$, the two markets are identical. The demand in each market, d_i, depends on the difference between the chosen product position and the locally required strategy (i.e., on the maladaptation of the subsidiary, α_i): $d_i = 3 - e\alpha_i^k$, where e and k are parameters.

There are economies of scale and scope in production: the more similar the products sold, the lower the unit cost paid by both subsidiaries. If the products are completely or almost identical, they can perhaps be produced in the same location with the same equipment – thus generating economies of scale – and even if they are only "somewhat" similar, they may be built using common skills, components, and processes, and hence generate economies of scope. The unit cost function is therefore given by $c = y\sigma^z + 1$, where y and z are parameters. There are no fixed costs, and market price is 4 in both countries. Note that the resource endowment and environment of the firm is an exogenous variable subsumed in the profit function of the firm here. As such, this interpretation of the model is about the IR trade-off in exploitation rather than exploration. A learning interpretation of the model will be discussed in the concluding sections.

Under these assumptions and assuming $k > 1$ and $D = 0$, it can be shown (see Appendix B) that the firm faces the following profit function

$$\pi(\sigma) = 2(3 - e(x - \sigma)^k)(3 - y\sigma^z) \tag{8}$$

The performance of the three strategies follows directly from this equation. The integrated strategy earns $\pi(0) = 6(3 - ex^k)$, the responsive strategy $\pi(x) = 6(3 - yx^z)$, and the dual strategy $\max_\sigma \pi(\sigma)$, before organizational costs. With this in mind, the next section explores how internal and external contingencies, captured by the parameters of the model, affect the relative attractiveness of the three strategies.

4.1. Comparative Statics

First, the parameters e and y will be interpreted as pressures for responsiveness and integration, respectively, and then it will be shown how the parameters k and z affect the demand and cost functions of the firm.

4.1.1. Reproducing the IR Grid

To analyze the impact of the parameters e and y, it is instructive to look at a logarithmic transformation of the firm's profit function. Let the transformed profit function of the firm be

$$\hat{\pi}(\sigma) = \ln \frac{1}{2}\pi(\sigma) = \ln(3 - e(x - \sigma)^k) + \ln(3 - y\sigma^z) \tag{9}$$

This is a monotonic transformation of the profit function, leaving the ranking of all performance levels intact – maximizing $\hat{\pi}$ is equivalent to

maximizing π and all qualitative conclusions based on this transformation will therefore also apply to the original profit function. The transformed profit function is easier to interpret, however: the first part of the expression, which is increasing in σ, reflects only the positive demand effect of reducing maladaptation ($x-\sigma$) and can therefore be interpreted as responsiveness benefits. The second part of the expression is decreasing in σ; it captures the negative effect of divergence on the margin of the firm and can be interpreted as integration benefits. Hence $RB = \ln(3 - e(x - \sigma)^k)$ and $IB = \ln(3 - y\sigma^z)$. An increase by the amount of ln2 in either *RB* or *IB* is equivalent to a doubling of the demand or margin of the firm, respectively. Plotting this gives us Fig. 3.

From Fig. 3 it is evident that the parameter e only influences responsiveness benefits. With $e = 0$, the *RB* curve is flat since the demand in each country is unaffected by maladaptation – the customers are effectively indifferent to the product offered. As e increases, however, the left-hand intercept of the *RB* curve and hence π^{I} moves down. This increases the relative attractiveness of the responsive strategy, and e may therefore conveniently be interpreted as pressures for local responsiveness.

Similarly, y influences integration benefits by scaling the marginal costs of divergence. With $y = 0$ there are no economies of scale and scope, so unit costs are independent of product similarity and the *IB* curve is flat. As y increases, the right-hand intercept of the *IB* curve and with it π^{R} moves down. Hence, when y is high, there are significant pressures for global integration as the degree of integration has a high performance impact. These

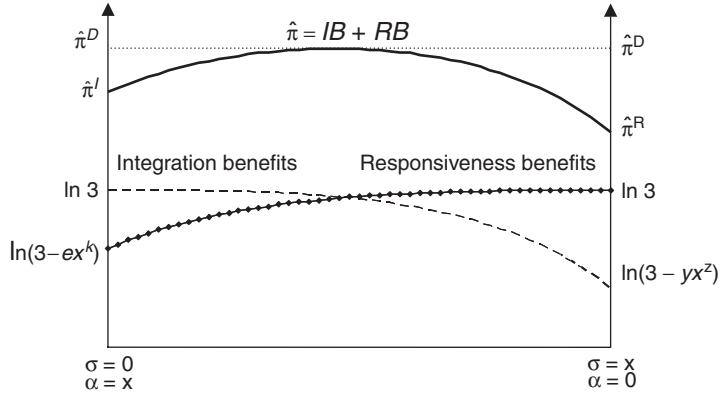

Fig. 3. A Special Case of the Integration–Responsiveness Trade-Off (with $x = 1$, $e = 1$, $y = 2$, $k = z = 2$).

comparative statics support a contingency view, where the relative strength of integration and responsiveness pressures determines the optimal strategy. In Fig. 3, for example, pressures for integration dominate ($y > e$), so the integrated strategy performs better than the responsive one does. Fig. 4 shows how the three strategies are generally determined in the IR grid.

In panel (a), we can see how the untransformed profits of the three strategies (Eq. (8)) vary with the level of integration and responsiveness pressures. As expected, pressures for integration reduce the performance of the responsive strategy, and pressures for responsiveness reduce the performance of the integrated strategy. An increase in both dimensions, as sometimes hypothesized in the literature (Bartlett, 1986), reduces the performance of both solutions, making the dual strategy relatively more attractive. The normative implications are summed up in panel (b), which shows the optimal strategy, assuming that the dual strategy incurs an administrative penalty due to its higher complexity. This means that pressures for both integration and responsiveness have to be above a certain threshold before it is worthwhile to try to find an optimal trade-off.

The IR grid developed from this model is very similar to the one found in the literature (Prahalad & Doz, 1987; Bartlett & Ghoshal, 1989). First and foremost, this ability to reproduce the conceptual framework mathematically confirms its internal logic.[9] A potentially more important reward from

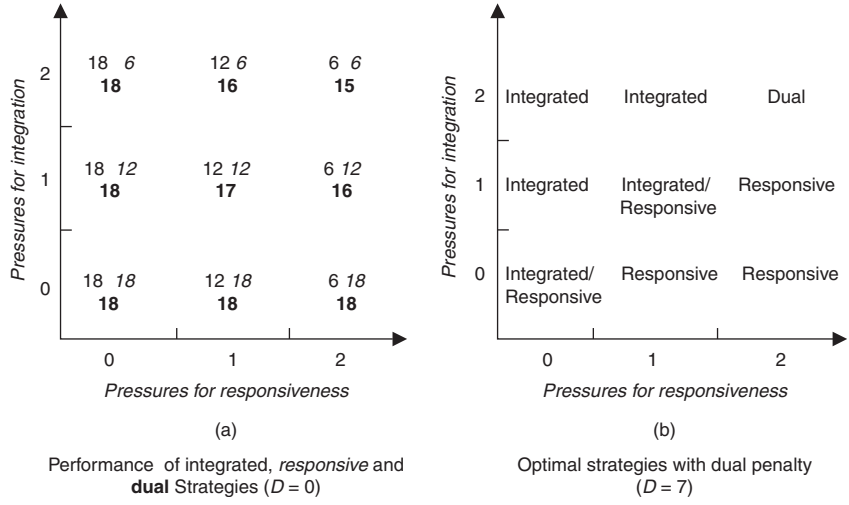

Fig. 4. A Simulated Integration–Responsiveness Grid (with $x = 1$, $k = z = 3$).

this exercise, however, is the precision and clarity it gives to the *interpretation* of integration and responsiveness pressures. Here, pressures for integration are directly derived from the unit cost function, and pressures for responsiveness from the demand sensitivities of consumers. Note also that the model contains both complementarities and trade-offs between *IB* and *RB*: a high margin (*IB*) makes each unit of demand (*RB*) more valuable, but to obtain a high margin some demand has to be sacrificed.

4.2. The Performance of the Dual Solution

We have seen how y and e affect the balance between integration and responsiveness pressures by scaling the costs and benefits of divergence. However, the attractiveness of the dual strategy is determined not only by the scale of the *IB* and *RB* curves but also by their shape, i.e., whether or not they are concave upwards as they are in Fig. 3. If they are *not* then neither is the profit function (being a sum of *IB* and *RB*) and in that case the dual solution will be no more attractive than the integrated or responsive one. The shape of the profit function, in turn, depends on the parameters z and k.

To see this, we can set $x = 1$ and differentiate the profits of the three solutions (Eq. (8)) with respect to z and k, using the envelope theorem in the case of the dual solution. This gives us the following results

$$\begin{aligned} \pi_k^{\mathrm{I}} &= \pi_z^{\mathrm{I}} = \pi_k^{\mathrm{R}} = \pi_z^{\mathrm{I}} = 0 \\ \pi_k^{\mathrm{D}} &= -2ek\ln(1-\sigma)(3-y\sigma^z) \geq 0 \\ \pi_z^{\mathrm{D}} &= -2yz\ln\sigma(3-e(1-\sigma)^k) \geq 0 \end{aligned} \tag{10}$$

As long as $0<\sigma<1$, the inequalities are binding. It seems, then, that the parameters z and k are direct determinants of the attractiveness of the dual strategy by affecting performance only at *moderate* degrees of divergence and maladaptation – at compromise positions in the IR trade-off. How do we interpret z and k in economic terms, then? Fig. 5 shows the way that the two parameters affect margin and demand, respectively.

4.2.1. Economies of Scale vs. Economies of Scope

The first panel of the figure shows how the margin of the firm varies with divergence under different assumptions about z. When z is low (0.2), unit costs increase (and margins hence fall) rapidly as soon as the two product designs diverge, but flatten out at higher levels of divergence. In this case, the products have to be almost identical in design to enable low cost production.

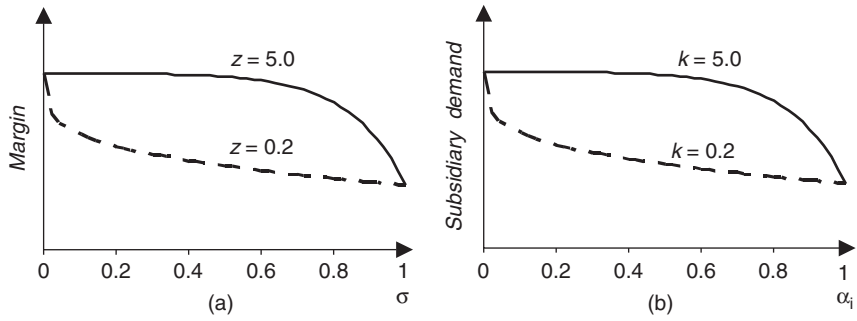

Fig. 5. Comparative Statics of z and k.

If they are not, it makes little difference whether they are only somewhat different ($\sigma = 1/2$) or dramatically different ($\sigma = 1$); perhaps, because they have to be produced separately in smaller batches anyway. This interpretation of the production function suggests the presence of economies of scale.

When z is high (5.0), on the other hand, unit costs do not initially increase much with divergence and margins therefore stay high. As long as the products are merely "sufficiently identical" – perhaps based on the same technologies, manufactured on the same equipment, or requiring similar skills – synergies and thereby cost savings are realized. It does not really matter whether the products are completely identical ($\sigma = 0$) or moderately different ($\sigma = 1/2$). However, if the products become too different (σ approaching 1) these synergies disappear and margin falls. This interpretation is closer to economies of scope.

The implication of this is that economies of scope favor the dual strategy, while economies of scale do not. With economies of scope ($z = 5.0$), the dual solution can achieve some responsiveness while sacrificing very little of the integration benefit. With economies of scale ($z = 0.2$), on the other hand, we cannot get even a moderate degree of responsiveness without sacrificing most of the integration benefit.

4.2.2. National Standards vs. Local Tastes

In the second panel of Fig. 5, we can see how k moderates the relationship between maladaptation and subsidiary demand. When $k = 0.2$, the demand of the firm in a given market decreases rapidly as soon as maladaptation rises above 0. In other words, the costs of maladaptation are incurred as soon as the product deviates just slightly from the locally required strategies. This could be the case if, for instance, different technological, linguistic,

or other types of standards in different countries are the main source of responsiveness benefits, so that exact specification of the product is required. With $k = 5.0$, on the other hand, low to moderate degrees of maladaptation have little impact on demand: as long as the product is sufficiently close to the locally required products, demand will be high. This could be the case if cultural preferences and tastes were the main source of local responsiveness benefits. The implication here is that local tastes favor the dual solution while national standards do not.

4.2.3. The Best of Both Worlds or Between Two Chairs?

The comparative statics of z and k is perhaps best illustrated by contrasting two extreme cases. Assume $x = 1$, $e = y = 2$ and $D = 0$. Under these assumptions, the margin of the firm and the demand in each subsidiary ranges from 1 to 3, and both the responsive and integrated strategies earn profits of 6. With economies of scope and local tastes ($z = k = 5.0$), then, a compromise position in the IR trade-off ($\sigma = 0.5$, $\alpha_i = 0.5$) will virtually get us "the best of both worlds" with margin and subsidiary demand both at 2.94, almost the full benefits of integration and responsiveness, and profits at 17.29. With $z = k = 0.2$, on the other hand, a compromise position strategy performs badly with margin and subsidiary demand both at 1.26 and profits only at 3.17. So when economies of scale and local standards prevail, trying to achieve both global integration and local responsiveness simultaneously will only land us "between two chairs."

5. CONCLUSIONS AND IMPLICATIONS

This paper has presented a general-function model of the IR trade-off at the choice variable level as well as a parameterized special case of this model. As its most significant contribution, the model gives a highly stylized but also very concrete and unambiguous account of how integration and responsiveness benefits could be determined. The model contains, unlike previous conceptual models, a set of explicit assumptions under which the antecedents to the two types of benefits follow logically. Such antecedents are of paramount interest to both researchers and practitioners: researchers must operationalize them to predict behavior and performance, and managers use them as inputs in decisions of critical strategic consequence.

As an example, the model implies that variables like R&D or advertising intensity would have very little impact on the optimal position in the IR trade-off. A firm may have a high R&D or advertising budget because it

pursues an integrated strategy with high investment in globally leveraged technologies or brands – or because it pursues a locally responsive strategy, using these budgets to research and advertise a highly diverse set of technologies or brands. What *would* make global integration attractive, however, would be if such diversity was costly: if the foregone economies of scale and scope resulting from diverging strategies were high. This could be measured either using detailed cost data or perceptual measures obtained from managers.

Similarly, and more surprisingly, market heterogeneity did not qualify as a real pressure for responsiveness. The markets of the firm may be highly heterogeneous in terms of preferences, yet the firm could be wise to insist on standardized strategies simply because it would be too expensive to adapt locally to this diversity. In that sense, market heterogeneity could favor an integrated strategy as well as it could a responsive one – the balance between the two forces is determined exclusively by demand sensitivities to deviations from locally required strategies and cost sensitivities to international strategy differences. Hence, the more accurate source of responsiveness pressures are the costs of deviating from the local standards and tastes; costs that could be measured with perceptual scales or by the use of marketing techniques such as conjoint analysis.

Finally, and in answer to the main research question of the paper, the model gives an interpretation of what it means to achieve "both integration and responsiveness" at the functional or task level. At this level, firms should see integration and responsiveness benefits neither as two independent dimensions, nor as a dichotomous either/or choice. Instead, integration and responsiveness are opposites on each end of a continuous scale, and under certain conditions a large share of both types of benefits can be achieved at a position somewhere in the middle of that scale, rather than at the extreme positions. This suggests that the relationship between integration/responsiveness and performance may be curvilinear rather than linear, and performance tests based on the IR framework should therefore include a quadratic form of these variables. Using the example of product positioning, a parameterized special case showed that a strategy of dual objectives is indeed more attractive when pressures for both integration and responsiveness are above a certain threshold level, as predicted by existing models. Unlike in these models, however, knowing the magnitude of integration and responsiveness pressures (e and y) is not enough to predict the performance of the dual strategy in this model. We also need to know if these benefits exhibit increasing or decreasing returns at intermediate levels of divergence (as determined by k and z). The parameterized model showed

that the dual strategy is most attractive when integration benefits are caused by economies of scope rather than economies of scale, and when local tastes rather than national standards are the source of responsiveness benefits.

The special case of the model was designed to replicate the production-oriented interpretation of the integration and responsiveness found in much of the conceptual literature, and as such it is well suited to compare with and inform on those theories. However, a different parameterization or a different functional form may yield different results. Also, the scope of the model goes beyond just production – in fact, any choice variable characterized by international interdependencies and heterogeneities will give rise to integration and responsiveness effects. Therefore, the general-function model can potentially be used as a template for more informative models of international advertising, procurement, R&D, pricing, distribution, etc. In fact, the approach described in this paper is also sufficiently general to potentially incorporate, albeit at a very broad level, the benefits of learning. To see this, let the objective function of the firm be "learning benefits," consisting, for example, of vertical differentiation (quality improvement of the product). Environmentally derived innovation occurs through local search and adaptation of products and processes to the local environment, for example, by working closely with demanding customers in a location. If the local strategies are unresponsive to the host country environment, no new knowledge is gained, so the maladaptation of each subsidiary inhibits local learning benefits. To transfer the obtained knowledge across borders, however, some degree of integration is also necessary. Thus, strategic divergence inhibits the economies of learning: if each subsidiary follows completely idiosyncratic strategies, it would be difficult to transfer quality innovations, while some degree of standardization would facilitate diffusion of innovation. Hence, the IR trade-off in learning is a trade-off between local knowledge extraction and global knowledge diffusion – a view consistent with the results of Venaik et al. (2005) – and the dual objectives strategy obtains a balance of these conflicting objectives.

Even with such an interpretation, however, the model presented in this paper is essentially static. It works best as a model of short-term profit or present-value maximization, and factors such as government policies and competitor responses are exogenous, subsumed in the profit function faced by the firm. There is significant potential to advance the model, for example, by using game theory to model the competitive aspects of the IR trade-off or dynamic optimization to model learning. Despite the complexity and volatility facing real-world MNCs, however, the question of the nature of the

IR trade-off remains an important one, and this paper is an attempt to model that trade-off in a parsimonious way.

NOTES

1. An exception from the three-strategy typology is Bartlett and Ghoshal's (1989) fourth strategy, the "international strategy" combining low integration and low responsiveness. However, no other authors have identified this strategy – conceptually or empirically – and it was described mainly as a temporary phenomenon observed among MNCs in the early phase of internationalization. Since this paper does not deal with the process of internationalization itself, it henceforth discusses only the three "mature" strategies outlined above

2. Since this paper searches for performance implications, only IR studies with performance measures are reviewed here. See Harzing (2000) for an example of a non-performance study as well as a more extensive review of the theoretical and empirical IR literature.

3. This should be compared to the 25% that would arise by chance if there was no relationship between environment and organization.

4. Responsiveness was measured as the adaptation of the degree of formalization, centralization, and normative integration to the local environment, while integration was defined as the average use of these three subsidiary control mechanisms. However, suppose high responsiveness across five subsidiaries requires that formalization is (low, high, low, high, high). If the firm currently uses (high, high, high, high, high) it would clearly face a trade-off: as soon as it lowered formalization in some subsidiaries to increase responsiveness, it would sacrifice integration, as defined here. Note that the original paper was based on the terminology of Lawrence and Lorsch (1967) and therefore used the terms "integration" and "differentiation" rather than integration and responsiveness.

5. The question of whether firms are really "forced" or "pressured" or "driven" to take advantage of these benefits, or whether some of them can survive with suboptimal strategies for an extended period of time, is beyond the scope of this paper, which aims at the more basic (but arguably sufficiently ambitious) task of deriving the performance implications of the IR framework. A population ecology viewpoint could be evoked here: If the selection forces of the market are very strong, the strategy of the firm will be completely determined by the environment, at least in the long run; and if they are very weak, strategy is entirely at managerial discretion and so organizational heterogeneity may persist in the same industry (Carroll, 1993). In all cases between these two (probably unrealistic) extremes, the IR grid is semideterministic.

6. This expression is just one way of measuring the variation of r_i; other measures such as variance or standard deviation could also be used. However, the expression used here is the simplest measure of market heterogeneity which adequately captures the concept.

7. The profit function may also contain a set of independent variables characterizing industry, firm, or country characteristics, in order to deduce comparative-static implications. A parameterized special case in the next section will illustrate this.

8. Paradoxically, much of the international business literature assumes away these international interdependencies by treating each individual foreign market as an isolated strategic issue. This neglect of international spillover effects has been identified as one of the main research gaps, for instance, in the foreign operation mode literature (Datta, Herrmann, & Rasheed, 2002), and can be addressed using a theoretical framework like the one presented in this paper.

9. Also note that we do not need a specific strategy in the bottom-left corner of the grid. In fact, if $e = y = 0$ the firm might as well treat all its markets as one, and the IR trade-off becomes irrelevant.

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APPENDIX A

Assume without loss of generality that $r_1 < r_2$. By Eqs. (1) and (2), market heterogeneity with two subsidiaries is given by $x = (r_2 - r_1)/2$ and average maladaptation by $\alpha = (\alpha_1 + \alpha_2)/2$. Which values of s_1 and s_2 are likely to be

chosen by the firm? We can rule out any $s_1 < r_1$ and $s_2 > r_2$ since that would increase both α and σ and hence lower profits for sure compared to $s = (r_1, r_2)$. We can also rule out any $s_1 > s_2$, since that would increase both α and σ compared to $s_1 = s_2$. Thus, the arguments of the maladaptation and divergence functions are always nonnegative and we can therefore disregard the absolute value operators: divergence is given by $\sigma = (s_2 - s_1)/2$ and average maladaptation by $\alpha = (r_2 - s_2 + s_1 - r_1)/2$. Adding the two and combining with $x = (r_2 - r_1)/2$, we get $\alpha + \sigma = x$.

APPENDIX B

The assumptions of the parameterized example results in the following subsidiary profit functions:

$$\begin{aligned} \pi_1 &= \left(3 - e\alpha_1^k\right)(3 - y\sigma^z), \\ \pi_2 &= \left(3 - e\alpha_2^k\right)(3 - y\sigma^z) \end{aligned} \tag{AB1}$$

We know from the general model that $\alpha_1 + \alpha_2 = 2(x - \sigma)$. This tells us the total amount of maladaptation implied by any level of divergence, but it does not say how this total maladaptation is best allocated between the two subsidiaries. Assume that $k > 1$. This means the marginal cost of maladaptation is increasing, i.e., $\partial^2 \pi_i / \partial \alpha_i^2 < 0$ – subsidiary performance decreases at an increasing rate as we move away from the locally required strategy. With this assumption the optimal allocation must equate the marginal cost of maladaptation in the two subsidiaries, so the firm must keep $\alpha_1 = \alpha_2 \Leftrightarrow \partial \pi_1 / \partial \alpha_1 = \partial \pi_1 / \partial \alpha_1$. Otherwise, we could shift s_1 and s_2 by an arbitrary amount – we could move maladaptation from the country with a high level to the country with a low level, while keeping strategic divergence constant, realizing a profit on the margin. Hence, an optimal distribution of maladaptation at any level of divergence requires $\alpha_1 = \alpha_2 \equiv x - \sigma$. Using this knowledge, the total profit function of the firm can be stated as a function of divergence only: $\pi(\sigma) = 2(3 - e(x - \sigma)^k)(3 - y\sigma^z)$.

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THE PERFORMANCE IMPACT OF MEMBERSHIP IN A GLOBAL ALLIANCE: EVIDENCE ON THE REVENUE GROWTH RATE OF MOBILE OPERATORS

T. J. Vapola and Tomi T. Seppälä

ABSTRACT

In this paper, we use the co-opetition theory to evaluate empirically whether global alliance membership has an impact on the performance of participating firms in their respective country markets. Our sample consists of firms in the mobile telecommunications service industry, where certain firms have joined a global alliance with the motive of increasing performance in their local markets. We contrast the group of alliance members to the group pooled from all stand-alone firms in the corresponding countries. We analyse performance development longitudinally with respect to average revenue per subscriber and number of subscribers. Our findings show that there is a statistically significant difference between the alliance group and the stand-alone group in the growth rate of the number of subscribers during the period from 2001 to 2004. In contrast, there was no statistically significant difference in the growth rate of the average revenue per subscriber during the period.

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1. INTRODUCTION

The phenomenon of strategic alliances has been increasing over the past two decades (Gomes-Casseres, 1996). Strategic alliances are a diverse and popular topic in strategic management and international business (Harrigan, 1988; Hamel, Doz, & Prahalad, 1989; Ohmae, 1989; Parkhe, 1996; Eisenhardt & Schoonhoven, 1996; Khanna, Gulati, & Nohria, 1998; Koza & Lewin, 1998). In this paper, we define strategic alliances as interfirm *co-opetitive* constellations with the explicit membership of multiple firms having joint- and firm-specific strategic objectives. Strategic objectives for alliancing include achieving economies of scale and scope and limiting transaction costs (Hennart, 1988), learning (Hamel et al., 1989; Hagedoorn, 1993; Khanna et al., 1998), gaining market power (Hagedoorn, 1993), managing and sharing risk (Hennart, 1988; Hamel et al., 1989; Ohmae, 1989), creating options for future investment (Kogut, 1991), and competitive responses (Gimeno, 2004). The reasons can be offensive or defensive (Spekman, Forbes, Isabella, & MacAvoy, 1998, p. 747), and they can be interrelated.

Strategic alliances have received increasing attention as a source of differential firm performance (Teece, 1987; Harrigan, 1988; Parkhe, 1993; Hamel, 1991; Dyer, 1996; Sarkar, Echambadi, & Harrison, 2001; Gimeno, 2004). However, despite the importance of the performance impact of an alliance, it remains one of the least understood aspects of alliances (Das & Teng, 2003). It appears that limited attention has been paid to the dynamics of competition (Gulati, 1998) and to the implication of alliance involvement for performance (Lazzarini, 2003, p. 2). This paper uses co-opetition theory to evaluate empirically whether participating in a global alliance affects the performance of the participating firms in their respective country markets.

We have selected to analyse the involvement of mobile operators within a global alliance in the mobile telecommunications service industry. This industry is of particular interest because its growth is currently slowing and it is being globalised by mega-operators such as Vodafone, Hutchison, and T-Mobile. Moreover, the change from 2G to 3G technologies has increased the investment needs of the operators. Harrigan (1988) suggests corresponding contextual drivers. Thus, in this type of context, smaller regional or local players are in vulnerable positions (c.f. Eisenhardt & Schoonhoven, 1996). On the basis of the data from the Global i-mode Alliance,[1] we analyse whether there is a difference in the average increase in performance *between* two groups: alliance members and alliance non-members. Distinct member-specific attributes should induce differential performance for firms belonging to the alliance (Lazzarini, 2003, p. 9).

The remainder of the paper is structured as follows: first, we review the theory and main concepts in the existing literature. This is followed by the model development. Then the chosen methodology is explained. After that the results of the study are reviewed. Finally, the conclusions and implications for further study are drawn.

2. THEORY OF CO-OPETITIVE STRATEGY

Co-opetition theory addresses a central dilemma in alliances by simultaneously focusing on cooperative and competitive behaviour (De Wit & Meyer, 2004, p. 368); firms are regarded as utility maximisers (Hartwig, 1998). Brandenburger and Nalebuff (1996) derived the co-opetitive theory from the cooperative game theory. We assume that the strategy is about creating, appropriating, and protecting value. Game theory appears to provide a fruitful baseline for the analysis of business strategy (Nalebuff & Brandenburger, 1997) because its free-form interaction between players corresponds well with active search for value creation and appropriation opportunities (Brandenburger & Stuart, 1996, pp. 6–7). Hence, *co-opetitive strategy* refers to a firm actively seeking opportunities for value creation and bargaining a maximum value appropriation from the joint effort (Brandenburger & Nalebuff, 1996).

A co-opetitive game consists of five strategic levers operating within the value net: players, the added-value of each player, the rules of the game, the tactics used by each player in the game, and the scope of the game (Brandenburger & Nalebuff, 1996). The value net provides an interesting tool for analysing the players and their embeddedness in the external network. It also reveals that competitors and complementors play symmetrical roles (Katz, 1996). Furthermore, it redefines success from beating the competition to adding value to the firm (Hartwig, 1998); the power in any game depends on the added value (Katz, 1996). A number of studies have used co-opetitive theory in their research (Carayannis & Alexander, 1999; Bengtsson & Kock, 2000; Tsai, 2002; Kotzab & Teller, 2003; Levy, Loebbecke, & Powell, 2003; Vapola & Tossavainen, 2004; M'Chirgui, 2005; Lin & Zhang, 2005; Luo, 2005).

3. THE ADDED VALUE OF AN ALLIANCE

When studying performance, we focus on the value that is created by participating in an alliance. Brandenburger and Stuart (1996, pp. 7–8) define

value created as the difference between the willingness-to-pay of the buyer and the opportunity cost of the supplier, which is then appropriated between the players according to the differential added value contributed by each player to the game (Brandenburger & Stuart, 1996, p. 13). This is extended beyond the boundaries of the firm to address an alliance context. Spekman et al. (1998, p. 748) suggest that alliances create value through synergy as the partners achieve mutually beneficial gains that neither would have been able to achieve individually. Fundamentally, a firm can benefit from joining an alliance by capturing the positive externalities emanating from the presence of other firms in the alliance network (Lazzarini, 2003, p. 7). For a participating firm, the value added of an alliance is the share of the jointly created value it is able to bargain for itself. Within the global alliance context, value is created through firms participating in global value creation with other firms, which then has an impact by either increasing the willingness of the customers to pay or by lowering the cost structure of the participating firm vis-à-vis other firms within a particular local market.

The question of whether the alliance strategy yields a higher private value added than a stand-alone operation has received considerable attention. The initial conditions of firms participating in an alliance have an impact on the firm performance (Doz, 1996). Changing the environmental characteristics affects the performance (Harrigan, 1988). Gomes-Casseres (1996) suggests that it is dependent on the industry dynamics: where economies of scale are important, a single-firm approach beats an alliance, whereas where flexibility is needed, the alliance mode of operation is more effective. In contrast, alliancing could be used for the creation of global technology standards that allow sufficient economies of scale for the solution with network effects in the global markets. It is also suggested that the structure of the alliance (Lorenzoni & Baden-Fuller, 1995; Kleymann & Seristo, 2004), and hence the firm's position within it (Powell, Koput, Smith-Doerr, & Owen-Smith, 1999), have an impact on firm performance. Internal characteristics, such as control and trust (Mohr & Spekman, 1994; Zaheer, McEvily, & Perrone, 1998) and proactiveness (Sarkar et al., 2001) are also emphasised as key determinants for performance. Eisenhardt and Schoonhoven (1996) argue that the strategic position prior to joining alliance has an impact on the expected pay-off. Furthermore, Bleeke and Ernst (1991) suggest that alliances result in lower performance compared to stand-alone firms. However, there are also examples of the opposite: Baum, Calabrese, and Silverman (2000) found that start ups can enhance their early performance by establishing alliances. Lazzarini (2003) also found evidence that membership in a constellation enhances performance in the airline industry. Hence, there are

various drivers that have an impact on the level of firm performance in the alliance.

In the literature (Das & Teng, 2003, p. 284), discussion of the critical issues relating to performance is fragmented. This paper does not attempt to integrate the various determinants and explain why the firms that are part of an alliance perform better or worse than stand-alone firms. In short, we use the alliance involvement itself as the measured determinant for performance, regardless of its underlying determinants. This approach is in line with Lazzarini (2003).

4. MODEL DEVELOPMENT

Suppose that the firms that join a global alliance cause the partition of a set of firms within the industry into two disjoint subsets A and NA, where A stands for the alliance group and NA for the non-alliance group. Drawing from Besanko, Dranove, and Shanley (1996), let S_{itk} be the number of subscribers of operator firm i in year t and in country k, and let P_{itk} be the average price that a customer, a subscriber to the firm i, pays for the mobile telecommunication service in that country k. Furthermore, let C_{itk} denote the cost of offering such a service in country k. Thus, the value VA created for firm i belonging to subset A by providing this service in year t and in country k can be expressed as

$$VA_{itk} = P_{itk}S_{itk} - C_{itk} \tag{1}$$

Correspondingly, let VNA_{itk} denote the value created for firm i belonging to NA in country k in year t. For firm i to create value, a necessary condition, ceteris paribus, is either that P_{itk} should increase, S_{itk} should increase, or C_{itk} should decrease (possibly all at the same time).

Ceteris paribus, if an involvement in an alliance A adds value for firm i, then the yearly change in the value when joining the alliance, i.e., ΔVA_{itk}, should be higher than in the case of not joining the alliance, i.e., ΔVNA_{itk}. To be able to control for the size effect, it is convenient to measure these changes in logarithmic terms. This facilitates a relative comparison of growth rates. To be more accurate when defining the growth rates in logarithmic terms, if an involvement in an alliance A adds value to firm i, then for the growth rates of the value added from year $t-1$ to year t

$$\Delta VA_{itk} = \ln VA_{itk} - \ln VA_{i,t-1,k} > \Delta VNA_{itk} = \ln VNA_{itk} - \ln VNA_{i,t-1,k} \tag{2}$$

While value added consists of three levers (price, number of customers [or volume], and cost), we decided to further focus our quest to the revenue impact of an alliance membership. This decision was based on the following reasons. First, Kleymann and Seristo (2004, p. 143) suggest that most of the financial benefits are accrued from the revenue side within the first years of alliance membership. Second, the telecommunications industry experts we interviewed stated that the cost impact of i-mode alliance is negligible.[2] Third, the cost implications of the i-mode alliance are not available from public sources, and thus including the cost impact would compromise the objectivity of this study. On the other hand, if the alliance adds value for the customer, it should increase the willingness-to-pay of the customer[3] and the price should go up. Further, if the alliance adds value for a wider range of potential customers, the number of customers should go up. Hence, we use the following decomposition of the growth rate of the value added to two revenue components involving growth rates of the average price ΔP_{it} and the number of customers ΔS_{itk}

$$\begin{aligned}\Delta VA_{itk} &= \ln VA_{itk} - \ln VA_{i,t-1,k} = \ln P_{itk}S_{itk} - \ln P_{i,t-1,k}S_{i,,t-1,k} \\ &= \ln P_{itk} + \ln S_{itk} - (\ln P_{i,t-1,k} + \ln S_{i,,t-1,k}) \\ &= \ln P_{itk} - \ln P_{i,t-1,k} + \ln S_{itk} - \ln S_{i,,t-1,k} \\ &= \Delta P_{itk} + \Delta \ln S_{itk} \end{aligned} \tag{3}$$

A similar decomposition clearly applies to ΔVNA_{itk}. Hence, do alliance members have a higher increase in the growth rates of the average price and the number of customers compared to the reference group of non-alliance members? Jointly, these hypotheses aim at increasing our knowledge on not only the alliance's impact on the firm's market performance but, through the logic previously explained, also the alliance's impact on the firm's financial performance.

Hypothesis 1. Members of a global alliance will have a higher growth rate of the average price compared to the stand-alone firms in their respective country markets.

Hypothesis 2. Members of a global alliance will have a higher growth rate of the number of customers compared to the stand-alone firms in their respective country markets.

5. DATA AND METHODS

There are various perspectives to measuring the impact of alliance on firm performance (Das & Teng, 2003, p. 280). In this paper, we are interested in the objective measurements of growth rates for price and volume, attributed to individual firms in the local market level.

5.1. Data

We have selected to use the context of Global i-mode Alliance in the mobile telecommunications service industry between 1999 and 2004. Since mobile operators operate their services on a frequency band licensed by governments, it is easy to take account of all operators in the selected countries. Global i-mode Alliance was selected because it is the biggest[4] global horizontal alliance in the telecommunication industry. Furthermore, since this particular alliance has explicit memberships, it is easy to classify firms as members or non-members. Third, the alliance provides its members the rights to i-mode value-added services in their respective countries. Fourth, it allows us to study the performance implications of a global alliance in the country markets where operators are already currently present. Hence, the aim of i-mode alliance is well aligned with the concept of co-opetitive strategy and it makes a very interesting context for testing whether the initial expectations are met in practice.

The data come from multiple sources. Operator membership in Global i-mode Alliance is based on references by Natsuno (2003), public announcements in the NTT DoCoMo[5] website, and analyst reports.[6] Subscriber information is based on EMC cellular subscribers database. Finally, monthly average revenue per user (ARPU) figures are based on Yankee[7] and Merrill Lynch.[8] The database includes information for the period from 1999 to 2004 (included). Although there is heterogeneity in terms of the markets and resources of individual operators, telecommunications technology is fairly standardised, which facilitates comparison (c.f. Lazzarini, 2003, p. 16). Idiosyncratic features of the mobile telecommunication industry may prevent a direct generalisation of empirical results to other contexts. Nevertheless, this study aims at providing an appropriate reference to this important topic.

In contrast to Lazzarini (2003),[9] we measure the performance from launching the service: joining an alliance is not considered a sufficient condition for determining a performance impact because a firm must

subsequently launch its i-mode service and then subscribers need to adopt the service. At the time of our analysis, the i-mode service has been launched in 14 countries. However, the performance will be accumulated over several years after the i-mode service was launched in the respective country. Therefore, we excluded countries where the service was launched after 2002 in order to measure the performance improvement longitudinally. To homogenise the sample, we also excluded Japan because its NTT DoCoMo is the originator of the i-mode and it launched the service earlier than the others. It is known[10] that i-mode is successful in Japan. After these exclusions, our sample includes six countries. This gives us six firms that belong to *A* (the particular firm is one of the alliance members), and 21 that belong to *NA* (the particular firm is not one of the alliance members). These details are listed in Table 1.

The performance is measured at local country level because the members of the alliance tend to be smaller local or regional operators, and hence the local market performance is crucial. Since the multi-market competition is of less importance to most of them, it can offer more scope for global joint co-operation for value creation within the global alliance. Since we are interested in the change over time, the change in performance can be calculated for the years from 2001 to 2002, from 2002 to 2003, and from 2003

Table 1. Firms and Countries Included in the Sample.

Firm	Country	Group[a]	Firm	Country	Group
BASE	Belgium	A	Libertel	Netherlands	NA
Belgacom Mobile	Belgium	NA	Far East Tone (KG Telecom)	Taiwan	A
Mobistar	Belgium	NA	KG telecom	Taiwan	NA
Bouygues	France	A	Mobitai	Taiwan	NA
Orange	France	NA	Taiwan mobile company	Taiwan	NA
SFR (Vodafone)	France	NA	Chungwa telecom	Taiwan	NA
E-Plus (KPN)	Germany	A	Transasia	Taiwan	NA
02	Germany	NA	AT&T Wireless (Cingular)	USA	A
T-mobile	Germany	NA	Cingular	USA	NA
Vodafone D2	Germany	NA	Verizon (Vodafone)	USA	NA
KPN Mobile	Netherlands	A	Sprint	USA	NA
Orange	Netherlands	NA	T-mobile	USA	NA
T-Mobile	Netherlands	NA	Nextel	USA	NA
Telfort	Netherlands	NA			

[a]A, the alliance group; NA, the non-alliance group.

to 2004. This gives us the longitudinal performance growth rates with a sample size of $N = 81$.

5.2. Dependent Variables

We test whether there is a difference in the average price change ΔP_{itk} and the number of subscribers ΔS_{itk} between alliance and non-alliance firms. ΔP_{itk} is operationalised as a relative increase in the average revenue generated by a user, ARPU, which is calculated as a proxy for the dependent variable ΔP_{itk}. Similarly ΔS_{itk} is operationalised as an increase in the number of customers and is also used as a dependent variable. We have measured the values for the dependent variables for three periods: 2001–2002, 2002–2003, and 2003–2004, for which refer by the end year of each period, i.e., $t = 2002$, 2003, and 2004.

Using overall financial results may add for which we refer by the error to the assessment of certain strategies (Ray, Barney, & Muhanna, 2004; Lazzarini, 2003). The main disadvantage is that if operators fail to perform due to factors unrelated to their membership in the global alliance, such as changes in domestic competition, it is more difficult to control for. However, the majority of the factors unrelated to the membership are symmetrical for operators in the same country. By accounting for the relative growth rates, we assume that the majority of the factors unrelated to their membership in the global alliance are controlled for. This relative scaling also allows comparison between different operators in different countries.

5.3. Independent Variables

The *Alliance* A_i, an independent dummy variable, represents whether a firm i belongs to the alliance. When an operator i operates as a stand-alone firm in its home country, the independent dummy variable $A_i = 0$ for all $t = 2002$, 2003, 2004. When a firm i has joined the alliance and has launched the i-mode service, $A_i = 1$. We have also considered the time e*lapsed* effect, X_{it}, which at the end of year t indicates the number of months elapsed since firm i launched the i-mode service. Since we decided to include only operators that launched the service in 2002, the elapsed time $X_{it} > 0$ for all alliance companies and $X_{it} = 0$ for all non-alliance companies ($t = 2002$, 2003, 2004).

5.4. Control Variables

In order to evaluate the effect of the independent variables on the dependent variables, it was important to control for other variables that may influence the performance. First, we controlled for previously used determinants of performance: firm size and country. *Country* was used as a control variable to account for the country effect L_k; $k = 1, 2, \ldots, 6$. As the performance development can vary from country to country, each country was assigned a dummy variable to control the impact. Size was adjusted for in the study by scaling the dependent variables with the logarithmic transformation. Hence, both the size of the mobile network (in terms of number of customers) and the relative size of the firm in their local markets are controlled for through the linear transformation. Since this study was conducted in one industry only, industry-specific variables and the variation in performance caused by them can be omitted. The time varying unobserved heterogeneity is eliminated by controlling for the year effect, i.e., including the year effect Y_t, $t = 2002$, 2003, and 2004.

5.5. Method

For assessing the differences between group means, we performed analysis of covariance (ANCOVA) with fixed effects *year* and c*ountry* and with time *elapsed* as a covariate (Hair, Anderson, Tatham, & Black, 1998). This comparison of alliance member group (A) vis-à-vis non-alliance member group (NA) in respective countries indicates the effect whether participating in the alliance increases the willingness-to-pay per subscriber or increases the number of subscribers. Indirectly, it also indicates an effect on the competitive position. In other words, this addresses expectations that the joining operators have on ARPU uplift and subscriber growth.[11] Based on the decomposition in Eq. (4), we performed the ANCOVA separately for the growth rate of ARPU and the growth rate of the number of subscribers. Our model can be expressed as follows

$$\Delta Z_{itk} = \mu + A_i + Y_t + L_k + \alpha X_{it} + YL_{ik} + \beta XL_{itk} + \varepsilon_{itk} \qquad (4)$$

where Z_{itk} stands either for ARPU or the number of subscribers, μ refers to the overall mean, A_i the alliance effect, Y_t the year effect and L_k the country effect; X_{it} the time elapsed since the i-mode was launched, YL_{ik} the interaction effect between year and country, and XL_{itk} the interaction effect between elapsed time and country; ε_{itk} the error term. To assess the statistical significance of each of the effects we have run ANCOVA separately

for ARPU and the number of subscribers. The ordinary *F*-test is used for both models separately.

6. ANALYSIS OF RESULTS

Fig. 1 shows the differences in mean values of relative ARPU growth rate and subscriber growth rate between the i-mode and the non-i-mode operator groups, respectively. As the growth rate perspective is taken, figures above zero indicate growth and figures below zero indicate fall of i-mode operators' relative performance by country (*x*-axis). The figure suggests that there are differences in performance between the groups: these differences are clearly country dependent, and generally, in the case of subscriber growth rate, the positive difference increases over the time period considered. These findings are justified statistically by the ANCOVA model.

Table 2 presents the results of our ANCOVA model for ARPU. The results do not suggest any statistically significant difference in the growth rate of ARPU between the groups. Hence, Hypothesis 1 is not supported.

However, Table 3 suggests that there is a statistically significant difference at 5% level ($p = 0.04$)[12] in the subscriber growth rate between the *Alliance* and *Non-Alliance* groups and thus Hypothesis 2 is supported. For the model describing subscriber growth rate, the coefficient of determination is $R^2 = 0.618 = 61.8\%$, which can be considered to give sufficient explanatory value for the performance development in the field of strategic management research.

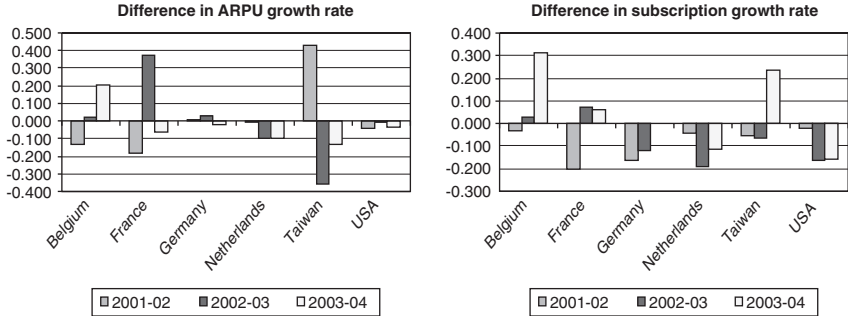

Fig. 1. Differences in the Means of the Dependent Variables between the Groups Per Country.

Table 2. ANCOVA Table for ARPU Growth Rate.

Tests of between-Subjects Effects/Dependent Variable: ARPU Growth						
Source	Type III sum of squares	df	Mean square	*F*	Significance	Observed power[a]
Corrected model	0.569[b]	24	0.024	1.369	0.166	0.848
Intercept	0.011	1	0.011	0.615	0.436	0.120
Country	0.060	5	0.012	0.697	0.628	0.234
Alliance	0.004	1	0.004	0.211	0.648	0.074
Year × Country	0.456	12	0.038	2.195	0.024	0.903
elapsed	0.003	1	0.003	0.200	0.657	0.072
Country × Elapsed	0.072	5	0.014	0.834	0.531	0.277
Error	0.970	56	0.017			
Total	1.560	81				
Corrected total	1.539	80				

[a]Computed using alpha = 0.05.
[b]$R^2 = 0.370$ (adjusted $R^2 = 0.100$). Levene's test of equality of error variances ($p = 0.019$).

Table 3. ANCOVA Table for Subscription Growth Rate.

Tests of between-Subjects Effects/Dependent Variable: Subsgrowth						
Source	Type III sum of squares	df	Mean square	*F*	Significance	Observed power[a]
Corrected model	1.304[b]	24	0.054	3.781	0.000	1.000
Intercept	0.013	1	0.013	0.904	0.346	0.154
Country	0.412	5	0.082	5.730	0.000	0.988
Alliance	0.046	1	0.046	3.199	0.079	0.420
Year × Country	0.808	12	0.067	4.686	0.000	0.999
Elapsed	0.047	1	0.047	3.293	0.075	0.430
Country × Elapsed	0.166	5	0.033	2.313	0.056	0.702
Error	0.805	56	0.014			
Total	2.820	81				
Corrected total	2.108	80				

[a]Computed using alpha = 0.05.
[b]$R^2 = 0.618$ (adjusted $R^2 = 0.455$). Levene's test of equality of error variances ($p = 0.858$).

The time *elapsed* from launching the i-mode is also statistically significant at 5% risk level ($p = 0.038$ for a one-tail test). The *country* effect is statistically very significant ($p < 0.001$), which justifies its use as a control variable, and thus there are significant differences between countries as to subscriber growth rate. The interaction effects *year* × *country* ($p < 0.001$) and *country* × *elapsed*

($p = 0.056$) indicate difference in the evolution of growth rate between the countries involved in the study. Some of these statistical significances are not very strong but considering the evidence from a limited period and range of countries, they should be considered indicative. However, as new data becomes available, the model could easily be retested with a larger data set.

7. DISCUSSION AND CONCLUSIONS

The main finding of this paper is that participation in a global alliance improves the local market performance of the participating firm. We examined this by measuring the difference in product-market performance between the group of firms belonging to a global alliance, compared with a group of firms not belonging to the global alliance. We used a sample of firms in the mobile telecommunications service industry, which allowed us to omit industry-specific factors and better control the firm-specific factors. We divided the firms into two groups: members of an alliance and non-members, i.e., stand-alone firms, based on whether a firm has an explicit contract with Global i-mode Alliance. Based on industry analyses, the firms joined the Global i-mode Alliance to increase their performance in their respective markets. Non-alliance group members were determined on the basis of whether there is an alliance member in their respective countries. We measured the effect on those firms that had launched i-mode service in 2002; this allowed us to both measure performance longitudinally and to limit the effect of different launch years.

Univariate analysis of variance was performed between the groups. We analysed the performance development before and after joining the alliance, over the years from 2001 to 2004. We analysed performance development based on the ARPU and subscriber growth rate on a country-by-country basis. When we controlled for the other main variables impacting performance, we found that the alliance group did outperform the stand-alone group during the period with respect to the subscriber growth rate. This effect increased over time. While the country and country-alliance interaction effects were significant, the results were inconclusive as to whether this supported Gomes-Casseres's (1996) argument that the alliance membership benefited the firms least in the large countries with economies of scale.

While this study solely focused on the impact of alliance membership on the revenue growth rates, it is interesting to consider here the cost implications that we excluded. Theoretically, an increase in economies of scale that is generated by an alliance should increase the bargaining power, and

hence yield the lower purchasing costs. Also, in the case of the Global i-mode alliance, the bargaining power has been listed as one of the motivations in the industry press. However, the unique feature of the i-mode Alliance is that it aims at increasing willingness-to-pay by introducing new differentiating services for its alliance members to offer end customers in their respective country markets. In practice, this means extra requirements for the devices on which these services are offered. Hence, even though the bargaining power is presumably increased, the unit-purchasing cost increases counterbalance the potential savings in this particular case. The evidence we present here reveals a gap between the promise of cost savings through increased scale that is suggested by theory and the reality of an alliance's apparently limited capabilities for realising such savings.

Like any multivariate study, the interpretation of our results hinges on how well other factors affect performance. Performance impact is typically difficult to measure objectively, since there are a large number of variables influencing it. However, in this study we included typical control variables such as country and size, while assuming that others would have a homogeneous impact on all players within the same market. We also make a reservation due to the reasonably low statistical significance of some of the results in our analysis. However, this could be due to analysing a relatively new phenomenon; the effect was expected to increase over time in line with a typical adoption curve for new technologies. Furthermore, the total population in this particular study is rather small, which did not allow us to run the model on split samples. Hence, this gives a suggestion for further study as new data becomes available.

Our focus on contrasting one alliance to non-alliance firms in only one industry also has both benefits and drawbacks. It has allowed us to obtain better firm-level data and supporting industry insights than otherwise possible, and hence be able to better control for extraneous factors. Focusing on one alliance has also resulted in more systematic data collection, but may involve a risk of bias. Further, mobile telecommunications are typically characterised by network externalities that can make alliances more attractive compared to industries in general. Hence, while the idiosyncratic features of the mobile telecommunication industry may prevent a direct generalisation of empirical results to other contexts, the generalisation to industries with similar characteristics might hold better. Nevertheless, our study provides an appropriate contribution to this important topic.

Furthermore, it is unknown how much of the performance variation is caused by the fact that just this particular alliance happens to be structured,

controlled and run in a certain manner, and whether another alliance would yield a different result to its participating members. We also acknowledge that there are other performance indicators that could be used in measuring the impact of alliance membership, such as stock market reactions on alliance announcements, cost positions, subjective managerial opinions as well as the durability and stability of the alliance membership. Further, it is acknowledged that financial measures ignore 'soft' aspect on the performance, which are difficult to measure, but may be the key drivers of firm's product-market success (Kleymann & Seristo, 2004, p. 133). These aspects also provide interesting prospects for testing the performance implications of alliance participation.

This study complements the prior research on strategic alliances as a source of differential firm performance (Teece, 1987; Harrigan, 1988; Parkhe, 1993; Hamel, 1991; Dyer, 1996; Sarkar et al., 2001; Gimeno, 2004). With the notion that the performance impact has been one of the least understood aspects of alliances (Das & Teng, 2003), we shed more light on this important aspect. The prior findings suggest that a firm that is a rival in one market may be an outstanding partner in another instance (Hamel et al., 1989; Barbee & Rubel, 1997). This was supported in our study. Second, while the existing literature also warns that collaborative arrangements are a tactical tool to be selectively employed (De Wit & Meyer, 2004, p. 375), this study adds to the evidence that the use of alliances as a method for improving performance persists (Lazzarini, 2003).

Porter (1990, p. 224) argues "alliances are rarely a solution … no firm can depend on another independent firm for skills and assets that are *central* to its competitive advantage … . Alliances tend to ensure mediocrity, not create world leadership". In the case of mobile telecommunications operator industry, the initial conditions seem to indicate that the alliance members tended to be performing slightly worse in the number of subscriber additions, relative to alliance non-members. This supports the selection bias of firms that were in vulnerable positions prior to joining alliances (Harrigan, 1988; Eisenhardt & Schoonhoven, 1996). However, the development over time shows that the alliance members are catching up in subscriber growth when the time elapses from the launch. The development over time is in line with Eisenhardt and Schoonhoven (1996): the weaker players appeared to benefit most of the alliancing. Whether the positive relative performance trend persists, or whether it just lifts the weaker players to mediocrity, it will be interesting to observe the impact of global alliances in the future landscape of telecommunications.

NOTES

1. Global i-mode Alliance is a rather new phenomenon in the industry: initiated in Japan in 1999, followed by European, Asian, and American members in the early 2000s. Members expect ARPU (average revenue per user) uplift, a rapidly growing alliance providing greater reach and collective bargaining power, access to attractive i-mode devices, a say in the i-mode technical specifications, an opportunity to use alliance bargaining power for between procurement deals, improved user experience through i-mode services, market exclusivity, multimedia fast track, and shared information (Ovum: Zoller, 2005, pp. 4–5). In June 2005, the member firms provided value-added i-mode service to 50 million customers, but only 5 million of these were outside of Japan (NTT DoCoMo, 2005). C.f. http://www.nttdcomo.com for further information on the Global i-mode Alliance.

2. Based on industry experts' insights, even though the bargaining power through the alliance is improved, it is offset by the additional costs of i-mode specific requirements.

3. The telecommunication service is a package of multiple services offered at different tariff schemes. Services can range from simple voice call service to sophisticated i-mode data services. Hence, a potential increase in the average revenue generated by the customer consists of the combination of effects.

4. While Global i-mode Alliance is the biggest global horizontal alliance in the telecommunication industry, this does not imply that it would be the only alliance in the industry.

5. http://www.nttdocomo.com.

6. Analysys Research, CurrentAnalysis, Gartner, Jupiterresearch, Ovum, Yankee Group.

7. Yankee Carrier Tracker.

8. Merrill Lynch, Global Wireless Matrix, April 2005: figures for Greece, Belgium, Taiwan.

9. Lazzarini (2003) assumes that a firm is a member of an explicit constellation in a given year if it announced its association with the group in the first half of that year. However, this adds to an error of almost one year in worst cases. Consider two firms joining in June and July, respectively. Even though there is a difference of one month in between, the analytical difference becomes one year. Furthermore, this method adds to the error because the actual month of joining is not considered. Third, this method does not take into account the lead time from the alliance membership to performance.

10. Suggested by Analysys Research: Heath, Brydon, and Pow (2004) and Ovum: Anderson (2004).

11. Expectations from Ovum: Zoller (2005).

12. The *F*-test in ANCOVA is a two-tail test. Our hypothesis was one tailed, so we divided the two-tail significance by 2 to obtain the one-tail significance, that is, e.g., for *Alliance* $p = 0.079/2 = 0.04$. We preferred this approach instead of having some of the significances two-tailed and some one-tailed.

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THE CHANGE OF SALES MODES IN INTERNATIONAL MARKETS: EMPIRICAL RESULTS FOR GERMAN AND BRITISH HIGH-TECH FIRMS

Helmut Fryges

ABSTRACT

The choice of the appropriate sales mode belongs to the firm's most important strategic decisions when entering into a foreign market. However, since the firm's available resources and capabilities change over time, it might be necessary for the firm to adjust its foreign sales mode to these changing conditions. This paper applies logistic regressions and analyses empirically the probabilities of changing between the two sales modes most frequently used by young technology-oriented exporters in Germany and the UK: direct exports and exporting via an intermediary. The estimation results confirm the importance of the firm's (intangible) resources as well as the influence of transaction-specific assets on a sales mode change.

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1. INTRODUCTION

The choice of the appropriate sales mode belongs to the firm's most important strategic decisions when entering into a foreign market. Firstly, it determines the amount of resources a firm has to invest in establishing business relationships with its foreign partners and customers. Secondly, the way of organising the firm's distribution and logistics depends crucially on the chosen sales mode. For example, if a firm decides to export directly using the Internet it will have to build-up an electronic trade platform on its server and reorganise its logistics and workplaces in order to guarantee smooth handling of the orders it receives from abroad via the Internet. Alternatively, a firm that sells its product via a foreign distributor or agent needs to provide, for example, technical training of the foreign intermediary's sales personnel and has to create incentives and monitoring mechanisms for controlling the foreign partner. Finally, the sales mode used determines the level of control the exporting firm possesses over its international transactions. If the exporter chooses a sales mode that is integrated in its hierarchical structure, like direct exporting or a foreign direct investment (FDI), this will ensure a high level of control. On the other hand, firms that export their products via an intermediary or that enter the foreign market via an acquisition or a joint venture with a strategic foreign partner have only limited control over the production and distribution of their products in the target country. Moreover, working together with a foreign partner also means that the domestic firm has to transfer its (technological) know-how to the foreign partner in order to enable it to produce or distribute the domestic firm's products. Thus, using a non-integrated sales mode implies a loss of control over the firm-specific know-how that often constitutes the firm's competitive advantage.[1]

Considering the far-reaching consequences of the choice of a sales mode, it is important that the firm selects a foreign sales mode that best suits its available resources and capabilities. However, these resources and capabilities change over time. Firms grow and shrink, accumulate financial and physical capital, develop new products, and introduce these into their domestic and foreign markets. Accordingly, it might be necessary for a firm to adjust its foreign sales mode to these changing firm-specific conditions. Otherwise, its selected sales mode might become inappropriate for selling the firms' products abroad. However, most theoretical and empirical literature on foreign sales modes is static and concentrates on the firm's entry mode, i.e., the first sales mode a firm uses in a particular target market. Subsequent changes of sales modes are neglected in most cases. The most

prominent exception is the internationalisation process model derived by Johanson and Vahlne (1977, 1990) which describes a sequence of sales modes. However, this theoretical model is rather deterministic and its only, or at least its most important explanatory variable is the experiential knowledge a firm has acquired in a foreign target market. Thus, it is questionable whether this model is able to account for all the changing conditions a firm might be faced with. Empirical analyses of sales mode changes were conducted in particular by Pedersen, Petersen, and Benito (2002) and Benito, Pedersen, and Petersen (2005), who analysed the change of foreign operation methods using a sample of Danish exporters. The authors of theses two papers emphasised both the role of factors that motivate changes of sales modes, like dissatisfaction with the currently used foreign distributor or agent (labelled "switch motivators") and factors that impede such changes, like the cost of recruitment and training of sales personnel (labelled "switch deterrents" or "switching costs").[2]

There are some parallels between this paper and the studies of Pedersen et al. (2002) and Benito et al. (2005). All three studies examine actual switches, whereas earlier studies like that of Weiss and Anderson (1992) investigated intended switches. In fact, the data on which the studies of Pedersen et al. and Benito et al. are based were collected in a way similar to the data collection procedure used for this paper. In both cases, a sample of firms was contacted by means of two surveys, enabling us to measure the exporters' foreign sales mode at two different points in time. Another parallel between the work of Pedersen et al. and Benito et al. and this paper is the underlying notion that a firm decides on a sales mode change based on a cost-benefit analysis. A firm will switch to an alternative foreign sales mode only if the (expected) benefits that result from such a change exceed the (switching) costs associated with this change (cf. the discussion below).

Despite these similarities, this paper differs from the studies of Pedersen et al. and Benito et al. in three particular ways. Firstly, it analyses changes of sales modes in a sample of newly founded technology-based firms (NTBFs) in Germany and the UK. For these firms, international business activities are regarded as crucial for growth and long-term survival since sales potentials in their domestic European markets are limited (see, e.g., Bürgel, Fier, Licht, & Murray, 2004). Moreover, firms operating in high-tech sectors presumably experience profound changes during the early stages of their life cycles. Thus, provided that the firms have internationalised, it is of special interest under which conditions firms from this particular sample change their foreign sales modes. The focus on a sample of NTBFs also implies that this paper examines changes of sales modes of small and internationally

inexperienced firms. Pedersen et al. and Benito et al. explicitly excluded such firms from their data set.

Secondly, the analyses of Pedersen et al. and Benito et al. are restricted to a sales mode change from exporting via a foreign intermediary to integrated in-house operations (e.g., direct exports or a wholly owned foreign sales subsidiary).[3] This paper also considers switches that go in the opposite direction. Finally, this paper differs from the work of Pedersen et al. and Benito et al. with respect to what is measured by the explanatory variables. The studies of Pedersen et al. and Benito et al. primarily focus on motivators and deterrents for switching that are directly linked with the (contractual) relationship between the foreign intermediary and the exporting firm (e.g., perceived dissatisfaction with the foreign intermediary, contractual restrictions). These factors are undoubtedly very important when a firm decides whether or not to change its foreign sales mode. However, such variables are not available in the data set this paper is based on. Instead, I focus on firm-specific and product-specific variables that are likely to influence the expected present value of future cost and benefits associated with various sales modes used abroad. For example, the transaction costs of exporting a highly customised product probably depend on whether an integrated or a non-integrated sales mode is used in the foreign market.

As already mentioned earlier, this paper's empirical research is based on two surveys that were conducted simultaneously in Germany and the UK. In 1997/1998, a stratified random sample of German and UK-based NTBFs founded between 1987 and 1996 was contacted by sending out a written questionnaire (see Bürgel et al., 2004). In the summer of 2003, all surviving firms from the original sample were contacted once again by means of computer-aided telephone interviews (CATI). As a result, 217 companies could be retained for the analyses. In both 1997 and 2003, just under three quarters of the firms sampled had international sales. The two most frequently used sales modes were direct exports and exporting via an intermediary. Our results show a high persistence in the chosen sales mode over time, probably because of the existence of sunk costs the exporter had to pay when entering into a foreign market, because of binding contracts the exporter made with its foreign distributors or customers, or because of switching costs associated with a sales mode change. Nevertheless, we observe changes from direct exports to exporting via an intermediary as well as transitions in the opposite direction. The former mode of transition took place primarily in the period between target market entry and the time the first survey was conducted, whereas transitions from an intermediary to direct exports were observed primarily in the period between the two surveys.

This paper applies logistic regressions to analyse the probabilities of these two modes of transition. The results confirm the importance of a firm's physical and intangible resources as well as the influence of transaction-specific assets on a sales mode change, according to the hypotheses derived from the literature. However, especially during the early stages of a firm's international engagement, the effects of these theoretically derived factors are often dominated by the existence of traditional distribution channels and by additional strategic and structural considerations that are not covered by our data. Consumer goods, for example, are traditionally sold via intermediaries. Thus, this sales mode is also preferred abroad. Moreover, young high-tech firms often decide to use an intermediary since it is the only way of coming into contact with foreign customers, even if a non-integrated sales mode does not optimally suit the exporter's resources.

Section 2 of the paper reviews the main theoretical models derived from the literature to explain the sales mode choice in foreign markets. The data used for the empirical analysis as well as some descriptive statistics are presented in Section 3. The econometric implementation is described in detail in Section 4 and the estimation results are discussed in Section 5 and Section 6 concludes.

2. THEORETICAL BACKGROUND

Firms decide on a change of their sales modes based on a cost-benefit analysis. Generally speaking, a profit-maximising firm benefits from a sales mode change by means of a higher (expected) profit from its export activities in comparison to the profit the firm would earn if it did not change its sales mode.[4] Conversely, a change of the sales mode currently used is associated with switching costs. As Pedersen et al. (2002) pointed out, a firm will only change its sales mode if the expected increase in profit more than offsets the anticipated switching costs. I will discuss switching costs at the end of this section. At first, however, I will focus on those factors that are likely to have an impact on the benefit of a sales mode change.

The benefit of a sales mode change is reflected by the profits earned abroad. These profits depend on the chosen foreign sales mode in various ways. On the one hand, the sales mode used influences the revenues generated in a foreign destination country. If the domestic firm exports its products via a foreign intermediary, it may profit from the intermediary's local-market knowledge and existing contacts with potential foreign customers. Switching from an integrated sales mode to exporting via an

intermediary may thus increase the domestic firm's revenues. On the other hand, the exporter's profit will rise if the sales mode change leads to a reduction of the costs associated with selling the firm's product in the foreign market. For example, a foreign intermediary may sell the exporter's product in a far distant market at lower costs than the exporter's own, home-based sales personnel. However, exporting via an intermediary may induce higher monitoring and controlling costs. Changing from exporting via an intermediary to direct exports may reduce these costs.

Whether or not one particular sales mode is superior (read: more profitable) to alternative ways of distributing the firm's products abroad obviously depends on firm-specific variables. Several theories have been developed in the literature which provide us with hypotheses on how the decision on the optimal sales mode is affected by firm-specific variables. Although most of these theories are static and intend to explain either the firm's entry mode decision or the choice of the optimal sales mode at a particular point in time, they might nevertheless be useful in a dynamic context. The importance of static theories for explaining changes of sales modes becomes apparent when we consider that the static models' explanatory variables might fluctuate over time. For example, a sales mode that was optimal at the time of foreign market entry might lose this property if the exporter experiences profound changes in its firm-specific variables over time. In this case, it might be optimal for the firm to switch its sales mode and adjust it to the renewed conditions (Calof & Beamish, 1995). Changes in the explanatory variables which were highlighted by the static theories might thus induce switches of the foreign sales modes used.

The main (static) theories of firms' foreign market entry mode choice are summarised by Malhotra, Ulgado, and Agarwal, (2003), who synthesised these different theories in order to derive a multi-theoretical framework of internationalisation and entry mode choice. Although the primary focus of the framework of Malhotra et al. is on entry mode, the authors themselves pointed out that "the preentry and postentry processes of internationalization are implicitly embedded in [their] conceptual framework" (Malhotra et al., 2003, p. 1), thus emphasising the relevance of the theories reviewed for analyses with a longer-term perspective. The theories reviewed include internationalisation process theory, the resource-based view (RBV) of the firm in which theories of organisational capabilities are rooted and transaction-cost analysis (TCA) theory.[5]

Before summarising these three theories, two notes have to be made. Most models investigating foreign market sales modes consider large companies that have to choose, for instance, between exporting and FDI. Even in the

case of internationalisation process theory where a small firm starts its international business activities with no regular exports and a low resource commitment (see below), the final stage is FDI and foreign production – assuming continuous firm growth during the internationalisation process. However, the majority of firms stay small, never growing into a multinational firm with foreign subsidiaries. Nevertheless, the arguments derived in the existing theories remain appropriate; although when examining young and small firms, we distinguish only between two alternative ways of exporting (direct exporting to end-users versus exporting via an intermediary). Further, it should be noted that in the following the decision whether to export or not is taken as given, i.e., only the group of exporters will be considered. There are several theoretical and empirical studies that examine individual firms' export market participation (e.g., Roberts & Tybout, 1997; Bernard & Wagner, 2001; Bernard & Jensen, 2004; or for this paper's firm sample, Fryges, 2004a). Moreover, some of the theories discussed below are also appropriate for deriving firm-specific variables that are assumed to influence the export decision. Thus, the decision on the optimal entry mode might not be independent of the decision to sell abroad. This possible correlation will nevertheless be neglected.

One of the most influential theories is the internationalisation process model developed by Johanson and Vahlne (1977, 1990). They regard internationalisation as a gradual process in which firms incrementally increase their commitment in foreign markets. The commitment of resources to a foreign market increases knowledge of that market. The internationalisation process is therefore combined with a dynamic learning process over time, during which the firm acquires experiential knowledge about the foreign market. The internationalisation process model is the basis of the so-called "stage" models of internationalisation (e.g., Bilkey & Tesar, 1977; Bilkey, 1978). In these theories, the internationalisation behaviour of a firm is linked with different stages of the firm's life cycle. A firm goes through the following stages: (i) no regular exports; (ii) exports via an intermediary; (iii) foreign sales subsidiary; (iv) foreign production (FDI). Thus, a firm chooses a sequence of foreign sales modes in order of increasing resource intensity.

The most important criticism of the internationalisation process model and especially of stage theories is their quasi-deterministic character (Reid, 1983). The argument is that firms can and will decide on an entry mode and on expansion of their international activities contingent on market conditions. There is no need to proceed in the incremental way described by the model. Johanson and Vahlne have themselves already listed three exceptions where firms are likely to deviate from the gradually expanding commitment

predicted by their model. Firstly, large firms may have enough resources to take larger, i.e., more resource-intensive internationalisation steps. Secondly, relevant knowledge that reduces uncertainty in a foreign market can be acquired by means other than one's own experience, for example, by employing an internationally experienced manager. Finally, if market conditions in different foreign markets are homogenous, firms may generalise experience gained in one market to make larger internationalisation steps in another.

The RBV interprets a firm as an idiosyncratic bundle of assets (physical resources as well as intangible resources like know-how, experience or tacit knowledge). Since physical assets are relatively easily obtained or imitated, a firm differentiates itself from its rivals by the intangible resources it possesses (Penrose, 1959; Wernerfelt, 1984). Based on the RBV, Madhok (1997) developed the organisational capability (OC) perspective of the firm. The OC framework proposes that a firm's entry mode depends on the nature of the resource advantage a firm possesses. If a firm's advantage is inimitable and difficult to transfer to other firms, such as intermediaries, without loss in value (e.g., tacit knowledge), the exporter will prefer a high level of control over transactions (hierarchical structure, internalisation[6]). In contrast, if the firm's routines and strategies (i.e., its idiosyncratic way of doing business) are highly specific and thus difficult to transfer to a foreign environment without loss in value, sales via an intermediary will be the favoured sales mode. Madhok called this the "locational effect" (Madhok, 1997, p. 48).

Obviously, the internationalisation process model and the OC framework both emphasise the role of the firm's intangible assets (in particular, experiential knowledge) for its choice of the optimal sales mode. However, whereas the former theory only distinguishes between different sales modes according to the level of resource commitment, the OC framework differentiates by the level of control, i.e., whether transactions are carried out internally or whether a third partner is involved.

According to the TCA theory, the optimal foreign market sales mode is chosen by minimising the transaction costs (cf. Williamson, 1985). Anderson and Gatignon (1986) described the choice of sales mode as a trade-off between control (the benefit of internalisation) and the costs of resource commitment (the costs of internalisation) under conditions of risk and uncertainty. The authors derived several propositions on how transaction-specific assets may influence the desired level of control. A high level of control will be preferred if a firm's product is technically sophisticated (i.e., it incorporates higher proprietary knowledge), is unstructured and poorly understood, requires intense product customisation, or can be classified as

an immature product. Novel technology that is incorporated in a (new) product is often not yet codified and therefore difficult to transmit to an intermediary. Thus, direct exporting is preferable.[7] Intense product customisation demands close contact to customers, with the result that the decision-maker (i.e., the domestic firm) relies heavily on these working relationships with its key customers. It is proposed that the domestic firm is interested in controlling these important relationships.

In addition to transaction-specific assets, Anderson and Gatignon hypothesised how external and internal uncertainty affect the entry mode decision. External uncertainty is related to a firm's environment and is typically labelled "country risk" (e.g., political instability, economic fluctuations). Anderson and Gatignon argued that in the absence of transaction-specific assets, a low-control entry mode is appropriate. The domestic firms are able to retain flexibility and shift country risk to their foreign partners since the latter can easily be replaced if the outcome is unsatisfactory. If, however, transaction-specific assets, as described above, are prevalent, switching between different foreign partners is expensive, making a partner nearly irreplaceable. These difficulties in selling a technically sophisticated product abroad are intensified in an uncertain environment. Thus, Anderson and Gatignon hypothesised that the *combination* of transaction-specific assets and external uncertainty leads to a higher degree of control. Internal uncertainty describes the lack of experience in international business activities firm managers might perceive. Moreover, internal uncertainty is higher, the greater the sociocultural distance is between its domestic market and the foreign market entered by the firm. A low-control entry mode, for instance an intermediary, will be preferred if internal uncertainty prevails.[8]

The main limitation of the TCA theory is that, in reality, firms do not evaluate the benefits of internalisation solely on the basis of the reduction of transaction costs. Other considerations like the desired penetration of the foreign market might be relevant as well. If these motives are taken into account, firms will arrive at different entry mode choices (Andersen, 1997; Madhok, 1997).[9]

The theoretical models reviewed are complementary rather than substitutable. They contain some of the same explanatory variables, although the argumentation as to how these variables affect the firms' entry mode choice differs. It is thus not surprising that all the theories reviewed found empirical support (internationalisation process model: Barkema, Bell, & Pennings, 1996; Delios & Henisz, 2003; organisational capabilities: Madhok, 1998; Ekeledo & Sivakumar, 2004; Bürgel & Murray, 2000; transaction-cost

analysis: Hennart, 1991; Erramilli & Rao, 1993). The validity of a theory depends, among other things, on the sector and size of the firms that have been examined.

Most research on entry mode choice concentrates on manufacturing firms. However, the data set examined in this paper contains manufacturing firms as well as service firms. Services differ from manufactured goods. They tend to be personnel-intensive, inseparable (production and consumption are geographically and temporally linked), and perishable (services cannot be stored). Theories that were developed to explain the entry mode choice of manufacturing firms are therefore not necessarily also applicable to service firms. Brouthers, Brouthers, and Werner (1996) analysed the entry mode selection of small software firms in the United States. The authors stressed that software firms in their sample behave like larger manufacturing firms. Since software is produced in the domestic country and can be transferred as a disk or via the Internet, software is indeed separable and not perishable. Therefore, it is questionable whether these findings are transferable to other service sectors.

Erramilli and Rao (1993) modified the TCA theory approach in order to consider the special characteristics of service firms. They hypothesised that inseparability causes additional costs and risks that have to be borne either by the firms themselves (an integrated entry mode) or by the chosen foreign partner (a non-integrated mode). According to Erramilli and Rao, a firm chooses a higher degree of integration, the higher the transaction-cost specificity of the firm's service is (e.g., if the firm offers a technically sophisticated service).

Neither the RBV of the firm nor the internationalisation process model was developed to account for the entry mode choice of service firms. However, whereas the notion of the RBV and Madhok's OC framework are also appropriate to explain foreign sales modes of service firms, the internationalisation process model is less valid in service industries, especially in technology-oriented sectors. Bell (1995) claimed that there is only little empirical support for the view that software firms increase their engagement in one particular foreign market in small incremental steps. The growing commitment to exporting is expressed by an expansion into new destination countries rather than by an increasingly resource-intensive sales mode in one market. Sharma and Johanson (1987) demonstrated for a sample of Swedish technical consultancy firms that the latter bypass some of the incremental steps proposed by the stage models since "resource commitments are of minor significance" for them (Sharma & Johanson, 1987, p. 28). Of course, there are services for which an international engagement might

entail large-scale investments (e.g., hotels or hospitals). For software and consultancy firms, however, comparatively cheap sales modes are available (e.g., transferring a digital document via the Internet), allowing firms to expand their engagement in a foreign market without a large-scale commitment of physical resources.

As pointed out at the beginning of this section, a firm will change its sales mode if the benefits of a sales mode change exceed the switching costs. The theories reviewed above are suitable for identifying firm-specific variables, which are likely to have an impact on the benefits an exporter may gain from a sales mode change. Moreover, changes in these firm-specific variables may induce a sales mode switch since such changes alter the (expected future) benefits associated with the sales mode currently used. Replacing the firm's foreign operation method is, however, not without costs. Pedersen et al. (2002) summarised four types of switching costs. Firstly, a firm that terminates its relationship with a foreign intermediary prior to the expiration of the contract period may be forced to pay compensation to its foreign partner (severance payment). In addition, lawsuit expenses may occur (Petersen, Benito, & Pedersen, 2000, p. 52). Secondly, a sales mode change may result in a loss of foreign revenues. Particularly in the case of young and small exporters like those in our sample, foreign customers may not trust the exporting firm. The use of an intermediary is then the only way of coming into contact with foreign customers. As a consequence, customers' loyalty is related to the foreign distributor or agent and not to the exporting firm. If the exporter terminates its relationship with the foreign intermediary and switches to an integrated sales mode, it is likely that the exporter will lose a substantial number of customers and experience a decrease in foreign sales – at least temporarily. On the other hand, if the exporter changes from an integrated to a non-integrated sales mode its foreign customers might suspect that the new distributor cannot offer the same quality of customer services previously provided by exporter's own sales personnel. This problem is particularly relevant in the case of technically sophisticated products and may also lead to the loss of a certain number of foreign customers.

Thirdly, a sales mode change is associated with search, recruitment, and training costs. If the exporter switches from exporting via an intermediary to direct exports it will have to recruit and train new marketing and sales personnel. Further, the exporter will have to gather information about the foreign destination country and carry out a marketing campaign. In the case of a sales mode change in the opposite direction, the exporter will have to bear the costs of searching for an appropriate foreign partner and training the intermediary's sales personnel. Finally, after changing to a new foreign

sales mode the exporter lacks knowledge and experience on how to fully exploit the advantages of the new sales mode. Thus, the exporter will probably make initial failures. Pedersen et al. (2002) denoted these as "foreign operation learning costs".

The existence of switching costs may deter firms from changing their sales modes provided that the switching costs exceed the expected increase in profits that result from a sales mode change. Moreover, the switching costs a firm has to pay might be regarded as sunk costs. Considering further that selecting an appropriate sales mode is a decision made under uncertainty, this induces an option value of waiting: even if the current sales mode is not optimal according to a cost-benefit analysis, it might be best to retain the present sales mode in order to avoid (sunk) costs of switching back in the foreseeable future. This leads to a spell of inaction similar to the model of export market participation as developed by Roberts and Tybout (1997). This phenomenon is known as "hysteresis" (Dixit, 1989). Thus, we expect to observe a relatively high persistence over time in the selected sales modes.

Although switching costs are undoubtedly important for the decision on changing the foreign operation method, they are unfortunately not directly covered by the variables in our data set. However, some variables indirectly measure certain types of switching costs as summarised above. For example, if the firm exports a technically sophisticated product this will increase training costs for (foreign intermediaries' or the exporters' in-house) sales personnel. Our data set includes variables that measure the technology incorporated into the firms' products.

3. DATA AND DESCRIPTIVE ANALYSIS

This paper's empirical analysis examines changes of international sales modes of technology-based firms in Germany and the UK. Technology-oriented firms are identified using the definition of high-technology manufacturing sectors in the UK established by Butchart (1987). He provided a definition based firstly on the ratio of R&D expenditures to sales and secondly on the share of employees working in R&D. Using this definition, Butchart identified 19 UK 1987 SIC codes, which were translated into the NACE Rev. 1 code and are listed in detail in Table 1. The table defines four aggregated manufacturing sectors and augments Butchart's list with a number of selected service sectors (cf. Bürgel et al., 2004).

The data for this paper's empirical analysis result from two surveys simultaneously carried out in Germany and the UK. The source data set

Table 1. Definition of High-Tech Sectors.

Aggregated Industries Used	NACE Rev. 1	Short Description According to NACE Rev.1
R&D-intensive service industries	64.20; 72.20; 72.30; 72.40; 72.60; 73.10	Telecommunication, computer programming and software services, data processing, miscellaneous computer services, R&D in natural sciences and engineering
ICT-hardware	30.01; 30.02; 32.20; 32.30	Office equipment; computers and other information processing equipment; television and radio transmitters and apparatus for line telephony and line telegraphy; television and radio receivers, sound or video recording and reproducing apparatus
Engineering industries	33.20; 33.30; 33.40	Electronic instruments and appliances for measuring, checking (except industrial process control); electronic industrial process control equipment; optical instruments; photographic equipment
Health and life sciences	24.41; 24.42; 33.10	Pharmaceutical products and preparations; medical and surgical equipment and orthopaedic appliances
Other high-tech manufacturing	24.16; 24.17; 31.10; 31.20; 32.10; 35.30	Plastics and synthetic rubber in primary form; electric motors, generators and transformers; electricity distribution and control apparatus; electronic valves, tubes and other components; aircraft and spacecraft manufacturing

Source: Manufacturing sector: Butchart (1987); service sector: Bürgel et al. (2004).

originates from Dun & Bradstreet in the UK and Creditreform[10] in Germany. Using these databases, all firms with at least three employees in 1997 that were operating in one or more high-tech sectors as defined by Butchart (1987) and having been founded as legally independent companies[11] between 1987 and 1996 were selected. This resulted in a population of 3,562 firms from the UK and 5,045 from Germany. A random sample of 2,000 firms was drawn from each country's population, stratified by size class, sector (manufacturing versus services), and, for Germany, by region (Western and Eastern Germany).

The firms were first contacted in winter 1997/1998 via a written questionnaire. The first survey was carried out by the London Business School in the UK and the Centre for European Economic Research (ZEW) in Germany. Three hundred and sixty two completed questionnaires were returned from the UK along with 232 questionnaires from Germany, resulting in a combined net sample of nearly 600 NTBFs from the two countries. The net sample showed no bias with respect to age, size, or sector when compared with the random sample. A bias with respect to internationalisation behaviour could, however, not be ruled out.[12]

In order to determine development and status of internationalisation of this sample of 600 NTBFs, a joint research team from the University of Exeter and the ZEW prepared a new survey in which all the firms that had previously responded were to be contacted a second time. In 2003, the companies from the original sample were an average of 12 years old. Thus, some of them were no longer definable as new technology-based firms.[13] Considering this notion, we shifted our interest from analysing newly founded firms to a more longitudinal perspective of firm development. To determine the target sample of the second survey, all former respondents that turned out to be mismatches (e.g., non-high-tech firms, non-independent foundations) were first excluded. We then eliminated each German firm labelled in the database of Creditreform as "dead" (due to bankruptcy as well as voluntary firm closure) at the beginning of 2003. In the UK, firms that could be identified as dead by the researchers themselves were also excluded from the target sample. It turned out that about 25% of the firms had already dissolved. As a result, we produced and subsequently contacted a final target sample of 188 German and 250 UK-based firms that had responded to the first survey.

The second survey was conducted in 2003 via CATI. The research team decided on a telephone survey because, due to the limited number of former respondents that made up the target sample, the assurance of a relatively high response rate and thereby a sufficiently high number of observations was necessary to obtaining reliable econometric results. Fortunately, in both the UK and Germany, the response rate exceeded 50%, giving us a pool of 244 completed interviews. After performing several consistency checks, 217 companies were retained in the data set for econometric analyses.

On an average, 26 employees worked in the sampled firms in 2003. Applying a *t*-test proves that the number of employees of exporting firms significantly exceeds the number of employees of firms with only domestic sales both in Germany and the UK. Investment in R&D is of major concern to technology-oriented firms. In 2003, the firms in our sample spent on an

average 12.8% of their total sales on R&D. Similarly to firm size, the mean R&D intensity of firms with international sales is significantly higher compared with the mean of non-exporting firms. Interestingly, this significant difference between exporters and non-exporters with respect to their R&D activities can only be observed based on the data of the second survey in 2003. Comparing R&D activities in 1997, i.e., at the time of the first survey, no significant difference in the mean R&D intensity could be found. Both exporters and non-exporters spent about 15% of total sales on R&D. Obviously, during the period between the two surveys, R&D activities became a distinctive characteristic by which an internationally oriented firm discriminates from its domestic-oriented competitors.

In both countries, more than two-thirds of the respondent firms had international sales. Even in the service sector, the majority of firms (mainly software firms) turned out to have exports, although the percentage of firms with foreign sales is smaller than in any aggregated high-tech manufacturing sector. There was a slight increase in international engagement between 1997 and 2003. The overall share of exporting firms increased from 72% in 1997 to 74% in 2003. Although there is a high persistence in the individual status of internationalisation, quite a high number of firms changed their internationalisation status, leading to entry and exit over time.[14] Nearly 12% of German and 8% of UK-based firms left the foreign market between 1997 and 2003. During the same period, 14% of German firms and 8% of firms sited in the UK entered the international market. Thus, German high-tech firms more frequently change their internationalisation status, whereas UK firms show a higher persistence in their export behaviour.

The number of foreign countries to which internationally active firms sold their products and services also increased between 1997 and 2003. At the time of the first survey, UK-based exporters had sales in an average of just over nine foreign countries, whereas German firms supplied seven foreign countries on average. These numbers rose up until the second survey in 2003 to 19 foreign destinations for UK firms and just under 12 foreign countries for German firms. Similarly, both UK-based and German exporters were able to enlarge the share of foreign sales in their total sales: The average share of total turnover of UK (German) exporters generated by foreign sales rose from 39% (24%) in 1997 to 50% (33%) in 2003. Obviously, the degree of internationalisation, measured by the number of foreign countries entered as well as the share of foreign sales, was higher for UK-based exporters than for their German counterparts.[15] As Bürgel et al. (2004) argued, this might be the case because British exporters are pro-active in exploiting the sales potential of foreign markets and/or because German firms are less

dependent on the international market because of the larger size of their domestic market.

There are also differences between German and UK firms with respect to the geographical focus of the firms' foreign destination countries. The two surveys this paper is based on asked the exporters to indicate the three most important countries (in terms of their contribution to total sales) where they had international sales. Aggregating these countries shows that countries from the European Union (15 member states, plus Switzerland, Norway, and Iceland [EU 15]) represent the main regional group for both German and UK-based firms. Countries from the EU 15 are, however, more important for German than for UK firms. On the other hand, more distant markets are of greater importance for UK firms than for their German counterparts. This is partly due to the more prominent role of English-speaking countries from the British Commonwealth (Australia, South Africa, Canada).

Comparing the regional distribution of each nation's three most important countries in 1997 and 2003, a similar pattern emerges between the two points in time. However, whereas the role of countries from the EU 15 had increased for German firms, the share of EU 15 member countries among the three most important destinations had fallen for UK firms. Moreover, for German firms Asian markets became more prominent and, somewhat surprisingly, the role of Eastern European markets decreased in return. For UK firms, the share of both North American and Asian markets increased. The United States presented the single most important foreign destination for UK firms both in 1997 and 2003. The most important country for German firms in 1997 was Austria. In 2003, this place was occupied by Switzerland.

Referring to the three most important target countries, the first survey asked the firms' representatives to indicate the sales modes used to sell to these three countries at the time of market entry and in 1997. The second survey also referred to the three most important markets the companies had identified in 1997. Firms were first asked whether they still had foreign sales in each of these three countries. If this was the case, firms had to indicate the dominant sales channel they were currently using in each respective market in 2003. Thus, we arrived at a sequence of three sales modes in each of the firms' most important foreign markets of 1997. Of course, the markets investigated may no longer represent the firms' most important markets of 2003. In fact, a good one-third of the foreign markets analysed lost this property between the two surveys.

Table 2. Sales Modes Used in Most Important Foreign Markets of 1997 (in %).

Sales Mode	Germany			UK		
	Entry mode	1997	2003	Entry mode	1997	2003
Direct exporting	42.31	35.77	47.31	37.81	30.57	35.71
Agents	11.54	12.20	5.38	10.95	9.84	13.49
Distributors	40.00	44.72	38.71	45.27	49.74	45.24
Sales joint venture	0.77	0.81	1.08	2.49	4.66	1.59
Wholly owned subsidiary	0.77	2.44	3.23	1.49	3.11	3.97
Licensing	4.62	4.07	4.30	1.99	2.07	0.00
Total	100	100	100	100	100	100

Source: ZEW, University of Exeter, own calculation.

German firms most frequently used direct exporting to end-users as their entry mode in foreign markets (see Table 2). In contrast, foreign distributors that sell on a regular basis were the preferred entry mode for UK exporters. The more prominent role of direct exporting among German firms might reflect that they more often started exporting due to an unsolicited order from abroad (pull-strategy, Andersson, 2000). In contrast, UK exporters, who tended to pro-actively exploit the foreign market, more often began their international business activities based on a contractual agreement with a foreign partner (push-strategy).[16] UK firms' relative preference for using an intermediary probably also reflects that UK firms' three most important foreign markets were relatively often remote, non-European countries, where a co-operation with a foreign partner might be particularly advantageous. Besides foreign distributors, foreign agents that sell ad hoc on a commission basis might also act as this kind of foreign partner. In a good 10% of the most important foreign markets, both German and UK firms used foreign agents as their entry mode. The literature on entry modes generally does not distinguish between agents and distributors: both export intermediaries are assumed to possess local-market knowledge and crucial contacts with foreign customers. Moreover, finding good distributors or agents demands considerable efforts (see, e.g., Root, 1987). Although it might be argued that firms have to choose efficiently between agents and distributors and that their choice might be affected by transaction-specific assets and production-cost economies (Bello & Lohtia, 1995), this paper follows most other studies and regards the two export intermediaries as one sales mode.[17]

Sales joint ventures and wholly owned sales subsidiaries were rarely chosen as the entry mode. These two entry modes constitute more resource-intensive modes than direct exporting or export intermediaries. Most of our sample's exporters probably did not possess enough resources to enter the foreign market via a sales subsidiary. This is true not only for the firms' entry mode but also for the sales mode used in 1997 and 2003. Although a slight increase in the share of markets that were supplied via a sales subsidiary could be observed, these resource-intensive sales modes continued to be of minor importance. Therefore, they are neglected in the subsequent analyses.

Licensing as a foreign market sales mode is commonly defined as a contractual agreement where the domestic firm (licensor) provides a foreign company (licensee) with intangible assets or property rights in return for payment (Root, 1987, p. 85). In general, licensing is discussed in the context of foreign production of manufacturing firms as opposed to FDI. This sales mode, however, is almost irrelevant for our sample. Only one manufacturing firm indicated licensing as its sales mode. The firms that pointed out licensing as displayed in Table 2 were software firms that sold licenses for the use of their software programmes to foreign end-users. In the following, licensing will be neglected as well.

In 1997, exporting via an intermediary (agents and distributors) was used in more than 50% of the firms' most important foreign markets as the dominant sales mode. In comparison, the share of foreign countries that were serviced via direct exporting decreased for both German and UK firms. Some firms that had first entered a foreign market with direct exports changed their sales mode to exports via an intermediary before 1997.[18] If the initial stimulus of starting an international engagement on a foreign market was an unsolicited order, firms might have first supplied their new foreign customer on that market by a direct export. Later, firms might have raised their commitment on that market by making a contractual agreement with a foreign distributor or agent. Thus, changing from direct exports to an intermediary can be regarded as an increased commitment of resources as predicted by the internationalisation process model (Johanson & Vahlne, 1977, 1990). However, exporting via an intermediary is not necessarily more resource-intensive than direct exporting. If direct exporting means selling standardised products or pre-packaged software via the Internet (business-to-business or business-to-consumers e-commerce) transaction costs will fall below that of selling via a foreign distributor or agent (e.g., costs for finding and controlling the foreign intermediary). Indeed, the share of firms that used direct exporting is significantly higher for our sample's software firms than for manufacturing firms. If, however, the firm sells a product that

requires close contact to end-users (because of individual client customisation, for instance), direct exporting will turn out to be highly resource-intensive. In this case, transaction costs could well be reduced by a foreign intermediary.[19] Thus, it depends on a firm's product characteristics whether exporting via an intermediary comprises a more resource-intensive sales mode than direct exporting or vice versa. Similarly, a change of sales mode from direct exporting to an intermediary may or may not mean a more resource-intensive commitment to the foreign market. However, young and small technology-oriented firms might still be forced to use a foreign partner in order to overcome what Bürgel et al. (2004) called the "liability of alienness". Customers might not trust an unknown foreign supplier, which is not even established in its own domestic market. Thus, using an intermediary might be the only way for a young high-tech firm to sell on a foreign market.

Taking this into account, it is rather surprising that between 1997 and 2003 some firms changed their dominant sales mode from using an intermediary to direct exporting.[20] German firms in particular increased the share of foreign markets where they used direct exports so that in 2003 this sales mode was more prevalent than exporting via an intermediary. The share of foreign markets where UK firms sold their products via direct exporting also rose between the two surveys, although intermediaries retained their most frequently used sales mode.[21]

The resurgence in the importance of direct exporting between 1997 and 2003 might have several causes. Firstly, the sample's exporters might have become established suppliers on their foreign markets, reducing the liability of alienness and thus the necessity of using an intermediary. Secondly, the investigated market might no longer belong to the firm's most important markets in 2003. Assuming that exporting via an intermediary is the more resource-intensive sales mode, a small firm might have reallocated its limited resources to its current most important markets in order to build up new relationships with local distributors or agents. On the remaining, currently less important markets, an exporter might restrict itself to serving its occasional customers by direct exports. Furthermore, an exporter might have increased the innovativeness of its products. According to the theories summarised in Section 2, a higher degree of innovativeness should raise the firms' inclination to use a sales mode with a higher level of control, i.e., in our case, direct exports. Finally, firms might also have changed to direct exporting because the (relative) transaction costs of this sales mode decreased between 1997 and 2003. For example, electronic commerce (e-commerce), by which the costs of cross-border transactions can be reduced,

Table 3. Changes of Sales Modes in Firms' Most Important Foreign Markets of 1997.

	n %	Sales Modes *t*			Total
		Direct exporting	Intermediary	Other sales modes	
Sales modes *t*–1	Direct exporting	146	28	6	180
		81.11	15.56	3.33	100
	Exporting via an intermediary	30	266	12	308
		9.74	86.36	3.90	100
	Other sales modes	8	4	23	35
		22.86	11.43	65.71	100
	Total	184	298	41	523
		35.18	56.98	7.84	100

Note: Other sales modes: sales joint venture, wholly owned subsidiary, licensing.
Source: ZEW, University of Exeter, own calculation.

became more and more widespread in both Germany and the UK.[22,23] If direct exporting became relatively cheaper than exporting via an intermediary, this should make a change more likely.

Table 3 shows in how many markets firms chose a particular sales mode, given the sales mode they had used in the previous period. Although switching is relevant, we observe a high persistence in the sales mode utilised. In more than 80% of the firms' export destinations, the selected sales mode remained the same in the following period (observations on the main diagonal). This might be explained by the existence of (sunk) switching costs. In just under 16% of foreign markets where direct exporting was used as the dominant sales mode in the previous period, firms changed to exporting via an intermediary in the following period. As described above, this transition (not exclusively but) primarily occurred in the period between the foreign market entry and the 1997 survey. A transition from exporting via an intermediary to direct exporting was observed in just under 10% of export destinations that were supplied via an intermediary in the previous period. Such a transition took place primarily in the period between the two surveys 1997 and 2003. Changes from and to other sales modes were numerically unimportant and will therefore be neglected. The econometric analysis thus concentrates on the upper-left four-field transition matrix in order to find out what factors influence the probabilities of a transition from direct exporting to exporting via an intermediary and vice versa.

4. ECONOMETRIC IMPLEMENTATION

For the examination of the probability of a transition from one sales mode to another or remaining in the same sales mode in the next period, I apply a model inspired by Gouriéroux (2000) and used by Van, Kaiser, and Laisney (2004) in order to estimate the transitions between different states of firm performance. The econometric model was also applied by myself (Fryges, 2004a) in estimating foreign market entry and exit for this paper's sample, i.e., the transition probability between different states of export market participation. Since our sample's exporters were asked to indicate the sales mode used in their three most important foreign markets of 1997, the individual observation i is not the exporter but the sales mode used by the exporter in one particular foreign market.

Let Y_{it} denote the sales mode j used in a particular market at time t, with $Y_{it} = 1$ if the exporter has chosen direct exports and $Y_{it} = 0$ otherwise. The transition probabilities are modelled with the logistic formulation and depend on a set of explanatory variables. The probability of transition from sales mode j at $t-1$ to sales mode j' at time t is then given by

$$P_{ijj'}(t) \equiv P(Y_{it} = j' \mid Y_{it-1} = j) = \frac{\exp(x_{it}\beta_{jj'})}{\sum_{j'=0}^{1} \exp(x_{it}\beta_{jj'})}, \tag{1}$$

with $i = 1, \ldots, N$, $t = 0, 1, 2$, and $j, j' = 0, 1$.

Imposing the identifying restrictions $\beta_{11} = 0$ and $\beta_{00} = 0$, we obtain

$$P_{ijj'}(t) = \frac{1}{1 + \exp(x_{it}\beta_{jj'})} \tag{2}$$

$$P_{ijj'}(t) = \frac{\exp(x_{it}\beta_{jj'})}{1 + \exp(x_{it}\beta_{jj'})} \tag{3}$$

with $j, j' = 0, 1$. Thus, a logit model is specified for each row of the transition matrix. Let us define $n_{i,t-1,t}(jj') = 1$ if sales mode j was used at $t-1$ and sales mode j' at time t, and 0 otherwise. Then the log-likelihood conditional on the chosen sales mode at time $t-1$ is

$$\ln L = \sum_{j=0}^{1} \sum_{j'=0}^{1} \ln L_{jj'}, \quad \text{with} \quad \ln L_{jj'} = \sum_{i=1}^{N} \sum_{t=1}^{2} n_{i,t-1,t}(jj') \ln P_{ijj'}(t) \tag{4}$$

Since the quantity $\sum_{j'=0}^{1} \ln L_{jj'}$ only depends on $\beta_{jj'}$, the maximum likelihood estimators $\hat{\beta}_{jj'}$ can be obtained by individually maximising the elements of $\sum_{j'=0}^{1} \ln L_{jj'}, j = 0, 1$.[24] The vector of explanatory variables x contains firm-specific variables as derived from the theoretical models reviewed in Section

2 and some further control variables. A detailed description of the independent variables is given in Table 4.

The most important explanatory variable of the internationalisation process model as developed by Johanson and Vahlne (1977) is the experiential knowledge a firm has acquired in a foreign target market. Our model measures the country-specific experience by (the logarithm of) the number of years a firm has conducted international business activities in the particular country since market entry.[25] As exceptions to the gradually expanding commitment predicted by their model, Johanson and Vahlne (1990) proposed that large firms are able to use a more resource-intensive sales mode and that uncertainty prevalent on a foreign market can be reduced by hiring an internationally experienced manager. The econometric model operationalises firm size as the logarithm of the number of employees at time t. In order to measure firm managers' international experience, firms were asked whether a member of the firm's management team had work experience abroad, had previous work experience in the domestic country for an international company, or whether a manager was educated abroad before joining the company. The regression equation includes a dummy variable taking the value 1 if the firms' representatives indicated at least one of these kinds of international experience. According to Johanson and Vahlne (1990), these two variables should be positively correlated with a change to a more resource-intensive sales mode. However, as discussed in Section 3 it is not clear, a priori, whether direct exporting is more resource-intensive than exporting via an intermediary or vice versa. Thus, it is not possible to hypothesise which sign these two variables are expected to take based on the internationalisation process model.

Madhok's OC perspective of the firm, which is based on the RBV, predicts that the exporter will use an integrated sales mode (direct exporting) if the firm's advantages are inimitable and difficult to transfer to other firms (Madhok, 1997). Assets of this sort may be generated by conducting R&D activities and may be reflected by the innovativeness of the firm's products and services. I will include a dummy variable in the regression equation that indicates whether a firm carries out permanent R&D activities. Moreover, the innovativeness of the firm's best-selling product or service is approximated by a dummy variable taking the value 1 if, according to the representatives of the firm, the product or service incorporates a novel, self-developed technology. It is hypothesised that both variables lower the probability of switching from direct exporting to exporting via an intermediary and increase the probability of a change from using a foreign distributor or agent to direct exports.

Table 4. Measurement of Independent Variables.

Variables	Measurement
Industry dummies	Classification according to the definition given in Table 1 based on the description of the firm's best-selling product or service in the questionnaire.
Number of employees	How many persons are employed by your company (including owners)? Please state in full-time equivalents.
International experience of management	Before joining your company, did any member of your senior management team … have work experience abroad? … work previously in the UK (Germany) for an international company? … receive education abroad? (dummy: 1 if at least one of these kinds of international experience was indicated by the interviewee)
Permanent R&D activities	In the last two years, has your company carried out research and development activities on a permanent basis, occasionally or not at all? (dummy: 1 in the case of permanent R&D activities)
Novel, self-developed technology	How would you best describe the innovativeness of your best-selling product or service? It incorporates novel technology that had to be developed specifically for this product by your company. (dummy: 1 = yes)
Window of opportunity	Please indicate the estimated time for a competitor to launch a similar product with superior performance or a product with similar performance at lower price. (dummy: 1 if the indicated time period is one year or shorter)
Intense product customisation	Please describe key characteristics of the product, in particular the extent to which it requires individual client customisation. (Likert scale: 1 = "unimportant", 5 = "very important"; dummy: 1 if the firm describes the degree of customisation as 4 = "important" or 5 = "very important")
Typical customer	Which of the following statements best describes the typical use of your best-selling product or service by a typical customer? Your service is a business service used by another company. Your product or service is sold directly to customers.
Years since entry into target country	Difference between the year in which the survey was conducted (1997 or 2003) and the year of market entry as indicated by the firm's representative.
Rank of country risk 1998	Country risk data were obtained from the "Institutional Investor Magazine" (www.institutionalinvestor.com). Data were only available for 1998. Country risks were ranked and then entered into the model. Rank "1" was attributed to the lowest risk level.
GDP of target country	GDP, both in 1997 and 2003, is measured in US dollars at price levels and exchange rates of 2000. Data were taken from OECD Statistical Database (www.oecd.org) for OECD member countries and from Global Economic Data of EconStats (www.econstats.com) for non-member countries of the OECD.
Share of total sales generated in the target country's region	How are your total sales broken down by region? Please indicate the percentage of total sales your company generated in this region.

Note: With the exception of country risk and GDP data, all variables included in the model result from the two conducted surveys. All time-varying variables are measured at time t, i.e., at the end of the transition period examined.
Source: Own presentation.

The TCA theory emphasises the role of a firm's intangible assets that may be generated by intense R&D activities. Both the dummy variable indicating a firm's permanent R&D activities and the dummy variable reflecting novel, self-developed technology incorporated into the firm's best-selling product characterise the TCA theory in my econometric model. According to the TCA theory, a high-control sales mode (direct exporting) will be preferred if the exporter sells a technically sophisticated product. Additionally, the transaction costs and thus the desired level of control might be influenced by the necessity for close contacts to key customers. As Anderson and Gatignon (1986) argued, the exporter will use a high-control sales mode if intense product customisation is prevalent. The questionnaires used in both surveys measure the degree of customisation on a 5-point Likert scale ranging from 1 "unimportant" to 5 "very important". For the econometric estimations, a dummy variable will be used taking the value 1, if the firm has classified the requirements of customisation as "important" (4) or "very important" (5). If customisation is important, the probability of changing to an intermediary should decrease, while switching to direct exporting should be more likely.[26]

Today's high-tech markets are characterised by shrinking product life cycles. The time span during which a high-tech firm can exploit its technological advantage is therefore limited (cf. Sampler, 1998). Malhotra et al. (2003) proposed that according to the TCA theory a short window should increase the probability of selecting a low-control sales mode in order to exploit the technology in the shortest time (see also Bürgel & Murray, 2000). When interviewing the firms in our sample, we asked firm representatives to estimate the time a competitor would need to launch either a similar product with superior performance or a product with similar performance at a lower price. Bürgel et al. (2004) called this competition-free time period when firms can realise temporary monopolistic rents the "window of opportunity". I will include a dummy variable in the estimation equations taking the value 1 if the estimated window of opportunity is one year or shorter. However, in contrast to Malhotra et al., I hypothesise that in the case of a short window of opportunity a firm is more likely to choose direct exporting. If a firm has to replace its product line at least once a year, the sales personnel of the foreign partner will have to be trained annually. Especially, in the case of a technically sophisticated product where the transfer of knowledge to an intermediary is difficult, the costs of exporting via a distributor or agent will rise. It is questionable whether these costs can be amortised within a very short window.

Anderson and Gatignon (1986) further considered the role of external and internal uncertainty in the decision on the optimal sales mode. They argued

that country risk (i.e., external uncertainty) increases the probability of choosing a high-control sales mode only in *combination* with transaction-specific assets. Hence, I calculated two interaction variables by multiplying an ordinal variable that ranks the risk of the destination country[27] with the two dummies that represent the intangible assets incorporated into the firm's best-selling product or service. The first interaction term is the product of country risk and the dummy variable that indicates whether a firm permanently carries out R&D activities. The second interaction variable is the product of country risk and the dummy denoting that novel, self-developed technology is incorporated into the firm's product or service. To control for an independent effect of country risk, i.e., without an interaction with transaction-specific assets, the rank of country risk is included individually in the regression equations.

If firm managers have a low level of international experience (i.e., internal uncertainty), this is hypothesised to lead to a low-control sales mode. The international experience of firms' managers is measured by the dummy variable indicating the managers' international experience before joining the company and by (logarithm of) the years a firm has conducted international business activities in a particular destination country since market entry (cf. the discussion on how the internationalisation process model is represented in the estimation equations).

In addition to these variables derived from the literature, some control variables that may also influence the exporter's decision on its optimal foreign operation method are added to the estimation equations. Firstly, the model includes the target country's market potential, approximated by (the logarithm of) the target country's GDP. It is difficult to predict how sales mode selection is affected by target market size. On the one hand, for a firm to establish its own distribution network for direct exporting in a large country is more resource intensive. On the other, a country with a large market potential is attractive and firms might invest in this country in order to pro-actively exploit that market (cf. Barkema & Vermeulen, 1998; Bürgel & Murray, 2000). Secondly, the sales mode used in a foreign market might also depend on the importance of that market, measured in terms of the country's contribution to total sales. If a firm generates only a relatively small share of its total sales in a particular foreign country, e.g., due to some occasional orders from that country, the firm might not be willing to commit a high amount of resources to finding and training a foreign distributor or agent. In this case, occasional direct exports might be optimal. Conversely, in a target market that makes important contributions to the firm's total sales, a resource-intensive sales mode might be selected. Unfortunately, the

share of total sales generated by each target country is only available in the data set for the first survey and not for the second survey. In the second survey, firms were asked instead to indicate the percentage of total sales generated in the different regions (e.g., EU 15, Rest of Europe, North America, Asia). Hence, I will use the share of total sales generated in the region the target country belongs to in order to approximate the importance of the particular market for the firm.[28]

Thirdly, the logit regressions contain a dummy variable that indicates whether the product or service is directly sold to end customers and a further dummy variable to indicate whether the firm sells business services to other companies. The base category is a firm selling manufactured goods to other companies (either as a component or as an investment good). Selling a product or service directly to what is probably a large number of end-users is personnel intensive, but is often a matter of routine business that can easily be handled by an intermediary (e.g., a foreign retailer). In contrast, selling to other companies is often practised via personal contact to the other firm's purchasing department. This means that direct exporting will be preferred, in particular, if the exporter only has a limited number of key corporate customers.

Finally, I will include three dummies in order to control for unobserved country-specific and sector-specific effects. The first dummy variable takes the value 1 if the exporter is sited in Germany. The other two dummies included are industry dummy variables. The first industry dummy variable characterises firms that belong to an engineering industry. The second dummy variable indicates firms from other manufacturing sectors, including ICT-hardware and health/life sciences. Thus, service firms are used as the base category. More disaggregated industry dummies might be desirable, but the number of firms from the sectors ICT-hardware and health/life sciences is so small that I decided to consider only two industry dummy variables.

Before discussing the estimation results, it should be noted that in the case of a time-varying explanatory variable the latter is estimated at time t, i.e., at the end of the transition period examined. Since our sample's firms are observed only twice with a six-year interval between the two surveys, we unfortunately have annual information neither on the firm-specific variables included in the econometric model nor on the sales modes used by the firms. This means that we do not know the precise chronological development of the endogenous and exogenous variables. If we observe a sales mode switch during the period from $t-1$ to t, accompanied by a change of one or more firm-specific variables within the same period, we will not know whether the

change in these firm-specific variables occurred before or after the exporter changed its sales mode.[29] In this way, my paper shares the characteristics of cross-sectional studies that analyse, for instance, firms' foreign market entry modes. Since the explanatory variables are, in general, observed after foreign market entry, these variables might well have changed between market entry and the point in time at which the survey was conducted. This problem can only be avoided by building up a panel data set which comprises annual data over a longer time period. The fact that the independent variables are measured at time t has an important implication for the interpretation of this paper's estimation results. If the probability of using sales mode j' at time t, given that the firm used sales mode j at time $t-1$, is positively correlated with the realisation of variable x_1 measured at time t the decision to change the sales mode from j to j' may either be induced by a permanently high level of x_1 or by an increase in this variable. Both scenarios have to be considered in the following.

5. EMPIRICAL RESULTS

The results of the empirical model are given in Table 5.[30] The second column shows the vector of coefficients, $\hat{\beta}_{10}$, explaining the sales mode change from direct exporting at time $t-1$ to exporting via an intermediary at time t. The third column includes the vector $\hat{\beta}_{01}$ for a change in the opposite direction, i.e., from an intermediary to direct exports.

The country-specific dummy variable is insignificant in both transition equations. Thus the fact that UK-based firms more often changed to exporting via an intermediary when they had used direct exporting in the previous period can be explained by the remaining observable variables in the vector of coefficients. There is no additional country-specific effect.[31]

Manufacturing firms are more likely to change from direct exporting to exporting via an intermediary than service firms. Moreover, the probability that an engineering firm will keep on selling its products via a foreign distributor or agent if it had already used this sales mode in the previous period is higher than for other manufacturing and service firms. These results coincide with the findings of the descriptive analysis that service firms more often use direct exports as their dominant sales mode. For our sample's service firms (mainly software firms), direct exporting probably constitutes a relatively cheap sales mode since they can distribute their digital services directly via the Internet. Surprisingly, engineering firms differ from other manufacturing firms in their lower probability of switching to direct exports.

Table 5. Propensities of Sales Mode Changes – Results of Logit Models.

	Sales Mode Change Direct Exports → Intermediary		Sales Mode Change Intermediary → Direct Exports	
	Number of observations = 130 LL = −41.033 $\chi^2(17) = 29.71$ Prob > $\chi^2(17) = 0.029$ McFadden's $R^2 = 0.355$		Number of observations = 242 LL = −46.699 $\chi^2(17) = 40.28$ Prob > $\chi^2(17) = 0.001$ McFadden's $R^2 = 0.419$	
	Coefficient	Robust standard error	Coefficient	Robust standard error
German firm	−0.272	0.771	0.907	0.698
Engineering	4.000	1.492***	−2.206	1.072**
Other manufacturing industries	3.238	1.316**	−0.235	0.891
Log (number of employees)	0.090	0.255	1.043	0.426**
International experience of management	1.026	1.000	2.354	1.315*
Permanent R&D activities	0.857	0.813	−0.797	0.621
Interaction (country risk * permanent R&D)	−0.096	0.040**	−0.023	0.043
Novel, self-developed technology	−0.232	1.426	2.016	0.859**

Interaction (country risk * novel technology)	−0.006	0.064	−0.055	0.045
Window of opportunity ⩽ 12 months	−2.175	0.793***	1.077	0.535**
Intense product customisation	−1.171	0.593**	0.860	0.695
Consumer good	2.212	0.730***	−1.211	0.690*
Business service	1.303	0.866	3.272	0.977***
Log (years since entry into target country)	1.233	0.590**	3.802	1.120***
Rank of country risk 1998	0.053	0.049	0.040	0.023
Log (GDP of target country)	−0.043	0.310	−0.305	0.247
Share of total sales generated in the target country's region	−0.016	0.020	−0.008	0.041
Constant	−6.548	2.223***	−14.565	4.412***

Note: Base category: entry of a UK-based software/service firm.
Source: Own estimation.
*10% level of significance.
**5% level of significance.
***1% level of significance.

There are perhaps additional industry-specific costs that have to be borne by engineering firms, costs that are not captured by the variables of our model.

Firm size, measured by the number of employees, does not affect the probability of a change from direct exports to exporting via an intermediary. Interpreting size as representing the firms' financial or physical resources, this is an interesting result. It corresponds to the findings of Bürgel et al. (2004), who estimated a probit model for the exporter's decision on an entry mode (the first sales mode used in a particular target country), using the cross-sectional data set of the first survey this paper is based on: the (logarithm of) start-up size has no effect on choosing a distributor as the first sales mode.[32] Thus, identifying and forming commercial relationships with a foreign partner requires so few additional resources that they can be raised even by the small, high-tech firms of our sample. On the contrary, replacing exporting via an intermediary by direct exports is facilitated if the firm has large financial or physical resources at its disposal. The coefficient of firm size is positive and significant in the transition equation. Finishing the co-operation with a foreign partner and establishing one's own distribution network for direct exporting can thus be interpreted as a more resource-intensive commitment to a particular market, at least for manufacturing firms.

The influence of the management's international experience goes in the same direction as that of firm size. While it does not have any effect on switching to exports via an intermediary, it supports a change to direct exports. If managers possess international experience, they are less reliant on a foreign partner to sell their products. However, the managers' international experience does not prevent a firm from being forced to use an intermediary during an early stage of its international engagement, possibly because the firm has to overcome the liability of alienness.

Permanent R&D activities do not have any individual influence on the transition probabilities. There is only a slightly significant negative effect of the interaction term with the country risk variable. Moreover, the prevalence of novel and self-developed technology only raises the probability of switching from an intermediary to direct exports, having no effect on the transition in the other direction. The signs of the significant variables thus correspond to the predictions of transaction-cost theory and the OC perspective. Nevertheless, the transition probability from exporting directly to exports via an intermediary seems to be rather independent of the firm's intangible and inimitable assets, created, for instance, by a firm's R&D activities and incorporated into the firm's best-selling product. In fact, the marginal effect of the interaction term is relatively small. Setting all variables to their means, the interaction term decreases the probability of a

change from direct exports to an intermediary by less than one percentage point (see the discussion below). Similarly to the firm managers' international experience, it might be argued that during an early stage of the firm's international engagement, intermediaries are a prerequisite for selling abroad in order to cope with the liability of alienness.

After becoming established in the foreign market, firms are able to select the sales mode that minimises transaction costs or that is best suited to the firms' intangible resources. Thus, the technology incorporated into the firms' products is more important for explaining a change from an intermediary to direct exports. However, switching from exporting via an intermediary to direct exports cannot exclusively be interpreted as a change from a formerly suboptimal sales mode (from a transaction-cost point of view) to an optimal one during a later stage of the firm's international engagement. This interpretation assumes that the firm has incorporated novel and self-developed technology into its best-selling product both in 1997 and 2003, which is only one possible scenario. Alternatively, choosing an intermediary during an early stage of the firm's export activities might have been perfectly optimal because at the time of the first survey the exporter was producing its product using a "tried and tested" technology. The transaction-cost theory and the OC perspective suggest that in this case a low-control sales mode (i.e., an intermediary) is preferred. However, 40% of the exporters that were using a "tried and tested" technology at the time of the first survey changed to a novel and self-developed technology in the period between the two surveys. Thus, switching from an intermediary to direct exports was necessary because the exporter increased the degree of innovativeness of its product.

Interestingly, the dummy variable representing permanent R&D activities is not correlated with the probability of such a transition. This might be due to the fact that R&D constitutes an input variable and may not necessarily reflect the product's transaction-specific assets. It may be that firms carry out R&D not to realise product innovations, but rather to make process innovations. The latter may lead to cost reductions and, as a consequence, to lower prices and an improved competitiveness of the firm's product. Therefore, R&D activities may be able to explain the decision to internationalise, but may not have an impact on the choice of sales mode.[33,34] More suitable for measuring transaction-specific assets is the dummy variable indicating novel and self-developed technology. This variable is presumably closely related to the technological characteristics of the product, since it directly reflects what firm managers said about their product.

As I hypothesised, a short window of opportunity decreases the probability of changing from direct exports to an intermediary and, conversely,

increases the chance of switching in the reverse direction. Contrary to the hypothesis of Malhotra et al. (2003), high-tech firms that have to exploit their technological advantages in a very short period of time favour direct exports. If technically sophisticated products are replaced or upgraded at least once a year, this will require, among other things, expensive training of foreign distributors or agents which raises the costs of exporting via a distributor or an agent. The impact of a short window of opportunity might also be interpreted from Madhok's OC perspective (cf. Madhok, 1997). The notion of the OC perspective is that a firm exploits its competitive advantage in order to generate rents in a foreign market. The empirical results show that if the time period for exploiting a competitive advantage is limited, an integrated sales mode will be optimal.

The requirement for intense product customisation acts as a barrier to initiating exports via an intermediary. Since customisation demands close contacts to individual customers, the costs of selling abroad could be reduced by a foreign distributor who is assumed to already have such close contacts to foreign customers. On the other hand, customisation increases the costs of controlling the foreign partner. Our results imply that the latter effect dominates: changing from direct exports to an intermediary is less likely if individual client customisation is prevalent. An alternative interpretation is that firms that reduced the requirement of customisation in the period from $t-1$ to t are more likely to change to exports via an intermediary. However, once an exporter has chosen a foreign intermediary, the probability of changing the distribution channel is unaffected by the degree of customisation. Finding a foreign distributor and making a contractual agreement with it might be regarded as a sunk investment. Especially if customisation is important, such an investment might be relatively high, implying that switching from an intermediary to direct exports is observed less frequently. This could eventually explain the insignificant effect of product customisation on the transition probability from exporting via an intermediary to direct exports.

Consumer goods or services that are directly sold to end customers are generally distributed to the foreign market via an intermediary. Even if the firms have entered the foreign market by direct exports, e.g., because they received an unsolicited order from abroad, it is likely that they will try to find an appropriate distributor or agent. Comparing companies that produce a consumer good with firms that sell their products to other firms (either as a business service, an intermediate good or an investment good), our results show that for the latter firms, the probability of changing from direct exports to an intermediary is lower and that switching from an

intermediary to direct exports is more likely once a foreign intermediary has been chosen. The probability of changing to direct exports during a later stage of the firm's international engagement is even higher for business service firms than for manufacturing firms selling intermediate or investment goods (the base category), perhaps because e-commerce became more widespread in the period between the two surveys, offering software firms a relatively cheap way of distributing their services abroad.

The transaction costs analysis of Anderson and Gatignon (1986) assumes that the longer a firm is engaged in a particular market, the more experience it is able to gain, allowing its ability to export directly to increase. In fact, the number of years the exporter is engaged in the target country has a positive effect on the probability of a transition from exporting via an intermediary to direct exports. However, the coefficient of this variable is also significantly positive in the second transition equation, which contradicts the theory and is inconsistent with the positive result in the other equation. The number of years a firm sells its products in a target country probably does not measure the experiential knowledge acquired by the exporter. Instead, the two positive coefficients might be interpreted in the sense that changing the dominant sales mode in a country is more likely the longer the firm is engaged in that country. Or in other words, it takes time to make a change. Binding contracts a firm has entered into with a foreign customer or a foreign distributor can make an early replacement of the used sales mode impossible.

The remaining target country-specific variables that were included in the regression equations are neither individually nor jointly significant.[35] As proposed by Anderson and Gatignon (1986), the rank of country risk has no individual effect on the selection of the optimal sales mode. Only the interaction term with permanent R&D activities decreases the probability of a transition from direct exports to exporting via an intermediary, although the effect is relatively small. The potential of the foreign target market, approximated by the target country's GDP, is not relevant for changes in the sales modes used. Of course, a country's GDP is only an imprecise measure for market size, in particular in the case of technology-oriented firms that often occupy small market niches.[36] The share of total sales generated in the region of the target market entered cannot explain why exporters change their sales modes either. The latter variable was intended to measure the importance of the particular target market for the exporting firm. Admittedly, this measure is rather vague, especially because the second survey contains only aggregated information about the share of total sales generated in several regions and none about the shares in the individual target

markets. Moreover, the share of total sales might be endogenous since it can be regarded as a measure of the exporter's success in a country, which in turn might be influenced by the selected sales mode. Thus, it is impossible to say whether the variable proved to be insignificant because it is not suitable to measure the importance of a particular target country or whether a sales mode change is, in fact, independent of country-specific variables and can better be explained by firm-specific or transaction-specific assets.

In order to get further insights into how the individual variables affect the probability of switching to another sales mode, I calculated marginal effects. It is well known that the marginal effects vary with the values of x (see, e.g., Greene, 2000), and it is thus common practice to evaluate the marginal effects at the means of the independent variables. The results of this specification are given in Table 6 and Table 7 labelled as Model 1. Whereas the probability of a transition from direct exports to exporting via an intermediary changes significantly as discussed above, the probability of a transition in the reverse direction is not influenced significantly by any of the independent variables, given that all variables are set to their mean. At first glance, this outcome is a bit surprising since we found some significant coefficients included in the vector $\widehat{\beta}_{01}$. However, it was argued above that a change from exporting via an intermediary to direct exports was primarily observed during a later stage of a firm's engagement in a particular target market. Therefore, I took the mean number of years between target market entry and the year of the second survey, 2003, for calculating marginal effects. Moreover, the regression results have shown that switching to direct exports is also positively correlated with firm size. Since the firms in our sample grew in the period between the two surveys,[37] I also used the mean number of employees at time of the second survey when calculating marginal effects. This specification is given in Table 7 as Model 2. For the third specification in Table 7, I additionally set the dummy variable indicating a novel, self-developed technology to the value 1 in order to examine the marginal effects given a high degree of innovativeness incorporated into the firm's product.

In Table 6, which reflects the marginal effects on the transition probability from direct exports to exporting via an intermediary, I varied the two continuous variables (number of employees; years since target market entry) in a similar way. Specification 2 shows the marginal effects, setting the two continuous variables to their mean at the time of the first survey, whereas in Model 3, these variables take the value of the mean at the time of the second survey. All other independent variables were set to their overall mean.

Table 6. Marginal Effects of Logit Model – Sales Mode Change from Direct Exports to Exporting via an Intermediary.

	Model 1	Model 2	Model 3
	Probability of change = 0.080	Probability of change = 0.050	Probability of change = 0.177
	Marginal effect (robust standard error)	Marginal effect (robust standard error)	Marginal effect (robust standard error)
German firm	−0.020	−0.013	−0.039
	(0.057)	(0.036)	(0.113)
Engineering	0.537	0.419	0.703
	(0.203)***	(0.178)**	(0.210)***
Other manufacturing industries	0.371	0.268	0.558
	(0.150)**	(0.113)**	(0.216)**
Log (number of employees)	0.007	0.004	0.013
	(0.020)	(0.013)	(0.037)
International experience of management	0.059	0.037	0.120
	(0.045)	(0.034)	(0.080)
Permanent R&D activities	0.054	0.034	0.109
	(0.051)	(0.036)	(0.098)
Interaction (country risk × permanent R&D)	−0.007	−0.005	−0.014
	(0.004)*	(0.003)	(0.006)**
Novel, self-developed technology	−0.016	−0.011	−0.033
	(0.095)	(0.059)	(0.195)
Interaction (country risk × novel technology)	−0.000	−0.000	−0.001
	(0.005)	(0.003)	(0.009)
Window of opportunity ⩽ 12 months	−0.206	−0.139	−0.356
	(0.086)**	(0.072)*	(0.140)**
Intense product customisation	−0.094	−0.061	−0.178
	(0.055)*	(0.044)	(0.088)**
Consumer good	0.234	0.161	0.389
	(0.086)***	(0.075)**	(0.136)***
Business service	0.141	0.095	0.242
	(0.109)	(0.075)	(0.187)
Log (years since entry into target country)	0.091	0.058	0.179
	(0.036)**	(0.020)***	(0.111)
Rank of country risk 1998	0.004	0.003	0.008
	(0.004)	(0.003)	(0.007)
Log (GDP of target country)	−0.003	−0.002	−0.006
	(0.023)	(0.014)	(0.046)
Share of total sales generated in the target country's region	−0.001	−0.001	−0.002
	(0.002)	(0.001)	(0.003)

Note: Model 1: All variables set to their overall mean.
Model 2: Like Model 1, but log (employees) and log (years since entry into target country) set to their mean of 1997.
Model 3: Like Model 1, but log (employees) and log (years since entry into target country) set to their mean of 2003.
Base category: entry of a UK-based software/service firm.
Source: Own estimation.
*10% level of significance.
**5% level of significance.
***1% level of significance.

Table 7. Marginal Effects of Logit Model – Sales Mode Change from Exporting via an Intermediary to Direct Exports.

	Model 1	Model 2	Model 3
	Probability of change = 0.006	Probability of change = 0.077	Probability of change = 0.200
	Marginal effect (robust standard error)	Marginal effect (robust standard error)	Marginal effect (robust standard error)
German firm	0.006	0.071	0.153
	(0.006)	(0.056)	(0.125)
Engineering	−0.012	−0.131	−0.292
	(0.012)	(0.069)*	(0.127)**
Other manufacturing industries	−0.001	−0.017	−0.038
	(0.006)	(0.066)	(0.144)
Log (number of employees)	0.007	0.074	0.167
	(0.005)	(0.034)**	(0.071)**
International experience of management	0.008	0.097	0.234
	(0.007)	(0.036)***	(0.082)***
Permanent R&D activities	−0.006	−0.066	−0.140
	(0.007)	(0.061)	(0.129)
Interaction (country risk × permanent R&D)	−0.000	−0.002	−0.004
	(0.000)	(0.003)	(0.007)
Novel, self-developed technology	0.016	0.167	0.167
	(0.017)	(0.081)**	(0.081)**
Interaction (country risk × novel technology)	−0.000	−0.004	−0.009
	(0.000)	(0.004)	(0.009)
Window of opportunity ⩽ 12 months	0.008	0.083	0.180
	(0.008)	(0.050)*	(0.095)*
Intense product customisation	0.006	0.067	0.144
	(0.008)	(0.060)	(0.119)
Consumer good	−0.008	−0.087	−0.192
	(0.008)	(0.047)*	(0.116)*
Business service	0.109	0.568	0.674
	(0.077)	(0.197)***	(0.134)***
Log (years since entry into target country)	0.024	0.269	0.607
	(0.017)	(0.120)**	(0.210)***
Rank of country risk 1998	0.000	0.003	0.006
	(0.000)	(0.003)	(0.007)
Log (GDP of target country)	−0.002	−0.022	−0.049
	(0.002)	(0.020)	(0.041)
Share of total sales generated in the target country's region	−0.000	−0.001	−0.001
	(0.000)	(0.002)	(0.004)

Note: Model 1: All variables set to their overall mean.
Model 2: Like Model 1, but log (employees) and log (years since entry into target country) set to their mean of 2003.
Model 3: Like Model 2, but dummy variable indicating novel, self-developed technology set to "1".
Base category: entry of a UK-based software/service firm.
Source: Own estimation.
*10% level of significance.
**5% level of significance.
***1% level of significance.

The two industry dummy variables have the highest marginal effects on the probability of a change from direct exports to exporting via an intermediary.[38] The second most important marginal effect comes from the dummy variable indicating a consumer good, followed by the dummy reflecting a short window of opportunity and the dummy indicating intense product customisation. As already mentioned, the marginal effect of the interaction term between the rank of country risk and permanent R&D activities is rather small. It only increases the transition probability by about one percentage point. The order of the marginal effects on the probability of switching from exporting via an intermediary to direct exports is similar. Neglecting the influence of the years since target market entry, the highest marginal effect is attributed to the dummy variable indicating a business service firm, followed by the dummy reflecting the firm managers' international experience and the dummy for the engineering sector (see Model 2 in Table 7). The marginal effects of the remaining independent variables that had a significant coefficient increase the probability of a transition to direct exports by between seven and ten percentages points in Specification 2.

The strongest predictors in the transition equations are the dummy variables controlling for unobserved industry-specific factors and those indicating a typical customer of the firms' products or services. Thus, the choice of sales modes is, to a relatively large degree, determined by unobserved industry-specific influences. Moreover, traditional distribution channels exist for certain kinds of products. For example, a consumer good is traditionally sold via an intermediary. Hence, the high explanatory power of the two dummies indicating a typical customer might mirror embedded routines and experiences the firm has in supplying such a typical customer, e.g., when distributing its product in the domestic market. Such routines can also be interpreted as reflecting the "locational effect" of the OC perspective of the firm (Madhok, 1997).[39] Nevertheless, the variables that are intended to measure transaction cost-specific assets (e.g., product customisation) or the firm's (intangible) resources must not be neglected when explaining changes of sales modes. For example, the dummy variable indicating a novel, self-developed technology becomes a good predictor for a transition from an intermediary to direct exports.

The empirical model fits well with the data. In the logit model explaining the determinants of a transition from direct exports to exporting via an intermediary, McFadden's R^2 reaches a value of 0.355. In the logit model examining a reverse transition, McFadden's R^2 is 0.419.

6. CONCLUSION

The objective of this paper is to examine the change of sales modes in foreign markets by German and UK-based technology-oriented firms. For this purpose, I investigated a data set of about 200 German and British NTBFs that were contacted using two surveys conducted in 1997 and 2003. The two most frequently used sales modes were direct exports and exporting via an intermediary. Even in 2003, when our sample's exporters had been engaged in their most important target markets for an average of 9 years, more resource-intensive sales modes like sales subsidiaries or even FDI were still of minor importance. Descriptive analyses reveal that just under 16% of exporters that sold their products directly to their foreign customers in the previous period switched to exporting via an intermediary. A sales mode change in this direction was observed (not exclusively but) primarily in the period between target market entry and the first survey, i.e., during an early stage of the firms' export activities. On the other hand, a change in the reverse direction took place primarily in a later stage of the firms' international engagement. Just under 10% of those firms that exported via an intermediary in the previous period changed to direct exports. Thus, we observe a high persistence in the sales modes used over time, probably because of the existence of (sunk) switching costs or because of binding contracts an exporter made with its foreign distributors or customers (cf. Pedersen et al., 2002; Benito et al., 2005).

The only theory that derived a time-dependent order of sales modes, the internationalisation process model, is not suitable for explaining the behaviour of young firms in high-tech sectors. The descriptive result that firms change from direct exports to exporting via an intermediary during an early stage of their international engagement and that a transition in the other direction is observed during a later stage already contradicts the notion of the process model that an exporter gradually increases its commitment in a foreign market, regardless of which sales mode is considered as the more resource-intensive commitment. The number of years the exporter is engaged in a particular target market is positively correlated with the two estimated transition probabilities. However, as argued above, it is unlikely that this variable reflects the experiential knowledge the exporter gained in the target market. Furthermore, the percentage of firms that use resource-intensive sales modes like sales subsidiaries is still relatively small in 2003. This leaves almost no evidence that firms incrementally raise their commitment of resources.

Instead, the econometric analysis confirms that the OC perspective, which is based on the RBV of the firm, and the transaction-cost theory are both

relevant for explaining the probability of switching from one sales mode to another. According to both theories, a firm that possesses intangible, inimitable assets – generated, e.g., by permanent R&D activities and incorporated into the firm's best-selling product – prefers a high-control sales mode. Moreover, as predicted by the transaction cost theory, a high degree of product customisation deters a firm from changing to an intermediary. Similarly, a low level of internal uncertainty (i.e., the firm employs internationally experienced managers) induces changes to direct exports. It further corresponds to the OC perspective that a firm will prefer an integrated foreign sales mode if the time period for exploiting a technological advantage is limited (i.e., in the case of a short window of opportunity). We can conclude that these two theories, which are already known to be able to account for the choice of foreign entry modes, contribute to explain changes of sales modes, or in other words, a sequence of sales modes observed over a longer time period. The main managerial implication of this paper's analyses is that from a transaction-cost reasoning and an OC perspective, an exporter of a high-tech product which incorporates highly sophisticated technologies should use an integrated sales mode, that is, in the case of a young and small high-tech firm, direct exporting.

However, especially during an early stage of a high-tech firm's international engagement there are strategic and structural influences that might dominate the impact of the exporter's (intangible) resources or its transaction-specific assets. Due to the liability of alienness, an exporter might be forced to use an intermediary to sell its products abroad, since foreign customers might not trust a young and small firm that is even not established in its domestic market. In this case, the reputation of an established foreign distributor or agent might be a way of gaining indirect legitimacy.[40] Moreover, the existence of traditional distribution channels might determine a firm's sales mode choice. Consumer goods, for example, are traditionally distributed via intermediaries which might reflect embedded routines in distributing the product. Of course, these traditional sales modes might change over time. The growing importance of e-commerce for distributing software and other digital products might induce software firms to change to direct exports via the Internet. Our results are consistent with this interpretation. Finally, this paper's empirical results show that there are unobserved industry-specific effects which are actually the best predictors in our model. Therefore, in order to explain changes of sales modes by young high-tech firms, the theories usually applied are useful but not sufficient. Firms might deviate from the sales mode choice predicted by existing theories. Future research should pay more attention to these strategic

constraints a young high-tech firm has to consider in order to better understand a chosen sequence of sales modes.

NOTES

1. The importance of choosing the appropriate sales mode also lies in the fact that the firm's success in a particular target market will likely depend on the chosen sales mode. This question is, however, beyond the scope of this paper. The relationship between foreign sales mode and firm performance is examined, e.g., by Beamish and Nitsch (1999), Zahra, Ireland, and Hitt (2000), and Lu and Beamish (2001).

2. Beamish and Nitsch (1999) provided a longitudinal analysis of sales modes. However, the authors did not focus on the firm-specific conditions for a sales mode change but attempted to explain why they did not find any performance differences between a joint venture and a greenfield investment when examining a longitudinal data set.

3. Petersen et al. (2000) and Benito et al. (2005) further regarded "within-mode switches", that is, a replacement of the foreign intermediary currently used by a new intermediary.

4. Alternatively, a sales-maximising firm benefits from a sales mode change by means of a higher volume of international sales and a higher penetration of the foreign market.

5. In addition to the theories presented in this paper, the review by Malhotra et al. (2003) includes, among others, the international product life cycle theory, originally developed by Vernon (1966). This theory describes a four-stage sequence (domestic production and exports, foreign production, competition of foreign firms in the foreign market, and foreign firm production and importing to the domestic market) contingent on the stage of the product's life cycle. However, since the firms in our sample all belong to a high-tech sector, presumably producing a product at an early stage of its life cycle, this theory is not suitable for discriminating between the varying foreign market entry modes of our sample's firms. Another theoretical approach neglected in this paper is network theory (e.g., Coviello & McAuley, 1999; Coviello & Martin, 1999; Bell, 1995). Of course, networks are extremely important for young and small high-tech firms like those in our sample. However, the two surveys this paper's empirical analysis is based on (see Section 3) do not include any information on networks used by the firms in the context of their internationalisation process. Thus, we are unable to examine any hypothesis that could be derived from network theory.

6. As usual, I assume that the concepts of control and internalisation/integration are closely related (Andersen, 1997).

7. Technically sophisticated products also impede the monitoring of foreign distributors and agents. In this case, accurate measures of distributors' performance might not be available. Thus, we have a classic principle–agent situation, where problems like adverse selection and/or moral hazard might occur (see, e.g., Zacharakis, 1997).

8. Anderson and Gatignon (1986) further proposed that a high-control entry mode will be more efficient the higher the intermediary's free-riding potential. If the

domestic firm possesses a high-value brand name, the foreign partner can "free ride" on the international recognition of the domestic firm, realising a high turnover without making its own sales efforts. Therefore, the domestic firm might prefer a high level of control in order to shield their brand name from degradation by free riders. However, the domestic, i.e., German and UK-based firms in this paper's sample are young and small (see Section 3). They do not (yet) possess an internationally recognised brand name. If anything, quite the opposite is true: if the firms in our sample decide on an intermediary for entering a foreign market they might be interested in profiting from the recognition of the chosen distributor in that market.

9. Dunning's well-known OLI (ownership, location, internalisation) framework combines elements of all theoretical approaches reviewed above (Dunning, 1993). For example, a firm's tangible and intangible resources which are emphasised by the RBV represent an ownership advantage according to the OLI framework. However, as pointed out by Dunning himself, the OLI framework intends to explain "what are" rather than, in the normative sense, "what should be" a firm's international business activities.

10. As Germany's largest credit rating agency, Creditreform has the most comprehensive database of German firms at its disposal. Creditreform provides data on German firms to the Centre for European Economic Research (ZEW) for research purposes. Dun & Bradstreet is the UK equivalent.

11. Subsidiaries, de-mergers, or firms that were founded as a management buy-out (MBO) or buy-in (MBI) were excluded from the analysis.

12. The first survey is described in detail in Bürgel et al. (2004). This report also includes numerous descriptive and econometric analyses of this unique data set.

13. In his influential study, Little (1977) used a definition of NTBFs which includes firms as old as 25 years. In contrast, the first survey on which this paper is based considered only firms that were 10 years of age or younger in 1997, which is in line with more recent studies of NTBFs (see, e.g., Storey & Tether, 1996).

14. Roberts and Tybout (1997) developed a dynamic model with sunk costs that can explain the observed high persistence in firms' export behaviour. The authors also empirically proved the existence of sunk costs for a sample of Colombian plants of the manufacturing sector, observed between 1981 and 1989 inclusively. For the sample used in this paper, I analysed entry in and exit from the foreign market (see Fryges, 2004a). Although the data set is not suitable to prove empirically the existence of sunk costs, my results are consistent with the sunk costs hypothesis.

15. According to *t*-tests, the means for UK firms are significantly larger than the means for German firms. This is true for both measures and for both points in time.

16. In connection with the first survey conducted in 1997, 40 case studies (20 in each country) were carried out in order to illustrate the statistical findings of the large mail survey. The interviews, which are documented in detail by Bürgel et al. (2004), also support the interpretation that the internationalisation process of German firms can be described as a pull-strategy, whereas UK firms rather follow a push-strategy.

17. Adding up the percentages of agents and distributors reveals that for German exporters, as for their British counterparts, export intermediaries comprise the most frequently used entry mode. However, direct exporting remains more prominent among German firms.

18. The number of observations in the two columns "entry mode" and "sales mode in 1997" are almost identical since the information for both was given in the first survey conducted in 1997. The minor deviation in the number of observations is only due to some item non-responses. Changes in the share of sales modes in the two columns therefore result from firms changing their sales mode in one market or another.

19. Note that this argumentation contradicts the propositions of Anderson and Gatignon (1986) as reviewed in Section 2. They assumed that transaction costs of selling a technically sophisticated product via an intermediary (low-control sales mode) exceed those of direct exporting (high-control sales mode), in particular because of high costs of controlling a potential intermediary. In contrast, I argue that in the presence of transaction-specific assets the costs of controlling a foreign distributor rise as proposed by Anderson and Gatignon, but that the costs of direct exporting also increase tremendously. Thus, the costs of exporting via an intermediary may or may not exceed the costs of direct exporting.

20. The number of observations in the column "sales mode in 2003" is smaller than in the first two columns of Table 2. German firms left a good 18% of their three most important markets of 1997 between the two surveys, while UK firms left just under 10%. Thus, the shares of sales modes used in 2003 differ from the 1997 column because firms left certain markets and because they changed the sales mode used on the foreign markets where they still had international sales in 2003.

21. During the time period we observe, the majority of the firms in our sample switched their sales mode just once. There are a few markets where the sales mode was changed twice. Whenever this was the case, the sales mode first changed from direct exporting at the time of market entry to exporting via an intermediary in 1997, and then back to direct exporting in 2003.

22. There are only a few reliable and internationally comparable figures for the application of e-commerce. OECD (2003) uses the number of SSL-servers (secure socket layer) as an indicator for the potential of e-commerce, because SSL-servers are needed for business transactions via the Internet that require the transmission of confidential data, in particular, in the case of electronic payment. The number of SSL-servers per 100,000 inhabitants increased remarkably during the last years: Whereas in 1998 there were 0.6 (1.2) SSL-servers per 100,000 inhabitants in Germany (in the UK), the number rose to 9.7 (17.2) in 2002. According to a ZEW survey, 39% of all German companies with at least five employees utilised the Internet for e-commerce activities in 2002 (Hempell, 2004).

23. Fritz (2000) analysed how international market entry strategies will change if the possibilities of the Internet economy are taken into account.

24. It is important to note that the dependent variable is the transition probability. Provided that there are no missing values for the independent variables, a particular foreign market will enter the log-likelihood function twice: with the transition probability from market entry to 1997 and with the transition from 1997 to 2003.

25. Since we observe the firms in our sample only at the time of the two surveys, i.e., in 1997 and 2003, it cannot be excluded that a firm may have left and re-entered a particular foreign market between the two surveys. Thus, the number of years used in the regressions is, strictly speaking, only correct in the case of a continuous engagement in a foreign country.

26. Anderson and Gatignon (1986) further proposed that the probability of using a high-control sales mode will increase if the firm sells an immature product. I estimated a specification that included (the logarithm of) the age of the firm's best-selling product, but this variable turned out to be insignificant in both transition equations and was therefore excluded from the final specification.

27. Country risks were ranked and then entered into the model. Rank "1" was attributed to the lowest risk level. See Table 4 for more details.

28. Data from the first survey were appropriately aggregated in order to obtain comparable data for both periods examined.

29. The same argument would apply if we measured the exogenous variables at time $t-1$: if we observed a sales mode change in the period between $t-1$ and t, the independent variables might have changed in advance of the sales mode switch.

30. The results were obtained using the statistical software package STATA, version 8.2 SE.

31. I also estimated the two transition equations for each country separately. Since the number of successes (i.e., a sales mode change) is relatively small, country-specific estimations involve some problems. Nevertheless, there is no evidence of structural differences between German and UK-based firms.

32. For the subsample of UK-based firms, Bürgel et al. (2004) found a positive effect of start-up size on the probability of selecting a distributor, but only at the 10% level of significance.

33. In fact, analysing foreign market participation of the firms in our sample, I found that R&D activities can be used to discriminate between exporters and non-exporters (see Fryges, 2004a).

34. Estimating the determinants of entry mode choice for the firms of our sample, Bürgel et al. (2004) found a significantly negative effect of R&D intensity on the probability of choosing a distributor. However, the reported marginal effect is very small: a marginal increase in R&D intensity reduces the probability of using a distributor as the first sales mode by only 0.3 percentage points.

35. Wald tests of joint significance of the three remaining country-specific variables: transition from direct exports to exporting via an intermediary: $\chi^2(3) = 3.17$, $(\text{Prob} > \chi^2) = 0.366$; transition from exporting via an intermediary to direct exports: $\chi^2(3) = 4.48$, $(\text{Prob} > \chi^2) = 0.215$.

36. This result corresponds to that obtained by Benito et al. (2005) and Pedersen et al. (2002) who used foreign market's GNP as a proxy for market size. The authors emphasised that in future studies data on more disaggregated levels should be collected.

37. The annualised employment growth rate in the period from 1997 to 2002 of our sample's exporters amounts to 7.7% (see Fryges, 2004b).

38. The marginal effect for a dummy variable is the discrete change of the dummy variable from 0 to 1.

39. The first survey this paper is based on contains information about the dominant sales mode used in the domestic market (distributors versus direct sales from headquarters). Estimating a probit model of the choice on foreign market entry mode of the UK firms in our sample, Bürgel and Murray (2000) found out that the domestic sales mode is the strongest predictor of the chosen entry mode. This finding stresses the importance of firm-specific routines.

40. Bürgel and Murray (2000) further argued that accepting the product of a young innovative firm might not be attractive from the foreign distributor's point of view either. The distributor also has to invest, for instance, in specialised training of his sales personnel, although the return of this investment is highly uncertain. Thus, the distributor has to be paid to bear this risk, which makes exporting via an intermediary quite expensive for a small high-tech firm. If it is nonetheless forced to use an intermediary in the foreign market due to the liability of alienness, it will be interested in switching to direct exports as early as possible.

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ANALYSIS OF INTERNATIONALIZATION STRATEGY CHOICES OF FIRMS THROUGH THE METAPHOR OF GAME

Pasi Sajasalo

ABSTRACT

A novel, dynamic approach building on the metaphor of game for analyzing the international expansion of firms and strategies used in the process is proposed. Based on analysis of 358 strategic moves by the three largest Finnish forest products firms to test the applicability of the approach, it emerges that the internationalization strategy of these firms evolved in three distinct phases, and that change between phases is best characterized as discontinuous change. The paper closes with a discussion of the suggested contributions of the approach to the field of IB in general, and to the behaviorally oriented internationalization process perspective in particular.

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1. INTRODUCTION

There is a long and continuing tension between schools of thought that aim at explaining the international expansion of firms within the international business (IB) literature. On the one hand there is the economics-based school, which subscribes either to the internalization or the OLI framework (cf. Buckley & Casson, 1976; Dunning, 1977, 1979, 1980) as the basis for their explanation of the international expansion of production. On the other there is the behaviorally oriented "Nordic School" (cf. Carlson, 1966, 1975; Johanson, 1972; Johanson & Wiedersheim-Paul, 1975; Johanson & Vahlne, 1977), which explains the international expansion of firms as a learning process linked to bounded rationality and uncertainty reduction.

While sharing a common interest and regardless of repeated calls for integration (Daniels, 1991; Schollhammer, 1994; Vernon, 1994), the various schools and their theories have remained somewhat self-contained without much interaction, let alone integration. This paper explores a way of reducing the perceived tension and distance between the two lines of theorizing by introducing an alternative approach for the analysis of international expansion and strategies followed in it, one based on the metaphor of game. The approach, it is suggested, serves as a bridge between the two contrasted lines of reasoning by helping to highlight both the rational – an underlying guiding principle of internationalization study – and the emergent elements in internationalization processes in order to trace and analyze the internationalization strategies of rival firms.

The neglect of emergent elements in theorizing on the international expansion of firms as well as the neglect of the role of competitive rivalry between close rivals for internationalization is surprising. Especially, allowing for the fact that already decades ago Vernon (1966, p. 195) pointed toward their importance as a motive for internationalization:

> [U]ncertainty can be reduced by emulating the pathfinding investor and by investing in the same area; this may not be an optimizing investment pattern and it may be costly, but it is least disturbing to the status quo.

The suggested bridging capacity and metatheoretical qualities of the proposed approach will be discussed in more detail below. While the paper is mostly of an exploratory nature, the internationalization development of the leading Finnish forest products firms is used as an empirical setting to test the applicability of the proposed approach. The empirical setting was chosen because the recent history of the three largest remaining Finnish forest products firms, Stora Enso, UPM-Kymmene and M-real presents an

interesting case in terms of the evolution of internationalization strategy. Historically, the dominant mode of strategic conduct of Finnish forest products firms has been that of cooperation between domestic rivals in the world market (cf. Heikkinen, 2000). It is held in this paper, however, that this perception is limited in the light of more recent evidence.

The paper will show how the cooperative and competitive modes of strategic conduct have coexisted, and how cooperation has been clearly replaced by competitive strategic conduct, more recently, as the firms have continued their internationalization processes. This accentuates the need to incorporate more competitive dynamics considerations into theorizing on the international expansion of firms. The industry setting of the paper serves furthermore as an excellent illustrative case for global corporate evolution in many other industries characterized by a shift from a competitive setting of many small firms to one dominated by large multinational corporations.

2. AIMS OF THE PAPER

The aims of this paper are twofold. First, it aims to contribute to the field of internationalization study by suggesting and utilizing an alternative approach for the analysis of the evolution of internationalization strategies of firms, paying more attention to the role of competitive dynamics in the process than is typically found in the extant literature. Second, empirically the paper aims to make a contribution to our understanding of the processes of internationalization/corporate globalization within the context of the forest products industry with special emphasis on analyzing the change of strategic orientation of the firms studied, and discussing some of the underlying factors contributing to the orientation change.

3. METHODOLOGY AND DATA

Time has recently become an important facet of the analysis of various transformative phenomena in organizational and management studies (Pettigrew, 1985, 1997; Pettigrew & Whipp, 1991; Whipp, 1987; Van de Ven & Poole, 1990; van den Bosch, 2001). This paper recognizes that an interest in the development of a certain phenomenon necessarily bears with it a need to adopt a process perspective in its study. Thus, a longitudinal process orientation to the study of the individual firms' internationalization processes

is the underlying idea followed in this paper. Methodologically the study could be best characterized as a multiple case study (Yin, 1984) concentrating on description and analysis of the evolution of the case firms' internationalization strategies.

The process data utilized is based on annual reports of the firms studied over the period 1985–2000, articles from the leading Finnish business magazine *Talouselämä*, and leading national newspaper *Helsingin Sanomat*, both covering events within the industry in detail as well as on extant literature offering additional information on some of the major internationalization events and historical development of the firms analyzed predating the mid-1980s.

The use of various sources of data to track the internationalization strategy of the firms analyzed, while initially resulting in duplicate entries on the same event, is justified by the need for triangulation (Denzin, 1978; Jick, 1979; Scandura & Williams, 2000) to increase the reliability of data, and as a result, the interpretations made based on it. However, in the final analysis any duplicate entries describing one and the same occasion are combined into one single event regardless of how many times it appears in the combined raw data from different sources.

There are some obvious problems associated with the use of documents produced in organizations as a source of data, one of the most fundamental being the fact that they are produced for some specific purpose and audience, other than research (Yin, 1984, p. 81). As annual reports serve not only the information conveyor function, but also persuasive functions toward different stakeholders, it is likely that they tend to portray the company in the most favorable light possible. Positive aspects of operations tend to get treated explicitly as resultant of actions taken by the firm, while negative aspects are treated as resultant of the functioning of an indefinite and vague "environment" beyond the firm's control (Sierilä, 1989; Das & Teng, 1999; Schwenk, 1995).

However, annual reports as a source of data possess some major strengths that offset the problems. The annual report is the most official, audited document produced by a company when reporting its activities (Sierilä, 1989), and since strict demands are placed on the content of annual reports by stock market bodies and legislators, the reliability of the information contained in these may be regarded as high (recent notorious counter-examples notwithstanding). Thus, the question regarding the usability of annual reports as a source of data may not actually be the reliability of the information, but rather a question of whether there is enough and sufficiently detailed information for research purposes.

The use of annual reports for strategic research purposes in the context of forest industry is promoted by Sierilä (1989, 1991), who, based on his studies utilizing them as a source of data, concludes that they are a useful, yet unnecessarily neglected source of data for strategy researchers. Also, Forster (1994) promotes the use of organizational documentation, such as annual reports, as a source of data. He argues that various forms of company documentation are needlessly overlooked by social scientists, although they provide both contemporaneous records of events in organizations and a way of taking a closer look at historical processes and developments in them. Both Sierilä's and Forster's views regarding annual reports' usefulness as a source of data are acknowledged here, but, nevertheless, the data drawn from annual reports is supplemented by other sources of data providing a basis for triangulation (e.g. Denzin, 1978; Jick, 1979), and hence an important means of increasing the validity, reliability and, above all, credibility of the research findings.

4. THEORETICAL UNDERPINNINGS

Numerous ways of defining the concept of internationalization of the firm can be found in the literature (Welch & Luostarinen, 1988). In this paper internationalization is seen to cover an array of cross-border activities, whether they concern production or trade, and whether the activity takes place within one organization or between independent organizations by which a firm develops its international involvement and commitment to foreign markets (Johanson & Vahlne, 1977; Welch & Luostarinen, 1988). Hence, interest focuses on the variety of forms that the expansion of business operations abroad may assume instead of just one narrowly defined aspect of the same, which (regrettably) seems to be a strong inclination within IB literature (cf. Benito & Welch, 1994; Boddewyn, 1997; Kutschker & Bäurle, 1997).

In this paper, the emphasis is on the later phases of the internationalization process. In effect, the organizational form of the firms analyzed could be characterized as mature multinational enterprise (MNE) as their operations spanned dozens of countries already in the mid-1980s. Thus, it is taken as given that these firms are relatively experienced in terms of international operations at the outset of the study and, as a result, well capable of leapfrogging steps in the establishment chain as suggested by Nordström (1991) due to experience gained in previous operations. This is seen to hold true while, as discussed below, involvement could be characterized as

passive during the early years of analysis. Furthermore, the firms analyzed may be termed highly internationalized by any traditional indicator of degree of internationalization as shown by Benito, Larimo, Narula, and Pedersen (2002) findings analyzing the 10 largest multinationals in three Nordic countries, the three firms analyzed in this paper being included in their sample of Finnish firms.

Despite widespread acceptance of the processual nature of internationalization, the inherent dynamism related to the phenomenon seldom receives enough attention; instead, static models and approaches dominate study of the internationalization of firms (Melin, 1992; Kutschker & Bäurle, 1997; Kutschker, Bäurle, & Schmid, 1997; Welch & Welch, 1996). The same applies to temporal considerations: seldom do the historical repercussions of strategic decisions and oft-resultant path-dependent processes (North, 1990; Lamberg & Parviainen, 2003) get the attention deserved in internationalization studies, but decisions and resultant activities get treated as one-off disconnected investment decisions. This is especially true of approaches relying on economics-based reasoning typically sharing an assumption of rationality (explicit or implicit) as the guiding principle of behavior (Benito & Welch, 1994).

While the state of affairs is well recognized even by scholars themselves closely associated with the economics-based school, not much attention has been devoted to increasing the dynamic aspect in theorizing. Peter Buckley (1989, p. 83) comments that

> preceding theoretical frameworks have a limited dynamic content and it is in this direction which theory must develop to encompass the complexities of market servicing strategies.

In this paper, the international expansion of firms is taken to be an inherently dynamic phenomenon resulting from specific actions taken by firms based on judgment (perfect rationality not implied) of their management, with past decisions playing an important role in the process. Thus, the starting point of the paper is a critique of the dominant static, ahistorical approaches to the study of internationalization development of firms. Moreover, it is argued that the proposed approach building on the metaphor of game brings a much needed action orientation in the spirit of Vernon (1966) to the analysis of internationalization, which, in itself as a term, epitomizes change.

Ideationally, similar perspectives or conceptual models that attempt to import certain aspects of strategic management literature to study of the international expansion of firms, or imply the need for more strategic

considerations to be incorporated into the analysis of internationalization processes include, for instance, the contribution of Melin (1992) where the internationalization of a firm is treated explicitly as a strategy process, and the issue of IB research suffering from overly deterministic models and the static nature of theorizing is raised. Furthermore, Melin suggests that paying attention to dynamics involved in the development as well as paying more attention to context is the way forward in internationalization research. Welch and Welch (1996) also suggest a need to incorporate more consideration for strategic issues into internationalization research and propose a model for doing exactly that comprising strategic planning and flexibility as well as strategic foundation (resources of various kinds) as important drivers of the overall internationalization process and of the specific foreign market commitments, which they refer to as stepping stones. They frame their discussion mainly in the network context, but their contribution too goes to show the importance placed on context as a factor in internationalization strategy.

Addressing the internationalization of firms through the metaphor of game and the frames of reference utilized in this paper that build on the game metaphor puts the firm center-stage as the major actor whose undertakings are examined over an extended period of time. The central supporting idea in examining internationalization development through the frames of reference, setting it apart from the dominant static approaches to internationalization study, is that here the internationalization of firms is seen as dynamic, goal-oriented, intentional strategic game-playing activity characterized by rivalry and struggle between firms to match, outmaneuver, and outperform their competitors in order to maintain or strengthen the firm's respective strategic position within its industry.

Thus the international expansion of firms, more specifically MNEs within the Finnish forest products industry are seen to be largely motivated by competitive rivalry within a group of firms competing for dominance in their industry. This is not to say, however, that other factors apart from competitive rivalry do not matter; obviously they do. The array of issues affecting internationalization decisions is wide, as demonstrated for instance by the OLI framework (Dunning, 1977). However, the very same OLI framework serves as a prime example of the lack of competitive dynamism considerations regarding the international expansion of firms within economics-based theorizing on internationalization.

In this paper, the examination of internationalization development of firms relies on the observable manifestations of it, and strategic moves made by firms that are perceived to be resultant of the collective action of

members of an organization. Thus what is of interest from the point of view of this paper are the observable manifestations of internationalization development, detectable strategic moves carried out by firms in their task environment. Overall, then, the core ontological assumption is to treat the social world, as Morgan and Smircich (1980) would put it, as a concrete process.

The proposed method of analysis based on the metaphor of game allows theoretical insights from various streams of literature to be drawn together within a unifying framework without becoming captive to any single line of thought. The framework allows more realistic assumptions, such as reactive decision making based on imperfect information (or even misinformation), conflicting goals caused by corporate structures and the like which theorizing building on neoclassical theory of the firm would have difficulties coping within complex and uncertain environments as pointed out by Shubik (1961).

Thus, although 'game' appears in the title of method of analysis proposed in this paper, and while it is conceptually akin to game theory (see Blackwell, 1954; von Neumann & Morgenstern, 1944; Shubik, 1954), game theory, with its mathematical modeling complexities and unrealistic simplifications, is not the ideal built upon. An approach building on game metaphor to analyze the strategic conduct of firms in their international expansion efforts allows relaxation of the rather rigid central assumptions held within game theory related to rationality – a closely-held assumption in economics-based internationalization literature as well – perfect information, set and known rules, number of players, sequence of moves and similar assumptions. Hence, the game metaphor approach is held to offer versatile tools for making sense of internationalization under competitive conditions, a complex phenomenon not neatly falling into the domain of any single academic discipline or functional area within an organization.

Overall, the suggested approach is in agreement with the behaviorally oriented schools' line of thought building on the behavioral theory of the firm (Cyert & March, 1963) inspired by the findings of Simon (1955, 1956) related to bounded rationality, limited information and uncertainty. Instead of maximization and rationality as the guiding principles of organizational behavior subscribed to in various approaches building on orthodox economic theory, satisfizing (Simon, 1956) – striving for an acceptable level of a particular corporate objective – is seen as the rule. This means that the approach suggested here building on the metaphor of game offers a very different orientation to the analysis of internationalization and strategies utilized in the process than do the economics-based models, setting the

discussion and analysis of the phenomenon in a very different mental frame from the economics-based approach.

Addressing the phenomenon from the point of view proposed in this paper allows appreciation of the internationalization of business activities as a dialectic process (Van de Ven, 1992) by placing it in the context of the overall business opportunities and competitive forces on one hand, and the search processes and satisfying behavior of the firm on the other. Moreover, looking at internationalization from the game perspective further highlights the emergent nature of the process in which intended courses of action are seldom realized exactly as planned (Mintzberg & Waters, 1985).

5. ANALYTICAL TOOLS BUILDING ON THE METAPHOR OF GAME

The frames of reference utilized in analyzing the internationalization strategy choices of Finnish forest products firms build on the works of Näsi (1991, 1996, 1999), where he first proposes the game-playing view as a discernible line of thought within strategic thinking (Näsi, 1991), and later develops the analytical frames of reference more fully (Näsi, 1996, 1999) into the form in which they appear in Näsi and Sajasalo (2006), a historical analysis of an industry-level concentration process in the Finnish forest industry setting. The frames of reference pull together various lines of strategic thought on the forms of competitive conduct of firms combined with ideas treating organizational activity through the metaphor of game (cf. Carse, 1986; Clancy, 1989; Mitroff & Pauchant, 1990). The frames of reference are synthesizing and metatheoretical by nature, and offer workable tools for analysis of the international expansion of firms under competitive conditions, as well as for tracking strategy choices and the strategic conduct of firms over time during the process.

Ideas derived from the portfolio management literature (e.g. Henderson, 1984; Hamermesh, 1986) and diversification literature (e.g. Wrigley, 1970; Rumelt, 1982) are most visibly present in the frame of reference related to the ways of meeting competition in the sense that various operations are seen to resemble a portfolio of operations from which a firm may attempt to build a balanced portfolio by choosing the most desirable modes of operation for a given target country where a given competitive situation prevails. Furthermore, the use of ideas from diversification literature is relevant as the early strategy literature typically treats internationalization as one avenue of diversification (see Ansoff, 1965).

Influences from value chain literature (e.g. Porter, 1985; Galbraith & Kazanjian, 1986) are evident in the frame of reference dealing with the target of the move in terms of its location within the production chain. International expansion in terms of the location of various value-adding stages of the chain may range from moves aimed at securing raw material supply – a very important consideration for natural resource-based industries such as the forest products industry – to the customer interface at the opposite end of the chain.

Utilizing the metaphor of game, the behaviorally oriented schools' line of thought related to the processual nature of the phenomenon, and the aforementioned streams of strategy literature as the ideational background for analysis of the international expansion strategy of firms and tracking their evolution over time, two analytical frames of reference depicted in Fig. 1 are used in this paper.

The frames of reference below are not intended to present an exhaustive list of strategic moves firms may resort to in expanding internationally, nor are they intended to be universally applicable, although calls for the development of universal taxonomies of organization types and of strategic actions of firms have been expressed (Smith, Grimm, Gannon, & Chen, 1991; Chattopadhyah, Glick, & Huber, 2001). However, what the frames of reference above allow is the creation of a codification scheme that enables

TARGET	RAW MATERIAL	SEMI-FINISHED PRODUCTS	FINISHED PRODUCTS	SALES, MARKETING & SERVICE

WAY OF MEETING COMPETITION	OPENING/EXPANSIVE MOVES	CLOSING/WITHDRAWAL MOVES
ACTIONS AIMED AT MEANS OF PRODUCTION	CAPACITY-ADDING INVESTMENTS	DOWNSIZING, SHUTDOWN OF CAPACITY
COMPANY DEALS	ACQUISITION OF A COMPANY/UNIT, ESTABLISHMENT OF A NEWCOMPANY/UNIT	SALE OF A COMPANY /UNIT
COMBINING COMPANIES	MERGER	DEMERGER
COOPERATION	ALLIANCE, IJV	TERMINATION OF AN ALLIANCE, IJV

Fig. 1. The Two Analytical Frames of Reference.

classification of moves performed by internationally expanding firm(s) according to their nature.

At this point, it is important to clarify what is meant by a strategic move in this paper. Strategic move refers here to actions that involve significant commitments of specific, distinctive resources, and that are difficult to implement and reverse (Galbraith & Kazanjian, 1986). Although Galbraith and Kazanjian (1986) originally use the term strategic action to refer to such acts that bear great importance for the future of the firm, the term move is preferred for these in this paper. A strategic move, then, is a move dealing with considerable allocation of resources, thus bearing significant implications for a company's future prosperity. A strategic move furthermore necessitates consideration of numerous environmental factors, and requires top management involvement. In addition, the fact that moves aimed at international expansion of a firm's activities are not easily reversible highlights their strategic nature. Taken together, the above features associated with international expansion make decisions and moves regarding it important, in essence, decisions of corporate strategy level, and thus of a strategic nature.

The target of a move within the production chain may range from securing attractive sources of raw material – either wood or recycled fiber – to arrangements concerning the production of paper and board or their converted products, and finally, to the sales and marketing of those products. The opposite ends of the target frame correspond with Porter's (1985) value chain activities of inbound logistics and marketing and sales with the exception that service functions serving sales and marketing purposes are also included.

The ways of meeting competition and girding oneself for it range from internally oriented moves of productive capacity investments (or divestments), or establishment of new units to arms-length dealings to secure control over a firm through markedly financial and contractual means, and further to more informal cooperative arrangements such as alliances or more contractually binding arrangements with a cooperative undertone, international joint ventures (IJVs). In addition, the second frame of reference helps to identify the move's future orientation in terms of it being aimed at starting something new, as with moves aiming at creating a new entity or adding an existing one to the organizational whole thus expanding it, or terminating something existing, as with moves aimed at scaling down or terminating an activity, thus withdrawing from some function or operation.

Overall, it is argued and later demonstrated that the use of the two frames of reference enabling a dynamic strategy-centered orientation to the analysis

of internationalization processes are of assistance in performing comparisons between firms, and discovering patterns in the international expansion and strategies used in the process by following a quantification strategy (Langley, 1999): quantifying the qualitative process data into a more readily comparable form.

Furthermore, it is argued that with the help of the frames of reference above two goals are attainable: (1) performing comparisons of firms' internationalization processes (over time, between firms), and (2) making the strategies followed more visible by means of longitudinal analysis. In Mintzberg's (1987b) terms, what is sought by the use of the two frames of reference in analyzing the internationalization process of a firm is the uncovering of a plan or a pattern: making the realized strategies followed by the firm visible. As discussed above, highlighting both the emergent nature of international expansion processes and the competitive dynamics influences on it are seen to be important for advancing theorizing in the field of IB.

6. INTERNATIONALIZATION OF FINNISH FOREST PRODUCTS FIRMS' PAPER BUSINESS OPERATIONS

The time frame of the analysis, 1985–2000, was a period characterized by great turmoil within the Finnish forest products industry (cf. Näsi, Lamberg, Ojala, & Sajasalo, 2001). It also represented a major reorientation of growth strategies of forest products firms (Sajasalo, 2003) that has attracted only limited study in the internationalization strategy context. Furthermore, the importance of this period is accentuated by a Europe-wide transformation within the industry: over the last 20 years the share of total production capacity held by the top 10 firms in Europe jumped from 20 percent to 50 percent (Hyvärinen, 2000), and thus the competitive setting within the industry in Europe could be seen as virtually oligopolistic.

Following an overview outlining the major strategic moves in the international expansion process of each of the firms analyzed, an accompanying analysis utilizing the frames of reference of altogether 358 internationalization moves performed by the firms studied, Stora Enso, UPM-Kymmene and M-real – and their predecessors is presented in order to examine more closely the differences in the internationalization strategies followed by them.

To offer some background on the history of the internationalization of the Finnish forest products industry, the paper industry in particular, it has

been from the very outset among Finland's most important export industries (Ojainmaa, 1994) with a peculiar organizational arrangement for handling exports. Sales associations, non-profit organizations jointly owned by the Finnish forest products companies acting as a unified front for the firms handled exports, making cooperative arrangements the dominant mode of IB operations for several decades.

To go over the most important events in the internationalization processes of the firms studied, starting with Stora Enso's predecessor Enso-Gutzeit (hereinafter Enso), the international involvement of Enso, especially in terms of foreign production, took off relatively late. However, Enso was fairly active in building its wholly owned marketing network from the 1950s onward, and could thus be described as having been active in commercial internationalization (Reinikainen, 1991).[1] Although Enso was a late starter in production terms, it became involved in a difficulty-ridden joint venture with several Finnish forest products firms in Canada in the 1970s (Lamberg, 2001; Ojala, 2001). This early internationalization attempt was based – as were most other attempts by Finnish forest products firms at the time – on overly optimistic market predictions and raw material cost calculations (Ahvenainen, 1992).

The internationalization moves of Enso during the 1980s were markedly dominated by a cooperative mode of internationalization strategy. During that time Enso either acquired minority stakes in several companies or established joint ventures in such varied locations as Barbados, Indonesia, France and the UK. It also became involved in an international cooperative arrangement with the Soviet Union by forming a wood procurement joint venture, and a joint venture in pulp production in 1989. As an indication of aspirations for full strategic freedom, Enso withdrew from long-time marketing cooperation in 1986 and became the first of the Finnish forest products firms to rely solely on its own sales network.

Overall Enso's internationalization may be described as a process marked by a series of moves characterized by decisive action followed by periods of relative quiet (Sajasalo, 2003, 2002, 1999) bearing a close resemblance to what Mintzberg and Waters (1982, pp. 492–493) refer to as a sprint and pause strategy. The early 1990s formed a turning point in Enso's internationalization strategy. After an extended period of relative quiet and withdrawal from Canada in 1993, Enso's process of increasing international involvement continued closer to home base. By acquiring a crisis-struck Finnish rival's forest industry operations, Enso made a giant leap forward in its foreign production operations and gained units in Spain, Italy, Germany and Sweden in 1993. The following year marked the startup of a greenfield

newsprint investment in Germany. The investment was Enso's first of its magnitude in Germany, and only the second major greenfield investment by a Finnish forest products firm in Germany overall.

In the mid-1990s, Enso was active on several fronts: it merged with a Finnish rival, Veitsiluoto, which withdrew from the jointly owned sales associations in 1995. Furthermore, at that time Enso reorganized and expanded its sales network worldwide. In 1997, Enso continued its expansion in Germany by acquiring a majority stake in magazine paper and newsprint producer Holtzmann. The increasing of international involvement actively pursued from the early 1990s finally escalated into the merger of Enso and Stora of Sweden in 1998, marking a quantum leap (Miller, 1982) in the internationalization of Enso: it turned from a domestically oriented firm into a multinational corporation virtually overnight.

In 1998, Stora Enso further acquired one-fifth of an Indonesian pulp and paper firm, a large sawmill in Austria, and divested several units. Overall, the magnitude of the merger and resultant reorganizations were considered to be of a scale that would restrict any major investments in the near future. However, the next major internationalization move, acquisition of US-based *Consolidated Papers* took place already in 2000, and marked the company's re-entry to the North American market on a major scale after an absence of 8 years.

The internationalization of UPM–Kymmene's other predecessor Kymmene[2] through foreign direct investment started quite early in comparison to other Finnish forest products firms. Having been the largest within the industry in Finland, Kymmene held itself to be sufficiently large to operate on its own in the international marketplace, which had its effects on strategies followed by Kymmene. Overall, Kymmene may be seen to have followed a two-pronged strategy in its international involvement. First, it established a relatively strong production presence early on in the most important markets served previously through exports, and second, it complemented its market coverage by operating through the jointly owned sales associations in markets less central to it. In addition, Kymmene was active in building a wholly owned marketing network for its core products, fine papers, while at the same time utilizing the sales associations as a parallel channel. Due to this, Kymmene was often regarded as a somewhat untrustworthy partner by the other members of the sales associations (Heikkinen, 2000; Ojala, 2001).

Kymmene proceeded in internationalizing its production first in the United Kingdom in the 1930s by gaining a bridgehead position in the UK

market in newsprint, and later, and more importantly, in West Germany in the mid-1960s (Ojala, 2001). The first-mentioned expansion followed an acquisitive strategy, while the latter was a greenfield organic expansion. Hence, in the mid-1980s Kymmene already had an established manufacturing presence in the UK and (West) Germany, in addition to France and Canada.[3]

With the exception of the 1989 startup of *Caledonian Paper* in Scotland, the internationalization moves of Kymmene in the 1980s may be seen as aimed at maintaining attained positions in markets already penetrated through relatively small investments. The startup in Scotland, however, radically diverged from the overall picture. It was the first investment in magazine paper production in the UK and thus clearly a groundbreaking and pre-emptive internationalization move by Kymmene.

The internationalization development of Kymmene in the 1990s was characterized mostly by reorganizations and divestments. In 1990 it divested UK-based *Star Paper*, the firm's first FDI made superfluous by the investment in Scotland. It also resigned from the sales association *Finnpap* to rely on its wholly owned sales network. In addition to these closing moves Kymmene performed an acquisition as well, of the French paper firm Chapelle Darblay. Thus, overall the internationalization process of Kymmene may be characterized as inconspicuous development primarily through organic growth with occasional acquisitions.

United Paper Mills (UPM), the other predecessor of UPM–Kymmene, relied heavily on exports as the dominant mode of international involvement. Although UPM had established a manufacturing presence in its core product newsprint in both the UK and France in the 1980s, it was, however, in terms of production heavily domestically oriented: almost 90 percent of its production took place in Finland. The UK-based *Shotton Paper* was a greenfield investment that started production in 1985, while the majority stake in the French firm Stracel was achieved initially by acquisition. Stracel was originally a pulp mill that was revamped through investments in 1988–1990 to handle newsprint production.

Hence, after the initial acquisition UPM followed an organic route. As with Kymmene, also UPM followed a two-pronged strategy: its non-core businesses – mainly converting – followed a process of small and cautious steps of relatively low-risk approach in internationalization. Especially Raflatac, UPM's self-adhesive laminate subsidiary was active in both internationalizing production and sales in the 1980s and 1990s. Regardless of this, the bulk of its production was exported through the jointly owned sales associations.

The latter half of the 1990s forms a clear turning point in UPM's strategy in relation to internationalization. At the time the newly merged UPM-Kymmene clearly revised its strategic orientation toward international involvement from generally speaking relatively small-scale, low-risk, low-commitment and dominantly cooperative modes to major and deep involvement. Symptomatic of the changed orientation was the established strategic alliance with Indonesian pulp and paper company, *April*. While the alliance eventually fell through and did not materialize as planned, it granted UPM–Kymmene a strong manufacturing foothold in China. At first the alliance partners jointly operated a paper mill in China, but after serious financial difficulties *April* was forced to sell its half of the mill to UPM–Kymmene in 2000. Furthermore, another indication of the changed strategic orientation was the acquisition of the US-based *Blandin Paper*, an aggressively pursued, yet failed, merger attempt with the US-based *Champion International*, and later, the acquisition of Canadian paper company *Repap*.

The late internationalization of M-real's predecessor Metsä-Serla was mostly due to its cooperative ownership and late start of the company in comparison to its domestic rivals. It was established only in 1986 through the merger of two small forest products companies, giving its domestic competitors a good head start in their internationalization processes. The merged companies making up Metsä-Serla were domestically oriented in their operations and relied on exports as their dominant mode of international involvement due to the ideology of the owners and a lack of available resources owing to smallness, which has been considered a significant drawback for a firm pursuing involvement in IB activities (e.g. Becker & Porter, 1983; Lewitt, 1983).

The internationalization of Metsä-Serla's business activities may be characterized as a process of relatively small, cautious steps in businesses that required a local presence, and thus "forced" Metsä-Serla onto a path leading to international production. In the mid-1980s the newly formed company had established a production presence, typically through minority stakes, in Sweden, Denmark, the UK and Greece in firms that could best be characterized as converting units and outlets of domestically supplied commodities closer to customers. The second half of the 1990s may be regarded as a decisive period for Metsä-Serla as it was for UPM–Kymmene in terms of internationalization strategy redefinition. By performing a series of major acquisitions in Europe Metsä-Serla entirely revised its strategy from small-scale, low-risk, relatively low-commitment and predominantly cooperative modes of operation to the very antithesis of the strategy previously followed.

7. RESULTS AND ANALYSIS

In order to present a comparative analysis of the international expansion and strategies followed in the process by the three firms – close rivals – studied, the analytical frames of reference based on the metaphor of game are put to use. First, by utilizing the frame of reference dealing with the target of a move as shown in Table 1, some differences between the firms can be found.

While the strategic moves of the three firms are dominated by moves aimed at expanding production of finished products internationally, in the case of Stora Enso the share of moves in this category is one-fifth lower than in the case of UPM–Kymmene and M-real. This is most likely because the firms' attempts to locate new capacity geographically closer to the main markets in Europe in order to lower operational costs, most importantly the cost of logistics related to the final products. Furthermore, in the light of the analysis, Stora Enso appears to have been more upstream-oriented in its internationalization moves than its two Finnish competitors, as reflected in the share of strategic moves aimed at securing raw material supply. This is due to the large-scale cooperative arrangements with the Soviet government in which Enso was engaged. Moreover, the low share of moves by UPM–Kymmene aimed at organizing sales and marketing internationally reflects, in particular, United Paper Mills' history of strong reliance on the sales associations as the principal mode of engaging in IB activities (Sajasalo, 2003).

Taking a closer look at the international expansion of the firms studied and strategies followed in the process through the frame of reference dealing with the way of meeting the competition and with the type of strategic move displayed in Table 2, some interesting differences between the firms are revealed as well.

Table 1. Target of Move (Percent).

$N = 358$	Raw Material	Semi-Finished Products	Finished Products	Sales & Marketing	**Total**
Stora Enso	9	9	56	26	**100**
UPM–Kymmene	2	13	73	12	**100**
M-real	0	4	71	25	**100**
Total	**4**	**9**	**67**	**20**	**100**

Source: Annual reports of the companies, magazine and newspaper articles 1985–2000.
Note: UPM–Kymmene moves, United Paper Mills and Kymmene moves combined.

Table 2. Way of Meeting Competition (Percent).

$N = 358$	Capacity-Adding	Acquisition Establishing	Merger	Alliance	Downsizing Shutdown	Sale	De-Merger	Alliance Breakup	**Total**
Stora Enso	9	48	8	17	3	9	0	6	**100**
UPM–Kymmene	18	44	7	8	6	12	1	4	**100**
M-real	16	55	3	5	3	15	1	2	**100**
Total	**15**	**48**	**6**	**10**	**4**	**12**	**1**	**4**	**100**

Source: Annual reports of the companies, magazine and newspaper articles 1985–2000.
Note: UPM–Kymmene moves, United Paper Mills and Kymmene moves combined.

While acquiring and establishing both new subsidiaries and units clearly dominated the three firms' strategic move repertoire, differences between the firms, nevertheless, do exist. First, Stora Enso appears to have been more inclined toward cooperative arrangements in its international expansion than its rivals: just over one-sixth of Stora Enso's moves were aimed at establishing cooperative arrangements to meet the competition in the international marketplace and to establish a market presence abroad. Second, Stora Enso appears to have been the least prone of the three firms to meet the competition by capacity-adding investments abroad, while both UPM–Kymmene and M-real were clearly more attuned to strengthening their positions through organic growth of already established foreign units. The above tendency of Stora Enso is most likely due to its predecessor Enso's state ownership, which acted with all probability as an inhibiting factor for Enso's internationalization attempts prior to the latter part of the 1990s.

To further analyze the role of cooperative strategic moves in the international expansion of the firms studied, but on this occasion the termination aspect of them, taking a closer look at the category reveals a clear orientation change in terms of the formerly dominant cooperation between domestic rivals in the world markets. Apart from a small fraction of the strategic moves falling into the "Alliance breakup" category, aimed at terminating alliances with foreign partners abroad, such as the alliance breakup between *April* of Indonesia and UPM–Kymmene, the majority of them were aimed at terminating alliances with domestic rivals, most often cooperation within the jointly owned sales associations. This finding reinforces the earlier claim made about the coexistence of both cooperative and competitive modes of strategic conduct of the firms, and the change of orientation toward competition as the prevalent mode of strategic conduct between former allies in the international markets.

A closer examination of the strategic moves falling into the category "Acquisition or establishment of a new firm or unit" reveals an interesting orientation change in the international expansion strategies of the firms when examined over time: prior to the mid-1990s close to half of the moves falling into the category were, in fact, related to establishing new units, while after the mid-1990s nearly 70 percent of the moves falling into the category were acquisitions. This would indicate a clear change in the international expansion strategy of the firms studied: from a strategy dominated by organic growth and internal development to extend the firms' current international operations to one clearly marked by acquisitions as the primary means of further geographical expansion of business operations.

Table 3. Change in Type of Move over Time (Percent).

$N = 358$	Opening/Expansive Moves	Closing/Withdrawal Moves	**Total**
Prior to 1985	96	4	**100**
1985–1995	82	18	**100**
1996–2000	71	29	**100**
Total	**78**	**22**	**100**

Source: Annual reports of the companies, magazine and newspaper articles 1985–2000, extant literature pre1985.

Again, by examining the development over time, other clear indications of the changed strategic orientation of the firms studied are a slight, but noticeable move toward a more downstream-oriented strategy and – reflecting a shared concern within the industry for capacity control – a rise in the share of closing moves. This may be seen as a result of phasing out outdated capacity and selling off non-core businesses. This development is most evident in the change of the share of opening and closing strategic moves over time, as shown in Table 3.

Despite the different strategies followed by the firms analyzed, the "final" outcomes of the individual international expansion processes of the firms at the turn of the millennium, however, resemble each other quite closely, with the important exception of M-real. It has maintained or has been forced to maintain a clearly more regional scope of operations – as noted also by Benito et al. (2002) in their analysis – than its two Finnish rivals which expanded their operations out of their home base in Europe to both North America and Southeast Asia.

This finding bears an important managerial implication: it seems that a firm counted among, or aiming for a position among the leading firms within a globally competitive industry with markedly oligopolistic features cannot differ substantially from its main competitors either in relation to the extent of international involvement or in the geographical scope of its international operations. This suggestion is closely related to some central propositions related to the nature of multimarket competition found in the global strategy literature (cf. Hamel & Prahalad, 1985; Porter, 1986; Yip, 1995).

8. DISCUSSION AND CONCLUSION

To conclude, some of the central empirical findings of the paper related to the internationalization development of three Finnish forest products firms

in the light of analysis building on the game metaphor are presented, and the merits of the proposed approach for the study of international expansion of firms and tracking the evolution of internationalization strategies discussed in what follows.

Based on the description of the Finnish forest products firms' international expansion processes and their analysis above, the overall development within the industry may be divided into three distinct phases according to the strategic importance assigned to increasing international involvement. During the first phase of internationalization, which could be termed as the "sales associations' hegemony" phase, lasting up to the latter half of the 1980s, the strategic orientation of the firms toward increasing their international involvement could be best characterized as passive. For the most part the international involvement of the firms took place through intermediaries, and firms' own decisive efforts to pursue international expansion were infrequent. Of special importance as a mode of operation were the jointly owned sales associations. In consequence international expansion during this phase could be seen as "indirect internationalization".

During the second phase, termed the "internationalization through organic expansion" phase, until the mid-1990s, the strategic orientation of the firms toward international expansion shifted from passive to clearly more active. This change was most clearly manifested in various greenfield investments through which the firms sought a stronger foothold in markets previously served through exports alone, as well as expansion of their marketing networks to gain a more comprehensive presence in the most important markets.

The third, ongoing phase from the late 1990s onward may be seen as "internationalization through acquisitions and mergers". The resultant fast increase in the international involvement of the forest products firms may be seen partly as a consequence of the changed global competitive setting, and partly as a consequence of the limits of growth having been reached in Finland. As a number of major forest products firms worldwide had assumed similar strategic aims – growth in order to achieve the required size to secure greater control over their own destinies, and to obtain dominant positions within the industry to cope with global competitive pressures – the means of growth provided by organic expansion soon became exhausted. The forest products firms had to revise their strategic orientation, rendering it even more active and, in addition, radically change their approach toward the means employed.

A similar development was noticed by Benito et al. (2002) in their analysis of the largest Nordic MNCs. During the late 1990s, a number of the

companies in their study had been involved in restructuring their industries globally with the aim of growing into one of the big global players in order to decrease the risk of becoming acquisition targets themselves. Thus, looking at the development during the third phase within the Finnish forest products industry, it may be seen as a clear indication of a paradigm change, with the old industrial wisdom (Hellgren & Melin, 1992) related to the means of growth being replaced by a new one, much like in other industries at the time as well.

To sum up the preceding discussion and the paper's main empirical findings, some of the central factors influencing the change of international expansion strategy within the forest industry will be discussed in what follows. The transition from one phase to the next, it is maintained, was triggered by discontinuous changes in the competitive setting of the industry, or otherwise by crises of some sort in the operating environment which adversely affected the operating possibilities of the firms within the industry.

The first discontinuity and accompanying wave of consolidation within the Finnish forest products industry over the period studied may be seen as a reaction to earlier restructuring within the Swedish forest industry in the early 1980s (see e.g. Hellgren & Melin, 1993). As a result, the largest Swedish forest products firms grew considerably larger than their Finnish counterparts. Thus, the wave of consolidation within the Finnish forest industry may be seen as a reaction to a major change in the competitive setting giving the newly transformed Finnish firms the necessary competitive muscle to begin reorienting their international involvement strategy toward the expansion of operations abroad by organic means, through foreign direct investments. The change in strategic orientation during the phase could be best characterized as taking small cautious steps into the relatively unknown as suggested by the internationalization process literature (Johanson & Wiedersheim-Paul, 1975; Johanson & Vahlne, 1977).

The second and latest discontinuity and resultant wave of consolidation over the period studied may be interpreted as brought about by the severe economic recession in the early 1990s (Sajasalo, 2003). Due to a prolonged recession, resultant heavy losses, intensified competition due to serious overcapacity, and major mergers within the industry, the Finnish forest products firms' main owner groups came to the conclusion that in order to be able to compete in the forest industry "major league", further consolidation within the Finnish forest industry was required.

The two most prominent manifestations of this new line of thinking were the mergers between UPM and Kymmene, and between Enso and the Swedish firm Stora. The two newly formed firms, UPM–Kymmene and

Stora Enso rose to the top of global forest products firms' pecking order, and have remained among the largest forest products firms globally ever since. M-real followed a different route in its rise to be counted among the largest forest products firms in Europe, relying on a strategic alliance.

By gaining in size through mergers and alliances the Finnish forest products firms studied were able to revise their international involvement strategy toward a strategy characterized by striking acquisitive moves in order to gain additional growth through further international expansion. Thus, the second, ongoing period is characterized by forceful action to further increase the internationalization of both marketing networks and production by means of some notable strategic moves.

The development outlined above matches quite closely the ideas presented by Miller (1982), and Miller and Friesen (1980, 1984) related to the nature of strategic change, it being characterized by "quantum leaps". The proponents of the punctuated equilibrium view of change have presented similar ideas by arguing that strategic change is characterized by relatively long periods of small, incremental change followed by a period of radical change (Abernathy & Utterback, 1978; Romanelli & Tushman, 1994).

This characteristic of strategic change is, as Mintzberg (1987a, 1987b) points out, due to the fact that the concept of strategy is rooted in stability, not change. Thus, strategy, especially once made explicit, may be seen as a force that "resists change, not encourages it" (Mintzberg, 1987b, p. 29). Due to the change-resisting nature of strategy, radical changes in it necessarily occur through revolutionary change: radical-strategic change within an organization could be seen as analogous to paradigm change within sciences (Kuhn, 1970); the received strategic perspective is given up reluctantly. It has been suggested that the quantum view of strategic change fits large, established, mass-production organizations particularly well (Mintzberg, 1987b) – all very fitting characterizations in the current research setting. This paper's findings related to the nature of changes in the Finnish forest products firms' international involvement strategy lend support to the above suggestion: the changes in the firms' strategies may be seen to have emerged through distinct periods, and the change from one period to the next is characterized by discontinuity in the firms' strategic orientation.

In all, the mid-1990s forms an important watershed in relation to the international expansion (and growth) strategies of the Finnish forest products firms. The firms clearly revised their growth strategy after having first grown at the home base through organic means, and later through mergers. The same pattern recurred in the strategy of international involvement of the firms: after international expansion through organic means the

orientation was shifted toward mergers, and later toward acquisitions as the primary means of further increasing international involvement. The changed strategy may be seen to reflect an overall change in strategic thinking within the industry related to the means of growth: instead of growing organically through capacity-adding investments the emphasis has shifted toward gaining closer control over capacity. Thus, growth through non-capacity-adding means such as acquisitions and mergers has been adopted as the dominant mode of growth and mode of increasing the international involvement of the firms throughout the industry. This trend is clearly reflected in the change of share of opening and closing moves in Table 3 above.

To wrap up the development process and the importance of the mid-1990s as a watershed for the Finnish forest products firms' internationalization strategies, the development may be presented in a nutshell as follows: prior to the mid-1990s the firms increased their international involvement via small steps in relatively small-scale operations while standing firmly on Finnish soil. This was done in order to accumulate experiential knowledge (Johanson & Vahlne, 1977) of international operations and in preparation for a shift toward more demanding modes of international involvement characterized by high commitment that took place during the latter half of the 1990s. This change manifested itself in a series of spectacular mergers and international acquisitions not witnessed earlier in the history of the Finnish forest products industry. The merger wave resulted in three firms that may with reason be characterized as having reached a mature stage of internationalization (Luostarinen, 1979; Vernon, 1977), since their operations currently extend to dozens of countries.

Lastly, to discuss some of the proposed contributions of the paper to the field of IB studies in general, and to the behaviorally oriented internationalization process perspective in particular, these lie first and foremost in the introduction of a dynamic, action-oriented approach for the examination of the inherently dynamic phenomenon of internationalization processes of firms. An approach building on the metaphor of game offers an alternative to the dominant static approaches in the field of IB for the analysis of a firm's internationalization and strategies followed in the process. Second, the proposed approach to the study of internationalization processes may be considered a response to calls for the (re)introduction of the missing strategic viewpoint to analysis of the internationalization development of firms (cf. Melin, 1992). Thus, unlike Johanson and Vahlne (1990, p. 12) when stating "an internationalization process, once it has started, will tend to proceed regardless of whether strategic decisions in that direction are made or not", the internationalization of a firm is perceived as a process *explicitly*

driven by strategic considerations in this paper and reflected in the proposed approach. While the proposed approach is not by far the only contribution promoting the need to incorporate more strategic considerations into the analysis of internationalization processes (cf. Andersson, 2000; Calori, Melin, Atamer, & Gustavsson, 2000; Melin, 1992; Welch & Luostarinen, 1988; Welch & Welch, 1996) it is, however, one of the few that both proposes a dynamic model building explicitly on strategic considerations, and tests its applicability by utilizing empirical data. For another recent example incorporating explicitly strategic considerations into analysis of the internationalization processes of firms, while with a different level of analysis and scope (the entrepreneur's influence on internationalization strategy choice), see Andersson (2000).

Third, the frames of reference based on the metaphor of game offer an adequately broad means of addressing the multitude of ways a firm may choose to increase (or decrease) its international involvement. Thus, the proposed approach offers a way to integrate ideas found within two seemingly contradictory streams of literature, the behaviorally oriented internationalization process literature and the foreign direct investment literature, by combining the gradual organic process view of internationalization promoted by the internationalization process school with what constitutes a discontinuous change from the internationalization process school's point of view – acquisitions (see Andersson, Johanson, & Vahlne, 1997). This point is especially important, because, as for example Hennart and Park (1993), and Chao and Padmanabhan (1995) have noted, acquisitions as a means of internationalization have become increasingly important. In addition, various cooperative arrangements have grown in importance as means of internationalization as suggested in the international joint venture literature (see Geringer, 1991; Parkhe, 1993). Thus, any approach not taking into account these increasingly important modes of internationalization would be incomplete.

Fourth, the proposed approach allows true appreciation of the process nature of internationalization, and thus the incorporation of time in the analysis as one key variable. Hence, it offers a way to remedy the perceived lack of temporal considerations in analysis of the internationalization of firms (cf. Macharzina & Engelhard, 1991; Kutschker et al., 1997) by allowing longitudinal examination of the phenomenon. It further allows the incorporation of time into the analysis in varying time perspectives: the temporal duration of internationalization activity of firms may be considered to range from episodes to epochs, and further to evolution (Melin, 1992) within the overall internationalization process. Moreover, the

proposed approach based on the metaphor of game offers a way to make the realized strategies followed by firms more easily visible by allowing a longitudinal as well as a comparative approach, further aiding in the establishment of patterns of action. Finally, the proposed approach and frames of reference are offered as a versatile and flexible tool for the holistic analysis of internationalization processes that would be adjustable with relative ease to other contexts than the forest products industry alone. For instance, industries characterized by mass production of commodity-type goods in an oligopoly setting – labels that would fit many industries of today.

NOTES

1. Reinikainen uses the term commercially internationalized to describe a firm that is actively involved in foreign trade, but is either not at all, or is only moderately involved in foreign production.
2. UPM–Kymmene is the result of a merger in 1995 between two Finnish forest products companies United Paper Mills and Kymmene.
3. Kymmene was involved in the Eurocan joint venture with Enso-Gutzeit and Tampella in Kitimat, British Columbia. It, however, chose to pull out in 1981 and sold its interest in Eurocan to Enso-Gutzeit (Ahvenainen, 1992).

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