Asymmetric Demography and the Global Economy

Growth Opportunities and Macroeconomic Challenges in an Ageing World

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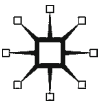

ASYMMETRIC DEMOGRAPHY AND THE GLOBAL ECONOMY

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To Ana, Paula, and Sebastian

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Introduction: The Project, the Results, and Policy Implications

José María Fanelli

The global economy has experienced deep structural transformations since the demise of the Bretton Woods system gave rise to the second globalization. From the point of view of emerging countries, three dimensions of the transformations are particularly relevant: the changes in the international growth dynamics, the expansion of capital movements, and the global demographic transition (Dervis, 2012; World Bank, 2012a).

The main purpose of this book is, precisely, to contribute to our understanding of why the demographic transition matters to the domestic macroeconomy and to global capital movements via the effects on the growth potential, the current account, and the economy's international financial position. We approach these questions from the perspective of "systemically important" emerging countries—that is, members of the G20—but considering both the national and the global side of the problem so as to identify issues that are relevant to these countries and the G20 policy agenda.

Growth, Global Capital Flows, and the Demographic Transition

Concerning growth dynamics, the developing economies' share of global income rose from 30 percent in 1990 to 50 percent in 2010 and growth miracles occurred in populous economies like China and India—whose weight in the world economy has increased. Thanks to the acceleration of growth, various emerging countries reached middle-income status in the 2000s. According to World Bank data, middle-income countries accounted for 13 percent of the global economy in 1990 and that share climbed to 30 percent in 2010. As a result, a set of developing countries is now considered "systemically important." This was reflected in the international political arena with the creation of the G-20, which brought together developed

and developing countries to discuss global financial problems and elaborate initiatives to improve the international financial architecture.

The expansion of global capital flows between developed and emerging countries has been such that it has become an autonomous factor promoting the structural transformations in emerging economies' markets and institutions. According to the Institute of International Finance data, in 1990 private capital flows involving emerging countries totaled 128 billion dollars. By 2010 they had grown to 1180 billion dollars. Together with the transformations in the process of creation and accumulation of financial assets, a key driver of change was the need to adapt the institutional framework—from the macroeconomic policy regime to financial regulations—to be able to absorb increasing amounts of private capital flows in the form of foreign direct investment and portfolio investment (Mateos y Lago, 2009; United Nations, 2009b).

The structural transformations in the international economy induced by the demographic transition have been no less impressive. The United Nations (2004) distinguishes three stages in the demographic transition. The first is the age of the child: a period when those under 15 years make up at least 30 percent of the population. The second is the demographic window of opportunity: a period when they have fallen permanently under 30 percent, but persons 65 years and older are still relatively few. The last stage begins when those 65 years and older have permanently increased to at least 15 percent of the population. This transition occurs over an extended period and the three stages almost always follow in sequence. Before entering the window, a country is labeled "young" and it is called "old" after it exits.

From the perspective of the global economy a key feature of the demographic transition is that it shows large asynchronies across countries and regions and, as a consequence, the share of emerging and advanced economies in the global population, as well as the countries' age structure, has been showing significant transformations. The evolution of the G20 countries well illustrates this point. In 1980 the emerging country members of the G20 accounted for 78 percent of the total G20 population. In 2010 that share was 81 percent. This is a consequence of the fact that developing countries are much less advanced in the demographic transition. In 1980 the window of opportunity was open in all rich countries and in 2010 it closed in all but the United States, Australia, Korea and Saudi Arabia. This contrasts with the case of developing countries: in 1980 only Russia was at the window of opportunity stage while four G20 countries reached that stage in 2010.

Despite the apparent benefits, these structural transformations have also been a source of concern for emerging countries. For one thing, these countries have not all benefited equally from the new opportunities. Some countries grew significantly more than others. Many regions of the developing world are still poor and unable to accelerate growth while a number of previously successful middle-income economies were caught in the so-called middle-income trap (Eichengreen et al., 2012). The fact that economies that had successfully achieved the status of high middle income—for example,

the three largest Latin American economies—were subsequently caught in a low-growth trap after achieving such status worries policy makers in countries that have relatively recently achieved the middle-income status, as is the case of China (Eichengreen et al., 2012; Zheng Bingwen, 2011). For another, the expansion of global capital markets was accompanied by macroeconomic and financial instability. Many systemically relevant emerging countries experienced severe financial turmoil, especially in the 1980s and 1990s. Indeed, the recurrence of financial instability was a primary reason for the creation of the G20 following the Asian crisis of the 1990s (Eichengreen and Baldwin, 2008; Fanelli, 2008). More recently, emerging markets were hit by the shocks associated with the 2008–09 financial crises and the subsequent stabilization policies implemented by advanced economies to cope with the sequels of such crises (Claessens et al., 2010). These latter policies gave rise to new challenges for the global economy, such as the currency war, the uneven build up of reserves, financial protectionism, and the instability of interest rates that accompanied the initiation of the process of normalization of extremely accommodative monetary policies in the United States (IMF, 2014; Medhora, 2007; Obstfeld and Rogoff, 2009).

In the postcrisis scenario, the need to deal simultaneously with the long-lasting sequels of the crises and the ongoing structural changes poses new collective action challenges to the global community In order to size the growth opportunities associated with the second globalization while coping with instability, emerging countries have been implementing sweeping institutional reforms and the international financial architecture has been transformed as well. But the task of adapting the rules of the game so as to provide effective governance to capital flows and ensure global stability has proved to be far more difficult than expected, as the experience with the implementation of different generations of reforms inspired in the Washington Consensus illustrates (Fanelli and McMahon, 2005). Indeed the emerging countries' experience with globalization suggests that growth traps, macroeconomic and financial instability, and imperfections in international capital markets associated with flaws in the domestic and global institutional framework may not be independent phenomena (Fanelli, 2008).

The interactions between growth, institutions, and global capital flows have received a great deal of attention in recent decades and have been thoroughly investigated (Lane and Milesi-Ferretti, 2001; Rajan, 2005). In contrast, the linkages between the demographic transition, the domestic macroeconomy, and international capital flows have received far less attention. The literature has made important contributions on the consequences of ageing for the government's inter-temporal budget constraint and the persistence of global imbalances has motivated studies on the effects of demographic changes on the current account (Bryant, 2006; Cooper, 2008; Kim and Lee, 2007; Wilson and Ahmed, 2010). Some economists have even advanced the hypothesis that demography may have a role in explaining the global imbalances and the liquidity trap (Bernanke, 2005, 2007; Blanchard and Milesi-Ferreti, 2009, 2011; Krugman, 2013). But the focus has targeted

large advanced economies and the ageing stage. A notable exception is the recent study by the World Bank (2012a).

One of the most relevant contributions to our understanding of the linkages between the demographic transition and the macroeconomy in the case of emerging economies is the literature on growth (Bloom et al., 2003a, 2009; Galor, 2005; Lee and Mason, 2010, 2011). This literature has provided analytical and empirical support to the hypothesis that the different stages of the demographic transition contribute to shaping the growth dynamics. According to Mason and Lee (2006a), at the beginning of the transition, the change in age structure associated with a drop in fertility leads to a period that is potentially growth-friendly because of the increase in the share of the working-age population in the total population. The future, however, will bring about a decline in the working-age share and a rise in the older population, as is the case of today's developed world. From this it follows that, concerning growth, developing countries face the challenge of getting rich before getting old, while advanced economies must try not to become poorer as they age.

The Project and the Research Approach

Our research approach embraces both the national and the global dimension. As to the national side, we analyze the channels through which the changes in the size and composition of the population and, hence, the life-cycle deficit and the demand for life-cycle wealth impinge on the macroeconomic balance between aggregate savings and investment, the speed of accumulation of physical capital and foreign assets and, consequently, on growth and capital flows. In this regard, we show the way in which some factors associated with the demographic transition can generate long-lasting macroeconomic disequilibria or low-growth traps. These factors are frequently related to the way changes in the population's structure influence both public and private national savings, the balance between the demand for life-cycle wealth and accumulated assets, and the government's financial position.

Our strategy to analyze the linkages between the demographic stages and the domestic macroeconomy was based on comparative analysis and simulations, as well as on four country studies of emerging economies that present two features: one, they are systemically relevant countries; and two, they are undergoing distinct stages of the demographic transition. More specifically, we study two "young economies"—India and South Africa—and two at the bonus stage—China and Brazil. Each of the studies focuses on different aspects, depending on the national features, but the main goal in all the cases is to identify the most relevant obstacles to dealing with the macroeconomic consequences of demographic trends and draw implications for the interelations with the global economy. The comparative analysis, in turn, is based on the information provided by the National Transfers Account (NTA) database (www.ntaccounts.org). Taking the case of the four emerging economies selected, we tried to identify similarities and differences in the

dynamics of the current account, the government budget, and asset accumulation originating in the changes in the life-cycle deficit and the demand for life-cycle wealth that accompanies the demographic transitions. We believe that, taking the experience of these four countries as benchmark, it is possible to draw lessons that are useful for developing countries undergoing similar stages of the demographic transtition.

With regard to the global side, the book centers on the asymmetries of the international demographic transition. In order to set the stage for the analysis undertaken in the book, we provide evidence that poor, advanced, and emerging countries are undergoing different stages. We show that many poor countries have not yet entered the "demographic window" stage; a number of emerging countries are enjoying it; and developed countries are approaching the ageing period. Based on these findings, we discuss the consequences for the global distribution of labor and savings and argue that demographic asymmetries create mutual benefits of trading financial assets: richer and older economies can help younger and poorer populations get rich by channeling their savings to support the accumulation of capital in the developing world while younger economies can act as vehicles for older countries to profitably transform their present income into future consumption.

A key obstacle to taking advantage of the opportunities created by demographic asymmetries is the absence of a solid international financial architecture in the postcrisis world. This weakness may not only impede financial deepening but may also be a source of instability. This must be taken into account when discussing the international policy agenda. Two key policy questions are: What strategies should emerging countries adopt to promote global cooperation that would allow them to exploit the opportunities associated with asymmetric demography? And, what are the implications for the G20 and other multilateral financial institutions agenda given the existing flows in the postcrisis international financial architecture? It would be difficult to answer these questions without considering the state of the international monetary system. This is why the book includes a chapter that analyzes the problems that such a system presents from the perspective of developing countries

The research work was undertaken by the project "Asymmetric Demography, Growth, and Global Financial Governance," a two-year project with the financial support of the International Development Research Centre from Canada and coordinated by José María Fanelli (Center for the Study of the State and Society, Argentina). The country studies were elaborated by Pranab Kumar Das and Saibal Kar from the Faculty of Economics, Centre for Studies in Social Sciences, Calcutta (Indian case), Ricardo Brito and Carlos Carvalho, from Pontifícia Universida de Católica do Rio de Janeiro and Insper respectively (Brazilian case), Harry Wu and Cai Fang from The Conference Board China Center, and the Institute of Population and Labor Economics, Chinese Academy of Social Sciences (Chinese case), and Melvin Ayogu, Hashem Dezhbakhsh, and Olumide Taiwo from the Mapungubwe Institute for Strategic Reflection of South Africa (South African case).

The book is divided into three parts. The first sets the stage for the analysis. Chapter 1 provides empirical evidence of the demographic transition and the international asynchronies in its evolution, discusses the connections with the international distribution of labor, savings, growth, capital flows, and changes in the countries' external balance sheets. On the basis of this evidence, we identify a number of stylized facts associated with global demographic asymmetries that are relevant to understanding the questions raised by the project. Chapter 2 presents a methodological framework to model the linkages between the demographic transition, the macroeconomy, and the global system. The methodology connects the demographic concepts utilized in the demographic literature—more specifically in the NTA approach—to those used in the analysis of macroeconomic fluctuations and growth in an open economy. We pay particular attention to stock-flow relationships and planning horizons and show the relationships between the cohorts' savings, the public budget, the current account, asset accumulation, and the demand for life-cycle wealth and public transfer wealth.

The second part addresses the global side of the problem. Chapter 3 uses the methodology developed in chapter 2 to conduct a comparative study, which aims to explore the channels that connect the demographic transition with the macroeconomy of the four emerging economies analyzed in the country studies. One main advantage of the NTA database is that the information about life-cycle deficits and the fiscal support ratio of different countries have been developed in a consistent way, following a common methodology to make comparative analysis possible. The study conducted in chapter 3 complements the analysis of the national experiences undertaken in the country studies with a comparative approach that allows us to identify stylized facts about the macroeconomic consequences of the demographic transition, as well as draw some lessons for the global economy. Chapter 4 elaborates further on the channels through which demography impacts growth and the current account. Chapter 5 discusses the challenges that the current international monetary system poses to emerging countries and provides a framework to assess the implications of the project's results in terms of demands for improving what the author calls the current international nonsystem. The chapter pinpoints where the institution-building efforts should focus and, in this way, sets the context to expand on the requirements to provide governance to demographic-driven capital flows.

The third part includes the four national studies. The goal of the country studies is to address the linkages between the demographic transition, growth and macroeconomic aggregates, taking into account a much richer economic and institutional context. The authors use a variety of approaches and methodologies. Although the studies provide an overall view of the problems, they allocate a good deal of effort to identifying those problems that should be given priority on the current policy agenda because they will impact the macroeconomic performance in the next two decades. We believe that the findings uncover factors that are relevant to other emerging economies because the countries selected are experiencing different stages of the

demographic transition and because many of the features of the macroeconomy are shared with economies at similar levels of development.

In the remainder of this introduction we summarize the project's principal research findings and discuss the policy implications. The analysis is organized in three parts. First, we review the findings corresponding to the global dimension, then examine the national side of the problem based on the results relating to India, China, Brazil, and South Africa, and, finally, discuss the policy implications.

The Global Dimension

The analysis of the evidence and the literature on the asynchronies in the international demographic transition and their effects on the global economy allowed us to identify a number of facts and expected developments concerning the size and allocation of international capital flows, macroeconomic equilibrium, and the global growth dynamics. The following points deserve mention in light of the hypotheses proposed in the book. We present the arguments in a stylized form, making reference to the chapters that present the quantitative information and the analysis on which the arguments are based.

(a) The share of the working-age population of emerging countries in the world will increase significantly in the next two decades and the main factors accounting for this expected evolution are the cross-country disparities that can be observed in the global ageing process (see chapter 1).

From this it follows that in order to avoid sizable structural disequilibria in national labor markets, future global job creation should be biased in favor of developing countries and international migration flows should help equilibrate domestic labor markets as well. However, given the existing restrictions in international labor mobility, a good part of the required reallocation of global resources as a function of the working-age population will likely occur through capital mobility. It is reasonable to conjecture, in this regard, that the changes in the cross-country relative price of labor will create incentives for foreign direct investment and bank and portfolio flows to finance productive investment in those countries in which the labor supply is growing faster.

The studies on South Africa and India underscore that creating quality employment is the most important challenge facing these two "young" emerging countries in the coming decades and both studies conclude that foreign direct investment plays a central role (see chapters 8 and 9).

In the case of Brazil and China (chapters 6 and 7), which are more advanced in the demographic transition, the simulations about the macroeconomic consequences of the future evolution of the working-age population suggest that a primary goal in these countries should be to prepare for the ageing process. After the closing of the demographic window, the increase in the older persons' demand for life-cycle wealth will be fast, according to the projections in chapter 3.

The projections based on NTA data indicate that a key condition to avoid persistent macroeconomic and financial disequilibria when approaching or entering the ageing stage is to ensure that the pace of asset accumulation is compatible with the expected trajectory of the demand for life-cycle wealth. As we discuss below, China is in a far better position than Brazil to meet this condition. A second condition that should be met for the ageing process to proceed smoothly is to ensure that macroeconomic instability and shallow finance do not impede the efficient management of national wealth. It is precisely because of this latter condition that the global trading of financial assets matters; in a world of globalized capital movements, as the weight of prime savers in total population augment in ageing emerging countries, investors could find it optimal to channel their savings to younger developing economies, where returns on investment are expected to be high. Emerging countries' investors could also allocate part of their wealth to buying assets sold by the oldest cohorts in richer countries.

(b) A substantial modification in the distribution of the global sources of savings is underway; emerging countries are expected to generate the largest part of the world's savings, displacing "old" advanced economies in the next two decades.

The two main driving forces behind this redistribution are the process of convergence and the demographic changes (see chapter 1). The higher expected growth rate in the developing world accounts for a large part of the modifications in the global sources of savings (World Bank, 2013). But demography will also play a positive role in the next 20 years.

The main channels through which demography influences aggregate national savings is the change in the aggregate life-cycle deficit—which impinges on government savings—and the behavior of prime savers. Based on NTA data, chapter 3 presents projections that try to isolate the effects of demography on savings, the current account, and global imbalances in the next two decades.

Although the change in the life-cycle deficit throughout the demographic transition follows the same qualitative pattern in all the economies analyzed, the effects on aggregate savings and asset accumulation can differ substantially because the size of the cohort's life-cycle deficit and the range of ages at which they run a surplus present large variations, according to NTA data.

The cases of China and Brazil well illustrate this point. China explains the largest part of the expected increase in the share of emerging countries in total world savings. Brazil's savings rate, on the contrary, is low and is expected to show a discouraging evolution to the point that the country will find it difficult to satisfy the demand for life-cycle wealth. The contribution of younger developing countries to global savings will increase, but from a very low initial level.

From our research we see that the country's initial level of the savings rate leverages the changes originating in demographic factors. Consequently, if the country has a low savings rate when entering a demographic stage in which the changes in the population's age push the savings rate downward,

there will be a tendency for the economy to fall into a low-growth trap. The chapters on South Africa and Brazil present evidence of the harmful consequences that can arise from a perverse interaction between the savings rate and the demographic transition. In the case of Brazil the weakness of the savings rate is related to a generous social security system (see also Turra et al., 2011 and chapter 6) while South Africa's high unemployment rate and the increase in public expenditures are important factors.

(c) Demographic-driven changes in the potential labor supply and savings will have both transitory and permanent consequences on growth in line with the predictions of the "dividends" view. This will contribute to modifying the world's growth dynamics in the next two decades and will likely favor the catching-up process.

Emerging countries are expected to grow faster because they are younger and, consequently, will benefit from the demographic dividends. However, the demographic dividends are not automatic as Cooper explains in chapter 4. Indeed, the country studies provide ample evidence in this regard and emphasize that complementary policies are necessary. We return to this below when discussing the national dimension.

(d) The changes in the global reallocation of savings induced by the demographic transition will impact the current account results around the world in the next two decades and, therefore, will affect international capital movements.

According to the evidence discussed in chapter 1 and chapter 3, demographic forces should cause the share of capital flows involving developing countries to increase substantially in the next 20 years. However, important obstacles exist. For one thing, the emerging countries' external balance sheets have not expanded sufficiently in recent decades. The increasing weight of emerging economies in global savings and investment flows was not fully reflected in the expansion of those countries' balance sheets, suggesting that financial deepening and financial integration with the global economy are lagging behind the path of fundamentals. For another, the sign and size of the current account of key G20 countries shows large departures from what we would expect from the projections based on demography alone. The main deviations have to do with China (all cohorts save more than the cohorts of countries at a comparable demographic stage) and the United States (which saves less than expected for an advanced country).

This raises difficult questions with respect to China's role in the global economy. China is expected to account for the lion's share of the emerging countries' expected contribution to global savings in the next two decades. If this country substantially reduced its savings rate in order to diminish global imbalances, there could be a shortage of savings if we assume that the global investment rate and the American savings rate will follow the trajectory projected by the World Bank (2013), which is consistent with the process of convergence. On the other hand, if Chinese savings did not adjust downward, global imbalances would tend to persist. The simulations and the Chinese case study suggest, nonetheless, that demography will play a

stabilizing role in this specific scenario; the process of ageing is expected to depress Chinese savings (see chapters 3 and 7).

It follows then that the management of global disequilibria will demand international coordination between emerging and advanced countries and that the design of strategies to achieve such coordination should not only consider the need to reduce global imbalances but also the requirements of the demographic transition. We argue below that the opportunities associated with the asymmetries in the global ageing process may provide the right incentives for developed and developing countries to coordinate their strategies so as to achieve a high-growth global scenario.

(e) The international financial architecture reveals important flaws with regard to liquidity provision and safety nets for developing countries and this generates incentives for self-insurance strategies and financial protectionism that are at odds with the requirements of demographically driven capital flows.

The following symptoms of distortion are relevant to our analysis. First, a large portion of capital flows have been running "upstream" from emerging to rich countries in the last decade and a good part of the funds were allocated to build international reserves and to sovereign wealth funds, strengthening the demand for safe assets rather than the demand for riskier instruments issued by young emerging market economies. Second, a number of "old" countries have experienced increases in the public debt/GDP ratios and changes in the international investment position that are barely consistent with their demographic stage; they will have to face significant debt-service payments during the ageing stage (see chapters 1 and 2). Third, developing countries' external balance sheets are falling behind the expansion required by demographic factors (chapters 1 and 3). Furthermore, the expansion of domestic financial deepening that should accompany the necessary expansion of the external balance sheet must be substantial, but the local investor base is weak and capital flows are still vulnerable to herding.

As chapters 2, 3, and 4 show, demography is an important determinant of the amount of productive capital, the size of the external balance sheets, and the net external position, but the ultimate results are not independent of the way in which the economy accesses external capital markets. Chapter 3 illustrates the way in which international financial imperfections—which result in Feldstein-Horioka-like effects—may hinder the process of wealth accumulation and result in an inefficient composition of the countries' balance sheets. If we take the demand for life-cycle deficit as a given, large differences concerning capital and foreign assets accumulation may appear under different assumptions about financial imperfections.

The National Side

The country studies particularly sought to identify the demographic challenges and opportunities that should be prioritized on the current policy agenda as they will significantly influence the domestic macroeconomic

performance in the next two decades. Although the studies examine the linkages between the demographic transition, growth, and macroeconomic aggregates under different structural and policy contexts, we believe that the findings are a source of general lessons because the countries under study present features that are common to emerging economies with comparable levels of development and at similar stages of the demographic transition.

One key lesson drawn from the studies is that countries have very different abilities to deal with the demographic transition, suggesting that the "details" of domestic conditions and policies matter. In this regard, the evidence of this book is in line with the hypothesis that the first and second demographic dividends are only potential, as is emphasized in chapter 4.

The first dividend (FD) has been or will be beneficial for the four countries under study but it is only transitory and will revert during the ageing stage. For the Indian and South African economies this will not be a problem in the decades to come. However, the studies on China and Brazil call attention to the fact that ageing is approaching and the process will be faster than in the rich economies. As a result, the macroeconomic implications of demographic factors for the next two decades in the case of India and South Africa, on the one hand, and China and Brazil, on the other, are very different.

The first dividend's most important contribution to growth is expected to occur in India and South Africa. As was mentioned, for this to occur it is imperative to create jobs for a fast-growing working-age population.

In the case of India, the study reveals that two types of dualism in labor markets are key: formality/informality, and rural/urban sectors. Concerning the first dualism, the evidence shows that formal industries have outsourced a significant amount of production to the unorganized sector in order to lower organizational costs and remain competitive in the face of steep competition from low-cost producers from East Asia and China. As a consequence, the unorganized sector was able to absorb the growing labor force. So, as the capital flow into the formal sector has not insulated itself, foreign direct investment can significantly contribute to creating employment in the unorganized sector and, hence, can play a part in the materialization of the first dividend. With regard to the rural-urban divides, the study concludes that to make the best of the demographic dividends, the government needs to design measures to foster entrepreneurship in the formal domain, even if a large number of these turn out to be small- and medium-sized ventures. At the same time, in order to accommodate a very large number of workers in productive activities, the informal sector must be given adequate access to capital and technology. To this end, financial policies—especially the banking sector policies—should be geared to incorporate the rural and informal industrial sector into the banking network much more aggressively than what has been achieved to date.

In the case of South Africa, the demographic transition's challenge has to do with the lack of skills in specific cohorts of the population who are growing at a fast pace (the young adults). The mismatch of job seekers' skills

results in joblessness, which deprives the youth of opportunities to earn and save effectively and thus constrains the materialization of the demographic dividends. The needed structural transformation involves boosting human capital expenditures with the potential to alter the stock (quantity) and the level of skill (quality) of labor in the future. It is also necessary to foster black empowerment in order to extend the benefits of national prosperity to the previously disadvantaged ethnic groups who now constitute the majority of the jobless, unskilled, and soon to become prime savers (who cannot save).

For Brazil and China to succeed in preparing for the ageing stage, the challenge is to make the most of the second dividend. The effects of the second dividend (SD) are potentially positive in all the economies analyzed but the materialization of such effects hinges critically on the quality of the policy framework. The book identified a number of mechanisms that impinge on the linkages between demography and the macroeconomy and determine the ability to reap the benefits of the SD (see chapter 3).

A key obstacle to materialize the SD is a weak savings rate. Brazil and South Africa present the worst situation in this regard. Savings are not the binding constraint in India while the obstacle in China might be excessive rather than insufficient savings.

The authors of the Chinese study, however, call attention to the fact that growth in China has largely been government-engineered and that a central component of such strategy has been the one-child policy, which had negative demographic effects because China's demographic transition has become premature. The relatively swift fall in the birth rate made human capital accumulation easier and promoted savings as well. But the government's forceful and substantial interventions aimed at achieving a faster catch-up with advanced economies have had costs: ageing will be premature and distorted resource allocation has resulted in overinvestment in some sectors (see chapter 7 for details). The premature demographic transition means that China will get old before getting sufficiently rich. The case study shows that the income per capita level at which ageing will start in China will be lower than it was in the case of countries like Japan or Korea (see also chapter 3).

Weak savings may place the economy on a low-growth track, which can be difficult to overcome. Based on a small-scale, two-country, general equilibrium overlapping generations model, the Brazilian case study shows that the generosity of the social security system harms national savings and, therefore, growth. Under these circumstances, Brazil will likely enter the ageing stage without having experienced the "high-growth" era that countries like Korea did. Chapter 3 shows that, as a consequence, the demand for life-cycle wealth is not consistent with the expected pace of asset accumulation in the next two decades.

Brazil's expected evolution indicates that demographics may, indeed, be part of the problem rather than the solution and may become a drag on growth. The funds needed to finance the social security system absorb resources from productive investment and, simultaneously, savings incentives will be weak if the social security system is generous or health care

expenses rise because of the ageing process. The generosity of the social security system can be particularly harmful if the weakening in the incentives to accumulate wealth occurs in the period in which the savings rate is potentially the highest.

The demographic transition has an important bearing on the savings/investment balance and, hence, on the current account. This is a key channel of transmission between the demographic transition in each country and the macroeconomy. The simulations based on Brazilian data suggest that the stock-flow dynamics may be unsustainable in some scenarios as a consequence of the accumulation of current account imbalances resulting from the low savings rate (see chapter 3).

In the case of China, long-lasting external imbalances appear and the accumulation of assets seems to run ahead of the demand for life-cycle wealth (see chapter 3). The authors of the study state, however, that we should not overlook that the distorted demographic and growth policies implemented in the past will result in a rapid ageing process and lower investment returns because of capital misallocation.

Policy Implications: The Demographic Transition as a Global Opportunity

Is the demographic transition a global opportunity? Based on the above evidence, we believe so, but with a number of caveats that can give rise to difficult policy challenges. We conclude this introduction with a discussion of the policy implications of this issue.

We will highlight two points that have to do with the future role of demography that follow from the research work undertaken in the project. The first is that the international demographic asymmetries will continue to generate incentives for countries at different stages of the global ageing process to trade financial assets. The second point is that the stage of the demographic transition each country is undergoing will continue to be a key determinant of the dynamics of asset accumulation and, therefore, of the trajectory of the capital/labor ratio and the country's international financial position.

The opportunities to achieve a better allocation of savings and investment during the demographic transition via international capital markets, enabling countries to take advantage of the demographic dividends, will likely be only partially exploited because of three obstacles. One is the failures in global financial markets, which have to do with long-dated structural flaws—such as home bias or pro-cyclical capital movements—and with the distortions related to the sequels of the advanced countries' financial crises. The second is the structural weakness of the financial system in the emerging world (small market size, reduced varieties of financial instruments, weak investor base) that restrains the capacity to absorb large capital flows. And third, the country studies found that demographic factors do not take priority on the national policy agenda while the goal of preserving short-run

global stability has taken priority in the postcrisis scenario, displacing other longer-run goals, as is the case of the goal to exploit international demographic asymmetries.

The policy challenge is, consequently, to coordinate national and multilateral efforts to improve the integration of emerging economies with global capital markets while promoting growth and domestic financial development in emerging countries.

In light of these conclusions and approaching the global agenda from the stance of emerging economies, it seems that it is in the interest of such economies to discourage the adoption of noncooperative strategies—such as financial protectionism and self-insurance—at the global level and to pay more attention to the macroeconomic and financial consequences of the demographic transition at the domestic level.

The expansion in the external balance sheets of emerging countries that is necessary to exploit the opportunities that are under analysis will not occur without global collective action aimed at building the required international governance structures. Furthermore, global efforts should be coordinated with initiatives at the national level to strengthen the domestic rules of governance; otherwise, the expansion in global flows would be limited by the absorptive capacity of national financial systems. Long-term instruments (bonds, equity markets, and vehicles for FDI) and a solid investor base are critical. Many emerging countries suffered financial crises in the 1980s and 1990s and are currently facing difficulties in the context of the normalization of the American monetary policy because of the limited absorptive capacity of their underdeveloped domestic capital markets. For the same reason—the lack of absorptive capacity—natural resource-rich countries have been facing the continuous threat of Dutch Disease-like effects triggered by excessive capital inflows.

The quality of the governance structures is a key determinant of national financial development, which is, in turn, necessary to sustain the continuous growth in international financial transactions and in the quality and diversity of the available financial instruments that should accompany the demographic transition (Fanelli, 2008; Kent et al., 2006). Establishing international and domestic financial architectures that are friendly to financial deepening, however, is far from easy. Nor is it easy to develop the structure of agents and organizations that are essential to the functioning of financial markets—from market makers to institutional investors and the banking system. Likewise, the international financial architecture should be suitable to govern both north-south and south-south demographically driven capital flows.

Building the appropriate national and global governance structures should be a priority for the G20 and the international financial institutions. José Antonio Ocampo (chapter 5) underscored three dimensions that an emerging country-friendly agenda for international monetary reform should contemplate: the global reserve system, macroeconomic cooperation, and global governance. In terms of the global reserve system, according to Ocampo, the

most desirable reform involves moving to a fully special drawing rights (SDR)-based IMF with a clear countercyclical focus. This would include countercyclical allocations of SDRs and counter-cyclical IMF financing made entirely in SDRs. From the point of view of macroeconomic policy cooperation, the major issues are counteracting the deficiencies in global aggregate demand and avoiding the build-up of large global imbalances. Two key points with regard to governance reforms are the increase of "voice and participation" of developing countries in the Bretton Woods Institutions and the Financial Stability Board, and the design of a multilayered architecture with the active participation of regional and sub-regional institutions.

As part of the MAP (mutual assessment process, see IMF, 2009) exercises the G20 could include an evaluation of the role demographic asymmetries play in the global macroeconomy. The exercise should classify countries into demographic stages and develop projections of the expected effects of the demographic transition on global savings, the current account, global imbalances, and capital flows.

The emerging countries' agenda for the G20 and other multilateral fora and organizations should include initiatives to discourage self-insurance strategies and financial protectionism while simultaneously promoting better mechanisms for global liquidity provision. The global and domestic agendas should be coordinated so as to reduce the risk of investing in emerging countries and promote not only North-South but also South-South capital flows in an attempt to accompany the structural changes associated with ageing. We should not overlook the fact that increasing integration with international capital markets can greatly favor prime savers. In the first place, the available national investment opportunities may or may not justify the fact that prime domestic savers allocate all their funds to national assets; in the second place, prime savers will probably prefer to diversify their portfolio's risks by buying foreign assets.

The agenda for the promotion of inclusive growth at the multilateral level should place demographic factors at center stage (on inclusive growth, see Ianchovichina and Lundstrom, 2009). In particular, it should prioritize employment creation in those countries that are going through the first demographic dividend.

The World Bank and the regional banks should develop strategies to identify a portfolio of demographic-friendly credit facilities that take into account the requirements of the stage of the demographic transition when the countries are eligible to borrow. This is crucial for young countries to exploit the FD and ensure that asset accumulation is consistent with the demand for life-cycle wealth in those countries in which ageing is approaching.

Policies to foster financial deepening should be part and parcel of the strategies to get the most from demography. In the case of countries that are experiencing the growth moment, weak financial development can be particularly harmful. If the financial system does not work adequately, savings will not be efficiently allocated to investment and this will be very costly in terms of missed opportunities during this privileged moment. Furthermore,

for the government to manage the demographic transition, the authorities need fluent access to bond markets to finance public investment in infrastructure and human capital accumulation. On the other hand, a growth-friendly environment could play an "indirect," positive role vis-à-vis financial constraints: as growth accelerates, the stock of productive and foreign capital increases, implying more assets for collateral in the domestic and external credit market (Caballero, 2000).

A particularly relevant conclusion concerning domestic policies is that design of the macroeconomic regime must consider the requirements of the demographic transition, especially, the need to ensure the consistency between life-cycle wealth and asset accumulation, as well as between domestic and foreign asset accumulation. The country studies advance policy recommendations that take into consideration these interactions.

More specifically, the Brazilian study analyzes the way in which the demographic transition, openness, and public policies interact to produce or prevent a second demographic dividend. The results suggest that, given the current social security system, a small second demographic dividend might arise. If Brazil opens up under the current social security arrangements, it would in fact harm growth. Indeed, scenarios in which the current social security system remains in place produce noncredible paths for expenditures on public pensions and taxes as a share of GDP. This is due to the fact that maintaining the very high replacement rates currently in place in Brazil will become unsustainable as the country starts to age fast in the next two decades. Moreover, given current rules, it appears more likely that expenditures with pensions will become unsustainable than that Brazil will grow its way out of this liability. Motivated by those results, the authors of the Brazilian study entertain reform scenarios. A deep reform of the social security system produces a meaningful second demographic dividend, irrespective of whether the economy is open or closed to trade; but under a more gradual reform keeping the economy relatively closed might arguably deliver a larger second dividend.

Fast ageing in China also creates complicated macroeconomic interactions with global implications. A premature demographic transition gives rise to two different problems. On the one hand, the savings rate should be high because asset accumulation should be rapid, given the premature process of ageing. But, on the other hand, it could be very difficult to find profitable domestic investment projects to allocate the increased amount of savings. Under these circumstances, the country will tend to run higher current account surpluses and to invest less efficiently domestically. From this point of view, access to capital markets may be a blessing: it would allow China to channel its savings toward high-return projects in the rest of the world. But as a counterpart, it does not help to reduce global imbalances. In this regard, global imbalances are, to a certain extent, the long-lasting sequel of a growth strategy based on an artificially hastened demographic transition.

In sum, our analysis indicates that both strong incentives and sizable obstacles exist for national policymakers to internalize the costs and benefits

related with demographic factors and international cooperation. Among the factors that deter global cooperation, higher exposure to financial shocks in the absence of a reliable global liquidity safety net is particularly important to the extent that it makes defensive strategies more appealing (reserve accumulation, greater demand for safe assets). This obstacle is particularly strong in the current postcrisis scenario, which boosts the rewards for free-riding and defensive strategies (financial protectionism, currency wars). An environment with higher unemployment, increased fiscal deficits, rising public debt/GDP ratios, and persistent volatility in financial markets increases the national authorities' expected payoffs for adopting noncooperative strategies. This is why the incentives to cooperate are likely to be stronger if the gradual reversion of the sequels of the crises continues to gain momentum. Concerning benefits, the existence of unexploited mutual advantages of trading financial assets increases the return that the countries can expect from global cooperation. Furthermore, the fact that the demographic window of opportunity (i.e., the dividends) will "soon" vanish for many large emerging economies, giving rise to the more complicated ageing stage, strengthens the incentives for rapid action.

PART I

The Demographic Transition and the Macroeconomy: Setting the Stage

CHAPTER 1

Demographic Asymmetries and the Global Macroeconomy

José María Fanelli and Ramiro Albrieu

This chapter sets the stage for the analysis in the rest of the book. We provide empirical and conceptual background concerning international demographic asymmetries and examine the consequences for the distribution of the international labor force, global savings, and the growth dynamics of countries experiencing different demographic stages. We focus on the countries of the G-20 and, particularly, the four emerging economies selected for the country studies: Brazil, China, India, and South Africa (see chapters 6–9). Based on this evidence, we discuss the implications for global imbalances, capital flows, and the required expansion of the domestic financial system in emerging market economies. We interpret the implications in light of the financial and monetary distortions and flaws in the rules of the game that the global post-crisis scenario reveals.

The analysis utilizes the findings of the literature on demography and growth, international capital movements, and financial development in emerging countries to identify and discuss a number of stylized facts that motivated our research hypotheses and contextualize our research results and policy questions. We aim to characterize demographic-driven forces that will have a bearing on the evolution of the international economy in the coming two decades and that consequently call for national and global initiatives that can be included on current policy agendas. Particularly important for developing countries is the fact that many of them are now going through the demographic bonus phase; if the opportunities associated with such phase are not exploited, they will be lost forever. In line with that aim, we will work with a shorter time horizon than what is canonical in the demographic literature because it is more suitable for the types of macroeconomic and financial issues that we will address.[1] In this regard, consider that one of the main hypotheses motivating the project was that certain domestic and international macroeconomic and financial dysfunctions can become stumbling

blocks along the path of the demographic transition, impeding emerging and developed countries from taking advantage of the opportunities that the asynchronous path of the global demographic transition creates.

1.1 Demographic Asymmetries: Labor, Savings, and Growth

The global demographic dynamics reveals significant asymmetries across countries (Bryant, 2005). The concept of "the demographic window of opportunity" that we present in the introduction helps illustrate the existing and future evolution of demographic asymmetries. Applying this definition to G-20 countries and using United Nations (2013a) data yield the results shown in table 1.1.

Three facts stand out: the initiation year of the demographic window can differ substantially; developing countries enter this stage later than developed economies; and the duration of the demographic window is not constant across countries (United Nations, 2004). By the year 2100 the demographic transition will have ended (Lee, 2003). European countries entered the demographic window before Canada, the United States, and Japan. Emerging economies are either "children" (e.g., India and South Africa) or going through the demographic window (e.g., Argentina and Indonesia). Among rich countries, shorter windows (from two to three decades) correspond to Japan and the United Kingdom. Australia and the United States are ending longer windows (from five to six decades). In the case of emerging countries, the shorter windows are expected to occur in Mexico, Korea, Brazil, and Turkey and longer windows in Russia. With the exception of Russia, the duration of the demographic window in emerging economies appears to replicate the Japanese experience.

Table 1.1 The demographic window in G-20 countries[a]

Country	*Start*	*End*	*Duration (decades)*	*Country*	*Start*	*End*	*Duration (decades)*
Argentina	1995	2035	4	Japan	1965	1995	3
Australia	1965	2015	5	Mexico	2010	2035	2.5
Brazil	2000	2030	3	Republic of Korea	1990	2015	2.5
Canada	1975	2010	3.5	Russian Federation	1950	2015	6.5
China	1990	2025	3.5	Saudi Arabia	2015	2045	3
France	1950	1990	4	South Africa	2015	2050	3.5
Germany	1950	1990	4	Turkey	2005	2035	3
India	2015	2050	3.5	United Kingdom	1950	1980	3
Indonesia	2005	2040	3.5	United States	1970	2015	4.5
Italy	1950	1990	4				

Notes: [a]Countries experience a period called the demographic window when the proportion of children and youths under 15 years old falls below 30 percent and the proportion of people 65 years and older is still below 15 percent.

Source: United Nations Population Division.

Global Reallocation of the Labor Force

Despite the asynchronous path of the demographic transition, the world is ageing. According to United Nations estimates, by 2030 the old age population (those above 65 years old) will have reached 12 percent of the total population, that is, nearly one billion people (United Nations, 2013a). Furthermore, ageing will accelerate over the coming years compared to previous dynamics (e.g., 1990–2010).

The old age population currently represents about 17 percent of the total population in advanced economies, but in 2030 it will have grown to about 24 percent. The situation in emerging economies is different: the working-age population is expected to maintain its share in total population in the future. A key consequence of the conjunction of asynchronies in the demographic path and global ageing is that the distribution of the world's total labor force across countries is changing (see figure 1.1).

Although the characterization of advanced economies as the "old world" and emerging ones as the "young world" certainly reflect the current situation, we should not overlook the fact that important within-group asymmetries exist in advanced as well as emerging economies (see figure 1.2, and Wilson and Ahmed, 2010). The share of the working-age population in countries in the first group, such as Japan and Italy, peaked in the early 1990s; in France and Germany in the mid-1980s; and in the United States, the United Kingdom, and Australia in the late 2000s. We also see differences among the (future) peaks in the emerging economies' working-age population. In South Africa and India the working-age population's share is expected to peak in the 2040s, in Argentina and Brazil in the late 2010s, and in China in 2014. Differences are also foreseen in the speed of adjustment after the peak, with

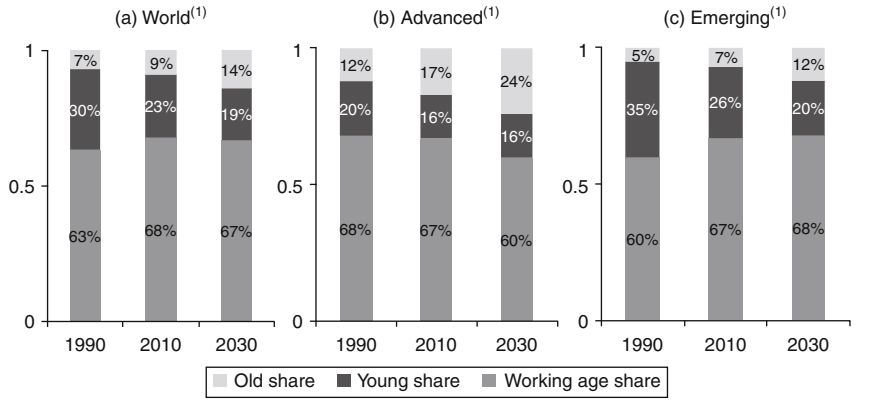

Figure 1.1 Global demographic dynamics, 1990–2030 (Share in total population)

Notes: (1) G-20 countries. Advanced: Australia, Canada, France, Germany, Italy, Japan, Korea, Saudi Arabia, United Kingdom, United States; emerging: Argentina, Australia, China, India, Indonesia, Mexico, Russia, South Africa, and Turkey. (World Bank, 2012 classification).

Source: United Nations Population Division.

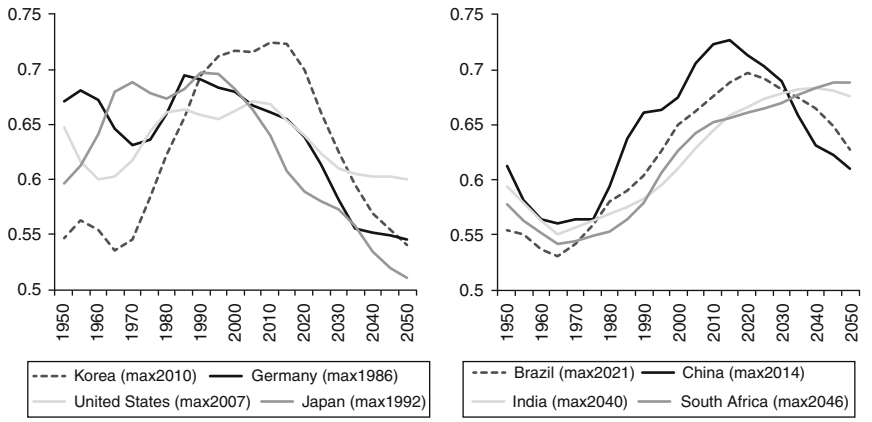

Figure 1.2 Varieties of experiences in population ageing (share of the working-age population in total population)

Source: United Nations Population Division.

some countries (such as China and Brazil) expected to age at a faster pace than others (such as Argentina and the United States).

Indeed, the velocity of the transition in emerging economies will surpass that of the advanced economies. The Chinese demographic transition, for example, will be the fastest in the world (Cai and Wang, 2005). Dependency ratios, defined as the dependent population over the working-age population, will increase faster in emerging market economies because of the rapid growth of the older population's share in total population (United Nations, 2009a).

The growth implications of the different stages of the demographic transition have been thoroughly analyzed in specialized literature.[2] The changes in the relative size of the labor force play a central role. According to Bloom et al. (2003a), if most of a nation's population falls within the working ages, the added productivity of this group can produce a "demographic dividend" of economic growth. For example, the low fertility that drives population ageing is also associated with rising rates of investment in human capital per child, which causes labor productivity to rise (Becker and Lewis, 1973; Lee and Mason, 2010).

The growth-acceleration effect induced by the increase in the relative size of the working-age population assumes, nonetheless, that labor demand increases together with the working-age population. This assumption can be too strong, as the country studies of India and South Africa in this volume suggest, especially because the necessary policies may not be in place.

When assessed from a global perspective, the redistribution of labor implies that the generation of employment in the next two decades should be biased in favor of the emerging world (World Bank, 2013). If the contribution of international labor mobility continues to be limited, as some researchers argue (Bryant, 2006), the required reallocation of new employment opportunities

should occur through the reallocation of capital so as to increase productive investment in those countries where the labor supply is growing faster. This places international capital markets at center stage.

Global Redistribution of Savings

In order to present the evidence on savings and demography, it would be fitting to classify the G-20 countries in four categories: "older" and "younger" emerging and "older" and "younger" advanced. We did not include Saudi Arabia in the classification because the case of this oil-rich country is highly idiosyncratic, but we show the corresponding figures separately. The younger emerging are South Africa and India and the older are Argentina, Brazil, China, Indonesia, Mexico, Russia, and Turkey. The younger advanced includes Australia, Korea, and the United States and the older are Canada, France, Germany, Italy, Japan, and the United Kingdom. Figure 1.3 presents an overall picture of the savings/investment dynamics corresponding to these groups over the last two decades.

Many emerging countries now enjoying the demographic window, such as China and Argentina, increased their savings rates, as did the two younger developing economies, which are about to enter the demographic window (see figures 1.3a and 1.3b). At the same time, savings rates decreased markedly both in older and younger rich economies. As a result of these divergent dynamics, the global distribution of savings has experienced a marked change: emerging countries, which accounted for some 15 percent of total savings in 1991, contributed one-half in 2012 (IMF, 2005 for an early analysis along these lines).

These figures refer to aggregate values per group and, consequently, they conceal important intragroup heterogeneities. In the emerging-older group, for example, China's savings rate increased by 25 percentage points of GDP after entering the demographic window, while Brazil's fell during the same period. The goal of the country studies of the book is precisely to deal with the role of idiosyncratic factors and to reveal "details" that matter and that can help shed light on the experience of economies undergoing similar stages of the demographic transition. In the advanced-older group the drop in savings rates was driven by the US behavior, whose rate fell from 14 percent to 10 percent of GDP between 2002 and 2012. In addition, the advanced-older group shows divergences within Europe: Germany's stronger savings rate, for example, was unable to counteract the fall in savings in Italy, France, and the United Kingdom. These divergent trajectories have consequences for capital flows, global imbalances, the distribution of global assets, and, hence, the welfare of future cohorts that are not necessarily in line with the requirements of a smooth demographic transition. A specific source of concern is that "old" countries are borrowing from "old" countries, as we will see below.

The world's distribution of investment has also changed. Not surprisingly, in light of the evolution of savings, the data reveal that emerging economies'

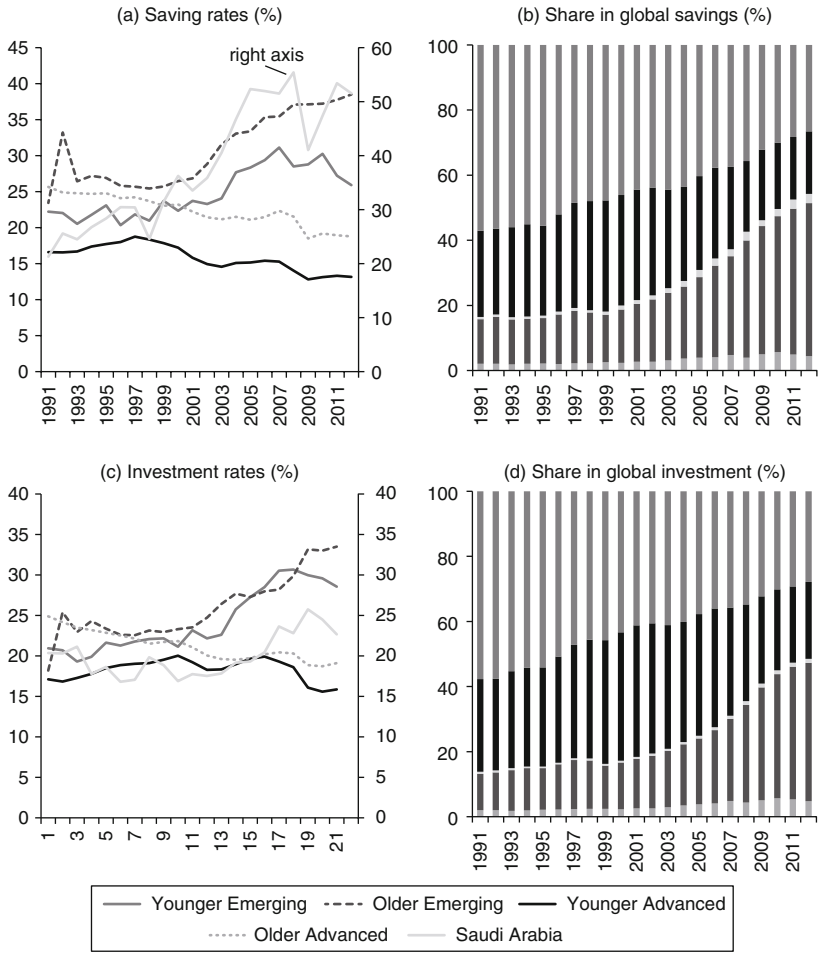

Figure 1.3 Saving and investment rates in G-20 countries

Source: Author's elaboration based on IMF data.

investment rates rose from 20 percent of GDP in 1991 to some 30 percent in 2012, while rates in advanced economies dropped (particularly in the older ones). These divergences resulted in a marked redistribution of global capital formation, as emerging economies' share in total investment rose from 13 percent in 1991 to 47 percent in 2012 (figure 1.3d).

Once again, these group dynamics hide within-group, country-specific trends that may differ. Diverging growth patterns in the emerging-older group, for example, have led to significant increases in the importance of China and Indonesia as global investors while we see no sizable changes in the cases of Brazil and Turkey. Different growth strategies have surely played a role: investment-driven strategies have been observed in Asian countries much more often than elsewhere in the world.

Have demographic factors contributed to the change in the world's redistribution of savings? The life-cycle hypothesis (Modigliani and Brumberg, 1954) posits that individuals tend to save while they work to finance consumption after retirement. It follows, then, that variations in the population's age structure should have as counterpart changes in the overall size of the life-cycle deficit generated by the economy's cohorts. This creates a linkage between changes in the structure of the population and the aggregate savings rate. Figure 1.4 shows the relationship between savings and the median age in the case of the G-20 countries.

Dependency ratios are often used to capture the life cycle's incidence on the macroeconomy (dependent ages under 15 and 65 or older): in line with the Modigliani and Brumberg hypothesis, it is assumed that children and the elderly produce much less than they consume while working-age adults produce much more than they consume and, consequently, the dependency ratio is related to national savings. In a seminal paper based on time series and cross-country data for 100 countries, Higgins (1998) found that "increases in both youth and old-age dependency ratios (are) associated with lower savings rates." The World Bank (2012a) reached somewhat similar results: they showed that national savings are negatively related to the old-age dependency ratio.

In addition to the dependency ratio, a summary indicator that is frequently used by researchers to capture the effects of demography on savings at the international level is the weight of the "prime-savers" group in the total population (aged 40–59). Some argue that young people are more likely to borrow and invest (in themselves or their children) and then undergo a period of "prime savings" when middle-aged to accumulate assets before gradually dissaving, as those assets are spent in retirement (IMF, 2005; Mason and Lee, 2007). Likewise, a good number of the prime savers are those members of the labor force who will likely have accumulated more experience and

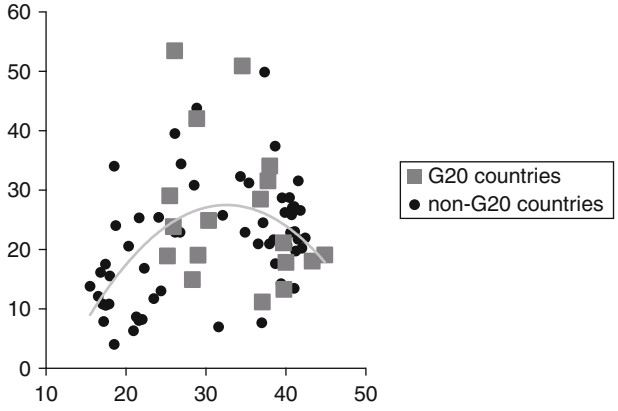

Figure 1.4 Savings rate and median age, c. 2010

Source: Author's elaboration based on World Development Indicators data from the World Bank.

production abilities. Hence, the proportion of prime savers in the population will have an influence on aggregate variables (Wilson and Ahmed, 2010). Regarding prime savers, McKinsey (2004), Speller et al. (2011), and Wilson and Ahmed (2010) offer empirical evidence confirming the hypothesis that the prime-savers' share in the total population is positively related to national savings.

The National Transfer Accounts (NTA) database provides detailed, country-specific data on the consumption/labor income profiles of the different cohorts that are internationally comparable, measures flows by age in a manner that is consistent with the United Nations System of National Accounts, and thus provides macroeconomic-friendly estimates of the life-cycle deficit.[3] Using data provided by the NTA database, figure 1.5 shows Japan's per capita age profiles for consumption, labor income, and asset income (normalized by the average per capita income) in 2004.

The Japanese case illustrates a stylized fact that is common to all economies: children and the elderly earn less than they consume, and it is just the opposite for adults; this is in line with the hypothesis that different population structures must yield divergent aggregate values for consumption, savings, and income (see the methodology developed in chapter 2 of this volume for a detailed formal presentation).

In the next two chapters we will use the NTA database to obtain a better understanding of the mechanisms and channels through which demography influences savings and asset accumulation. For now, we will restrict the analysis to the most commonly used indicators to show the connections with the existing literature and the links with the problems analyzed in the book.

In order to identify a set of stylized facts associated with the demographic transition at the national level, figure 1.6 depicts two ratios for selected countries based on the United Nations (2013a) demographic data and

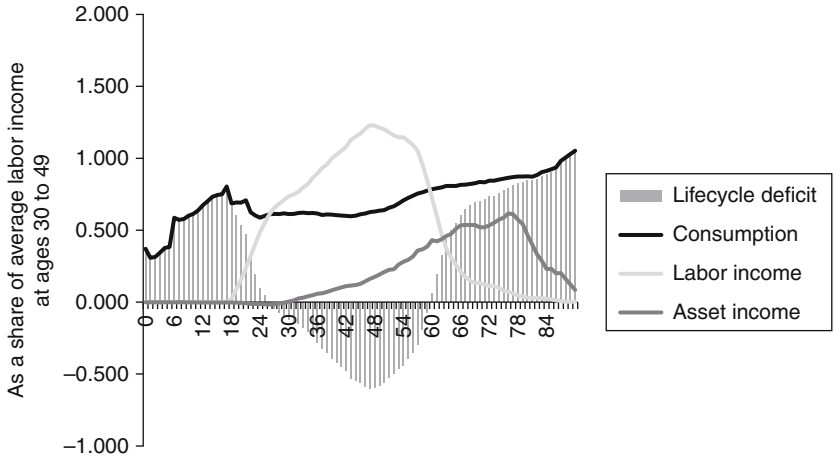

Figure 1.5 NTA age profiles, Japan 2004

Source: Author's elaboration based on NTA. (http://www.ntaccounts.org/web/nta/show).

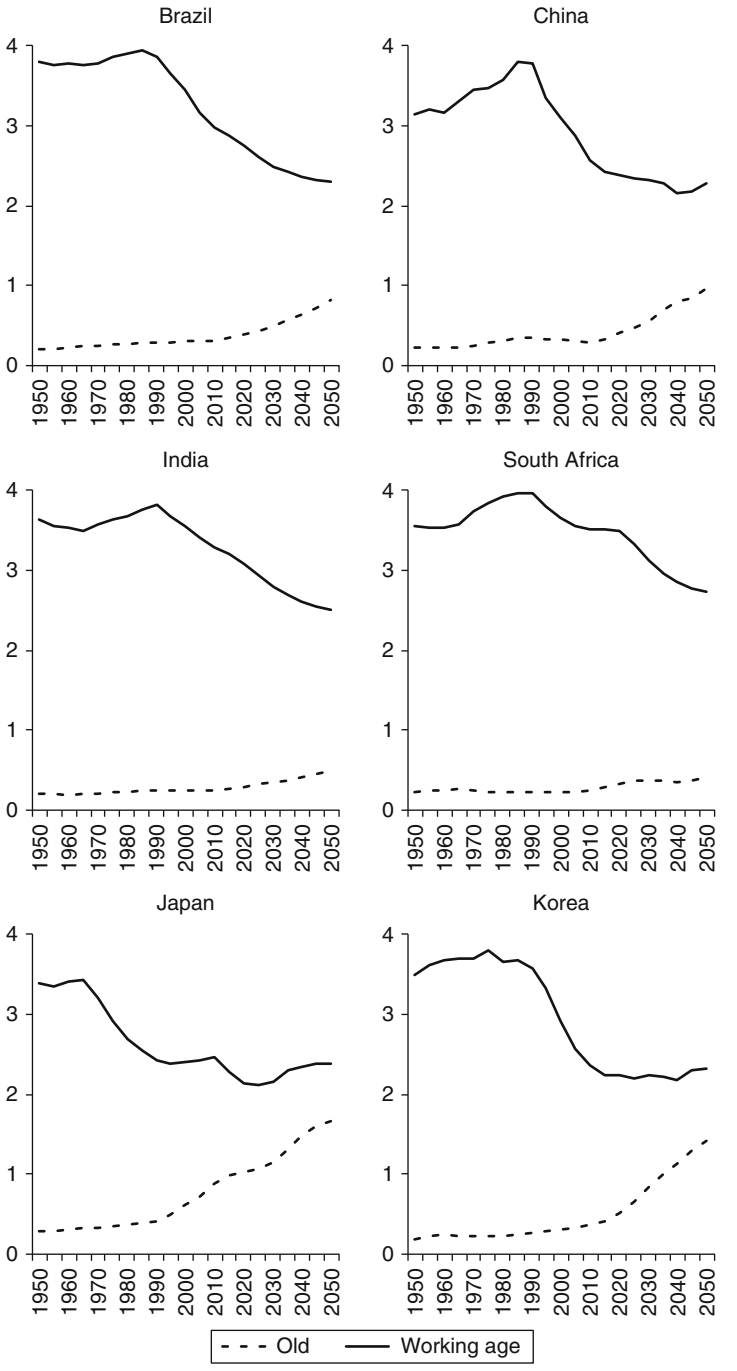

Figure 1.6 Working-age/primer savers and old-age/prime savers ratios (as a share of prime savers population)

Source: Author's calculations based on United Nations Population Division data.

projections: the old-age/prime savers and the working-age/prime savers. The G-20 countries that appear in the figure well represent the asymmetries within that group. Japan and Germany are "old"; India and South Africa are "young"; China and Brazil are still enjoying the demographic window stage; and Korea is about to abandon the demographic window.

When the working-age/prime-savers and old-age/prime-savers ratios move upward, the number of members of the corresponding age group increases in relation to the number of prime savers, making it more difficult for the economy to maintain high aggregate savings rates. We must consider, nonetheless, that it is easier to maintain the capital/labor ratio in the case of an ageing society. When the working-age population falls, there is a simultaneous decline in the savings rate and in the requirements of capital.

The following points concerning figure 1.6 are worth highlighting. The working-age indicator rises before the demographic window opens and tends to drop afterward, when the economy is going through the demographic window period. In various cases the working- age/prime-savers ratio achieves a maximum before the window opens. The period in which the window is open and, simultaneously, the working-age population is falling relative to prime savers is the "moment of growth": the size of the working-age population is increasing but the prime-age segment is growing faster. The evidence in figure 1.6 indicates that the oldest countries' (Japan and Germany) best growth moment is gone while the younger (South Africa and India) have not yet begun to enjoy it. The rest of the countries are experiencing a privileged demographic period, but it will soon terminate in the case of Korea and the United States.

When the window is open, the old-age/prime-savers ratio increases smoothly, but once the window closes, it tends to accelerate, while the working-age/prime-savers ratio stabilizes. This co-movement gives rise to the most challenging problems of the ageing stage: if the country did not accumulate enough wealth during the growth moment, it would be very difficult to maintain the living standards. These changes in the age structure of the population give rise to the first and second dividends, as explained below.

Difficulties could also arise because of imperfections on the financial side: for an "old" country to manage its aggregate portfolio of national wealth appropriately, it is crucial that wealth owners have access to financial instruments to hedge longevity risks and to allocate the funds where the return rate is higher (IMF, 2012a; Kent et al., 2006). Investing in "young" countries (e.g., South Africa and India) will probably be the best option for both objectives—obtain higher returns on investment and hedge the longevity risk. Note that hedging longevity risk in an ageing country might be extremely expensive. In addition, if there were high-return investments available in older countries, investors from high-savings middle-aged countries (e.g., China) might find it profitable to buy real assets in older countries. There is a mutual advantage because retired workers may want to sell real assets (e.g., the equities of national firms) to finance their consumption. All these

mutually beneficial transactions can only materialize under conditions that are friendly to international capital movements and under conditions of higher domestic financial deepening than levels not currently observed in developing countries.

1.2 Demographic Asymmetries and the Growth Dividends

Does the change in the population structure associated with per capita GDP indicate growth? The analysis of this question has a long tradition in economics (Bloom et al., 2003a). Since the late eighteenth century, economic theory has postulated that there exists a relationship between demographic changes and economic growth. As is well known, Thomas Malthus initiated the debate and his vision was pessimistic: as the human population grew exponentially and the food supply grew arithmetically, living standards would decline and only be able to provide the bare means of subsistence.

What happened throughout the nineteenth century and early twentieth century proved Malthus' forecasts wrong: the industrial revolution gained momentum and international trade spread prosperity across the world. Madison (2007) estimates that the annual global GDP growth accelerated from 0.3 percent during 1500–1820 to 1 percent during 1820–1913. Of the factors that caused such a great defeat of Malthusian pessimism, two stand out: changes in the population structure and productivity gains. The first factor was an unprecedented phenomenon: the dramatic decline in mortality rates (with the consequent increase in life expectancy), and the subsequent declining fertility rates in Europe from the late eighteenth century (Lee, 2003). As a consequence of these changes, the old continent's population went from young to adult. Productivity gains were impressive. In the United Kingdom, GDP per hour worked in 1913 tripled that of 1820 (Madison, 2007). Interestingly, modern literature is beginning to stress the increasing role of demographics in promoting the industrial revolution, either directly (Clark, 2001) or indirectly, through capital deepening and human capital accumulation (Boldrin et al., 2005).

The Great Divergence between Europe and Asia generated by the industrial revolution was interrupted in the second half of the twentieth century with the Japanese postwar growth acceleration followed by the East Asian miracle (Hong Kong, Singapore, South Korea, and Taiwan). During this period the population structure changed dramatically in these countries, with the working-age population growing faster than the dependent population (Bloom and Williamson, 1997). Accounting for long-run growth, Bloom and Finlay (2008) conclude that "demographic factors remain key in explaining economic growth in East Asia." This historical evidence suggests that developing countries could take advantage of the demographic transition. In this regard, as Wu Cangping said in the mid-1980s, the challenge seems to be "to get rich before getting old."

Indeed, the first decade of the twenty-first century brought dramatic changes in the configuration of global growth dynamics. During the period 1980–99, the convergence of national per capita GDPs in PPP (purchasing power parity) terms was rather moderate. In the late 1990s, Lant Pritchett estimated that "from 1870 to 1990 the ratio of per capita incomes between the richest and the poorest countries increased by roughly a factor of five and that the difference in income between the richest country and all others has increased by an order of magnitude" (Pritchett, 1997). In the 2000s, however, a major innovation in the global growth dynamic was the displacement of the engine of global growth toward the emerging world. Between 2002 and 2012, developing economies expanded by 6.4 percent per year, while the rich were up 1.6 percent per year. The magic of compound interest worked and the participation of emerging economies in global output increased from 38 to 50 percent (figure 1.7a). Figure 1.7b shows the long-run evolution of per capita GDP in PPP terms in different regions relative to those of advanced economies (excluding Japan). Note that the new global growth dynamics benefitted emerging economies worldwide: it stopped divergence in Latin America and accelerated convergence in Asia. As OECD (2010) notes, "[This is] a structural change . . . that moves the center of gravity to the south and east, from the OECD countries to emerging countries."

Table 1.2 classifies the G-20 into "winners" and "losers" concerning these modifications in global growth dynamics. To classify the countries into these

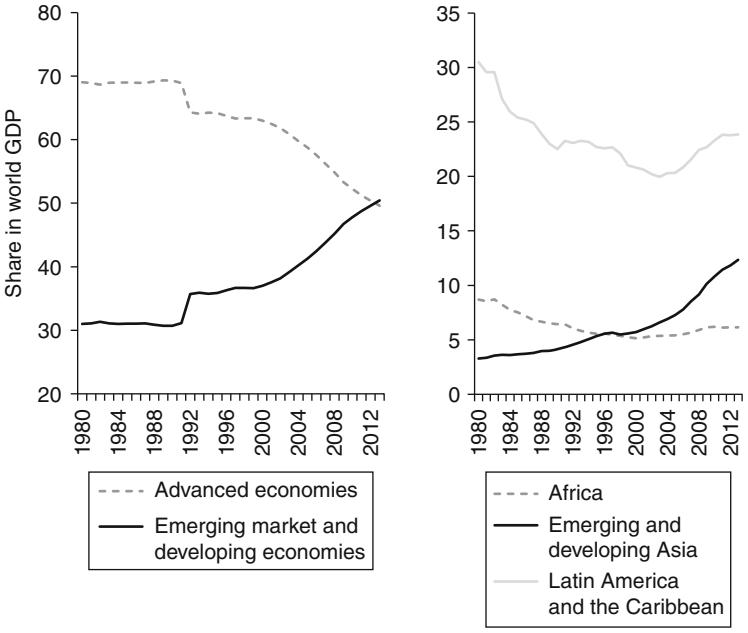

Figure 1.7 The changing pattern of global growth

Source: IMF and the conference board.

Table 1.2 Winners and losers in the G-20

Country	*Share in global output (%)*		*Gain/loss (%)*		*Country*	*Share in global output (%)*		*Gain/loss (%)*	
	2002	*2013*	*Global accumulated output change (%)*			*2002*	*2013*	*Global accumulated output change (%)*	
(a) Winners					**(b) Losers**				
China	7.92	15.43	7.5	83.7	United States	23.48	19.29	−4.2	−17.0
India	3.86	5.72	1.9	41.9	Japan	7.29	5.45	−1.8	−23.6
Indonesia	1.21	1.48	0.3	21.7	Germany	4.85	3.72	−1.1	−20.0
Saudi Arabia	0.82	1.07	0.3	26.3	Italy	3.20	2.08	−1.1	−32.3
Argentina	0.64	0.89	0.2	32.1	France	3.50	2.62	−0.9	−23.0
Russia	2.74	2.95	0.2	4.1	United Kingdom	3.52	2.74	−0.8	−22.1
Turkey	1.14	1.35	0.2	16.3	Canada	2.12	1.75	−0.4	−15.9
					Mexico	2.42	2.13	−0.3	−10.1
					Australia	1.25	1.15	−0.1	−7.0
					Brazil	2.86	2.79	−0.1	0.4
					South Africa	0.70	0.69	0.0	−1.2
					Korea	1.92	1.92	0.0	0.9

Source: Author's calculations based on IMF data.

two categories, we consider whether the country's economy gained or lost participation in the world's GDP between 2002 and 2013.

In light of the growth literature, it is only natural to conjecture that the asynchronies in the global demographic transition must have contributed to motorizing the changes in the world's growth pattern observed in the twenty-first century (Dervis, 2012). For one thing, an examination of the G-20 economies reveals that many emerging economies are enjoying the moment of growth while richer economies are approaching the ageing stage, when demographic factors weaken growth. Note, nonetheless, that Brazil and Mexico did not increase their participation in the world economy despite their favorable demography, suggesting that the link between demography and growth is far from automatic. Beyond this, the population projections indicate that demography will likely continue to influence growth in the coming decades to the extent that the world's population growth rate is far from the steady state.

As was mentioned before, the literature on the links between population changes and growth has identified the factors and classified the mechanisms that create such a link. Mason (2005) distinguishes between a first dividend (FD) and a second dividend (SD) stage. While the FD basically has to do with the effects of the evolution of the working-age population on per capita GDP, the second is closely related to the behavior of prime savers and the expected evolution of the share of older persons in the total population. More specifically, the SD has to do with the fact that people are forward looking and anticipate that they will have to finance consumption during retirement.

To obtain a more precise idea of FD and SD, we can use the age-specific consumption and income profiles—taken from the NTA database; see the Japanese example in figure 1.5—to obtain a measure of the "effective consumers" (N) and "effective producers" (L), which are weighted sums of the population's cohorts that use, respectively, the consumption and labor productivity profiles as weights (Cutler et al., 1990; United Nations, 2013b; and the methodology in chapter 2). On the basis of these indicators, we can decompose the evolution of the GDP per effective consumer (Y/N) into two ratios as follows:

$$Y / N = (Y / L)\,(L / N)$$

where L/N is the support ratio (the number of effective producers per effective consumer) and Y/L is the level of output per effective producer. This, in turn, allows us to distinguish between the contributions to the growth of per effective consumer income (g) of productivity growth (g^{lp}) and variations in the support ratio ($l - n$):

$$g = g^{lp} + (l - n)$$

Given the level of labor productivity, it follows that per capita income will only increase to the extent that $l > n$, a condition that is likely to be met

when a country is entering the demographic window and the working-age population is growing fast. On the other hand, as the economy approaches the ageing stage and the proportion of retired workers augments, $l < n$. This means that it will be necessary to foster labor productivity for the economy to offset the downward pressure on the growth rate. Fostering productivity calls for an increasing capital/labor ratio.

The SD will occur if agents are sufficiently forward looking and accumulate enough assets before retirement. The savings effort required to support the capital/labor ratio, nonetheless, will lessen during the ageing stage because the labor force will decrease as a share of the total population. United Nations (2013b) provides a dating of the demographic dividends based on the evolution of the support ratio. As figure 1.8 shows, the FD phase is perceptible by the interval during which the support ratio is rising, while the dating of the SD is not easy to determine because it depends on the ability of the economy to take advantage of the beneficial population structure during the FD to increase the savings rate.

According to Mason (2005), the FD occurs because—given the output per worker, labor force participation rates, and unemployment rates—a rise in the share of the working-age population will lead, as a matter of simple algebra, to an increase in output per capita. The first demographic dividend typically lasts for decades, but it is inherently transitory in nature. The FD arises and dissipates as changes in age structure interact with the life cycle

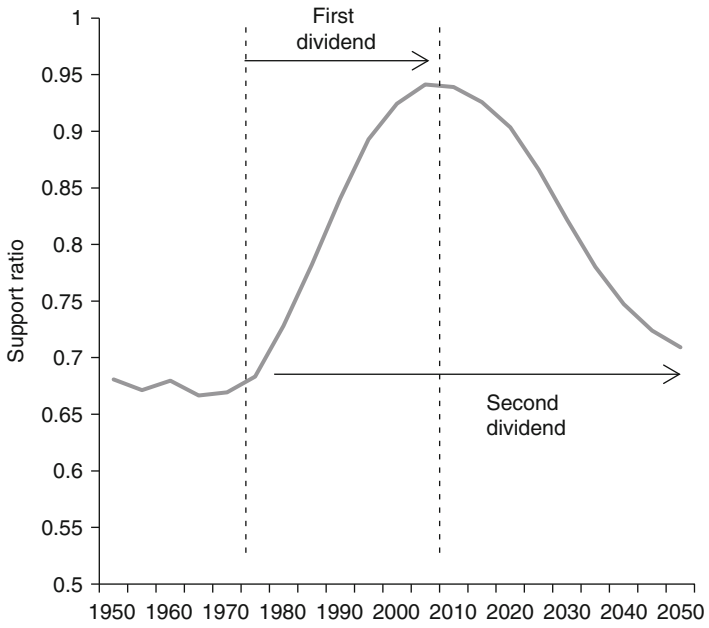

Figure 1.8 The demographic dividends

Source: United Nations NTA manual, 2013.

of production and consumption. As population ageing begins to dominate demographic trends, the share of the working-age population declines. In this way, the FD turns negative to become a demographic tax. The case studies of India and South Africa in this volume show that structural problems in the labor market can hinder them from taking advantage of the FD.

Mason (2005) presents quantitative estimations of the FD. The dividend period over which the FD is positive originated in industrialized countries in the 1970s and the rest of the regions followed. The onset of the FD was only substantially delayed in South Asia—to around 1985. The duration is short in the industrialized countries (30 years) and varies for others from 47 to 60 years. Both the magnitude and duration of the FD matter for total gain: total gain is lower for the industrialized countries and transitional economies (15–20 percent); and is higher in developing countries (around 40 percent in Latin America, the Middle East, and North Africa). The estimations corresponding to the United States and Mexico are good illustrations. In the United States at its peak, the FD contributed 0.67 percentage points per year to economic growth in 1985–90, and in Mexico, 1.25 (1995–2000). The FD lasted 30 years in the United States (similar to other industrialized countries) and will last much longer in Mexico (similar to Latin America) because Mexico began with a relative disadvantage.

Table 1.3 shows the expected evolution of the support ratio for G-20 economies in the coming decades, assessed on the basis of Mason and Lee (2006b) methodology. As can be seen, the trajectory for emerging countries

Table 1.3 The evolution of the support ratio in G-20 countries (maximum country value = 1)

	1960s	*1970s*	*1980s*	*1990s*	*2000s*	*2010s*	*2020s*	*2030s*	*2040s*
Argentina	0.98	0.95	0.92	0.92	0.95	0.98	1.00	1.00	0.97
Australia	0.91	0.92	0.96	0.99	1.00	0.97	0.93	0.89	0.87
Brazil	0.78	0.80	0.86	0.92	0.98	1.00	0.99	0.97	0.94
Canada	0.86	0.90	0.96	1.00	1.00	0.96	0.89	0.85	0.82
China	0.77	0.78	0.85	0.94	0.99	1.00	0.94	0.86	0.83
France	0.94	0.94	0.98	1.00	0.99	0.95	0.90	0.87	0.85
Germany	0.93	0.92	0.98	1.00	0.98	0.95	0.88	0.82	0.80
India	0.82	0.81	0.83	0.87	0.91	0.96	0.99	1.00	0.99
Indonesia	0.79	0.78	0.81	0.87	0.94	0.99	1.00	0.97	0.93
Italy	0.97	0.95	0.98	1.00	0.99	0.95	0.87	0.79	0.74
Japan	0.95	1.00	0.99	0.98	0.93	0.87	0.82	0.76	0.71
Mexico	0.70	0.70	0.75	0.84	0.93	0.99	1.00	0.96	0.91
Republic of Korea	0.74	0.77	0.87	0.96	1.00	0.98	0.90	0.79	0.71
Russian Federation	0.92	0.94	0.96	0.96	1.00	0.99	0.95	0.91	0.85
Saudi Arabia	0.75	0.75	0.80	0.84	0.88	0.94	0.97	0.99	1.00
South Africa	0.82	0.82	0.85	0.92	0.93	0.91	0.93	0.96	1.00
Turkey	0.77	0.77	0.81	0.89	0.96	0.99	1.00	0.98	0.95
United Kingdom	0.97	0.94	0.97	1.00	0.99	0.98	0.94	0.90	0.89
United States	0.89	0.92	0.97	1.00	0.99	0.96	0.92	0.91	0.91

Source: Author's elaboration based on Mason (2005).

will be favorable and negative for the older countries. It is interesting to note the differences among the countries analyzed in the country studies of the book. Brazil and China are well ahead of India and South Africa in the demographic transition and, consequently, are expected to gain less from the FD. In comparing Brazil with China, in turn, we see that China's drop in the support ratio will be faster than in Brazil, thus accelerating its arrival at the ageing state.

As was mentioned earlier, Mason and Lee (2006a) sustain that the SD is associated with the fact that ageing populations have to provide for the old-age consumption of older persons who typically have substantially reduced labor income. In some cases, societies seek to meet this challenge by relying on transfer systems (either public programs or family support systems), but other societies increase their savings rates in order to accumulate wealth. In turn, if policymakers are forward looking, they will also strive to accumulate enough capital to support the social security system and accrue increased health expenditures for the old. Hence, to the extent that the anticipated life-cycle deficits during the ageing stage are satisfied by relying on capital accumulation, the result will be a permanent increase in the capital intensity of the economy and a permanent rise in output per worker.

Is there evidence that the SD will not turn negative like the FD in the future? Mason (2005) provides evidence that supports the hypothesis of a permanent effect. Holding the transfer policy constant, so that the growth rates of the capital and life-cycle wealth[4] are equal, the SD is calculated to be positive for all regions and substantially larger than the FD for the period in question. In East and Southeast Asia, the SD was 1.31 percent per year in additional income growth—the largest of any region. It was also large in Latin America—1.08 percent per year.

The assumption that capital accumulation and life-cycle wealth will move together, however, is probably too strong. The simulations in chapter 3 show that large differences between the velocity of asset accumulation and the velocity of increased life-cycle wealth can arise in the case of the four countries analyzed. The methodology developed in chapter 2, in turn, shows why the inconsistencies between asset accumulation and the demand for life-cycle wealth may give rise to unstable macroeconomic trajectories associated with unsustainable public debt or persistent macroeconomic disequilibria, such as excessive current account surpluses that in the case of systemically important countries like China can contribute to feeding global imbalances. On the other hand, Brazil's analysis in this book indicates that a country can save too little during the window of opportunity. Large-scale pay-as-you-go pensions may undermine savings and work incentives. In addition, financial markets may not be sufficiently developed and may not provide the savings vehicles (mutual and pension funds, efficient professional investors) or the instruments to channel savings toward efficient investment in physical and human capital (Lee and Mason, 2010).

The SD may be far more important than the FD because its effects are permanent, but they are also more responsive to policies and the structural

context and much more difficult to evaluate. The country studies in this book dealt with these issues in more detail and chapter 3 analyzes the mechanisms at work based on simulations. Given that this chapter basically tries to show the relevance of the problems addressed, we will merely present here evidence to motivate the analysis of the relationship between growth and demographic asymmetries. Figure 1.9 shows the relationship between growth performance—based on table 1.2's indicator—and the demographic transition in order to provide an overall picture of the G-20.

There is a negative correlation between the two variables depicted (–0.48 for median age and the increase in the share in world GDP). Note that there is no old country in quadrant I, in line with the fact that, *ceteris paribus*, older countries tend to grow at a slower pace. But there are young countries and countries that are going through the dividends stage in quadrant IV, illustrating the fact that there is no automatic effect of demography on growth and that policy and conditions matter. The country studies provide ample evidence on this issue. Particularly relevant are policies to improve the labor market and create new jobs of increasing quality in young countries like South Africa, as well as the design of the social security system in middle-income countries (Brazil).

This evidence raises the question of whether unexploited opportunities exist within the G-20 to accelerate growth in relatively young but slow-growing countries like South Africa and Brazil and maintain the momentum in fast-growing India and China.[5] A closely related question is whether older countries can benefit from the higher growth potential of younger ones. One hypothesis motivating our research is that a better knowledge of the macroeconomic mechanisms connecting the population dynamics with growth

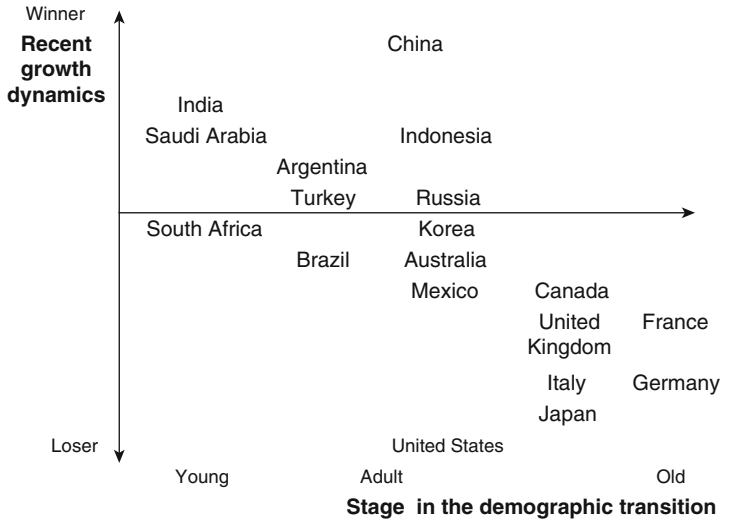

Figure 1.9 Growth dynamics and demography in G-20 countries

Source: Author's elaboration.

and the global economy may contribute to answering these questions and designing better policies. We will now consider the current account and capital flows dynamics associated with the savings, labor, and growth facts that we have already presented.

1.3 The Current Account, Capital Flows, and External Balance Sheets

Since variations in the aggregate life-cycle deficit impinge on aggregate savings, young countries are expected to save little, adult countries are expected to be big savers, and the savings rate is expected to decline in old countries. In standard growth theory, in turn, investment patterns are also influenced by demographic variables: younger countries should invest more than older countries as the labor/capital ratio increases. Nonetheless, several authors (Wilson and Ahmed, 2010) find that, empirically, the investment-demography nexus is weak. Combining these two facts, it follows that young countries should run current account deficits; adult countries should run current account surpluses; and it is inconclusive what the sign of the current account result in old countries should be, as investment and savings would decrease together (Higgins and Williamson, 1997). Considering our previous findings, this implies that the prime-savers' share in the population and the current account result should be positively related.

It is important to take into account that from the demographic view it is not neutral whether savings are allocated to physical capital or foreign assets. For one thing, it can induce nonneutral intertemporal reallocations of consumption among cohorts in a way that is not possible in a closed economy (see chapter 3); for another it is not neutral for the development of global capital markets (Kent et al., 2006). In order to include these issues in the picture we should consider the current account and capital movements. Indeed, the interest in the relationship between population structure and the evolution of the current account and capital flows has recently increased for another reason: the concerns about the persistence of large global imbalances in the 2000s (Bernanke, 2005).

Figure 1.10a presents the evolution of net capital flows that, obviously, reflect the evolution of the current account. There has been an overall current account deficit in younger emerging countries and a current account surplus in older ones. In advanced economies, the group of older countries experienced a drop both in savings and investment, resulting in a relatively invariant current account surplus. These facts do not contradict the expectations based on demography. The dynamics of the advanced-younger group, on the contrary, did not yield the expected results. The group's results were driven by the United States that ran a current account deficit. As Bernanke states in his famous talk on the global savings glut, "demographic factors should lead the industrial countries to try to save more, not less," but "current account positions in industrial countries adjusted endogenously to . . . changes in financial market conditions" (Bernanke, 2005), characterized by a boom in the

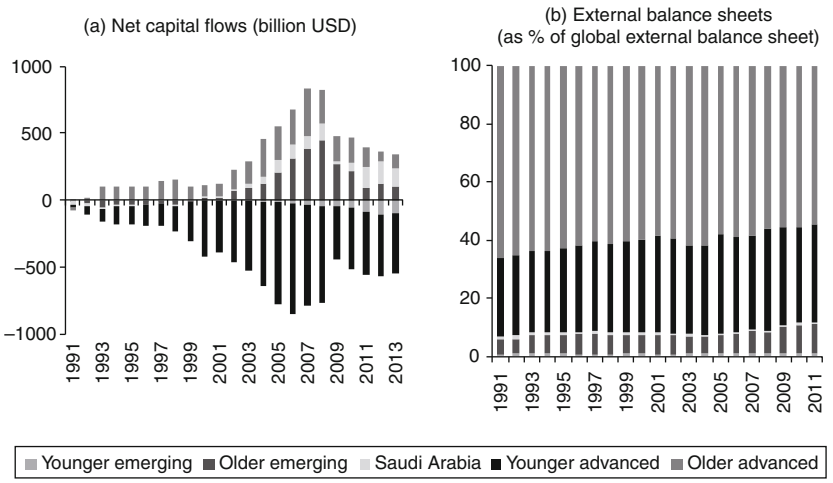

Figure 1.10 Capital flows in G-20 countries

Source: Author's elaboration based on IMF data.

foreign demand for US assets fueled by an increase in global savings and a sharp appreciation in the US real exchange rate.

On the basis of the trajectory of the current account, we can estimate the change in the external balance sheets of the different groups, defined as the sum of external assets and liabilities divided by two. Figure 1.10b shows that emerging countries only slightly increased their importance in global balance sheets. From this it follows that the changes in the global distribution of savings and investment flows observed in the last decade did not fully reflect in the expansion of the balance sheets of the emerging market economies, suggesting that financial deepening and financial integration with the global economy are lagging behind the path of fundamentals.

In order to assess the future evolution of the current account and capital flows, we should take into account the trajectories of savings and investment provided by the World Bank (2013) study, which found that the demographic transition, economic convergence, and financial development are the three key drivers of change in the size and composition of global savings. While the study projects no major changes in the global savings rate, it estimates that the share of emerging economies will increase in line with the tendency observed in the last decade.

Based on the World Bank's projections, figure 1.11 shows the global distribution of savings and investment among the groups that we previously identified at three moments: 1995, 2010, and 2030. First, note that the process of savings redistribution among emerging and advanced economies will continue in the future: in 2030 the former will save six out of every ten dollars of world (G-20) savings. Even if China accounts for the largest share of global savings on a single-country basis, favorable demographics will increase India's future role and to a lesser extent South Africa's. The relative role of

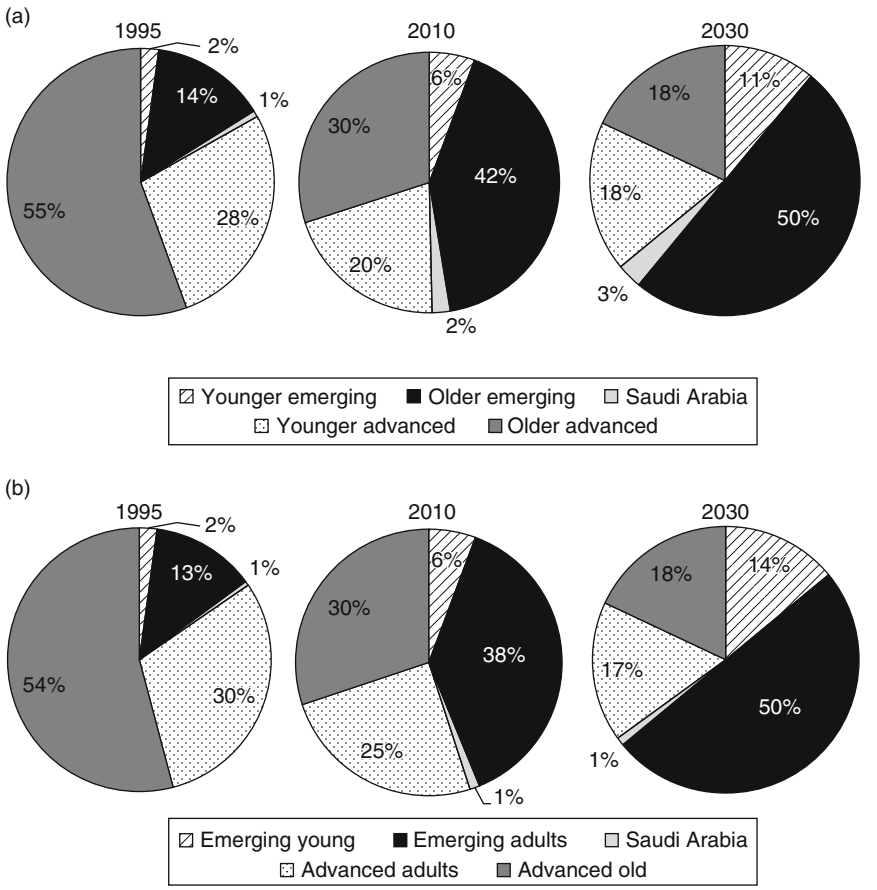

Figure 1.11 Changing patterns in global savings and investment

Source: Author's elaboration based on WDI data.

younger advanced and older advanced economies is also expected to change: the latter will lose importance in determining global savings.

Emerging market economies' role in global investment will also continue to grow in the coming years. Emerging-adult countries' share in global investment will increase from 38 percent in 2010 to 43 percent in 2030. Younger-emerging economies will also increase their share in global investment, and the group to lose share is the low-growing, older advanced economies.

How will these dynamics affect the cross-country distribution of current account results? Diverging patterns of national savings and investment will change the nature of net capital flows and current disequilibria that are threatening the global economy might easily persist instead of soften. According to the projections in figure 1.12, a small set of advanced countries—Japan, Germany, China, and Saudi Arabia—will have to provide net finance to an increased set of advanced (United States, France, Italy) as well as emerging economies (all the BRICS except Russia and China).

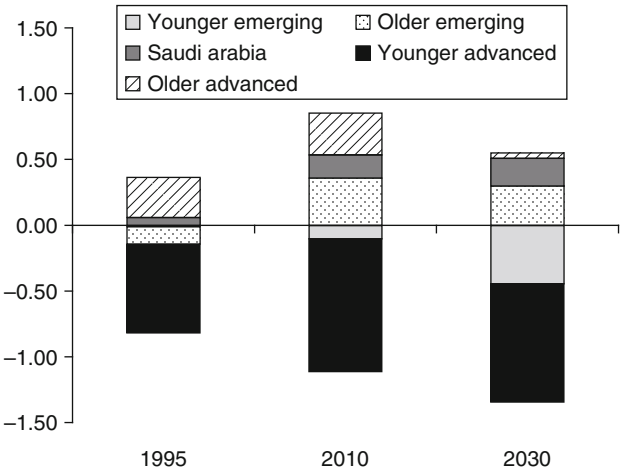

Figure 1.12 Evolution of current accounts (% G-20 GDP)
Source: Author's elaboration based on IMF data.

The United States plays a primary role in explaining these results. The US savings rates have fallen well below expected levels for a country in the demographic window, and as ageing deepens in the future, a declining prime-savers' share will further depress aggregate savings. As the investment rate should remain relatively stable (to be able to support the 2 percent productivity growth per year assumed in the World Bank's study), the expected result is a deepening in the current account deficit. The evolution of China's savings is also key because this country exhibits a far stronger position than countries that are undergoing similar stages of the transition. We must take into account, however, that China will experience rapid ageing in the future and this will depress savings. In chapter 3, we simulate the trajectory that savings would show if the change in population structure were the only force driving savings. Under such conditions, after 2011/2012, China's savings rate shows a downward path. In this demographic-driven scenario, if the investment-intensive strategy of growth does not change, China might run a current account deficit for the first time in two decades by the year 2025. This result is in line with the literature that incorporates demographics into current account projections (Lee et al., 2013).

Figure 1.13 exhibits the change in the external balance sheets of the different groups that we have projected using the World Bank's projections concerning savings and investment and following the methodology applied by Speller et al. (2011). One fact stands out: the emerging economies' balance sheets should experience a marked growth in the coming decades in order to meet the requirements originating in the evolution of fundamentals. In light of the necessary expansion in capital flows, the World Bank (2012) denominated this upcoming period the "Third Age" of financial globalization.

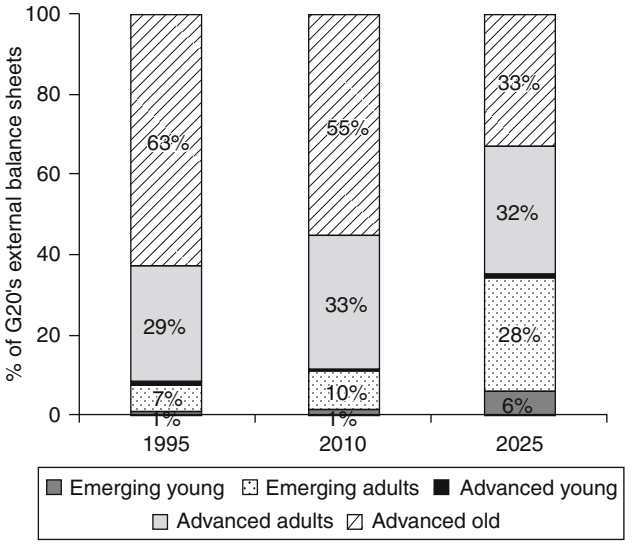

Figure 1.13 Contribution to global finance (external balance sheets)
Source: Author's elaboration based on Milesi-Ferretti's updated database and WDI.

1.4 The Case of Japan as Benchmark

Japan is one of the countries in which the ageing process has advanced more and has also been very successful during the dividends stage. Since the book focuses on emerging countries that will go through demographic stages that Japan has already experienced, we include a brief review of key indicators concerning the Japanese demographic transition as background for our discussion.

Japanese economic growth accelerated markedly during the 1960s and early 1970s, giving rise to a process of fast convergence with the American standard of living (figure 1.14a), a period denominated as "the Japanese miracle" by the Growth Commission (2008), among others. The investment rate rose during the miracle period, from some 20 percent of GDP in the early 1950s to 37 percent in the early 1970s. When the growth miracle ended in the 1980s, investment resumed its pre-miracle values.

Japan entered the demographic window in the mid-1960s, and the prime-savers' share (as defined using NTA estimates) maintained its highest levels until the mid-1990s (figure 1.14b). Savings rates moved according to the evolution of demographics: it more than doubled between the 1950s and the 1970s and recorded maximum values during the last part of the demographic window, not during the growth miracle period. Japan's case is very telling of the effects of ageing: there is a substantial drop in the average savings rate between 1995 and 2010.

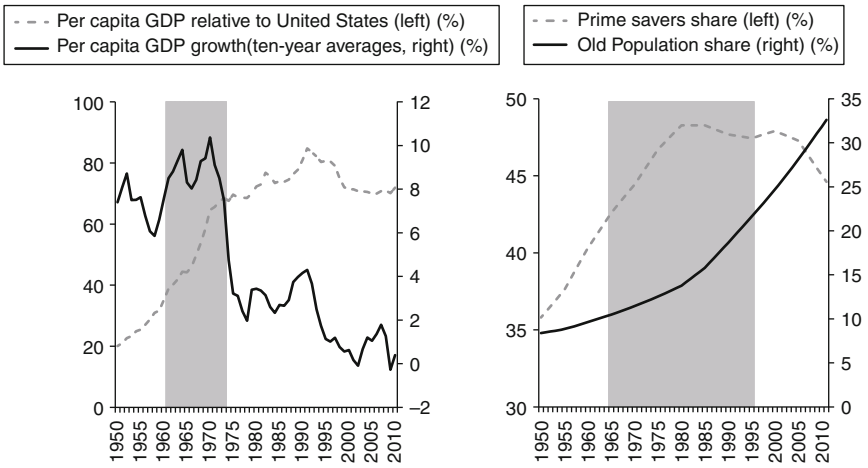

Figure 1.14 Structural change in Japan

Source: Author's elaboration based on data from the United Nations and the Penn World Table.

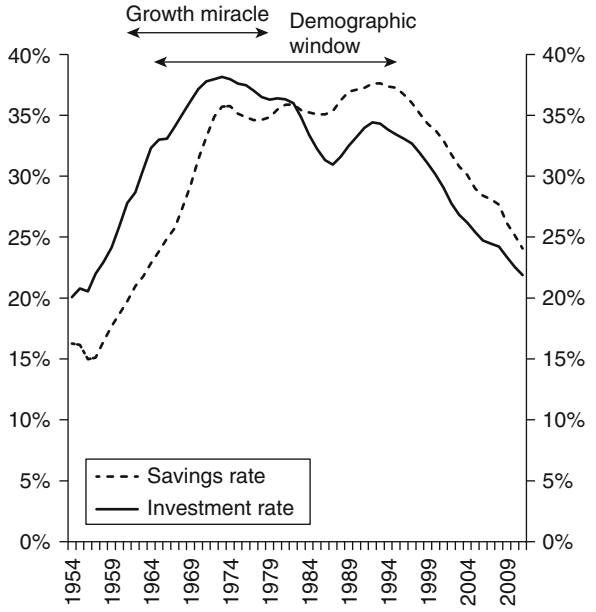

Figure 1.15 Japan: savings and investment rates (five-year averages)

Source: Author's elaboration based on PWT data.

What happened to net capital flows and the Japanese external balance sheet? The asynchronous evolution of investment and savings led to an improvement in the external accounts. Japan went from being a net capital importer in the 1950s to being one of the main capital exporters in the early 1980s (figure 1.16a). These flows dynamics markedly changed Japan's net foreign assets position, from being a debtor nation in the 1950s to a creditor nation in the late 1960s. The combination of the Japanese "lost decade" in terms of growth and the demographic window resulted in a further strengthening of the country's external position in the 1990s.

Figure 1.16b highlights the complexity of the relationship between gross capital flows and net capital flows. The fact that Japan became a capital exporter did not lead to a reduction in foreign liabilities; to the contrary, the debt of Japanese residents to foreigners as a percentage of GDP more than tripled between the mid-1970s and the early 1990s.

In sum, many of the stylized facts that we have pinpointed in this chapter concerning the G-20 countries are present in the case of Japan; in particular, important changes in the investment and savings rates that are compatible with the predictions of the demographic literature and increasing demand for external assets as the society ages. This suggests that a detailed analysis of the channels through which the demographic transition influences aggregate savings and investment and, hence, growth, capital flows, and global capital markets is necessary to complement other approaches to these issues based on the notion of growth convergence and studies on international finance. This book attempts to make a contribution in this regard.

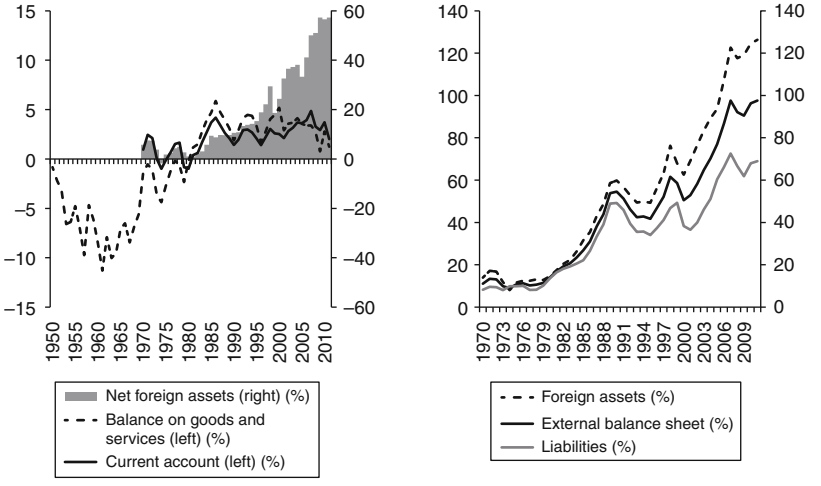

Figure 1.16 Japan: net capital flows and the external balance sheet

Note: The external balance sheet is the semi-sum of foreign assets and foreign liabilities.

Source: Author's elaboration based on PWT and Lane and the Milesi-Ferretti database.

1.5 Demographically Driven Capital Flows and the Postcrisis Constraints

The evidence analyzed indicates that the changes in population age structure impinge on the evolution of national savings and the trajectory of the current account and the external balance sheet. This is in accordance with previous research findings (Davis, 2006; Haldane 2010; Lane and Milesi-Ferreti, 2001; World Bank, 2013). Examining the stock-flow side of the problem, Lane and Milesi-Ferreti (2001) state that when demography changes, the desired financial positions also change, affecting capital flows (portfolio equity, FDI, and debt instruments). This author found that a small set of fundamentals explains net foreign asset positions and the behavior of the current account. These fundamentals are, in addition to demographic trends, shifts in relative output levels, and the stock of public debt. This means that demography can also influence capital flows indirectly because, first, the FD and SD modify the world's relative output levels and, second, the population's age structure is a determinant of the fiscal support ratio and, hence, of the trajectory of public debt; the simulations in chapter 3 show the relevance of this point.

If market failures were absent, the financial transactions induced by demographic disparities would be a prime determinant of the pattern of the world's current account results, international capital flows, and the cross-country distribution of financial wealth. We have seen, however, that the external balance sheets of emerging economies have not expanded in accordance with the increase in the share of world savings accounted for such economies. This suggests that reduced financial deepening in developing countries could become an important obstacle in the future. Based on the methodology developed by Speller et al. (2011) and the expected growth in the external balance sheets, it is possible to calculate the expansion in the size of domestic financial markets in real terms that would be necessary for such expansion to be consistent with the expected growth of capital flows.[6]

Figure 1.17 shows that the required increase in domestic financial deepening is much higher in the case of the group of emerging countries and, additionally, the increase in the size of bond markets and bank credit is larger in younger countries. This is a natural consequence of the fact that growth is more rapid in such countries and that savings will rise faster than output because of the increase in the proportion of prime savers in the population.

Establishing domestic architectures for the efficient governance of flows and developing the structure of agents and organizations of financial markets—from market makers to institutional investors and the banking system—is a complicated task. Many emerging countries suffered financial crises in the 1980s and 1990s because of the limited absorptive capacity of their underdeveloped domestic capital markets (Fanelli, 2008). In addition, a range of shocks originating in the global markets could hinder the process. In light of this, it seems natural to conclude this chapter by considering the constraints that the postcrisis scenario poses.

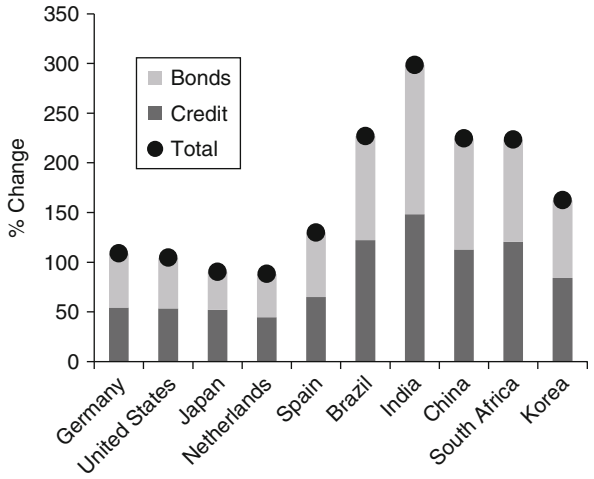

Figure 1.17 Required change in domestic financial deepening
Source: Author's calculations.

After making an empirical study of the constraints that emerging market economies face to further integrate with global markets, the IMF (2014) concludes that emerging market economies do not have a sufficiently strong local investor base comprising both banks and nonbanks and, under such circumstances, large foreign participation in local markets can introduce instability. Furthermore, the global regulatory reform agenda has had unintended consequences for market making: regulations restricting bank trading activities may have contributed to debilitating market liquidity. Market liquidity in bond markets has declined in emerging market economies in tandem with a drop in inventories maintained by global banks.

A positive development in the postcrisis scenario has been the expansion of local currency bond markets that has reduced the risk of currency mismatches. In addition, several countries have implemented macroprudential policies that have helped to improve risk assessing and to prevent capital flow reversals. According to the IMF (2014), however, emerging markets are still largely exposed to financial shocks. First, the changing mix of global portfolio investors—with the increasing presence of mutual funds—–is likely to make overall portfolio flows more sensitive to global financial shocks because the share of less stable bond flows is rising. Second, herding behavior among international mutual funds (retail investors) continues and they do not seem to be differentiating among emerging markets based on macro fundamentals during crises. Third, substantial spillovers to activities beyond neighboring trading partners could emerge if further turmoil leads to a renewed bout of increased risk aversion in global financial markets, or from disruptions to trade and finance. Finally, the normalization of monetary policy—both conventional and unconventional—is now on the US agenda and it implies tighter financial conditions and a tougher financial environment in which

investors will be less forgiving, and macroeconomic weaknesses will become more costly.

Within this context of persistent uncertainty in which the international architecture does not provide adequate liquidity and safety nets (see Ocampo, this volume), emerging as well as rich countries have been following policies that are frequently at odds with the requirements of demographic fundamentals and distort the global distribution of current account surpluses and deficits (Bernanke, 2005, 2007; Blanchard and Milesi-Ferretti, 2009, 2011). In the case of emerging economies, self-insurance via the accumulation of reserves and financial protectionism are the two most salient policies, while the policies implemented after the 2008–09 crises are relevant in the case of advanced economies.

With respect to self-insurance policies, a number of emerging countries that experienced episodes of financial turmoil in the 1990s—such as twin crises and sudden stops—implemented such policies in the 2000s to reduce their vulnerability to global liquidity shocks. The self-insurance strategy fed the demand for safe assets to the detriment of riskier instruments. This reinforced the already increasing demand for more reliable assets that originate in two sources. The first source is the sovereign funds that natural-resource-rich countries use to reallocate net export proceeds across generations and states of nature. The second source is the demand stemming from countries that follow "mercantilist" export-led growth strategies.

Under the distorted monetary and regulatory environment of the 2000s, capital flows have been to a certain extent running upstream—from advanced countries with high capital/labor ratios and more advanced in the demographic transition to countries with a younger population and lower capital accumulation per worker (Wilson and Ahmed, 2010). This fact is not independent of the fact that self-insurance and mercantilist policies have made the demand for safe assets stronger (Aizenman and Lee, 2008).

Many emerging countries—like Argentina, Brazil, Thailand, China, Indonesia, and Turkey—have been implementing corrective policies that have a bias toward financial protection, such as higher taxes on capital movements, quantitative limits, and regulations on short positions (on capital controls, see Ostry et al., 2010). A weak demand for risky assets and financial protectionism hinders global financial development and are stumbling blocks along the road to international cooperation.

As a consequence of the high costs of the anticrisis packages, the troubled advanced countries have experienced strong upward trends in the public debt/GDP ratios that create financial uncertainty (Buiter and Rahbari, 2010; IMF, 2014). From the demographic point of view, a primary source of concern is that a good number of the countries in which public debt has increased are ageing countries that will have to generate significant primary fiscal surpluses in the future when the ageing process is more advanced and downward pressures on the savings rate is present. Furthermore, since a good portion of the funds demanded by the public sector have been and will continue to be supplied by foreign investors, the increase in the public

Table 1.4 International investment position (% of GDP)

	2007	*2012*		*2007*	*2012*
Argentina	13.27	10.51	Italy	–24.52	–26.43
Australia	–56.29	–55.09	Japan	48.78	62.27
Brazil	–35.32	–38.41	Kore	–22.04	–8.15
Canada	–11.10	–16.62	Mexico	–35.55	–37.97
China	32.65	21.03	Russian Federation	–11.25	6.44
Euro Area	–13.59	–13.32	Saudi Arabia	90.13	95.81
France	–1.48	–21.14	South Africa	–31.86	–8.37
Germany	26.46	41.50	Turkey	–43.61	–53.03
India	–5.91	–16.10	United Kingdom	–22.63	–15.26
Indonesia	–40.33	–42.43	United States	–12.40	–23.79

Source: IMF data mapper, http://www.imf.org/external/datamapper/index.php.

debt/GDP ratio has as counterpart a deterioration in the net external investment position. Table 1.4 shows the investment position of G-20 countries.

Table 1.4 reveals a fact that is rather anomalous when assessed from the perspective of the demographic transition: old countries (Germany, Japan) as well as countries that are undergoing the demographic bonus (China, Argentina) have been lending money to old countries that are experiencing high rates of unemployment. Chapter 3 shows that the cohorts that will be alive in the future in those economies that are currently net debtors of the rest of the world will experience a reduction in their national income vis-à-vis domestic income because they will have to repay foreign debt. This is not the case when debt is held by domestic investors. Although it is true that future cohorts will have to repay domestic debt, it is also true that, as counterpart, some cohorts will receive a positive transfer in the form of debt payments. This implies that there will not be a fall in overall national income despite the obvious redistribution among cohorts. This raises important questions not only about financial and fiscal stability but also about distributional conflicts at the national level and the global economy. These are precisely the kinds of questions that the country studies in this volume address.

1.6 Summing Up: Stylized Facts and Research Questions

The following stylized facts are most relevant to the questions addressed in the book:

- The global demographic transition shows significant cross-country asynchronies, giving rise to demographic asymmetries between developed and emerging countries. The world as a whole is ageing but the emerging world is much younger.
- Marked changes in the global distribution of the labor force will occur as a consequence of the asynchronies in the global ageing process. Given

the restrictions in international labor mobility, this will require a concomitant redistribution of the sources of employment creation so as to avoid deep structural disequilibria in emerging labor markets.

- A deep modification in the distribution of the global sources of savings is underway; "young" emerging countries are expected to generate the largest part of the world's savings in the next two decades, displacing "old" advanced economies.
- The demographic-driven changes in the potential labor supply and savings will have both transitory and permanent consequences on growth, according to the "dividends" view. This will contribute to modifying the world's growth dynamics in the next two decades. The influence on global growth is independent of the process of convergence but will interact with it.
- In the next two decades, the effects of the FD are expected to be positive in the emerging world and to turn negative in advanced countries. But the dividends are not automatic and the first will revert in the ageing stage. The effects of the SD are potentially positive and permanent in both emerging and rich countries but the materialization of such effects depends critically on the quality of the policy framework (particularly regarding the social security system and financial development).
- The changes in the global reallocation of savings and investment balances will impinge on the current account results across the world in the next two decades and, therefore, on international capital movements: the share of financial flows accounted for developing countries are expected to increase substantially.
- As a consequence of the different accumulation paths, there will also be a redistribution of physical and foreign assets; however, the observed evolution of international capital markets in the 2000s suggests the presence of substantial imperfections that may weaken demographically driven flows. In particular: (i) developing countries' external balance sheets are falling behind the required expansion; (ii) a large portion of capital flows have been running "upstream"; and (iii) a number of "old" countries show increases in the public debt/GDP ratios and in the international investment position that is at odds with its demographic stage.
- The expansion of domestic financial deepening that should accompany the required expansion of the external balance sheet is substantial, but the local investor base is weak and capital flows are still vulnerable to herding.
- The international financial architecture shows important flaws with regard to liquidity provision and safety nets for developing countries and this generates incentives for self-insurance strategies and financial protectionism that are at odds with the requirements of demographically driven capital flows.

These stylized facts have implications that are at the core of the issues that we will analyze in the rest of the book.

Notes

1. In this regard, our approach is akin to the literature on capital movements and global macroeconomic disequilibria. Issues typically addressed in this literature are: capital movement volatility originating in an inconsistency between the size of capital flows and the absorption capacity of the domestic financial system; the financial consequences of excessive public debt/GDP ratios in the face of ageing and the fiscal costs of financial crises; and the effects of excessive exposure to financial shocks originating in currency and/or duration mismatches.
2. See Bloom et al. (2003a) and Mason and Lee (2006a).
3. Data are available in www.ntaccounts.org.
4. United Nations (2013b) defines life-cycle wealth as the wealth demanded by households to realize the prospective consumption and labor income profile. See the methodology in chapter 2 of this volume for a precise formal definition.
5. The comparison of the East Asian and Latin American experiences is very telling in this respect. While there is evidence that demography explains part of the Asian Miracle (see Bloom and Williamson, 1997, for Asia and Cotlear, 2010, for Latin America) macro and financially unstable Latin America was unable to fully benefit from the demographic dividends. This suggests that policies should ensure that the right kind of macroeconomic and financial environment is in place.
6. To estimate the relationship between the size of external balance sheets and domestic financial development, we tried two specifications—a logarithmic estimation for developed countries and a quadratic estimation for developing ones. More specifically, the set of equations is the following:

$$FVt = \alpha 0 + \alpha 1 \ln(EBt) + vt \text{ (for developed countries)}$$
$$FVt = \alpha 0 + \alpha 1 EBt + \alpha 2 (EBt)^2 + \alpha 3 (EBt)^3 + vt \text{ (for developing countries)}$$

   Where FV is a measure of financial development and EB is the external balance sheet, that is, the semi-sum of external assets and external liabilities as a share of GDP. We estimate these equations for banks (using credit to GDP as a proxy for banking development) and bond markets (using bond market capitalization to GDP as a proxy for bond market development). We then add them to find the effects in the domestic financial system as a whole.

CHAPTER 2

Demography and the Macroeconomy: A Methodological Framework

José María Fanelli

In this chapter we develop a methodological framework to examine demographic data from a macroeconomic perspective. It is based on the concepts utilized in the National Transfers Account (NTA) approach, as well as those used in the study of macroeconomic fluctuations, growth, and capital movements (Dervis, 2012). Using the data provided by the NTA database, we apply the framework in the next chapter to study the linkages between changes in the population's size and structure and the macroeconomy, seeking to identify a set of stylized facts on such linkages in emerging countries. The methodology also provides a framework to interpret the evidence and research results discussed in the rest of the book.

The structure of the chapter is as follows. The first section analyzes the three notions that constitute the milestones of the NTA methodology: the life-cycle deficit (LCD); the support ratio (SR), and the fiscal support ratio (FS). The second section establishes the connections between these variables and the savings of the public sector, the government, and the rest of the world. This allows us to show the way in which the changes in the population size and structure during the demographic transition are reflected in the investment/savings balance and, therefore, the current account and physical and foreign asset accumulation. The third section addresses asset accumulation and the demand for life-cycle wealth. On the one hand, we analyze the relationship between the life-cycle deficit and the demand for life-cycle wealth and, on the other, the link between transfer wealth (funded by public resources) and the stock of physical and foreign assets. This link is particularly relevant to emerging economies because an excessive reliance on transfer wealth to satisfy the demand for life-cycle wealth can not only harm growth but can also set public and external debt on unstable trajectories. We develop a method to identify the cohorts as a function of time that allows us to keep track of specific cohorts over time and determine their contribution

to the evolution of macroeconomic aggregates. We define the notion of "control cohort," which is designed to facilitate the analysis of the interactions between each stage of the demographic transition and macroeconomic aggregates. Finally, we analyze the relationship between the demographic and the macro perspective, distinguishing between longitudinal and cross-section views of the cohorts in the demographic transition.

2.1 The Life-cycle Deficit and the Support Ratios

The life-cycle deficit is defined as the difference between the cohort's consumption and labor income.[1] In line with this, we will start by defining aggregate consumption and labor income in terms of the cohort's decisions and then show the relationship with the support ratio and the fiscal support ratio, which are the synthetic indicators used by NTA to analyze the macroeconomic consequences of the different stages of the demographic transition.

Consumption and Labor Income Profiles and the Cohort's Support Ratio

The NTA database provides information on average per capita consumption, $c_{a,t} = \frac{C_{a,t}}{X_{a,t}}$ and labor income profiles, $y^L_{a,t} = \frac{Y^L_{a,t}}{X_{a,t}}$, for the a cohorts of size $X_{a,t}$ that make up the population at a base year $t = b$. The cohort's maximum age is ω. If we normalize these variables by the economy's income per capita, we obtain the cohort's "average propensity to consume" $\varphi_{a,t}$ and "labor income participation" $\gamma_{a,t}$, respectively. That is, $\varphi_{a,t} = \frac{c_{a,t}}{y_t} = \frac{C_{a,t}}{y_t X_{a,t}}$ and $\gamma_{a,t} = \frac{y^L_{a,t}}{y_t} = \frac{Y^L_{a,t}}{y_t X_{a,t}}$ Note that the NTA methodology defines these parameters using the average labor income of the cohorts aged 30–49 years rather than y_t for normalization. We use y_t to normalize because the concepts of consumption propensity and labor income participation are more suitable to macroeconomic analyses. In line with the NTA methodology, we will often assume that the cohort's consumption and income profiles are time-invariant parameters because data are only available for the base year. Hence, to simplify the notation we define $\varphi_{a,b} = \varphi_a$ and $\gamma_{a,b} = \gamma_a$.

Based on this, we can define the number of the cohort's "effective consumers" as $N_{a,t} = \varphi_{a,b} X_{a,t}$ and the number of "effective producers" as $L_{a,t} = \gamma_{a,t} X_{a,t}$. This means that the number of effective consumers and the weight of the cohort in total consumption will increase with both their population size and their propensity to consume. The same applies to effective producers: the cohort's importance depends on their size and their participation in total labor income. These concepts are designed to simplify demographic analysis. First, we can define the cohort's support ratio ($SR_{a,t}$) as the ratio of effective

consumers to effective producers: $SR_{a,t} = \frac{L_{a,t}}{N_{a,t}}$. This ratio is lower when the individuals that make up the cohort depend on the income of others to finance their own consumption. This occurs when a is either low or high, for example, in the case of Korea, $SR_a > 1$ for $a < 27$ and for $a > 59$. Second, we can define the cohort's life-cycle deficit in terms of $SR_{a,t}$, as we show below.

The cohort's propensity to consume can be expressed as: $\varphi_{a,t} = \varphi_a e^{\sum_{s=b}^{t}(g^c_{a,s} - g_s)} = \varphi_a \hat{\varphi}_t$, where $g^c_{a,s}$ and g_s are the continuous growth rates of the cohort's per capita consumption and the economy's per capita income, respectively, and $\hat{\varphi}_t = e^{\sum_{s=b}^{t}(g^c_{a,s} - g_s)}$. We will often assume that $g^c_{a,s} = g^c_s = g_s$. Under such circumstances, $\hat{\varphi}_t = 1$ and the consumption profiles become invariant $\varphi_{a,t} = \varphi_a$. The expression for the aggregate cohort's consumption will thus be:

$$C_{a,t} = \varphi_a \hat{\varphi}_t y_t X_{a,t} = y_t N_t \tag{2.1}$$

In a similar way, for the average per capita labor income of the cohort we can define: $\gamma_{a,t} = \frac{y^L_{a,t}}{y_t} = \gamma_a e^{\sum_{s=b}^{t}(g^L_{a,s} - g_s)} = \gamma_a \hat{\gamma}_t$, where $g^L_{a,s}$ is the continuous growth rate of the cohort's labor income and $e^{\sum_{s=b}^{t}(g^L_{a,s} - g_s)} = \hat{\gamma}_t$. If $g^L_{a,s} = g^L_s = g_s$, $\hat{\gamma}_t = 1$ and the labor income profiles do not change and are equal to γ_a in a set of exercises in the next chapter, we will frequently postulate that $\hat{\varphi}_t = 1$ and $\hat{\gamma}_t = 1$ in order to isolate the demographic effects of changes in the structure of the population. We can write the aggregate labor income of the population as:

$$Y^L_{a,t} = \gamma_a \hat{\gamma}_t X_{a,t} = y_t L_t \tag{2.2}$$

In order to analyze some aspects of the first dividend (FD), it is important to take into account that demography affects labor income through several channels. To see this, let us decompose $y^L_{a,t}$ into two different components: employment and the wage rate. The first component is the cohort's employment rate, $\mu^L_{a,t} = \frac{X^L_{a,t}}{X_{a,t}}$, which is the ratio between the number of members of the cohort that are employed $(X^L_{a,t})$ and the total cohort population. Note that the employment rate can vary with the participation rate as well as the unemployment rate. The second is the average cohort's wage $w^L_{a,t}$. This variable can be expressed in terms of the economy's average wage $(\tilde{w}^L_t)$ as $w^L_{a,t} = \lambda_a \tilde{w}^L_t$, where λ_a is a base-year parameter that represents the structural factors—such as education, experience, and labor union strength, which explain the differences between the cohort's wage levels. While the economy's average wage level will basically be determined by technological factors, the cohort's

wages will additionally depend on political economy variables that impinge on income distribution. Taking into account these elements, we can write, $Y^L_{a,t} = \lambda_a \tilde{w}^L_t X^L_{a,t}$, and the labor income profile of cohort a as $\gamma_{a,t} = \frac{\tilde{w}^L_t}{y_t} \lambda_a \mu^L_{a,t}$, which shows the variety of factors that contribute to determining the cohort's labor share and should thus be considered when assessing the ability of a given economy to tap the FD and prepare for ageing.

From equations (2.1) and (2.2), it follows that the cohort's life-cycle deficit per capita normalized by per capita income is $lcd_{a,t} = (\varphi_a \hat{\varphi}_t - \gamma_a \hat{\gamma}_t) y_t$. So, using the definition of support ratio, the aggregate value of the cohort's life-cycle deficit is: $LCD_{a,t} = y_t N_{a,t} (1 - SR_{a,t})$. The lower the cohort's support ratio, the higher the cohort's life-cycle deficit.

We will now introduce the fiscal dimension. Following the NTA methodology, we will define profiles for the "tax burden" ($\beta_{a,t}$) and the "benefits received" ($\alpha_{a,t}$) by the cohorts,[2] where β stands for the ratio of per capita transfers made to the government by the cohort normalized by per capita income and α stands for transfers received by the cohort normalized in the same way. As in the case of the consumption and labor income profiles, we will frequently assume that these parameters do not change because of data limitations and will drop the *t* subscript. We have to take into account, however, that the rate of growth of transfers made ($g^u_{a,s}$) and received ($g^q_{a,s}$) can differ from the growth rate of per capita income; hence, using the same logic as before, we can write: $\beta_{a,t} = \beta_a e^{\sum_{s=b}^{t} (g^u_{a,s} - g_s)} = \beta_a \hat{\beta}_t$ and $\alpha_{a,t} = \alpha_a e^{\sum_{s=b}^{t} (g^q_{a,s} - g_s)} = \alpha_a \hat{\alpha}_t$. Public policies are, of course, primary determinants of $\hat{\beta}_t$ and $\hat{\alpha}_t$, but in the case of dual emerging economies, these variables will also change endogenously as the relative size of the formal and informal segments vary over the demographic transition hand-in-hand with, for example, urbanization and labor unionization.

Aggregation: The Support Ratio and the Life-cycle Deficit

The economy's average propensity to consume φ_t can be expressed as the weighted sum of the cohort's propensity to consume using the cohort's participation in total population $\left(\mu_{a,t} = \frac{X_{a,t}}{X_t}\right)$ as weights: $\varphi_t = \sum_{a=0}^{\omega} \varphi_{a,t} \mu_{a,t} = \hat{\varphi}_t \sum_{a=0}^{\omega} \varphi_a \mu_{a,t} = \hat{\varphi}_t \varphi^{\mu}_t$. Note that we have defined $\varphi^{\mu}_t = \sum_{a=0}^{\omega} \varphi_a \mu_{a,t}$. This latter variable accounts for the portion of the variation in the economy's propensity to consume that can be attributed to changes in the population structure. Applying the same logic, we can define the economy's aggregate labor share as: $\gamma_t = \sum_{a=0}^{\omega} \gamma_{a,t} \mu_{a,t} = \hat{\gamma}_t \sum_{a=0}^{\omega} \gamma_a \mu_{a,t} = \hat{\gamma}_t \gamma^{\mu}_t$, where γ^{μ}_t stands for the demographic-driven changes in the aggregate labor share.

Aggregate consumption (C_t) and labor income (Υ_t^L) can be written as functions of, respectively, the aggregate number of effective consumers, $N_t = X_t \sum_{a=0}^{\omega} \varphi_{a,t}\mu_{a,t}$ and effective producers, $L_t = X_t \sum_{a=0}^{\omega} \gamma_{a,t}\mu_{a,t}$:

$$C_t = y_t N_t = y_t X_t \sum_{a=0}^{\omega} \varphi_{a,t}\mu_{a,t} = \varphi_t \Upsilon_t \tag{2.3}$$

$$\Upsilon_t^L = y_t L_t = y_t X_t \sum_{a=0}^{\omega} \gamma_{a,t}\mu_{a,t} = \gamma_t \Upsilon_t \tag{2.4}$$

These expressions clearly show the relationships between the cohort's consumption and labor income profiles, on the one hand, and the economy's propensity to consume and the labor share, on the other.

The economy's aggregate support ratio can be stated as the ratio of aggregate effective producers to effective consumers:

$$SR_t = \frac{L_t}{N_t} = \frac{X_t \sum_{a=0}^{\omega} \gamma_{a,t}\mu_{a,t}}{X_t \sum_{a=0}^{\omega} \varphi_{a,t}\mu_{a,t}} = \frac{\gamma_t}{\varphi_t} = \frac{\hat{\gamma}_t \gamma_t^{\mu}}{\hat{\varphi}_t \varphi_t^{\mu}} = \frac{\Upsilon_t^L}{C_t}. \tag{2.5}$$

The aggregate support ratio provides a simple way to measure the effects of the demographic transition on a society's ability to sustain overall consumption. From equation (2.5) it follows that the support ratio varies over time because it is a quotient between two time-varying parameters: the labor share (γ_t) and the economy's propensity to consume (φ_t). These parameters, in turn, vary over time for two reasons: one, disparities between the growth rates of per capita consumption, labor income, and aggregate income, which determine the evolution of $\hat{\gamma}_t$ and $\hat{\varphi}$; and, two, demographic changes reflected in $\mu_{a,t}$, which impinge on γ_t^{μ} and φ_t^{μ}.

To evaluate the role of the first and second dividends, let us express the economy's overall income in terms of effective producers and consumers. The average productivity of the effective producer is $\tilde{y}_t = \frac{\Upsilon_t}{L_t}$ and, consequently, income per capita can be written as $y_t = \frac{\Upsilon_t}{L_t}\gamma_t = \tilde{y}_t \gamma_t$. If we consider an economy in which the window of opportunity has opened, causing γ_t to trend upward—and assume a constant $\tilde{y}_t$ and $\hat{\gamma}_t = 1$ to isolate the demographic effect—it can easily be seen that it is the increase in γ_t^{μ} that causes per capita income to grow, giving rise to the FD. As the demographic transition evolves and ageing sets in, the opposite occurs.

Income can also be expressed in terms of the effective consumer's welfare: $y_t^N = \frac{\Upsilon_t}{N_t} = \tilde{y}_t\, SR$. This tells us that, for the welfare of the effective consumer

to improve, income per effective consumer must increase and this can occur either because the productivity of the economy trends upward, causing the income per effective worker to augment, or because the support ratio increases. *SR* increases throughout the period in which the window of opportunity is open but the situation is transitory: during the ageing phase the ratio tends to decline over time. In this latter stage of the demographic transition, welfare can only improve if productivity rises. This is why the second dividend (SD) is so important (see chapter 1 in this volume); if it is missed and the capital/labor ratio does not increase enough, $\tilde{y}_t$ will grow slowly and productivity increases might not compensate for the decline in *SR*. In this regard, it is important to consider that Mason and Lee (2006b) call attention to the fact that a longer life expectancy could reduce the size of the φ_a parameters corresponding to those cohorts that are approaching the retirement stage: the expectation of a larger period of retirement increases the demand for life-cycle wealth because more resources will be needed to finance consumption during a prolonged retirement.

The aggregate life-cycle deficit of the economy at time t is the difference between the consumption (private and public) of all cohorts and total labor income. Hence, using the previous definitions, we can express LCD_t as:

$$LCD_t = y_t N_t \left(1 - \frac{L_t}{N_t}\right) = C_t (1 - SR_t) \tag{2.6}$$

This means that the economy's life-cycle deficit is a function of total consumption—which in turn depends on the number of effective consumers—and the trajectory of the demographic transition as reflected in SR_t. Therefore, in addition to *SR*, demography matters via variations in the population size that increases LCD_t. In per capita terms, the evolution of the life-cycle deficit depends on the trajectory of income per capita, the propensity to consume, and the labor share.

$$lcd_t = y_t(\varphi_t - \gamma_t) = \tilde{y}_t \gamma_t (\hat{\varphi}_t \varphi_t^{\mu} - \hat{\gamma}_t \gamma_t^{\mu}) \tag{2.6'}$$

The trajectories of N_t and SR_t matter to growth and macroeconomic imbalances because variations in the investment/savings balance will occur hand-in-hand with variations in LCD. The following points deserve highlighting.

Wages and the labor share are largely determined by technological factors. However, we should not overlook the fact that political economy matters to wage determination and that an emerging economy may present "dual" features or may have not reached the "Lewis point." If this sort of structural characteristic is present, the effects of demographic changes on LCD and savings may differ from the canonical case in which technology plus perfect factor markets determine γ_t. To illustrate the point, let us assume an economy that presents the following two conditions. One, it is enjoying the FD and income per capita is thus increasing in tandem with γ_t^{μ}. Two, γ_t is falling because average wages grow slower than per capita income growth owing to

the fact that labor supply is very elastic. This means that $\hat{\gamma}_t < 1$. Given that $\gamma_t = \frac{y_t}{\tilde{y}_t}$, it is necessarily true that the effective producer's productivity, $\tilde{y}_t$, is increasing faster than per capita income. Whether the per capita LCD grows or falls will depend on the evolution of φ_t. For lcd_t to remain constant, the propensity to consume should fall with γ_t. If this were the case, savings would go upward, asset accumulation would accelerate, per capita wealth would rise, and the economy would be able to take advantage of the SD, because a higher capital/labor ratio would cause the average effective producer's productivity ($\tilde{y}_t$) to grow. The increase in wealth, however, should not necessarily take the form of a rise in the capital/labor ratio because domestic agents could accumulate assets abroad in an open economy. The increase in savings, on the other hand, would not impede the increase of per capita consumption. Equation (2.3) tells us that per capita consumption is $c_t = \varphi_t\, y_t$ and, consequently, if per capita income were growing fast, per capita consumption could also increase despite the fall in φ_t. In this way, during the FD period a country would be able to foster savings and asset accumulation while increasing consumption per capita. In the next chapter we will see that the Chinese and Korean growth dynamics during the FD present some of these characteristics.

From this example, it is clear that structural conditions are not neutral with respect to the effects of demography and that two key structural features are the values of φ_t and γ_t, which determine the absolute value of *SR* and, hence, the ability to seize the opportunities related to the dividends. The *SR* may be either too low (Brazil) or too high (China). In the former case, the extra savings created by the FD might not suffice to produce a "big push" that leads the economy out of a low-savings and low-growth equilibrium. In the latter case, the FD may result in excessive savings, creating a "savings glut" situation. Excessive savings may produce a high-growth trap in which the economy depends on high investment to sustain growth, giving rise to a situation in which the returns to investment may be too low, harming future growth.

As the changes in SR_t are leveraged by the size of N_t, a given change in *SR* will have different consequences on the scale of LCD. As the demographic transition advances, there will be changes in the household's demand for financing from the domestic financial system, the rest of the world, and the public sector via transfers. Consequently, the evolution of the absolute size of LCD will be one of the forces driving the structural transformations of financial relations, the government, and the linkages with the global economy.

Younger economies undergoing the first stages of the demographic transition might find it difficult to keep pace with the modifications in the institutional and macroeconomic policy framework that these changes require. We should not take it for granted, then, that the society and the political system will be able to meet the demands for the institutional arrangements and regulations that are associated with the demographic transition. Hence, if a society has a reduced institution-building ability and/or bad quality organizations,

a tension will arise between demography and the economic structure as the demographic transition evolves. Indeed, a great deal of evidence exists on the difficulties that emerging countries face to develop the institutions and organizations that are necessary for the financial system and capital flows to expand and the government to be able to effectuate the transfers required to accumulate human capital in a young society (see chapters 6–9, this volume). A weak institutional framework may thus result in a low-growth trap associated with financial underdevelopment and an excessively small government that is unable to collect sufficient taxes and make the transfers that the transition requires. In addition, the flaws in the international financial architecture may be an obstacle for the country to integrate with global capital markets and benefit from global demographic asymmetries. The rules of the game for international transactions should be provided by the global economy and a global government does not exist.

One important hypothesis motivating our work is that financial development matters to a country's ability to profit from the demographic transition. The evidence in chapter 1 of this volume suggests that financial markets should significantly expand in emerging markets in the coming decades in order to meet the requirements associated with the expansion of demographically driven capital flows.

When financial and labor markets present marked imperfections, as is usually the case in emerging markets, the mechanisms by which savings and investment are brought into equality may not work efficiently. Under such conditions, we may see persistent and/or recurrent macroeconomic and financial disequilibria—excessive government borrowing needs, unsustainable current account deficits, or pro-cyclical capital movements. In addition, the recent evolution of the global economy suggests that macroeconomic disequilibria in systemically relevant emerging countries may create international tensions. For example, some argue that excess savings at certain stages of the demographic transition may result in a savings glut and global imbalances, as well as contribute to creating the conditions for liquidity traps.

As the NTA data show, government decisions are key to accounting for the composition and level of the cohort's consumption, and these decisions are influenced by political economy factors. Policy decisions are relevant to γ as far as education and health expenditures may have different implications for each cohort, changing the distribution of human capital among cohorts. If, as a consequence, the structural parameter λ_a changes, the labor income profile and the support ratio will change. Note that an increase in the younger cohort's human capital could increase L_t if these cohorts were larger, as occurs during the demographic window stage.

The fiscal support ratio is useful when analyzing the interactions between demography and the government budget. Using the fiscal profiles of the cohorts, the number of effective tax payers can be defined as: $U_t = X_t \sum_{a=0}^{\omega} \beta_{a,t}\, \mu_{a,t} = \hat{\beta}_t X_t \sum_{a=0}^{\omega} \beta_a\, \mu_{a,t} = \hat{\beta}_t \beta_t^{\mu}$, and the number of effective

recipients of transfers as: $Q_t = X_t \sum_{a=0}^{\omega} \alpha_{a,t} \mu_{a,t} = \hat{\alpha}_t X_t \sum_{a=0}^{\omega} \alpha_a \mu_{a,t} \hat{\alpha}_t \alpha_t^{\mu}$; where $\beta_t^{\mu} = \sum_{a=0}^{\omega} \beta_a \mu_{a,t}$ and $\alpha_t^{\mu} = \sum_{a=0}^{\omega} \alpha_a \mu_{a,t}$ stand respectively for the components of β_t and α_t that account for the influence of demographic changes. The fiscal support ratio at time t (FS_t) is, then:

$$FS_t = \frac{U_t}{Q_t} = \frac{\sum_{a=0}^{\omega} \beta_{a,t} \mu_{a,t}}{\sum_{a=0}^{\omega} \alpha_{a,t} \mu_{a,t}} = \frac{\hat{\beta}_t \beta_t^{\mu}}{\hat{\alpha}_t \alpha_t^{\mu}}. \tag{2.7}$$

This equation states that both public policies—via changes in the structure of taxes and transfers that reflect on $\hat{\beta}$ and $\hat{\alpha}_t$—and demographic changes—via the $\mu_{a,t}$ parameter—contribute to determining FS_t and, therefore, the government's ability to sustain a given level of per capita transfers over time. We will often assume $\hat{\beta} = \hat{\alpha}_t = 1$, in order to isolate the effects of changes in the population's structure by maintaining fiscal policies constant.

In particular, if the number of effective taxpayers increases in relation to beneficiaries, as we can expect when the demographic window of opportunity (DW) is open, the public budget will improve. The financial effects in terms of the creation of more fiscal space to implement public policies, however, may or may not favor the materialization of the subsequent SD. The greater availability of fiscal space might foster government transfers rather than public investment and the increased government transfers, in turn, could be channeled to finance the accumulation of human capital but they could also be squandered on unproductive consumption. On the other hand, at the ageing stage, demographics is likely to exert substantial pressure on the government's budget because government transfers will tend to rise in a context in which the number of effective tax payers will be falling.

The government net transfers (Γ) to the private sector—which is the difference between aggregate transfers made to the private sector ($y_t Q_t$) and aggregate transfers received from that sector ($y_t U_t$) and is similar to the government's primary deficit—can be written in terms of FS and the evolution of public expenditures:

$$\Gamma_t = y_t Q_t (1 - FS_t) \tag{2.8}$$

This means that the trajectory of net government transfers and, therefore, the government's primary deficit and the accumulation of financial assets are influenced by demographics via variations in the fiscal support ratio, as well as population growth that causes the number of effective beneficiaries of public transfers to grow, increasing the scale of public expenditures. In per capita terms, net transfers will be:

$$\tau_t = y_t (\beta_t - \alpha_t).$$

2.2 Savings, the Macroeconomic Balance, and the Demographic Transition

We will now identify the linkages between SR, FS, and LCD, on the one hand, and the budget of the three representative agents, the aggregate investment and savings balance, and asset accumulation, on the other.

Cohorts and Sectoral Savings

Our starting point is the expression for the savings of cohort *a*. Private savings are the difference between the sum of the cohort's asset income ($\Upsilon^p_{a,t}$), net private transfer received ($\Psi_{a,t}$), and net government transfers ($\Gamma_{a,t}$), on the one hand, and the life-cycle deficit, on the other.

$$S^p_{a,t} = \Upsilon^p_{a,t} + \Psi_{a,t} + \Gamma_{a,t} - LCD_{a,t}. \tag{2.9}$$

Since asset income varies across cohorts, demographic changes have a bearing on aggregate private income $\Upsilon^p_t = \left(\sum_{a=0}^{\omega} \Upsilon^p_{a,t} \right)$. If ε^p_a stands for the ratio between the cohort's per capita private asset income and per capita income ($\varepsilon^p_a = y^p_{a,t} / y_t$), the aggregate private nonlabor income as a share of total income can be written as $\varepsilon^p_t = \frac{\Upsilon^p_t}{X_t y_t} = \sum_{a=0}^{\omega} \varepsilon^p_{a,t} \mu_{a,t}$ and, it follows that:[3]

$$\Upsilon^p_t = y_t \varepsilon^p_t X_t = \Upsilon_t \varepsilon^p_t \tag{2.10}$$

If we aggregate across cohorts and take into account that $\sum_{a=0}^{\omega} \Psi^p_{a,t} = 0$, national private savings can be expressed as:

$$S^p_t = \sum_{a=0}^{\omega} S^p_{a,t} = y_t \, \varepsilon^p_t X_t + y_t Q_t (1 - FS_t) - y_t \, N_t (1 - SR_t) \tag{2.11}$$

From this expression it follows that demography influences aggregate private savings directly via $\varepsilon^p_t, X_t, Q_t$, N_t, SR_t, and FS_t as well as indirectly via the effect of γ^{μ}_t on y_t

Considering these definitions, private aggregate savings in per capita terms (s^p_t) can be written as:

$$s^p_t = y_t (\varepsilon^p_t + \gamma_t + \alpha_t - \beta_t - \varphi_t) \tag{2.11'}$$

The government receives income from its holdings of foreign assets and physical capital $r'_t (F^g_t + K^g_t)$ and pays interests on bonds $r'_t B^g_t$. The variable Υ^g_t is

the algebraic sum of these three items. Since the government effectuates the net transfers received by the cohorts, its savings are:

$$S_t^g = \Upsilon_t^g - \sum_{a=0}^{\omega} \Gamma_{at} = \Upsilon_t^g - y_t Q_t (1 - FS_t) \tag{2.12}$$

The upward movement of FS_t and y_t when the demographic window opens should increase government savings and, therefore, asset accumulation. Using small letters to denote per capita assets and defining the government's nonlabor share as $\varepsilon_t^g = r_t'(f_t^g + k_t^g - b_t^g)$, the government's savings per capita will be:

$$s_t^g = [\varepsilon_t^g + y_t(\beta_t - \alpha_t)] \tag{2.12'}$$

The sum of government and private savings equals national savings (S^N). If we add foreign savings (S_t^f), which equals the result of the current account (CA_t) multiplied by minus one:

$$S_t^f = -CA_t \tag{2.13}$$

we get the economy's aggregate savings S_t:

$$S_t = S_t^N + S_t^f = S_t^g + S_t^g + S_t^f = \Upsilon_t^p + \Upsilon_t^g - y_t N_t (1 - SR_t) - CA_t \tag{2.14}$$

Savings in per capita terms $\left(s_t = \frac{S_t}{X_t} \right)$ are (note that $\varepsilon_t = \varepsilon_t^p + \varepsilon_t^g$):

$$s_t = y_t(\varepsilon_t + \gamma_t - \varphi_t) - ca_t \tag{2.14'}$$

Since demographic factors impinge on the variables y_t, ε_t, γ_t, and φ_t, equation (2.14') tells us that there must be a close relationship between the demographic transition and the current account and that demography matters to capital movements. To better understand the implications of this point, nonetheless, we need to specify the equations for asset accumulation.

Asset Accumulation

The cohorts allocate their savings to increase the amount of assets held. The assets that we will consider are physical capital, which can be held by cohorts (K_a^p) and the government (K^g), and two financial instruments: foreign assets supplied by the rest of the world (F) and demanded by the government (F^g) and the cohorts (F_a^p), and domestic bonds supplied by the government (B^g) and demanded by the domestic cohorts (B_a^p). On the basis of the living cohort's budget constraint, we can state the relationship between savings and asset accumulation:

$$S_t^p = \sum_{a=0}^{\omega} (\Delta F_{a,t}^p + \Delta B_{a,t}^p + \Delta K_{a,t}^p) = \Delta F_t^p + \Delta B_t^p + \Delta K_t^p. \tag{2.15}$$

Using small letters for per capita asset values and considering that n_t stands for the population's continuous growth rate in period t, we can write:

$$s_t^p = \sum_{a=0}^{\omega} e^{n_t}(f_{a,t+1}^p + b_{a,t+1}^p + k_{a,t+1}^p) - \sum_{a=0}^{\omega}(f_{a,t}^p + b_{a,t}^p + k_{a,}^p). \qquad (2.15')$$

The public sector holds physical capital and foreign assets (basically international reserves or sovereign funds) and liabilities (bonds). Hence, the government's budget constraint implies:

$$S_t^g = \Delta F_t^g - \Delta B_t^g + \Delta K_t^g. \qquad (2.16)$$

In per capita terms government savings are,

$$s_t^g = e^{n_t}(f_{t+1}^g + k_{t+1}^g - b_{t+1}^g) - (f_t^g - b_t^g + k_t^g). \qquad (2.16')$$

When the DW is open, the government's decisions about the allocation of the additional resources associated with the increase in *FS* have a bearing on the SD because such resources can either be allocated to Γ or be accumulated in the form of foreign or domestic assets. To be sure, if the extra savings were used to repay public debt, this would also promote the SD. It might favor private investment via crowding-in. On the other hand, if the fiscal support ratio deteriorated during the ageing period, the government might dissave, reducing its assets. Since the labor force decreases during the ageing period, this behavior will not necessarily result in a falling capital/labor ratio.

If the net international investment position of the government were positive, dissaving during the ageing period could take the form of capital outflows. Note, on the other hand, that the alternative of financing higher pension transfers via increases in public indebtedness would impinge directly on the private sector's portfolio. The domestic private sector should absorb the newly issued bonds into its portfolio and, consequently, public dissaving would call for compensatory increases in private savings—which would be difficult during the ageing stage—and/or the decummulation of physical or external assets by the private sector.

Finally, with respect to the rest of the world's asset accumulation equation, if CA is positive, the rest of the world's liabilities augment, therefore:

$$S_t^f = -\Delta F_t. \qquad (2.17)$$

Adding the budget constraints of the government, the private sector, and the rest of the world, we can deduce Walras' Law, which says that the sum of the excess flow demand for goods, foreign assets, and bonds must add up to zero:

$$(\Delta K_t^g + \Delta K_t^p - S_t^g - S_t^f - S_t^p) + (\Delta F_t^g + \Delta F_t^p - \Delta F_t) + (\Delta B_t^p - \Delta B_t^g) = 0. \qquad (2.18)$$

We have already shown that demographic changes have a bearing on private and public savings, as well as on the distribution of asset holdings across

cohorts. Equation (2.18), therefore, shows the interrelations between markets and demography. It tells us that whenever changes in the size and structure of the population causes the savings rate or asset holdings to change, a good part of the job of restoring equilibrium should be carried out by financial markets. For this reason, domestic financial market imperfections and weak integration with global capital markets might be an important obstacle to dealing with the demographic transition efficiently.

National wealth at time $t + 1$ (W_{t+1}) is the sum of private W^{p}_{t+1} and government wealth $W^{p}_{a,t+1}$ and it increases on the basis of national savings, $S^{p}_{t} + S^{g}_{t}$: $W^{p}_{a,t+1} = S^{p}_{a,t} + W^{p}_{a,t}$ and $W^{g}_{a,t+1} = S^{g}_{a,t} + W^{g}_{a,t}$. In per capita terms: $s^{p}_{t} = e^{n_t} w^{p}_{t+1} - w^{p}_{t}$ and $s^{g}_{t} = e^{n_t} w^{g}_{t+1} - w^{g}_{t}$. The trajectory of the stock of private and government wealth over time will thus be given by:

$$w^{p}_{t+1} = [w^{p}_{t} + y_t(\varepsilon^{p}_{t} + \gamma_t + \alpha_t - \beta_t - \varphi_t)]e^{-n_t} \tag{2.19}$$

$$w^{g}_{t+1} = [w^{g}_{t} + y_t(\varepsilon^{g}_{t} + \beta_t - \alpha_t)]e^{-n_t} \tag{2.20}$$

We have already demonstrated that demography matters to savings and, therefore, to wealth dynamics and the macroeconomy. However, there is an additional and closely related question: Is this dynamics of national wealth compatible with the future evolution of the demographic transition given the expected behavior of the cohorts, the government, and the rest of the world? Is it sustainable? A response should include the cohort's plans for the future and the notion of life-cycle wealth in the analysis. We will now address these questions.

2.3 Life cycle and Transfer Wealth

Decisions about savings and asset accumulation are inherently forward-looking. The level of transfers to younger cohorts and the need to finance consumption during retirement are key determinants of the living cohorts' decisions and public choices regarding savings in one way or another internalize the interests of future cohorts. However, unborn cohorts cannot make decisions today, and the desired wealth accumulation path, together with the length of the planning horizon that is relevant to different cohorts and policy makers performing diverse functions, might differ substantially. Consequently, the trajectory of the stock of wealth that results from the decisions taken by living cohorts and policy makers at each point in time might reveal, over time, to be inconsistent with the born and unborn cohorts' expenditure plans. Of course, this would not be the case in a world without market failures or political economy constraints. But market failures and political economy constraints are pervasive in the real world and emerging economies are far from the exception. Under such circumstances, inconsistencies between the path of asset accumulation—and, hence, income—and demographically driven consumption dynamics can arise, creating the conditions for macroeconomic

coordination failures to emerge. The failures can induce macroeconomic disequilibria of different magnitudes and degrees of persistence and can take the form of stubborn unemployment and distributional conflicts, financial instability, excessive current account deficits, fiscal stress, or growth traps.

In this section we present a set of methodological tools that are necessary to analyze the linkages between demography and the type of macroeconomic disequilibria mentioned above. We model the relationships between the cohorts' demand for life-cycle wealth, public and private transfer wealth, bequest, and wealth accumulation. To analyze the cohorts' end-of-life demand for wealth, we develop a method to identify the born and unborn cohorts and follow their decisions over time. The methodology is designed to be applied using the NTA approach and data.

Relevant Time Horizons and the Control Cohort

We will first identify the born and unborn cohorts and then characterize the time horizon that is relevant to them.

Let a_t be the a-year old cohort at time t and $t = \overline{t}$, the year in which the analysis begins. We will identify the cohorts on the basis of the initial year. Hence, $a_{\overline{t}}$ will be the cohort that is a years old at time $\overline{t}$. If z is the number of years elapsed since $\overline{t}$, at time $t = \overline{t} + z$, we can write $a_{\overline{t}+z} = (z + a_{\overline{t}})_t = a_t$. Note that $a_{\overline{t}}$ may be negative in the case of the still unborn cohorts; for example, $a_{\overline{t}} = -5_{\overline{t}}$ is the cohort that will be born at time $\overline{t} + 5$. Consequently, at time $t = \overline{t} + 7$, we can state that $-5_{\overline{t}+7} = 2_t$, which is the two-year-old cohort at time t. The size of cohort $a_{\overline{t}}$ at t, in turn, will be $X_{a_t} = X_{a_{\overline{t}+z}} = X_{a_{\overline{t}}}\, e^{zs_{a_{\overline{t}+z}}}$ where $s_{a_{\overline{t}+z}}$ is the average annual rate at which cohort $a_{\overline{t}}$ shrinks over a period of duration z and, consequently: $e^{zs_{a_{\overline{t}+z}}} = \dfrac{X_{a_{\overline{t}+z}}}{X_{a_{\overline{t}}}}$.

We will call "relevant time horizon" to cohort $a_{\overline{t}}$ to the shortest period of time that covers all the years that the cohort $a_{\overline{t}}$ is expected to live, taking $\overline{t}$ as the initial point of the period. Let $V_{a_{\overline{t}}}$ be the number of years of such horizon. It follows that $V_{a_{\overline{t}}} = \omega - a_{\overline{t}}$ and that "the end of life" of cohort $a_{\overline{t}}$ will occur at point $\overline{t} + V_{a_{\overline{t}}}$. If $a_{\overline{t}} < 0$, the duration of the relevant time horizon will of course be higher than ω. As time elapses, in turn, the relevant time horizon shortens: $V_{a_{\overline{t}}+z} = \omega - a_{\overline{t}+z} < \omega - a_{\overline{t}}$.

For analytical purposes, it may be useful to select a control cohort to study specific problems. We will denote the "control cohort" that is $a_{\overline{t}}$-year-old with $\tilde{a}_{\overline{t}}$. Hence, $\tilde{0}_{\overline{t}}$ means that we will use the cohort that was born in year $\overline{t}$ as the control cohort. Since $V_{\tilde{0}_{\overline{t}}} = \omega$, the control cohort $\tilde{0}_{\overline{t}}$ is the cohort with the longest relevant time horizon among those cohorts that are alive at $\overline{t}$. Another important control cohort is $\widetilde{15}_{\overline{t}}$ $V_{\widetilde{15}_{\overline{t}}} = \omega - 15$ that is the duration of the relevant time horizon corresponding to the youngest cohort of the working-age ones.

The above definitions imply that the relevant time horizon corresponding to cohorts of different ages will differ. Indeed, there will be no two cohorts

with the same relevant time horizon; if $a_{\bar{t}} \neq a'_{\bar{t}}$, then $V_{a_{\bar{t}}} \neq V_{a'_{\bar{t}}}$. This suggests that there is no "natural" way to set the duration of the horizon that is relevant to society as a whole. For one thing, how many cohorts' horizons should society take into account? Let Z be the number of unborn generations that are considered to take decisions at period $\bar{t}$. If $Z \to \infty$, all future cohorts' $V_{a_{\bar{t}}}$ will be taken into account. If $Z = 0$, only the time horizons that are relevant to those cohorts that are alive at $\bar{t}$ will be considered. We can define the average duration of the time horizon that is relevant to the economy as a whole at point $\bar{t}$, $(V_{\bar{t}})$ as:

$$V_{\bar{t}} = \sum_{a_{\bar{t}}=-Z}^{\omega} V_{a_{\bar{t}}} \mu_{a_{\bar{t}}} = \sum_{a_{\bar{t}}=-Z}^{\omega} (\omega - a_{\bar{t}}) \mu_{a_{\bar{t}}} \tag{2.21}$$

Where $\mu_{a_{\bar{t}}} = \dfrac{X_{a_{\bar{t}}}}{\sum_{a_{\bar{t}}=-Z}^{\omega} X_{a_{\bar{t}}}}$ and $X_{a_{\bar{t}}}$ is a projection if $a_{\bar{t}} < 0$. Equation (2.21) implies that, during the demographic transition, the average duration of the economy's horizon at each point $\bar{t} + z$ will be endogenous when Z is a finite number and that $V_{\bar{t}}$ will approach infinity as $Z \to \infty$. $V_{\bar{t}}$ will be endogenous because $V_{\bar{t}}$ is a weighted average of the cohorts' relevant horizons, and the weights $\mu_{a,t}$ will vary as the demographic transition evolves.

We expect Z and, hence, $V_{\bar{t}}$, to change as society's approach to intergenerational issues evolves and/or historical circumstances vary. This means that the time horizon that society considers relevant to decision making at a given point in time will be implicitly or explicitly determined by convention or cultural factors. There are two additional complications: first, society's election of Z is a problem of collective action, thus exposed to coordination failure risks; second, cohorts overlap. Given that policy planning horizons usually comprise a finite number of years (typically well below ω), public policy decisions will only consider segments of some of the Z cohorts' relevant time horizons $(V_{a_{\bar{t}}})$, depending on the relationship between $V_{\bar{t}}$ and Z. For example, if society's relevant horizon covers ten years, all the cohorts' future plans will be covered only if the cohorts meet the condition: $a_{\bar{t}} \geq \omega - 10$.

To be sure, it would be truly complex to construct a macroeconomic model with an endogenous average planning horizon. But the point is worth mentioning for the following reasons. First, changes in $V_{\bar{t}}$ will likely reflect in the trajectory of asset accumulation as well as the investment and savings balance. Second, as the duration of the relevant average horizon changes, the type of financial instruments required for the intertemporal allocation of resources should also change, and this implies that the demographic transition will be a driver of the transformation of the financial structure. Third, if global demographic asymmetries are present, the average length of the horizon of economies undergoing varying stages of the transition will probably differ and, hence, there will be cross-country variations in the desired size and composition—regarding risk and duration—of the private and government financial portfolios and the desired asset accumulation

path. These demographically driven asymmetries are likely to create mutual advantages for trading financial assets in global markets. Finally, market imperfections—particularly those affecting the financial system and labor markets—that create liquidity constraints may induce a wedge between the "notional" (optimal) and "effective" (liquidity-constrained) relevant time horizon, leading to an intertemporal misallocation of resources. For example, if it is not possible to access funds complementary to individual savings to finance long-run investment in physical and human capital, the current cohorts may underinvest, save too little, and maintain a level of consumption that is inconsistent with their demand for life-cycle wealth. Note that it is possible for liquidity-constrained consumers to maintain both high levels of consumption and demand for life-cycle wealth if they expect a generous social security system to provide the necessary funds in the form of public transfer wealth. To better understand these types of intertemporal inconsistencies, we have to analyze the factors that impinge on the trajectory of a given cohort's wealth.

Life-cycle Wealth and Transfer Wealth

How much are cohorts expected to save during their remaining years of life? What amount of assets and public transfer wealth should they be expected to accumulate? What about unborn cohorts, who will impinge on future accumulation but will be constrained by the decisions of previous cohorts concerning wealth accumulation?

The stock of wealth that cohort $a_{\bar{t}}$ will accumulate up to point $\bar{t} + V_{a_{\bar{t}}} + 1$ $(W^{p}_{a_{\bar{t}},\bar{t}+V_{a_{\bar{t}}}+1})$ is the sum of such cohort's initial wealth $(W^{p}_{a_{\bar{t}},\bar{t}})$, the savings accumulated throughout a lifetime $\left(\sum_{z=0}^{V_{a_{\bar{t}}}} S^{p}_{a_{\bar{t}}+z} = S^{p}_{a_{\bar{t}},V_{a_{\bar{t}}}}\right)$, and the value of the net inheritances $\left(\sum_{z=0}^{V_{a_{\bar{t}}}} H_{a_{\bar{t}}+z} = H_{a_{\bar{t}},V_{a_{\bar{t}}}}\right)$, where $H_{a_{\bar{t}}+z}$ represents the bequest received by cohort $a_{\bar{t}}$ at time $\bar{t}+z$. Therefore, the end-of-life wealth of cohort $a_{\bar{t}}$, which will be inherited by the cohorts living after $\bar{t} + V_{a_{\bar{t}}}$, can be expressed as:

$$W^{p}_{a_{\bar{t}},\bar{t}+V_{a_{\bar{t}}}+1} = W^{p}_{a_{\bar{t}},\bar{t}} + \sum_{z=0}^{V_{a_{\bar{t}}}} S^{p}_{a_{\bar{t}}+z} + \sum_{z=0}^{V_{a_{\bar{t}}}} H_{a_{\bar{t}}+z} = W^{p}_{a_{\bar{t}},\bar{t}} + S^{p}_{a_{\bar{t}},V_{a_{\bar{t}}}} + H_{a_{\bar{t}},V_{a_{\bar{t}}}} \qquad (2.22)$$

To express wealth in present value at the beginning of period $t = \bar{t}$—to simplify we assume a constant discount rate—we need to divide this expression by $e^{r(V_{a_{\bar{t}}}+1)}$ to obtain:[4]

$$pvW^{p}_{a_{\bar{t}},\bar{t}+V_{a_{\bar{t}}}+1} = W^{p}_{a_{\bar{t}},\bar{t}}\, e^{-r(V_{a_{\bar{t}}}+1)} + \sum_{z=0}^{V_{a_{\bar{t}}}} S^{p}_{a_{\bar{t}}+z}\, e^{-r(V_{a_{\bar{t}}}+1)} + \sum_{z=0}^{V_{a_{\bar{t}}}} H_{a_{\bar{t}}+z}\, e^{-r(V_{a_{\bar{t}}}+1)} \qquad (2.22')$$

Taking into account the definition of savings given in equation (2.9), we can show the contribution of each of the accumulated flows to the cohort's effort to accumulate wealth:[5]

$$pvW^{p}_{a_{\bar{t}},\bar{t}+V_{a_{\bar{t}}}+1} = W^{p}_{a_{\bar{t}},\bar{t}} + \sum_{z=0}^{V_{a_{\bar{t}}}} (pv\Gamma^{d}_{a_{\bar{t}}+z} + pv\Psi_{a_{\bar{t}}+z} + pvH_{a_{\bar{t}}+z} - pvLCD_{a_{\bar{t}}+z}). \quad (2.23)$$

Note that we have added the superscript *d* to the transfers Γ in order to indicate that this is the amount of transfers that the private sector expects to receive, which might be different from Γ^{s},—the amount that the government plans to supply. Equation (2.23) states that the end-of-life stock of wealth of cohort $a_{\bar{t}}$ results from the algebraic sum of the cohort's beginning-of-period wealth, accumulated net transfers from the government and the private sector (including bequests), and accumulated life-cycle deficits.

We will now introduce some definitions to obtain a more synthetic expression for the cohort's end-of-life wealth. We define the "demand for life-cycle wealth" of cohort $a_{\bar{t}}$ over the period $V_{a_{\bar{t}}}$ ($LCW_{a_{\bar{t}},V_{a_{\bar{t}}}}$) in present value as:

$$pvLCW_{a_{\bar{t}},V_{a_{\bar{t}}}} = \sum_{z=0}^{V_{a_{\bar{t}}}} LCD_{a_{\bar{t}}+z} e^{-r(z+1)} = \sum_{z=0}^{V_{a_{\bar{t}}}} pvLCD_{a_{\bar{t}}+z} \quad (2.24)$$

and the demand for "public transfer wealth" of cohort $a_{\bar{t}}$ ($pv\Gamma^{d}_{a_{\bar{t}},V_{a_{\bar{t}}}}$) in present value as:

$$pv\Gamma^{d}_{a_{\bar{t}},V_{a_{\bar{t}}}} = \sum_{z=0}^{V_{a_{\bar{t}}}} \Gamma^{d}_{a_{\bar{t}}+z} e^{-r(z+1)} = \sum_{z=0}^{V_{a_{\bar{t}}}} pv\Gamma^{d}_{a_{\bar{t}}+z} \quad (2.25)$$

The private transfer wealth that cohort $a_{\bar{t}}$ expects to receive ($\Psi_{a_{\bar{t}},V_{a_{\bar{t}}}}$) in present value is:

$$pv\Psi_{a_{\bar{t}},V_{a_{\bar{t}}}} = \sum_{z=0}^{V_{a_{\bar{t}}}} \Psi_{a_{\bar{t}}+z} e^{-r(z+1)} = \sum_{z=0}^{V_{a_{\bar{t}}}} pv\Psi_{a_{\bar{t}}+z} \quad (2.26)$$

Note that we can calculate the expected "fiscal cost" of cohort $a_{\bar{t}}$ to the extent that $pv\Psi_{a_{\bar{t}},V_{a_{\bar{t}}}}$ must be financed by the public sector if positive. Applying these definitions we can write the end-of-life wealth of $a_{\bar{t}}$ in a way that shows the importance of transfers for wealth accumulation and the financing of *LCW*:

$$pvW^{p}_{a_{\bar{t}},\bar{t}+V_{a_{\bar{t}}}+1} = W^{p}_{a_{\bar{t}},\bar{t}} + pv\Gamma^{d}_{a_{\bar{t}},V_{a_{\bar{t}}}} + pv\Psi_{a_{\bar{t}},V_{a_{\bar{t}}}} + pvH_{a_{\bar{t}},V_{a_{\bar{t}}}} - pvLCW_{a_{\bar{t}},V_{a_{\bar{t}}}}. \quad (2.23')$$

In order to calculate these present values we need to know the expected values of the variables involved. To facilitate the use of the NTA data for this

purpose, we express public wealth and life-cycle wealth in terms of the age profiles for consumption and labor.

$$pvLCW_{a_{\bar{t}},V_{a_{\bar{t}}}} = \sum_{z=0}^{V_{a_{\bar{t}}}} pv[(\varphi_{a_{\bar{t}}+z} - \gamma_{a_{\bar{t}}+z}) y_{\bar{t}+z} X_{a_{\bar{t}}+z}] \tag{2.24'}$$

$$pv\Gamma^{d}_{a_{\bar{t}},V_{a_{\bar{t}}}} = \sum_{z=0}^{V_{a_{\bar{t}}}} pv[(\beta_{a_{\bar{t}}+z} - \alpha_{a_{\bar{t}}+z}) y_{\bar{t}+z} X_{a_{\bar{t}}+z}] \tag{2.25'}$$

In the simulations in the next chapter, we will assume that the age profiles that appear in these equations are given. Hence, $\varphi_{a_{\bar{t}}+z} = \varphi_s$ with $s = a + z$ and the same logic applies to the other profiles. Consequently, the aggregate parameters φ_t, γ_t, α_t, and β_t will vary only as a function of the demographic factors reflected in changes in $X_{a_{\bar{t}}+z}$. In some exercises, nonetheless, the aggregate parameters will also vary because we let aggregate per capita consumption and/or transfers to increase at a rate differing to the rate of growth of per capita income.

Over period $\bar{t} \pm R$, it is possible to identify a sequence of control cohorts: $\tilde{a}_{\bar{t}-R}, \ldots \tilde{a}_{\bar{t}-1}, \tilde{a}_{\bar{t}}, \tilde{a}_{\bar{t}+1}, \ldots, \tilde{a}_{\bar{t}+R}$. If $R > 0$, the end-of-life wealth of these control cohorts in present value will be:

$$pvW^{p}_{\tilde{a}_{\bar{t}+R},\bar{t}+R+V_{\tilde{a}_{\bar{t}+R}}+1} = W^{p}_{\tilde{a}_{\bar{t}+R},\bar{t}+R} + pv\Psi_{\tilde{a}_{\bar{t}+R},V_{\tilde{a}_{\bar{t}+R}}} + pv\Gamma^{d}_{\tilde{a}_{\bar{t}+R},V_{\tilde{a}_{\bar{t}+R}}} + pvH_{\tilde{a}_{\bar{t}+R},V_{\tilde{a}_{\bar{t}+R}}} - pvLCW_{\tilde{a}_{\bar{t}+R},V_{\tilde{a}_{\bar{t}+R}}}$$

During the demographic transition, the end-of-life wealth of the successive control cohorts will vary even if the age profiles corresponding to transfers, consumption, and labor income were given because the size of the cohorts $X_{\tilde{a}_{\bar{t}+R}}$ will change. For example, if $R = B$ were a baby boom year while $R = A$ were a year corresponding to the period of ageing, and we took the 15-year-old cohort as the control cohort, we would expect: $X_{\bar{t}+B+15} > X_{\tilde{0}_{\bar{t}+A}+15} / X_{\bar{t}+A+15}$ and, therefore, we would also expect an increase in the aggregate demand for life-cycle wealth in the case of the baby boomers.

It seems reasonable to assume that for a control cohort that is just reaching the working age: $W^{p}_{\tilde{15}_{\bar{t}+R},\bar{t}+R} = 0$; and cohorts cannot bequest liabilities to younger cohorts, consequently, $pvW^{p}_{\tilde{a}_{\bar{t}+R},\bar{t}+R+V_{\tilde{a}_{\bar{t}+R}}+1} \geq 0$. Under such conditions:

$$pv\Psi_{\tilde{15}_{\bar{t}+R},V_{15_{\bar{t}+R}}} + pv\Gamma^{d}_{\tilde{15}_{\bar{t}+R},V_{15_{\bar{t}+R}}} + pvH_{\tilde{15}_{\bar{t}+R},V_{15_{\bar{t}+R}}} \geq pvLCW_{\tilde{15}_{\bar{t}+R},V_{15_{\bar{t}+R}}}$$

This means that if the demand for life-cycle wealth is positive, it will have to be financed by transfers from other cohorts—including bequests—or from government transfers. This places a significant constraint on the aggregate demand for life-cycle wealth in the case of large cohorts. In effect, in the case of the control cohort corresponding to a baby boomer born in $\bar{t} + B$, the

net private transfers that are expected to be received will not be high; baby boomers will have a good number of siblings at home and they will compete for bequests. If, therefore, the baby boomers' demand for life-cycle wealth were high, the demand for government transfer wealth would also be high, increasing the fiscal burden of younger and future cohorts. On the other hand, were the baby boomers to run a life-cycle surplus, the situation would be just the opposite: the large size of the cohort would leverage society's surplus with beneficial effects on the public budget.

If we assume that agents are rational and do not play Ponzi games, when R approaches infinity, for the control cohort $\tilde{0}_{\bar{t}+R}$, we can write $\lim_{R\to\infty} pvW^{p}_{\tilde{0}_{\bar{t}+R},\,\bar{t}+R+V_{\tilde{0}_{\bar{t}}}+1} = 0$, and consequently,

$$\lim_{R\to\infty} pvLCW_{\tilde{0}_{\bar{t}+R},\,V_{\tilde{0}_{\bar{t}+R}}} = W^{p}_{\tilde{0}_{\bar{t}+R},\,\bar{t}+R} + \lim_{R\to\infty}\left[pv\psi_{\tilde{0}_{\bar{t}+R},\,V_{0_{\bar{t}+R}}} + pv\Gamma^{d}_{\tilde{0}_{\bar{t}+R},\,V_{0_{\bar{t}+R}}} + pvH_{\tilde{0}_{\bar{t}+R},\,V_{0_{\bar{t}+R}}}\right]$$

That is, the demand for life-cycle wealth corresponding to the "last" of the control cohorts must equal their initial wealth plus the net bequests received from other cohorts plus the net value of transfers from the private and public sectors.

2.4 The Macroeconomic View of Asset Accumulation

The duration of the planning horizon that policy makers take as reference to designing macroeconomic policies (Z^{g}) may differ from the average time horizon that is relevant to society; $V_{\bar{t}}$ and this can be a source of coordination failures and political economy tensions. Policy makers must adapt their decisions to the available policy space in a world in which market imperfections and political economy constraints are pervasive. This means that policy dilemmas involving demographic variables will often arise. The horizons of the government may differ from the living cohorts' ones if cohorts are particularly selfish or myopic and the government is concerned about the welfare of future generations. Since living cohorts have a voice and still-unborn cohorts do not, living cohorts may try to influence the government's decisions over the degree of generosity of the social security system or health transfers. Furthermore, the young and the elderly usually have different abilities to pressure the government. This implies that political economy factors and, hence, each cohort's ability for collective action will have to be included in the analysis. We are not addressing political economy issues, but we do focus on the interactions between demographically driven intertemporal allocation and macroeconomic policy goals.

The View of the Policy Maker

To explore the way in which the public policy's planning horizon interacts with a cohort's plans, we will now take the view of the policy maker.

We will assume that the planning horizon that is relevant to macroeconomic policy making starts at $t = \overline{t}$ and ends at $t = \overline{t} + Z^g$ and therefore, $Z^g \geq z = t - \overline{t} \geq 0$. The cohorts that are alive or will be born during this period are expected to accumulate savings. Let $S^P_{\overline{t},Z^g}$ stand for the private sector national savings; then

$$S^P_{\overline{t},Z^g} = \sum_{t=\overline{t}}^{Z^g} \sum_{a_{\overline{t}}+z=0}^{\omega} S^p_{a_{\overline{t}}+z,t} = \sum_{a_{\overline{t}+z}=0}^{\omega} \sum_{t=\overline{t}}^{Z^g} S^p_{a_{\overline{t}}+z,t} = \sum_{a_{\overline{t}+z}=0}^{\omega} S^p_{a_{\overline{t}}+z,Z^g} = \sum_{t=\overline{t}}^{Z^g} S^p_t \tag{2.27}$$

Since $a_{\overline{t}} < 0$ for those unborn cohorts, we can distinguish between the expected savings that are generated by born $\left(S^{P^B}_{\overline{t},Z^g}\right)$ and unborn cohorts $\left(S^{P^U}_{\overline{t},Z^g}\right)$:

$$S^{P^B}_{\overline{t},Z^g} = \sum_{t=\overline{t}}^{\overline{t}+Z^g} \sum_{a_{\overline{t}}+z=0}^{\omega} S^p_{a_{\overline{t}}+z,t} \text{ where } a_{\overline{t}} > 0 \text{ and,}$$

$$S^{P^U}_{\overline{t},Z^g} = \sum_{t=\overline{t}}^{\overline{t}+Z^g} \sum_{a_{\overline{t}}+z=0}^{\omega} S^p_{a_{\overline{t}}+z,t} \text{ with } a_{\overline{t}} < 0.$$

Of course, $S^{P^B}_{\overline{t},Z^g} + S^{P^U}_{\overline{t},Z^g} = S^P_{\overline{t},Z^g}$. Only a part of the amount of savings that the born and unborn cohorts are expected to generate throughout their lives (that is, $S^P_{a_{\overline{t}},V_{a_{\overline{t}}}}$) will be generated during period Z^g. For example, only the expected savings generated by those cohorts that meet the condition $\omega - a_{\overline{t}} \leq Z^g$ will be included in its entirety in $S^P_{\overline{t},Z^g}$, which is the aggregate amount of savings that the policy maker will consider to design growth or stabilization policies. Furthermore, the younger the cohort, the smaller the portion of the cohort's life-long savings included in $S^P_{\overline{t},Z^g}$ will be. Indeed, it is only in the special case in which $Z^g \to \infty$, are life-long cohorts' plans included in full. This follows from the fact that the savings plans (or any other type of plan, for that matter) of any cohort, over the relevant time horizon, can be split into two parts: $\sum_{a_{\overline{t}}+z=0}^{V_{a_{\overline{t}}}} S^p_{a_{\overline{t}}+z} = \sum_{a_{\overline{t}}+z=0}^{Z^g} S^p_{a_{\overline{t}}+z} + \sum_{z=Z^g+1}^{V_{a_{\overline{t}}}} S^p_{a_{\overline{t}}+}$.

Using the definition of aggregate private savings and noting that the sum of between-cohorts net transfers $(\Psi_{a_{\overline{t}}+z,t})$ and bequests $(H_{a_{\overline{t}}+z,t})$ must add up to zero, it follows that

$$\begin{aligned} S^P_{\overline{t},Z^g} &= \sum_{t=\overline{t}}^{\overline{t}+Z^g} \sum_{a_{\overline{t}}+z=0}^{\omega} \left(\Upsilon^P_{a_{\overline{t}}+z,t} + \Gamma_{a_{\overline{t}}+z,t} - LCD_{a_{\overline{t}}+z,t}\right) \\ &= \Upsilon^p_{\overline{t},Z^g} + \Gamma_{\overline{t},Z^g} - LCD_{\overline{t},Z^g}. \end{aligned} \tag{2.28}$$

In terms of the NTA age profiles, this equation can be written as:

$$S^{P}_{\bar{t},Z^{g}} = \sum_{t=\bar{t}}^{\bar{t}+Z^{g}} \sum_{a_{\bar{T}}+z=0}^{\omega} X_t \gamma_t [(\varepsilon_{a_{\bar{T}}+z,t} + \gamma_{a_{\bar{T}}+z,t}) + (\beta_{a_{\bar{T}}+z,t} - \alpha_{a_{\bar{T}}+z,t}) - (\varphi_{a_{\bar{T}}+z,t} - \gamma_{a_{\bar{T}}+z,t})] \quad (2.28')$$

Hence, at the aggregate level, expected savings can be decomposed into the algebraic sum of the accumulated private nonlabor income ($\Upsilon^{p}_{\bar{t},Z^{g}}$), the accumulated net government transfers to the private sector ($\Gamma_{\bar{t},Z^{g}}$), and the accumulated life-cycle deficits ($LCD_{\bar{t},Z^{g}}$). These flows are expected to be generated by all the cohorts that will be alive at least one year during Z^{g}. These aggregates include expenditure-and-income plans of cohorts that are born and unborn at $\bar{t}$, as can be seen if we decompose the terms following the criterion presented above:

$$S^{P}_{\bar{t},Z^{g}} = \Upsilon^{P^{B}}_{\bar{t},Z^{g}} + \Upsilon^{P^{U}}_{\bar{t},Z^{g}} + \Gamma^{B}_{\bar{t},Z^{g}} + \Gamma^{U}_{\bar{t},Z^{g}} - LCD^{B}_{\bar{t},Z^{g}} - LCD^{U}_{\bar{t},Z^{g}}.$$

The expected stock of aggregate private wealth at the end of the policy planning horizon ($W^{p}_{\bar{t}+Z^{g}+1}$) can be expressed as the sum of aggregate wealth inherited from the past $\left(W^{P}_{\bar{t}} = \sum_{a_{\bar{T}}=0}^{\omega} W^{P}_{a_{\bar{T}},\bar{t}} \right)$ and accumulated savings:

$$W^{p}_{\bar{t}+Z^{g}+1} = W^{P}_{\bar{t}} + S^{P}_{\bar{t},Z^{g}} = W^{P}_{\bar{t}} + \Upsilon^{P}_{\bar{t},Z^{g}} + \Gamma_{\bar{t},Z^{g}} - LCD_{\bar{t},Z^{g}} \quad (2.29)$$

This equation shows the linkages between demographic factors and private wealth accumulation. For example, the period in which the DW is open is growth-friendly because expected accumulated life-cycle deficits are lower, favoring wealth accumulation. The cohorts living during such period can leave more assets to the cohorts that will be alive from $\bar{t}+Z^{g}+1$ on if they save and seize the opportunities associated with the SD. In this way, future cohorts would be in a better position to sustain wealth during the ageing stage because higher asset accumulation in the past would mean higher $\Upsilon^{p}_{\bar{t},Z^{g}}$. An increase in $\Gamma_{\bar{t},Z^{g}}$ would also augment the stock of wealth at the end of the planning horizon. However, $\Gamma_{\bar{t},Z^{g}}$ does not contribute to society's stock of wealth because transfers impinge negatively on the public sector's end-of-period wealth ($W^{g}_{\bar{t}+Z^{g}+1}$), as can be seen in the following equation:

$$W^{p}_{\bar{t}+Z^{g}+1} = W^{g}_{\bar{t}} + S^{g}_{\bar{t},Z^{g}} = W^{g}_{\bar{t}} + \sum_{t=\bar{t}}^{\bar{t}+Z^{g}} \left(\Upsilon^{g}_{t} - \sum_{a_{\bar{T}}+z=0}^{\omega} \Gamma_{a_{\bar{T}}+z,t} \right) = W^{g}_{\bar{t}} + \Upsilon^{g}_{\bar{t},Z^{g}} - \Gamma_{\bar{t},Z^{g}} \quad (2.30)$$

Equation (2.30) shows that in order to finance transfers during the planning period while preserving public savings, the government should accumulate a sufficient amount of assets to finance the projected transfers with asset income. In natural-resource-rich countries, a government's asset income is usually a means to finance transfers. However, the distribution of natural resource rents among cohorts can be a source of conflict and often gives rise to situations akin to the so-called natural resource curse. Another source of potential distributional conflict is public debt. If the government is a net debtor and $\Upsilon^{g}_{\bar{t},Z^{g}} < 0$, the public debt service will absorb funds that could be allocated to finance transfers. Furthermore, no "natural" way exists to allocate the debt burden among cohorts.

Adding public and private wealth, we obtain the economy's aggregate end-of-period wealth, which is the difference between the nonlabor income and the life-cycle deficits that cohorts are expected to accumulate over the period of duration Z^{g},

$$W_{\bar{t}+Z^{g}+1} = W^{P}_{\bar{t}+Z^{g}+1} + W^{g}_{\bar{t}+Z^{g}+1} = \Upsilon^{P}_{\bar{t},Z^{g}} + \Upsilon^{g}_{\bar{t},Z^{g}} - LCD_{\bar{t},Z^{g}} \tag{2.31}$$

This expression for aggregate or macroeconomic wealth resembles the equation corresponding to the end-of-life wealth of a cohort (see equation [2.22]). However, there is a crucial difference: we can attribute a precise demographic meaning to equation (2.22) but it would be misleading to attribute such a meaning to this aggregate. This aggregate comprises a heterogeneous mixture of cohorts and of segments of those cohorts' life-long expenditure-and-income plans. From this it follows that demography matters to macro-aggregates. For one thing, demographic changes can strongly influence the evolution of macroeconomic wealth over the policy period Z^{g}. For another, the decisions taken by policy makers considering period Z^{g} have consequences for both born and unborn cohorts. The main purpose of the methodology that we are developing is, precisely, to be able to explore these connections. In a sense, we want to unravel not only the consequences of demography on the macroeconomy but also the effects of macroeconomic policy decisions on the welfare and budget constraints of the different cohorts involved. In this regard, it will be useful to present the macroeconomic counterparts of life-cycle and public transfer wealth.

We will call the accumulated life cycle that born and unborn cohorts are expected to run over the period Z^{g}, "macroeconomic life-cycle wealth" $(mLCW_{\bar{t},Z^{g}})$. In present value we can write:

$$mLCW_{\bar{t},Z^{g}} = \sum_{t=\bar{t}}^{\bar{t}+Z^{g}} pvLCD_{t} \tag{2.32}$$

Likewise, we define "macroeconomic public transfer wealth" $(m\Gamma_{\bar{t},Z^{g}})$ as the accumulated expected net government transfers. Expressed in present value,

$$m\Gamma_{\bar{t},Z^g} = \sum_{t=\bar{t}}^{\bar{t}+Z^g} pv\Gamma_t \tag{2.33}$$

In order to show the relationships between macroeconomic life-cycle, transfer, and end-of-period aggregate wealth, we need to express the latter in present value:[6]

$$\begin{aligned} pvW^p_{\bar{t}+Z^g+1} &= W^p_{\bar{t}} + \sum_{t=\bar{t}}^{\bar{t}+Z^g} (pv\Gamma_t - pvLCD_t) \\ &= W^p_{\bar{t}} + m\Gamma_{\bar{t},Z^g} - mLCW_{\bar{t},Z^g} \end{aligned} \tag{2.32'}$$

$$pvW^g_{\bar{t}+Z^g+1} = W^g_{\bar{t}} - \sum_{t=\bar{t}}^{\bar{t}+Z^g} pv\Gamma_t = W^g_{\bar{t}} - m\Gamma_{\bar{t},Z^g} \tag{2.33'}$$

Transfer wealth negatively or positively affects the public or private sector budget respectively. The higher the expected transfers, the lower the government wealth and the higher the private end-of-period wealth will be. Note that government wealth at time $\bar{t}+Z^g+1$ can be negative. If this were the case, those cohorts that would be alive after $\bar{t}+Z^g+1$ would receive a negative bequest. It is interesting that the living cohorts cannot privately leave a negative bequest (a liability) but it is possible to leave a net debt burden as a legacy through the public sector. It goes without saying that this has important political economy implications.

On the bases of these definitions, total aggregate expected end-of-period wealth in present value can be expressed as:

$$pvW_{\bar{t}+Z^g+1} = (W^p_{\bar{t}} + W^g_{\bar{t}}) - \sum_{t=\bar{t}}^{\bar{t}+Z^g} pvLCD_t = W_{\bar{t}} - mLCW_{\bar{t},Z^g} \tag{2.31}$$

From this expression it follows that there is a tradeoff between expected total life-cycle wealth at the end of the period and life-cycle wealth. This is why the demographic transition matters to macroeconomic aggregates. But the reasons why policy makers are concerned over the impact that changes in the structure of the population have on the accumulation of savings may only be loosely related to the challenges that the demographic transition poses. One primary reason behind a policy maker's decisions is that accumulated savings affect the trajectory of three stocks that play a key macroeconomic role: public debt, the country's net external financial position, and the capital/labor ratio. To be sure, the evolution of these stocks is determined by many factors that policy makers consider, but we focus on the consequences of the demographic transition.

Indeed, monitoring aggregate savings would be somewhat misleading if the policy maker's goal was to evaluate the welfare of a living cohort or one that will be born between $\bar{t}$ and $\bar{t}+Z^g$. We have shown that aggregate variables such as Υ^p_t, LCD_t, and Γ_t result from adding the life-cycle deficit,

income, and transfers corresponding to cohorts of different ages, sizes, and time horizons. There is little interest in using more precise indicators in the "everyday life" of economic policy because the goals concerning the current account and growth usually take priority over demographic factors, despite typical clichés like: "We care about growth because we care about our children's future." The methodology presented here suggests, nonetheless, that it is indeed possible for policy making to be more precise in this regard.

Furthermore, under certain financial and political circumstances, macroeconomic policies can be particularly distortionary from a demographic standpoint. For example, if the fiscal deficit is high and the government faces a tight credit constraint, the authorities might try to reduce transfers without regard for the requirements of the demographic stage. Under such circumstances, if the voice of older generations were politically stronger than the voice of the young, the process of adjusting fiscal transfers would likely show a bias in favor of preserving social security transfers even if the country were relatively young and in need of strengthening its human capital. It is precisely because of this type of interaction between fiscal space constraints and political economy pressures that it has been so difficult for many economies to make the most of the opportunities that the first and second dividends bring about. Brazil's case study is highly relevant in this regard. Just the opposite occurs when the social security system is underdeveloped, the public-transfers bill is reduced, and, as a consequence, the savings rate tends to be too high, leading to an overaccumulation of capital and foreign assets and "too much" investment in future generations and/or inefficient capital accumulation. The study on China in this case is relevant.

Let us express W^{p}_{T+1} in per capita terms. For the sake of simplicity we will momentarily assume that the rate of growth of population n is constant and call $\theta = r - n$, the effective interest rate. Using small letters for the variables expressed in per capita terms, per capita wealth at point $T + 1$ can be expressed as:[7]

$$w^{p}_{\bar{t}+Z^{g}+1} = w^{p}_{\bar{t}} e^{\theta(\bar{t}+Z^{g}+1)} + (\Gamma_{\bar{t},Z^{g}} - lcw_{\bar{t},Z^{g}})e^{-n} \tag{2.34}$$

An elevated growth rate of the population negatively impinges on the effective interest rate and, hence, on the ability to accumulate wealth. Government and total wealth can be expressed in per capita terms following the same strategy.

The InterTemporal Budget Constraint and Persistent Disequilibria

If the policy horizon Z^{g} is infinite and wealth does not grow "too fast" (faster than the interest rate), the present discounted value of the stock of private

and public wealth at infinity will be zero; that is $\lim_{Z^g \to \infty} pvW^p_{T+1} = 0$. It follows that:

$$W^p_{\bar{t}} + \lim_{Z^g \to \infty} \sum_{t=\bar{t}}^{\bar{t}+Z^g} pv\Gamma^D_t = \lim_{Z^g \to \infty} \sum_{t=\bar{t}}^{\bar{t}+Z^g} pvLCD_t \tag{2.35}$$

We will distinguish between net transfers demanded by the private sector (Γ^D_t) and supplied by the government (Γ^S_t). We will also distinguish between the public wealth transfer that the cohorts demand $(\Gamma^D_{\bar{t},Z})$ and those that the government intends to supply $(\Gamma^S_{\bar{t},Z})$. Using the definitions stated above:

$$W^p_{\bar{t}} + \lim_{Z^g \to \infty} m\Gamma^S_{\bar{t},Z^g} = \lim_{Z^g \to \infty} mLCW_{\bar{t},Z^g}$$

As the policy planning horizon approaches infinity, the initial stock of private wealth plus expected public transfer wealth must be equal to the demand for life-cycle wealth. If expected transfer wealth is positive and the government is not playing a Ponzi game, that is, $\lim_{Z \to \infty} W^g_{\bar{t}+Z^g+1} = 0$, it follows that

$$W^g_{\bar{t}} = \lim_{Z^g \to \infty} \sum_{\bar{t}=t}^{\bar{t}+Z^g} vp\Gamma^S_t = \lim_{Z^g \to \infty} m\Gamma^S_{\bar{t},Z^g}.$$

The present value of projected net transfers should equal the value of the assets held by the government at the beginning of the planning period. In the case that $W^g_{\bar{t}} < 0$, the government should generate surpluses $(\Gamma^S_t < 0)$ during the planning period to meet the intertemporal budget constraint and avoid unsustainable public debt trajectories. If this were the case, public transfer wealth would be negative; it would be a liability rather than an asset.

Debt will be honored by some of the cohorts that will be alive in the future, although it is not specified which cohort it will be. It is important, in this regard, whether debt is foreign or domestic, to evaluate the ultimate effects of different combinations of transfer wealth and public debt on the welfare of future cohorts. If public debt is domestic, debt payments will take the form of transfers among resident cohorts. If debt is foreign, no domestic cohort will receive transfers as a counterpart of debt services. Consequently, to be able to assess the level of the cohort's income after $\bar{t}$, it is relevant whether public debt is held by residents $(B^p_{\bar{t}} > 0)$ or foreign investors $(F^g_{\bar{t}} < 0)$. Remember that national income is equal to $\gamma_t + \varepsilon_t$. External debt services will affect national savings and thus the ability to accumulate assets.

If all public debt were domestically held, the future stream of primary surpluses (negative net public transfers) would be accompanied by a flow of transfers to the private sector in the form of a public debt service. Since the two values would cancel out, the flow of aggregate national private income would not change over time for this reason, although, there would certainly be changes in the distribution of income among cohorts. For example, the younger cohorts would lose ground in favor of the older ones if the

government curtailed net transfers to education. Primary savers are usually the main debt holders.

In the case in which $F^g_{\bar{t}} < 0$ the stream of debt payments would reduce the national income of the cohorts living at point $\bar{t} + z$, when debt payments were made. In view of this, it comes as no surprise that the excessive foreign indebtedness of the public sector gave rise to severe distributional conflicts in Latin America and other emerging regions in which foreign debt payments increased substantially in short periods of time.

The previous arguments indicate that there are only two ways to reallocate income between the living and future cohorts as a whole: to accumulate capital or to draw on foreign financial instruments. It is not possible to make reallocations using local financial instruments because when a cohort renounces spending in order to lend, the cohort who borrows spends instead. And in the future, when the latter cohort repays debt, the income of the creditor cohorts will increase. It is also true that there is no reallocation for the economy as a whole when domestic agents borrow abroad in order to finance the current capital accumulation. This is so because the capital accumulated today will generate asset income in the future, providing the necessary funds for the foreign debt service. The worst scenario usually occurs, in this regard, when the government resorts to foreign credit to finance consumption rather than asset accumulation. If the consumption of the cohorts that are living at time $\bar{t}$ is financed by foreign credit, we will see a fall in national income in the future when debt payments are made and there will be no asset income to compensate for such fall.

According to the intertemporal budget constraint, the present value of the expected life-cycle deficits must be equal to the value of the public and private assets inherited from the past.

$$\lim_{Z^g \to \infty} \sum_{t=\bar{t}}^{\bar{t}+Z^g} pvLCD_t = W^p_{\bar{t}} + W^g_{\bar{t}} = K^g_{\bar{t}} + F^g_{\bar{t}} + K^p_{\bar{t}} + F^p_{\bar{t}} \tag{2.36}$$

To be sure, we are not considering the incentive effects associated with the situations under analysis. For example, if a good part of the flows of LCD_t are expected to be financed on the basis of net public transfers, the private sector's incentives to save may weaken. To illustrate the type of situation that can give rise to the disequilibria that we are discussing, we can write:

$$\begin{aligned} W^p_{\bar{t}} e^{r(Z^g+1)} + \Gamma^D_{\bar{t},Z^g} - LCW_{\bar{t},Z^g} &= K^p_{\bar{t}} + F^p_{\bar{t}} + B^g_{\bar{t}} \\ &\quad - \sum_{t=\bar{t}}^{\bar{t}+Z^g} (\Delta K^p_t + \Delta F^p_t + \Delta B^p_t) \end{aligned} \tag{2.37}$$

$$W^g_{\bar{t}}\, e^{r(Z^g+1)} - \Gamma^S_{\bar{t},Z^g} = K^g_{\bar{t}} + F^g_{\bar{t}} - B_{\bar{t}} + \sum_{t=\bar{t}}^{\bar{t}+Z^g} (\Delta K^g_t + \Delta F^g_t - \Delta B_t) \tag{2.38}$$

Let us assume that $LCW_{\bar{t},Z^g}$ increases because the economy is entering the ageing stage. The increase in the demand for life-cycle wealth can be financed

by either the private or the public sector. If the public sector agrees to finance the increase in the demand for life-cycle deficit via the social security system, there will be a "political economy" equilibrium: $\Delta\Gamma^{D}_{\bar{t},Z^{g}} = \Delta\Gamma^{g}_{\bar{t},Z^{g}}$. Under these circumstances, from equation (2.37) it follows that there will be no change in the private sector's ability to accumulate assets because $\Delta\Gamma^{D}_{\bar{t},Z^{g}} = \Delta LCW_{\bar{t},Z^{g}}$. Equation (2.38), corresponding to the government's budget constraint, in turn, indicates that the public sector must either decrease the speed to accumulate foreign and physical assets or increase its indebtedness. Hence, to finance the social security system, the government will leave fewer assets and/or a heavier debt burden to those cohorts who will be living after $\bar{t} + Z^{g}$; that is, $-\Delta\Gamma^{S}_{\bar{t},Z^{g}} = -(\Delta K^{g}_{\bar{t},Z^{g}} + \Delta F^{g}_{\bar{t},Z^{g}})$.

If the ageing stage begins but the government does not intend to finance the increase in the demand for life-cycle wealth, there will be no political economy equilibrium: $\Gamma^{D}_{\bar{t},Z^{g}} > \Gamma^{S}_{\bar{t},Z^{g}}$. If this occurred, it is unclear what mechanism should operate to restore equilibrium and make the future plans consistent. The inconsistency, however, may not be evident in the short run because phenomena like wars of attrition may emerge (Drazen 2000). To avoid the political costs of reforming the social security system or raise taxes, the authorities may either increase public debt or sell assets. If this strategy persists for a period, the government will be setting the stage for either a fall in the future national income or for undesired redistributions of wealth between cohorts. The fall in national income or redistributions will effectively occur when debt payments are made. To clarify this point, let us write the equation for the end-of-period government wealth:

$$W^{g}_{\bar{t}} - vp\Gamma^{S}_{\bar{t},Z^{g}} - vp\Gamma^{S}_{Z^{g}+1,R} = W^{g}_{Z^{g}+R+1}$$

If we take the limit and apply the non-Ponzi condition:

$$\lim_{R\to\infty}\left(W^{g}_{\bar{t}} - pv\Gamma^{S}_{\bar{t},Z^{g}} - pv\Gamma^{S}_{Z^{g}+1,R}\right) = \lim_{R\to\infty} W^{g}_{Z^{g}+R+1} = 0$$

We obtain:

$$W^{g}_{\bar{t}} - \lim_{R\to\infty} pv\Gamma^{s}_{Z^{g}+1,R} = pv\Gamma^{s}_{\bar{t},Z^{g}}$$

This means that the larger the amount of net public transfers effectuated between $\bar{t}$ and $\bar{t} + Z^{g}$, the smaller the transfers to the living cohorts after $\bar{t} + Z^{g}$ will have to be. If $pv\Gamma^{s}_{\bar{t},Z}$ were sufficiently large, $\lim_{R\to\infty} pv\Gamma^{s}_{Z^{g}+1,R}$ would be negative and the cohorts involved would be obliged to accumulate surpluses. This could easily lead to a Ponzi game, especially if $W^{g}_{\bar{t}} < 0$.

If we apply the same logic to the private sector budget constraint, we obtain:

$$\lim_{R\to\infty}(W^{p}_{\bar{t}} + pv\Gamma^{D}_{\bar{t},Z^{g}} - pvLCW_{\bar{t},Z^{g}} + pv\Gamma^{D}_{Z^{g}+1,R} - pvLCW_{Z^{g}+1,R})$$
$$= \lim_{R\to\infty} W^{p}_{Z^{g}+R+1} = 0$$

$$pv\Gamma^{D}_{\bar{t},Z^{g}} = pvLCW_{\bar{t},Z^{g}} + \lim_{R\to\infty} pvLCW_{Z^{g}+1,R} - \lim_{R\to\infty} pv\Gamma^{D}_{Z^{g}+1,R} - W^{p}_{\bar{t}}$$

Therefore, if $\Gamma^{D}_{\bar{t},Z^{g}} > \Gamma^{S}_{\bar{t},Z^{g}}$ these plans are inconsistent with the intertemporal budget constraint because:

$$pvLCW_{\bar{t},Z^{g}} + \lim_{R\to\infty} pvLCW_{Z^{g}+1,R} - \left(\lim_{R\to\infty} pvTRW^{D}_{Z^{g}+1,R} + \lim_{R\to\infty} pvTRW^{S}_{Z^{g}+1,R}\right) > W^{g}_{\bar{t}} + W^{p}_{\bar{t}}$$

The present value of future life-cycle deficits would be greater than the value of the beginning-of-period wealth. This situation could set public debt on an unsustainable path and the situation might persist for a period, generating a long-lasting disequilibrium and, as a rule, it is difficult to correct situations of this type, as the experience with the "lost decades" in Latin America and, now in Europe, suggests.

In addition to long-lasting disequilibria, the interactions between demography and the macroeconomy can generate traps if, say, the living cohorts and/or the government is somewhat myopic or the political economy constraints are tight and, consequently, society does not take into account the intertemporal constraints appropriately. For example, the FD may lead to an incorrect allocation of resources. In effect, when SR_t shows an upward trend and the effective number of taxpayers increases, tax collection will augment continuously. The government should take advantage of this to accumulate assets in order to profit from the SD and prepare for the ageing stage. A wealthier government, nonetheless, may be tempted to expend more to get short-run political benefits, favoring current employment and transfers to living cohorts. If, as a result, net public transfers increase, the incentives for the private sector to save may weaken and the economy could miss the SD. Wealth misperception is an important source of macro distortions. Under these circumstances the demographic transition could provoke such misperception, creating the possibility that the economy finds itself caught in a low growth trap.

Notes

1. For the precise definition of consumption and labor income, see Lee and Mason (2011).
2. For the operational definition of these two parameters, see Lee and Mason (2011).
3. We can state ε^{p}_{a} in terms of an asset's return. For the sake of simplicity, assume that the international interest rate $(r^{*'}_{t})$ is equal to the domestic rate $r^{'}_{t}$. The cohort's average private asset income can then be expressed as $Y^{p}_{a,t} = r^{'}_{t} W^{p}_{a,t}$, where $W^{p}_{a,t}$ stands for the stock of wealth of cohort a. If $\varsigma_{a,t}$ is the cohort's wealth to the per capita income ratio (i.e., $\left(\varsigma_{a,t} = \frac{w^{p}_{a,t}}{y_{t}}\right)$, we can also write

the private nonlabor share as $\varepsilon_t^p = r_t' \sum_{a=0}^{\omega} \varsigma_{a,t} \mu_{a,t} = r_t' \varsigma_t$, where $\varsigma_t = \sum_{a=0}^{\omega} \varsigma_{a,t} \mu_{a,t}$ is a time-varying parameter that will vary as the wealth distribution among cohorts and/or the population structure changes. This means that the participation of nonlabor income in total income is directly influenced by demographic factors.

4. Equation (2.22) can also be written as:

$$pvW^p_{a_{\bar{\tau}},\bar{t}+V_{a_{\bar{\tau}}}+1} = W^p_{a_{\bar{\tau}},\bar{t}} e^{-r(V_{a_{\bar{\tau}}}+1)} + \sum_{z=0}^{V_{a_{\bar{\tau}}}} pvS^p_{a_{\bar{\tau}}+z} e^{-r(V_{a_{\bar{\tau}}}-z)} + \sum_{z=0}^{V_{a_{\bar{\tau}}}} pvH_{a_{\bar{\tau}}+z} e^{-r(V_{a_{\bar{\tau}}}-z)}$$

5. Note that:

$$W^p_{a_{\bar{\tau}},\bar{t}+V_{a_{\bar{\tau}}}+1} = W^p_{a_{\bar{\tau}},\bar{t}} e^{r(V_{a_{\bar{\tau}}}+1)} + \sum_{z=0}^{V_{a_{\bar{\tau}}}} (\Gamma^d_{a_{\bar{\tau}}+z} + \Psi_{a_{\bar{\tau}}+z} + H_{a_{\bar{\tau}}+z} - LCD_{a_{\bar{\tau}}+z}) e^{r(V_{a_{\bar{\tau}}}-z)}$$

6. To determine the present value, we write the equations for private and government wealth as

$$W^P_{\bar{t}+Z^\beta+1} = W^p_{\bar{t}} e^{r(Z^\beta+1)} + \sum_{t=\bar{t}}^{\bar{t}+Z^\beta} (\Gamma_t - LCD_t) e^{r(Z^\beta-z)}$$

$$W^g_{\bar{t}+Z^\beta+1} = W^g_{\bar{t}} e^{r(Z^\beta+1)} - \sum_{t=\bar{t}}^{\bar{t}+Z^\beta} \Gamma_t e^{r(Z^\beta-z)}$$

7. Note that:

$$w^p_{\bar{t}+Z^\beta+1} = \frac{W^p_{\bar{t}+Z^\beta+1}}{X_{\bar{t}+Z^\beta+1}} = \sum_{t=\bar{t}}^{\bar{t}+Z^\beta} (\tau^d_t - lcd_t) e^{r(Z^\beta-z)} e^{-n(Z^\beta-z)} e^{-n} + w^p_{\bar{t}} e^{(r-n)Z^\beta};$$

$$w^p_{\bar{t}+Z^\beta+1} = \sum_{t=\bar{t}}^{\bar{t}+Z^\beta} (\tau^d_t - lcd_t) e^{\theta(Z-z)} e^{-n} + w^p_{\bar{t}} e^{\theta(Z+1)}. \text{ Where: } \tau^d_t = \frac{\Gamma_t}{X_t}; lcd_t = \frac{LCD_t}{X_t}.$$

PART II

Demographic Asymmetries and the Global System

CHAPTER 3

On the Macroeconomic and Financial Implications of the Demographic Transition

José María Fanelli and Ramiro Albrieu

3.1 Introduction

In this chapter we examine a set of problems concerning the interactions between the demographic transition and the macroeconomy in emerging countries that are particularly relevant to the issues discussed in the book. Analytically, the study is founded on the concepts, methodologies, and problems discussed in the previous chapter and, empirically, it is based on the UN population projections (http://esa.un.org/unpd/wpp/index.htm) and NTA demographic data on expenditure and income age-profiles (www.ntaccounts.org/) corresponding to four G-20 emerging countries: Brazil, China, India, and South Africa. To enrich the comparative perspective we will frequently refer to the experience of Korea as standard of comparison. Korea is a good standard because the country succeeded in accelerating growth during the period in which the demographic window of opportunity (DW) was open.

The four economies that we examine are undergoing different stages of the demographic transition and we consider that they well represent the kind of macroeconomic dynamics that typically arise in the demographic transition's stages preceding ageing. India and South Africa are younger economies and their main challenge to seizing the first dividend (FD) is the presence of economic dualities, which are the source of obstacles to job creation and financial development. Brazil and China, in turn, need to get the most out of the second dividend (SD) in order to be prepared for the beginning of the ageing process in two decades or so. The linkages and interactions between demography and the macroeconomy in each of these economies are analyzed in detail in the case studies presented in chapters 6–9. The perspective in this

chapter is different. We examine those linkages and interactions from a comparative standpoint. The main purpose of the exercise is heuristic. We seek to identify stylized facts that can help understand the macroeconomic dynamics that accompany the demographic transition in developing countries, as well as the potential consequences of asymmetric demography for the evolution of imbalances in G-20 countries.

We explore the linkages between demography and the macroeconomy in two dimensions: stocks and flows. On the demographic side, the key flow variables are the life-cycle deficit and fiscal transfers by cohort and, concerning stocks, the life-cycle wealth and public transfer wealth. To address the macroeconomic side of the problem we adopt the following strategy. First, we aggregate the above-mentioned stocks and flows across cohorts at each point in time in order to determine the "macroeconomic" counterpart of the life-cycle deficit, life-cycle wealth, government transfers and transfer wealth. Second, we use these aggregate variables to calculate the "end-of-period" aggregate wealth corresponding to a policy horizon of duration Z^g. Finally, we show the connections of these aggregates with the "traditional" macroeconomic flows and stocks: national savings, the current account, the government budget, physical capital, and foreign assets.

We approach the problems from the perspective of the policy maker's time-horizon. The concept of end-of-period wealth, defined in the previous chapter as a function of the macroeconomic policy time horizon, plays a pivotal role in articulating stocks, flows, demography, and the macroeconomy. By decomposing the structure of the end-of-period wealth into the cohorts' demand for wealth on the one hand, and foreign and physical assets, on the other, we will be able to identify a set of stylized facts that are the source of macroeconomic policy challenges for emerging economies.

The macroeconomic policy horizon that we consider is situated at some point between the short-run horizon usually considered to analyze the disequilibrium between aggregate investment and savings, and the much longer time horizon taken into account to study balanced growth, which assumes that investment equals savings and that the economy is on a stable path toward the steady state. We will assume that investment equals savings over the time-frame considered (the policy horizon) but we will not assume that the economy is necessarily on a stable path or that the steady state is necessarily unique. More specifically, we do not rule out the possibility of unsustainable foreign or public debt paths or that the economy falls into a growth trap. Our interest in these phenomena is motivated by the fact that to pass reforms, policy makers frequently argue that the economy is in an equilibrium in the short run when, in fact, it is situated on a potentially unstable long-run trajectory, thus calling for changes in the parameters defining the economy ("reforms") in order to ensure stability (Fanelli and Mcmahon 2005). Demography is a rich source of policy arguments of this sort. A few examples: "If we do not increase the retirement age, public debt will become unsustainable"; "If we do not reduce the current account deficit now, the country will have to default on its external debt when ageing";

"If the social security system continues to absorb so much savings, the long-run growth rate will be meager"; "If this large-sized high-growth economy does not increase consumption, the current account surplus will destabilize the world economy and developing a full-fledged social security system would be a good way to increase consumption."

These reform problems are difficult to address because they are neither short-run disequilibria nor balanced-growth phenomena and they are, to a certain extent, *terra incognita* from the analytical point of view. However, beyond these difficulties, it is a fact that policy makers must frequently deal with potential instability. Under these circumstances, our main purpose is to analyze NTA data from a macroeconomic stance to show that demography matters to emerging countries when accounting for persistent macroeconomic disequilibria and the threat of growth traps, as well as the fact that capital movements associated with demographic asymmetries can contribute to facing these challenges.

3.2 Varieties of Demographic Transitions: Life-cycle Deficit and the Cohort's Life-cycle Wealth

The consumption, labor-income, and government-transfer age profiles are the basic building blocks of our analysis. It is natural, then, to begin by discussing the empirical evidence on these variables. The notation concerning the variables and the equation numbers used in this chapter refer to those in chapter 2. Figure 3.1 shows the average per capita consumption (φ_a), labor income (γ_a), and life-cycle deficit ($lcd_a = \varphi_a - \gamma_a$) age profiles, normalized by per capita GDP (y_t).[1]

The countries' profiles present significant differences. Taking a comparative standpoint, we will focus on those that are deemed to have the stronger implications for the macroeconomy. With respect to consumption, China and Korea, two "Asian miracle" economies, present cohorts with a much lower propensity to expend. The difference with Brazil, South Africa, and India are particularly pronounced in the case of the cohorts older than 20 years (figure 3.1a). Brazil's cohorts older than 60, in turn, have very high propensities to consume. The economy's overall propensity to consume (φ_t) is a weighted average of φ_a, where the weights are the participation of each cohort in the total population, $\mu_{a,t}$. Consequently, the disparities in the level of the φ_a parameters have a bearing on the overall propensity to save ($1 - \varphi_t$) and thus leverage the changes in the size and structure of the population and contribute to determining the intensity of the effects on asset accumulation, the government budget, and the current account. This evidence suggests that South Africa, Brazil, and India will be in a less advantageous position than China—which shows a φ_a structure resembling that of Korea—to accumulate assets before ageing.

The distribution by age of the labor income parameters also registers disparities (figure 3.1b). The shape of the profile corresponding to the Korean standard presents differences with the rest. Two are worth mentioning—one,

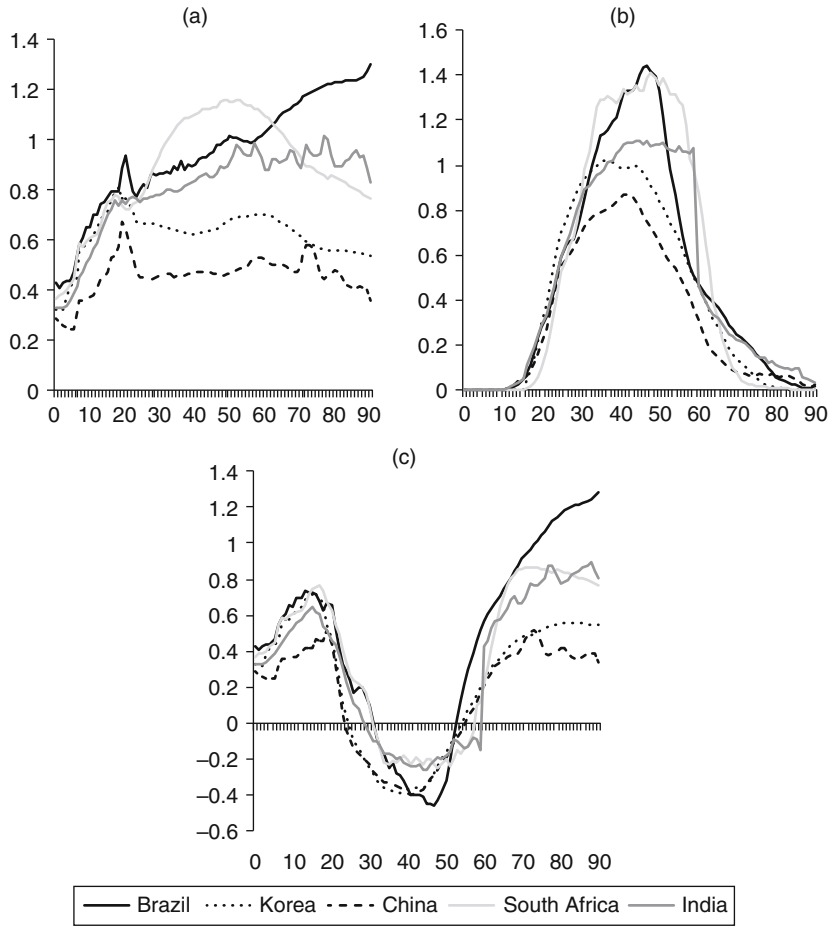

Figure 3.1 Age profiles: consumption, labor income, and life-cycle deficit (as % of base year's per capita GDP)

Note: Korea 2000, China 2002, South Africa 2005, and India 2004.

Source: Author's elaboration based on NTA data.

the average labor income of the age cohorts between the mid-30s and the mid-50s is higher than the Korean standard in the cases of the Brazil, India, and South Africa, probably reflecting a more unequal wage income distribution; two, the maximum γ_a in Korea is around one per capita GDP, while it is higher in the other cases except for China. This has implications for the macroeconomy and fiscal accounts to the extent that the cohorts with the higher γ_a but not yet retired are primary savers and also primary taxpayers.

The consumption and labor income profiles are reflected in the cohort's average per capita life-cycle deficit (figure 3.1c). The countries with high φ_a and labor income concentrated in the primary-saver cohorts tend to show a larger number of cohorts with a life-cycle deficit (Brazil and South Africa, see table 3.1). This implies that the ability to generate a life-cycle surplus is

Table 3.1 Life-cycle surplus and deficit and average labor income at key ages

Country	*Age at which the cohort begins to run lifecycle…*		*Average labor income/per capita GDP ratio*		
	Surplus	*Deficit*	*When surplus begins*	*When surplus ends*	*Maximum*
Brazil	32	53	0.96	0.86	1.44
China	27	59	0.48	0.49	0.87
India	29	60	0.81	0.75	1.11
South Africa	34	61	0.98	1.00	1.41
Korea	25	58	0.70	0.67	1.00

Source: Author's elaboration based on NTA data.

concentrated in a smaller number of adult cohorts that must simultaneously accumulate assets fast to provide for retirement needs and finance an important part of net government transfers. When the ability to generate labor income and surplus is concentrated in a fewer number of cohorts, the usual tension between taxes and aggregate savings and, therefore, between budget equilibrium and private asset accumulation strengthens (see table 3.1).

The differences in the cross-country lcd_t flows have a counterpart with stocks. The demand for life-cycle wealth can be calculated as the present value of the stream of life-cycle deficits that the control cohort will generate over their lifetime (see equation [2.24]), assuming that nondemographic factors remain constant in order to isolate the effects of the changes in the population structure. Table 3.2 presents the demand for life-cycle wealth of the control cohort corresponding to year 2000 (that is, $\tilde{a}_{\bar{\tau}} = \tilde{a}_{2000}$, which is the cohort that was born in 2000) as a proportion of that year's per capita income and assuming that the productivity of the average producer ($\tilde{y}_t$) does not change, that $\hat{\varphi}_t = \hat{\gamma}_t = 1$, and that the discount rate is 3 percent. The control cohort in the case of Korea demands life-cycle wealth for an amount that is seven times the country's per capita GDP in 2000. In the other cases, the stock of life-cycle wealth demanded is in line with the differences in the lcd_t's levels: the Chinese control cohort shows the lowest demand for life-cycle wealth while the Brazilian registers the highest, followed by South Africa. The Indian case is the closest to the Korean standard. Of course, if we took into account the growth of $\tilde{y}_t$, the present value of the cohort's demand for life-cycle wealth would increase (see equation [2.24']) but the cohort's ability to finance such demand would also increase. Indeed, if on average $\hat{\varphi} \leq \hat{\gamma}$ over the cohort's lifetime, it will be possible for the cohort to increase the current value of their consumption and, simultaneously, to improve their ability to finance their demand for life-cycle wealth by accumulating assets and, therefore, to increase their nonlabor income.

The cohort, however, does not necessarily have to finance their life-cycle wealth with their income from either assets or labor. A relevant source of life-cycle deficit financing is net government transfers. The present value of expected lifetime net public transfers constitutes the cohort's public transfer wealth (see equation [2.25]). Consequently, the demand for life-cycle

Table 3.2 The control cohort's life cycle and public transfer wealth (as % of GDP)

Country	*Lifecycle wealth*	*Public transfer wealth*
Brazil	12.0	0.1
China	4.4	n.d.
India	9.0	1.5
South Africa	10.9	1.2
Korea	7.1	1.0

Source: Author's elaboration based on UN projections and NTA data.

deficit can be financed by this type of wealth, reducing the need to generate asset income. Ceteris paribus asset's returns, the higher the control cohort's demand for life-cycle wealth, the lower their ability and/or the ability of the public sector to accumulate assets. If the social security system is excessively generous, public transfer wealth will represent a higher proportion of life-cycle wealth and the government's budget will weaken. Table 3.2 shows the amount of public transfer wealth demanded by the control cohort, assuming that the net transfer age-profiles do not change.

The case of Brazil is telling. There is a substantial discrepancy between the control cohort's demand for life-cycle wealth and the value of the public transfer wealth expected. This gap indicates that the Brazilian control cohort should accumulate a sizable stock of assets in order to finance their future life-cycle deficit with asset income. The NTA profiles, however, show that the propensity to save is not high. This suggests that there is likely to be an inconsistency in the future between the cohort's expenditures and their ability to generate the asset income required to finance their expenditures. Of course, the cohort's expenditure profile may change in the future and the cohort might become more austere but it is unclear what mechanism would be at work for this to happen. For example, the cohort might pressure the authorities to increase the amount of transfers to be received and to finance them with external debt. This would increase the net debt burden of future generations, might jeopardize the sustainability of public debt, and might also become a source of potential macroeconomic disequilibrium if the successive control cohorts repeat the pattern. In this regard, our analysis indicates that the more convenient strategy for Brazil—and countries like South Africa where the propensity to consume tends to be high—should be to promote the growth of $\tilde{y}$ while maintaining $\hat{\varphi} \leq \hat{\gamma}$, which is the stylized fact that is associated with the successful Korean standard where this fact did not impede per capita consumption from increasing at a high rate.

3.3 Varieties of Demographic Transition: The Support Ratio and Growth

The comparative examination of the evolution of the support ratio in the countries under study is a good starting point for the analysis of the

macroeconomic implications of the evidence presented above. As shown in equation 2.3, the SR is the ratio between the number of effective producers and consumers and can also be expressed as the ratio of the aggregate labor share γ_t to the overall propensity to consume φ_t Figure 3.2a shows the trajectory of the support ratio for the countries under analysis, assuming that consumption and labor income age profiles are given and that $\hat{\varphi} = \hat{\gamma} = 1$. Under these conditions, $\varphi_t = \varphi_t^{\mu}$ and $\gamma_t = \gamma_t^{\mu}$ and the variation in SR can only be attributed to changes in the structure of the population.

The trajectory of SR_t in the case of Korea, which is more advanced in the demographic transition, is bell-shaped and the projections shown in the

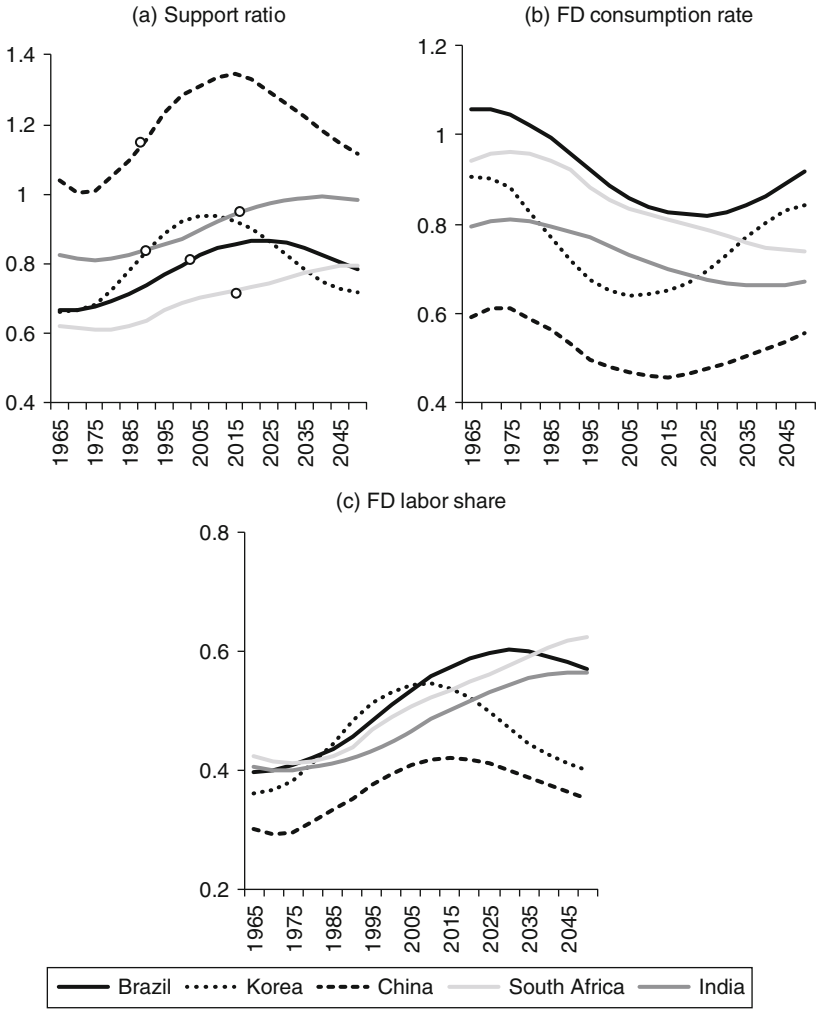

Figure 3.2 Support ratio, labor share, propensity to consume in key emerging economies

Source: Author's elaboration based on UN (2013b) and NTA data.

figure suggest that the SR of the other four countries will also follow a bell-shaped trajectory as the transition evolves. The stylized fact is, then, that the support ratio reaches a minimum, then grows, giving rise to the period of the demographic dividend and, finally, moves downward during the ageing period.

The evolution of the SRs depicted in figure 3.2 presents a number of features that are relevant to the macroeconomy. First, the support ratio grows at different speeds after reaching its minimum value. China is the only country in the sample that experienced a growth speed comparable to the Korean standard. The higher the speed at which SR increases, the stronger the FD period is. A rapid increase in SR and, hence, in per capita income may also incentivize savings, particularly in the case of those agents that plan to accumulate assets in anticipation of retirement. If this were the case, the SD would be larger. As we discuss below, the strength of this incentive also depends on public policies, particularly concerning the social security system.

Second, the dividend period starts at different years, giving rise to international asymmetries. The full circle in figure 3.2a signals the beginning of the DW period in each of the countries. As can be seen, in all cases *SR* begins to increase (causing the FD) before the window of opportunity opens, but the level of the support ratio at which the DW period begins differs markedly. China's and India's SR are higher than Korea's at the same stage of the transition while the opposite occurs in the cases of Brazil and South Africa.

Third, the SR levels differ markedly, reflecting the disparities in the age-profiles that we have commented on above. Brazil and South Africa present the lowest $\frac{\gamma_t}{\varphi_t}$ ratio and China the highest. This means that the aggregate life-cycle deficit as a percentage of GDP will be higher in Brazil and South Africa than in China to the extent that $\frac{LCD_t}{\Upsilon_t} = \varphi_t - \gamma_t$. This fact tells us that wage earners' ability to contribute to asset accumulation may differ substantially throughout the demographic transition.

Demography influences growth through different channels and generates the dividends but, as emphasized in the literature and chapter 2, the intensity and ultimate outcome of such influence depend on the interactions with the economy's structure and public policies as well.

An important structural factor to consider is the level of per capita GDP at which the FD stage begins. The evidence indicates that such level varies substantially. Point tin figure 3.3a stands for the year in which the DW period begins. The Chinese level is the lowest and both the Chinese and Brazilian per capita GDP was lower than the Korean standard at point $\overline{t}$. South Africa and India have not yet reached the DW point but they are not expected to catch up with the Korean level at $\overline{t}$ in the few years remaining until the window of opportunity opens.

The growth performance after $\overline{t}$, on the other hand, presents clear contrasts. Figure 3.3b shows the relationship between growth and the evolution of SR. The figure highlights the amazing performance of Korea over the

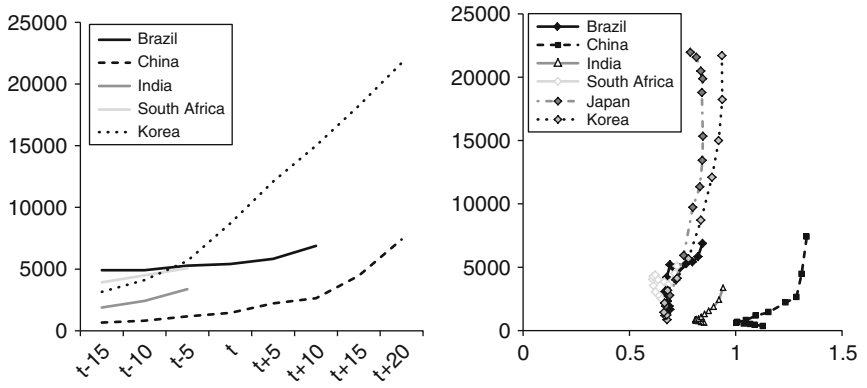

Figure 3.3 The demographic window of opportunity, SR, and per capita GDP in PPP dollars

Note: "t" is the beginning of the demographic transition.

Source: Author's elaboration with NTA, UN, and PWT data.

dividends period. In the 20 years after the DW opened, per capita GDP experienced a fourfold increase. This is a tough standard for comparison, but the Chinese post-$\overline{t}$ growth performance is, indeed, comparable. Its per capita income increases nine times in 30 years. The Chinese per capita income is systematically lower than the Korean at the same stage of the demographic transition (see figure 3.3a). Brazil's performance is discouraging: its per capita income grew at a very low rate and only increases by a factor of 1.3. Concerning the younger countries, their growth performance previous to $\overline{t}$ is dissimilar: India has been doing much better than South Africa.

These stylized facts support the hypothesis that the dividends are not automatic. To clarify the role of the factors that impinge on this, income per capita can be written as $y_t = \tilde{y}_t\, \gamma_t$, where $\tilde{y}$ stands for the average productivity of effective producers (see chapter 2). Given the effective producer's average productivity, per capita income only depends on γ_t. The FD emerges precisely because γ_t increases during the DW stage, driven by the changes in γ_t^{μ}, as explained in the previous chapter. Given that the FD has to do with changes in the composition of the labor force, to grasp the opportunity the economy has to be able to generate jobs so as to keep unemployment low and not discourage participation.

If $\tilde{y}_t$ is maintained constant, we can calculate what the trajectory of y_t would have been had demography—through γ_t^{μ}—been the only factor to cause growth. We denote this trajectory of per capita income by y_t^{FD} to emphasize that it reflects the FD. Figure 3.4 depicts the evolution of this variable for the countries under analysis. From 1965 to 2010, the evolution of y_t^{FD} is calculated with observed data and from 2011 on, it is based on projections using UN data and NTA profiles.

As can be seen, none of the four countries under study reached the maximum income per capita that could be obtained on the basis of the FD. This

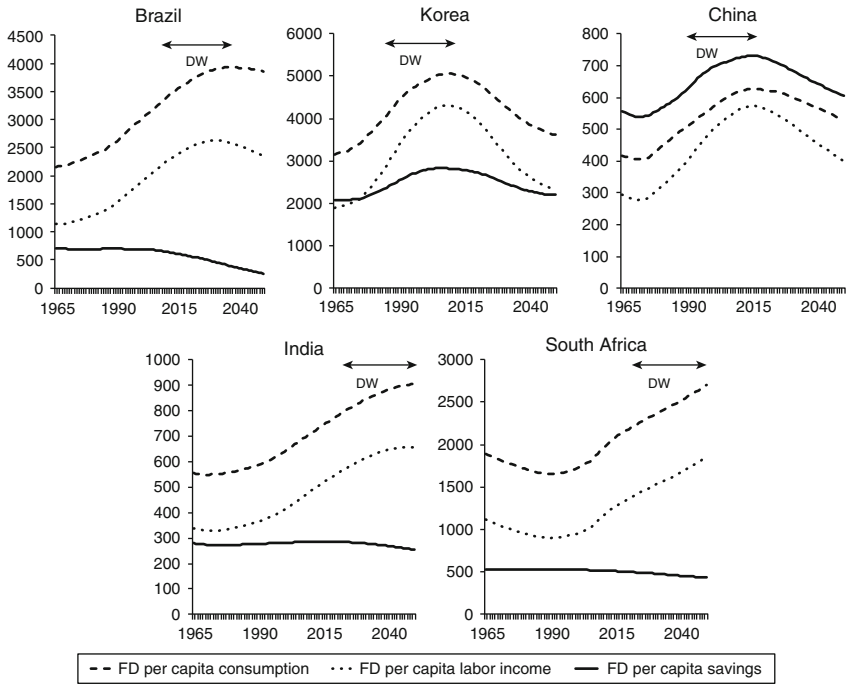

Figure 3.4 Evolution of demographically driven per capita labor income, consumption, and savings

Note: DW refers to the dating of the demographic window.

Source: Author's elaboration with NTA, UN, and PWT data.

contrasts with the case of Korea. The Korean y_t^{FD} has already peaked. The figure indicates, nonetheless, that Brazil and China are close to their peaks and to the beginning of ageing while the younger countries are much further away from the peak, which will occur after 2050.

Per capita consumption can be written as $c_t = \tilde{y}_t\ \gamma_t\ \varphi_t$. This tells us that c_t will be influenced by the changes in the population structure to the extent that γ_t and φ_t are functions of $\mu_{a,t}$. Maintaining $\tilde{y}$ constant, figure 3.4 shows the evolution of c_t^{FD}, which is the increase in per capita consumption that can be attributed to demography via φ_t^{μ} and γ_t^{μ}. These latter variables also impinge on savings per capita (s_t) to the extent that $s_t = \tilde{y}_t\ \gamma_t\ (1 - \varphi_t)$. Figure 3.4 also depicts the trajectory of s_t^{FD} to illustrate one of the most beneficial effects of the FD: as γ_t goes up driven by γ_t^{μ}, it is possible to increase simultaneously both per capita savings and per capita consumption. It also shows the other side of the coin. As the ageing stage begins and demographic factors start to exert a downward pressure on per capita income, both consumption and savings goes down together. As the projection shows, Brazil and China are approaching this stage while India and South Africa have a long way to go enjoying the FD.

The contribution of demography to growth can also operate through $\tilde{y}$. This stems from the fact that $\tilde{y}$ is a function of the stock of physical and human

capital per capita, and total factor productivity and demography impinges on these factors. We focus on asset accumulation and savings, which are the elements emphasized in the SD approach and also influence the current account, foreign assets, and, therefore, capital movements. The importance of the SD is illustrated by the fact that only a fraction of Korea's or China's impressive performance can be accounted for by γ_t^{μ} movements.

In order to assess the effects on welfare, we can consider the evolution of income per effective consumer N_t rather than per capita GDP and write: $\frac{Y_t}{N_t} = \tilde{y}_t \frac{\gamma_t}{\varphi_t}$. This tells us that the welfare of the average effective consumer increases with labor productivity and γ_t and falls with φ_t.This is, precisely, what the support ratio—defined as $\frac{\gamma_t}{\varphi_t}$—tries to detect. Note, however, that from the macroeconomic point of view it is not neutral whether it is γ_t or φ_t that causes SR to increase. SR may increase during the bonus stage because of a fall in φ_t as a consequence of changes in $\mu_{a,t}$ that reduce N_t, the number of average effective consumers. However, per capita GDP does not increase as a consequence of this effect. On the other hand, if it is γ_t that causes $\frac{Y_t}{N_t}$ to grow, there will be an accompanying increase in per capita GDP. Figure 3.2 above shows that both φ_t and γ_t contribute to generating the FD. The projections in the figure also show that the positive effects reverse during the ageing stage. This is why it is important to assess the extent to which the benefits of the FD contribute to strengthening savings and the nonreversible SD. To this end it is crucial to monitor the evolution of φ_t when the window of opportunity is open.

In chapter 2, we decomposed the trajectory of the economy's propensity to consume into two components: φ_t^{μ}, which is driven by changes in the population's structure and $\hat{\varphi}_t$ that varies over time because of factors that are not related to demography and that cause the rate of growth of the cohorts' consumption as a whole to grow faster $(\hat{\varphi}_t > 1)$ or slower $(\hat{\varphi}_t < 1)$ than per capita income (g). Figure 3.5 shows the decomposition of the observed evolution of φ_t in these two factors.

The variable φ_t^{μ} that reflects the influence of the demographic transition has been decreasing in all the countries under study. According to the projections, it will continue to fall in the younger economies (India and South Africa) but will begin to increase in the near future in China and Brazil as ageing approaches (see figure 3.5). The evolution of the overall propensity to consume, however, has not necessarily followed the trajectory of φ_t^{μ}. In effect, in China and India, φ_t^{μ} and φ_t move in tandem and, as a consequence, the propensity to consume has been falling. In contrast, the Brazilian φ_t remained somewhat constant for a period and increased afterward while it increased substantially in South Africa and, consequently, $\hat{\varphi}_t$ has been greater than one for a long period (see figure 3.5). This implies that China and India have been able to take advantage of the demographic-driven fall in the propensity to consume to reinforce savings and capital accumulation. The

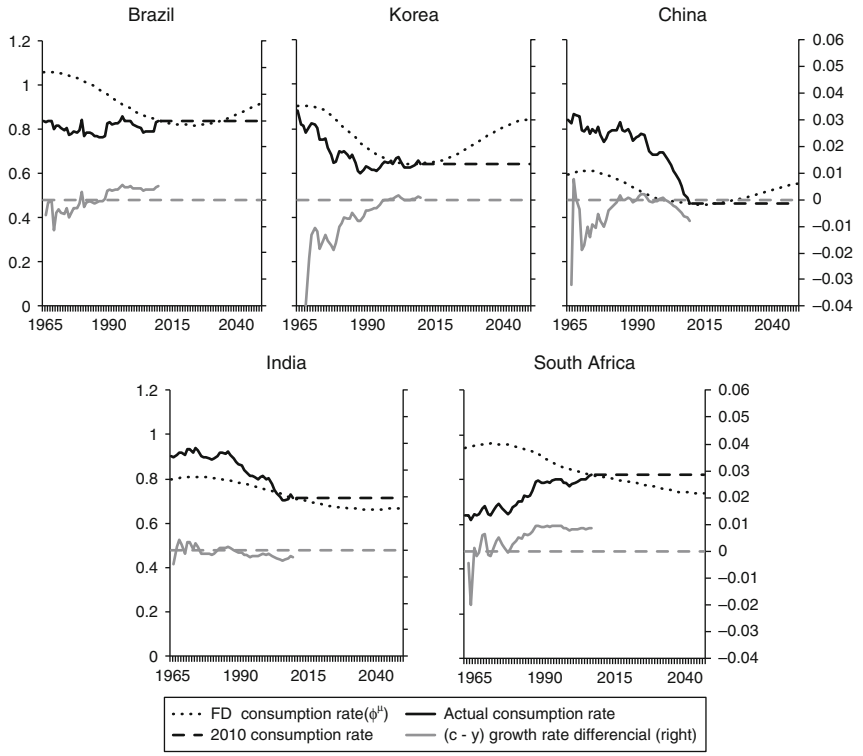

Figure 3.5 Per capita consumption rate and the effects of demographic factors
Source: Author's elaboration.

trajectory of the propensity to consume in these countries is more in line with the Korean standard. As can be seen in figure 3.5, the propensity to consume fell in Korea after the window of opportunity opened. Note, nonetheless, that a falling propensity to consume is perfectly compatible with substantial increases in per capita consumption as was, in fact, the case in China, India, and Korea. And this is particularly so during the beneficial stage of the FD in which γ_t is increasing, pushing per capita GDP upward. Indeed, in Brazil, where the extra resources created by the FD were not channeled to increasing savings and securing the SD, per capita consumption grew much less than in the case of the Korean standard. Indeed, the cases of Korea and China suggest that if the increase in savings is sufficiently strong, it may generate a big-push effect, helping the economy to avoid a low-growth trap. Brazil's low-growth, high φ_t combination during the DW period, in turn, seems to support the hypothesis that the SD is not automatic.

The projections in figure 3.5 show that φ_t^{μ} will trend upward as the population ages. Under such circumstances, if public policies sought to maintain φ_t constant so as to preserve the propensity to save, $\hat{\varphi}_t$ would have to be lower than one and, consequently, per capita consumption would grow less

than per capita income. Maintaining φ_t constant would not be necessary, however, if the economy accumulated enough assets in the past to finance consumption. In addition, the capital/labor ratio would endogenously tend to increase as ageing would induce a fall in the rate of growth of the number of effective producers.

3.4 The Aggregate Life-cycle Deficit, the Primary Fiscal Deficit, and the Current Account

The expected path of the aggregate life-cycle deficit has a direct bearing on the trajectory of macroeconomic variables—such as the amount of savings, the government's borrowing needs, and the current account deficit—that the authorities routinely scrutinize in order to assess the probable evolution of the short- to medium-run macroeconomic scenario and prevent the emergence of disequilibria.

When the authorities detect inconsistencies associated with demographic factors, however, the trajectories may be difficult to correct. For one thing, demographic changes are sluggish, generate long-lasting effects, and may involve the decisions of large segments of the population. For another, even if the origins and consequences of potential inconsistencies were known, the implementation of corrective policies might be difficult in a context in which pervasive financial market failures and political economy constraints limit the availability of policy instruments and the authorities' ability to implement reforms. Ageing is a paradigmatic example of a long-lasting demographic process that is difficult to manage from the financial, fiscal, and political economy points of view and that may give rise to persistent inconsistencies, such as unsustainable trajectories for the public debt, excessive foreign indebtedness, or low-growth traps associated with reduced investment rates.

In this section we discuss a number of exercises based on evidence and projections corresponding to the emerging countries under analysis and try to understand the demographic circumstances under which these kinds of phenomena may occur. Following the methodological framework of chapter 2, we will adopt the perspective of a policy maker that considers a finite horizon of duration Z^g. As was demonstrated in the previous chapter, the evolution of aggregate variables, such as the LCD over a finite policy horizon, results from decisions that involve the plans of cohorts of different ages and covers varying portions of the time horizons that are relevant to those cohorts (see equation [2.21]). In order to detect potential sources of long-lasting inconsistencies and growth traps, policy makers frequently rely on flow-flow (e.g., current account/GDP; fiscal deficit/GDP; savings/GDP) and stock-flow indicators (debt sustainability measured as public debt/GDP; and external debt/exports). We will try to show empirically the linkages between a number of these indicators and demography, on the one hand, and, on the other, the way in which the requirements of demography and the macroeconomy

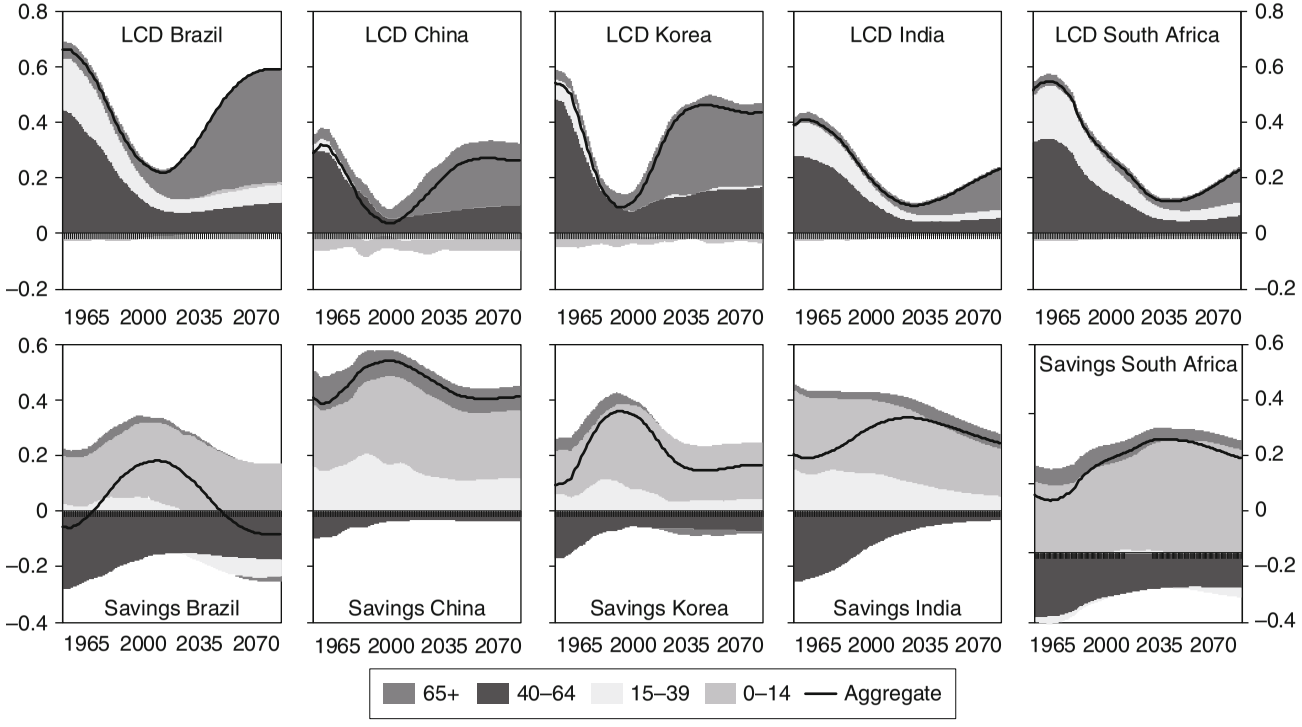

Figure 3.6 The LCD_t/GDP_t and S_t/GDP_t ratios over the demographic transition

Source: Author's elaboration based on NTA, UN, and PWT data.

can give rise to policy dilemmas and redistributions between cohorts. In what follows, we assume that only demographic forces are at work. Hence, unless stated otherwise, we assume $\hat{\varphi}_t = \hat{\gamma}_t = 1$ and $\tilde{y}_t$ constant and that the change in the variables originates exclusively in changes in the population structure $\mu_{a,t}$ that impinge on LCD, savings, and per capita income.

Figure 3.6 shows the aggregate LCD/GDP and savings/GDP ratios. We classified all of the cohorts into four groups—the young (0–14), young adults (15–39), older adults (40–64) and the elderly (65+)—and show the portion of the change in the ratios that can be attributed to each of the age groups. Up to 2010 the ratio is based on observed values and, afterward, on projections based on United Nations and Penn-Table data.

The figure clearly shows that transformations in the population structure can induce substantial and long-lasting changes in the LCD/GDP and savings/GDP ratios throughout the demographic transition. The following points concerning these projection exercises are worth highlighting.

1. The LCD/GDP ratio falls substantially during the DW period and then increases as the ageing stage begins; the transformations in the ratio are led by the young and adult young during the DW stage and by the elderly as ageing sets in.
2. The savings rate and the LCD/GDP ratio move in tandem and in opposite directions. In line with our previous analysis of the profiles, the countries' savings ratios differ substantially; they are much higher in the Asian countries of the sample, resembling the Korean experience, than in Brazil—where it is very low—and South Africa.
3. The evidence indicates that the cohort's behavior and, hence, demography is not neutral to these results. Confirming the hypothesis on the importance of prime savers, the older adult cohorts contribute the bulk of savings in all cases. In the high-savings Asian countries, in turn, young adults significantly contribute to savings but this is not the case in Brazil and South Africa. In the latter country, the elevated unemployment rate among younger cohorts exerts downward pressure on disposable income and thus, savings. Brazil's reduced overall savings rate, in turn, has to do with this weak young adult's savings, probably originating in an excessive tax burden (see figure 3.7). The elderly add to savings in all countries. The contribution is substantial in China, probably as a consequence of the underdeveloped social security system.
4. The distribution of an asset's ownership and income among cohorts matter to aggregate savings. The evidence reviewed reveals that the elderly simultaneously account for both a significant portion of the aggregate LCD and of savings. This means that they save on the basis of asset income and/or transfers in excess of their consumption needs. The fact that a share of the elderly continues to save suggests that the ability of an economy to maintain income above consumption for cohorts that go beyond the working age population may play a key role in the ageing stage.

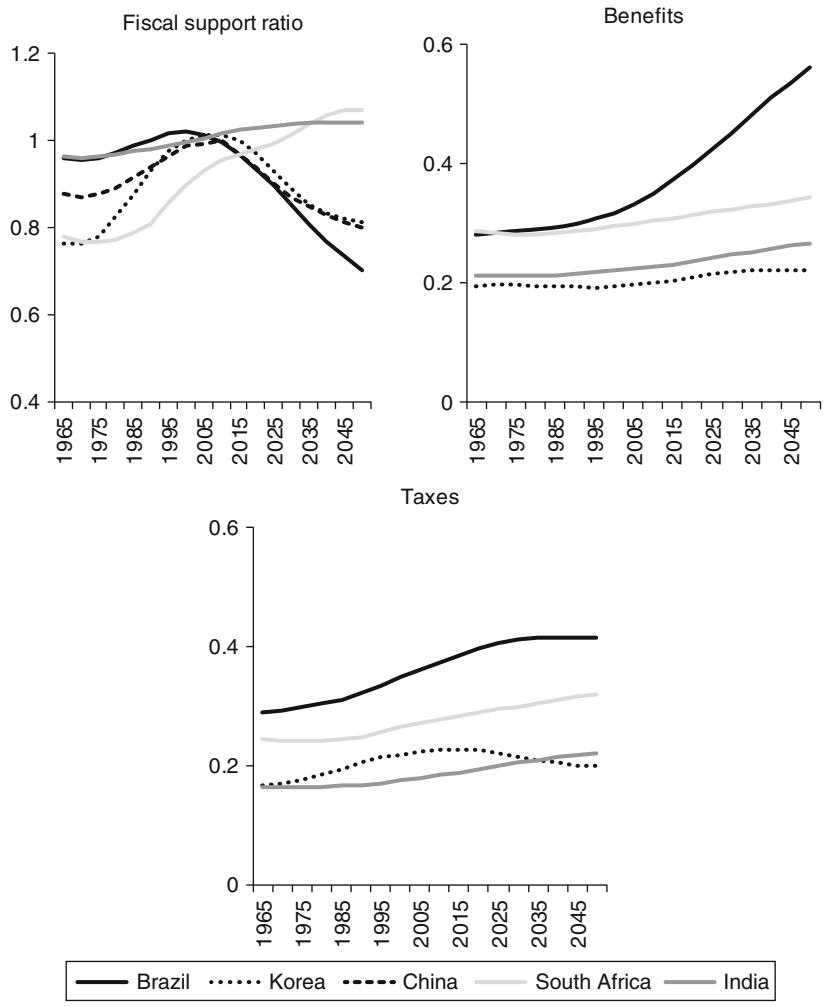

Figure 3.7 Fiscal support ratio, benefits, and taxes (as % of GDP, unless otherwise specified)

Source: Author's elaboration based on NTA, PWT, and UN data.

The aggregate LCD is also a primary determinant of the evolution of the government's primary deficit because the changes in the structure of the population have a bearing on both the demand for public transfers and the size of the cohorts that usually support the larger tax burden.

Figure 3.7 shows the fiscal support ratio, which is the ratio of public transfers received to transfers made by the cohorts (see equation [2.7]). The observed data and projections, which assume that demography is the only factor at work, indicate that FSR tends to improve during the DW period and to worsen afterward. This effect is basically explained by the upward

movement of tax collection as the number of effective producers increases during the DW period and of the increase in benefits with stagnant tax collection in the ageing stage.

A more detailed comparison of the Brazilian case with the Korean standard helps illustrate the way in which demographic changes can give rise to potentially unsustainable trajectories or can increase the probability that the economy gets caught in low-growth traps. Figure 3.7 reveals that the benefits granted by the Brazilian government have been rising and are expected to continue rising if public policies do not change as the ageing process advances. Indeed, one key difference between the Brazilian experience and the Asian model is the importance of the social security system. As is mentioned in Brito and Carvalho (this volume), the per capita consumption of the elderly is relatively higher in Brazil than in advanced economies. This reflects a political economy equilibrium in which the ability of some groups to obtain pension benefits has been exceedingly successful. Social security expenditures represent almost 10 percent of GDP in Brazil, unlike China, whose social security is underdeveloped. In Asia, public transfers to the elderly tend to be lower.

These contrasting facts suggest that a given demographics may lead to very different results depending on the configuration of taxes and expenditures. Figure 3.8, which exhibits the cohorts' contribution to the primary deficit in Brazil and Korea, provides further evidence in this regard.

In both cases the projections confirm that the demographic transition is expected to transform the structure of government transfers. More specifically, transfers to the elderly are expected to increase while the opposite is expected with transfers to the young. But the rise in the former is much

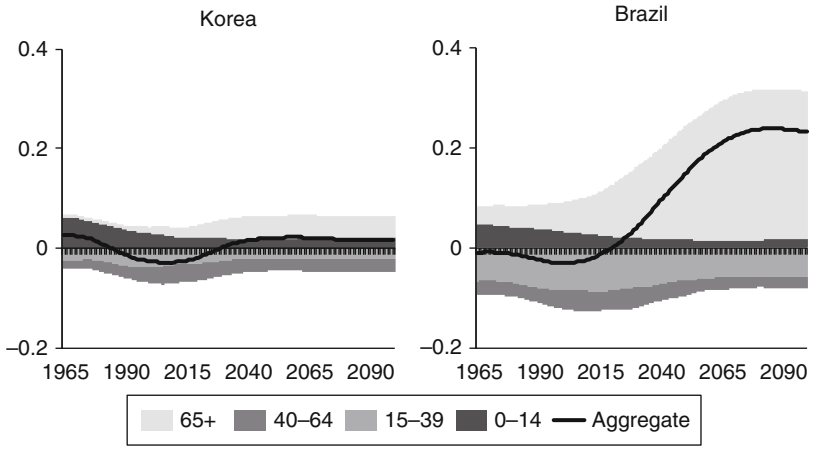

Figure 3.8 Contribution of different cohort groups to total primary deficit (as % of GDP)

Source: Author's elaboration based on UN, NTA and PWT data.

more marked in the case of Brazil, in line with the evidence in figure 3.7. Given the higher level of Brazilian transfers, it comes as no surprise that the net contribution of the adult population to finance the government is much more elevated in Brazil. Yet, compared to Korea, not only is the burden of financing the public sector heavier in Brazil but its structure of taxpayers also shows a bias against the group of youngest adults.

The flaws in the Brazilian transfer structure can easily create a low-growth trap. First, the bias of the transfer burden against the group of younger adults harms savings. As we have seen, this group's propensity to save is much higher in the Asian countries of our sample. Second, the accumulation of human capital when the window of opportunity is open may be low because, as Brito and Carvalho (this volume) highlight, social programs for the elderly dominate public transfers, while children's well-being depends largely on individual household efforts. Third, the increase in government transfers can easily result in an unsustainable fiscal position. So, even though the Brazilian tax burden grew in the last decade, reinforcing the effect of the increase in the number of effective taxpayers associated with demographics, the fiscal support ratio is expected to deteriorate, as figure 3.7a shows.

3.5 The Current Account and Life-cycle Wealth

The changes in the aggregate LCD impinge on the structure of deficit/surpluses at the macroeconomic level and, therefore, transform the agent's balance sheet by creating and destroying assets and liabilities. The resulting trajectory of the current account, investment, and the demand for life-cycle wealth—that compete with the accumulation of both productive capital and foreign assets—may be a source of macroeconomic inconsistencies. To complete our analysis, we will discuss evidence about two dimensions that we deem particularly relevant to emerging countries in this regard: the effects of demographic changes on the current account and the role of the demand for life-cycle wealth.

The current account is the difference between national savings and investment. Consequently, to the extent that variations in the LCD/GDP ratio impinge on savings it also influences the current account. In order to illustrate the links between demography and the current account, we conducted two exercises. In the first the investment rate remains fixed at the average corresponding to the 2000–10 period. This is compatible with the fact that no precise relationship between the investment rate and demography has been found in the applied literature (Speller et al., 2011). In the second exercise, we assumed a Feldstein-Horioka-like world in which savings and investment are correlated because financial market failures offer little room for the existing current account/GDP ratio to expand (Feldstein and Horioka, 1980). For the sake of brevity we will only comment on the two cases that offer the sharpest contrast: Brazil and China.

In the case of Brazil (see figures 3.9a and 3.9b), as the demographic transition evolves, weak savings rates accompanied by a deteriorating fiscal support ratio produce a tight trade-off between investment and the current account. In effect, figure 3.9b indicates that the investment rate can only be maintained at the 2000s level at the cost of a growing current account deficit that is potentially unstable. In the Feldstein-Horioka scenario (figure 3.9a), because of the inability to expand the current account disequilibrium and access international financing, the investment rate falls systematically. This indicates that there is no guarantee that asset accumulation will accelerate as a consequence of favorable demographics. Although Brazil is undergoing the DW stage, growth is far from ensured, and to avoid getting caught in a low-growth trap, the country should introduce reforms to create more fiscal space and strengthen savings. Indeed, it has been argued that the country is probably already caught in a middle-income trap.

Figures 3.9c and 3.9d present the exercise for China. The austere level of the aggregate life-cycle deficit and the strong trajectory of national savings

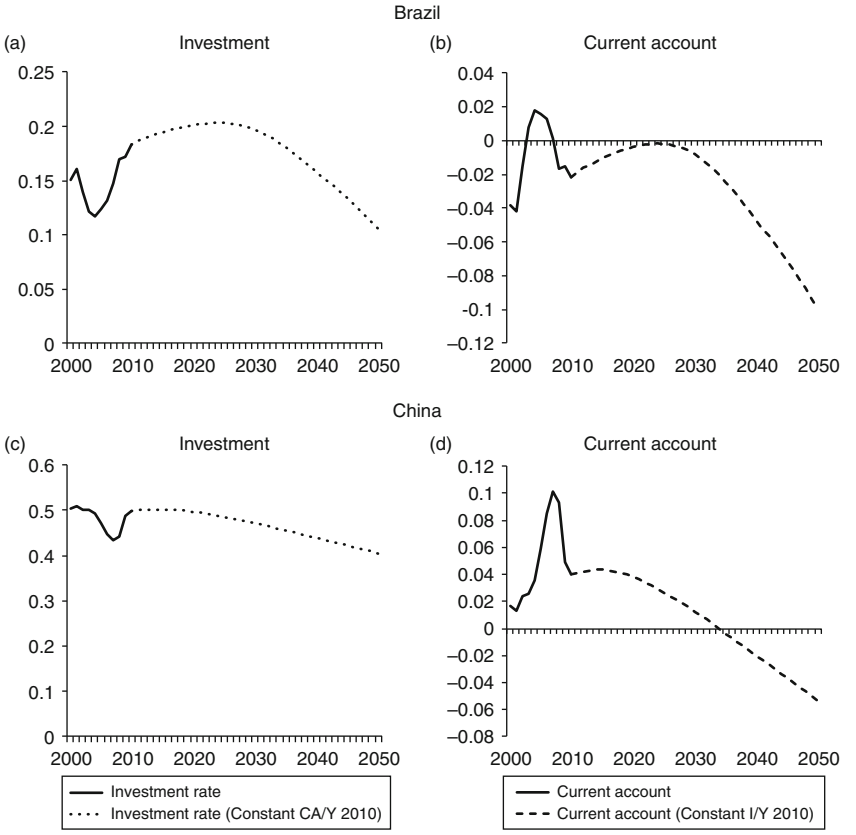

Figure 3.9 Demography, the current account, and investment (as % of GDP)

Source: Author's elaboration with NTA, Penn-Table, and UN data.

result in the accumulation of physical assets—in the Feldstein-Horioka world, figure 3.9d—or a lengthy current account surplus if the investment rate is maintained at the current level (figure 3.9c). The exercise indicates, nonetheless, that the investment rate and/or the current account surplus will ultimately begin to fall hand-in-hand with the fall in the national savings rate that will occur as ageing deepens. This means, in any case, if China maintains the low level of its aggregate LCD, the country will continue to feed global imbalances in the next two decades and will accumulate a huge stock of foreign assets with deleterious consequences for the stability of the global financial system. In a sense, China risks getting caught in a high-growth vicious circle: given the low propensity to consume, to create demand the country must increase the demand for either its exports, enlarging the current account, or productive investment, hence increasing the probability that resources are wasted on low-return projects. If the propensity to consume and, thus, the aggregate life-cycle deficit/GDP ratio does not augment, the strategy will ultimately be self-defeating because it will be increasingly more difficult to find profitable investments either domestically or abroad.

The trajectory projected for the LCD flows determine the aggregate demand for the stock of life-cycle wealth, and the level of this demand, in turn, has a bearing on asset accumulation because the stock of life-cycle wealth demanded absorbs funds that could be allocated to finance the stock of physical capital or foreign assets. Based on our previous projections for the aggregate LCD, we calculated the present value of the demand for life-cycle wealth—as defined in equation 2.32—taking 2010 as year $\overline{t}$, a 3 percent discount rate, and maintaining the assumption that demography is the only source of change in the variables involved. We considered three alternative policy time-horizons. Table 3.3 shows the results expressed as a percentage of 2010 GDP.

The Indian, South African, and Brazilian demands for life-cycle wealth for the coming decades are comparable. However, while a high demand for life-cycle wealth is consistent with the fact that the former two countries are young, the Brazilian demand is not in line with the stage of the demographic transition that the economy is undergoing. The Chinese demand, on the other hand, is more consistent with the Korean standard, although its demand is lower, reflecting the lower level of the Chinese support ratio. This suggests that the Brazilian cohorts that will be alive in the next two decades will likely accumulate a reduced stock of assets and, consequently, the cohorts that will be alive beyond the policy horizon period will inherit a relatively reduced amount of physical and foreign assets. The case of China is the opposite. There are two additional points to consider, however. First, China is poorer than Brazil and, second, Brazil is a natural-resource-rich country and one would expect natural-resource-rich countries to finance a larger part of the LCD based on rents from such resources. This establishes a connection between income distribution, natural resource endowment, and the analysis of the macroeconomic consequences of demographic changes that calls for more research.

Table 3.3 The macroeconomic life-cycle wealth/GDP ratio (2010)

Country	*Lifecycle wealth Policy horizon*			*Public transfer wealth Policy horizon*		
	10 years	*20 years*	*40 years*	*10 years*	*20 years*	*40 years*
Brazil	2.4	4.9	8.1	–0.1	0.0	0.9
China	0.4	0.7	1.4	n.d.	n.d.	n.d.
India	2.3	4.0	6.6	0.4	0.8	1.4
South Africa	2.9	5.0	7.8	0.2	0.4	0.7
Korea	1.0	1.8	3.1	–0.2	–0.3	–0.2

Source: Author's elaboration based on NTA data.

Table 3.3 reveals that the proportion of the demand for life-cycle wealth that is expected to be financed with public transfer wealth is higher in India than in other countries, suggesting that this country could face a lack of fiscal space in the future. The stock of public transfer wealth in Brazil is low and is consistent with the fact that the tax burden is elevated. Thanks to high tax collection, the generosity of the social security system does not generate a fiscal sustainability problem. However, the high tax burden is a drag on growth and savings, as discussed above.

This completes the analysis of the problems that we have selected to illustrate the importance of the linkages between demography and the macroeconomy in emerging countries. By way of conclusion, the following points deserve highlighting.

First, concerning growth, we have shown evidence that highlights the empirical relevance of the dividends but that also suggests that the dividends are not automatic. To reap the benefits of the FD it is crucial to motivate the participation in the labor force and to combat unemployment; otherwise, a low labor share may depress national savings because of the increase in the average per capita life-cycle deficit. To take advantage of the SD it is crucial to preserve savings. But we have shown, nonetheless, that this does not necessarily mean sacrificing consumption. The Asian experience indicates that an increasing propensity to save is compatible with a rapid increase in per capita consumption, particularly in the growth-friendly demographic stage that precedes ageing.

Second, the stock-flow dynamics associated with the demographic transition matters to growth sustainability and traps. We have shown that under certain conditions, some trajectories of the life-cycle deficit and, hence, of the demand for life-cycle wealth can either be unsustainable or can drive the economy into growth traps.

An excessive demand for life-cycle wealth and/or generous social security systems can easily weaken asset accumulation and lead to unsustainable public debt/GDP, external debt/GDP trajectories or a low savings/low growth equilibrium. Brazil and South Africa face the higher risk of falling into a growth trap. The evidence reviewed suggests that these countries might fall into a middle-income trap even during the FD stage if the demographic

effect is not leveraged by a reasonable propensity to save. Brazilian society, in particular, is demanding a level of life-cycle wealth that is not consistent with the current and projected accumulation of capital, foreign assets, and transfer wealth.

China faces a rather different risk: that of getting trapped in a high-growth vicious circle originating in a tendency to generate excess savings, which, in turn, is associated with a low average per capita life-cycle deficit. This case indicates that an exceedingly low demand for life-cycle wealth can also be a source of macroeconomic stability if it leads to a situation in which the savings rate is so high that the economy is condemned to maintain a high investment ratio and/or strong exports in order to sustain the growth momentum and create enough jobs for a growing working-age population. In addition, if the emerging economy suffering from these types of difficulties is large and systemically important—as in the case of China—it could give rise to global imbalances or currency wars.

We consider, in sum, that the evidence that we have presented provides support for two hypotheses. The first is that demographic factors can significantly influence the domestic macroeconomic dynamics as well as the relationships with the rest of the world via the effects on the current account and the accumulation of foreign assets. The second is that the interactions between demography and the macroeconomy can give rise to long-lasting imbalances, such as unsustainable current account or public deficits, and growth traps associated with a low savings rate. As we argued in chapter 1, although demography can be associated with macroeconomic challenges that can be difficult to manage, it can also generate opportunities. In addition to the dividends, the existing global demographic asymmetries create mutual advantages for trading financial assets that may help emerging countries to foster asset accumulation and, hence, growth.

Note

1. The values of the age profiles that we present here may differ from NTA estimates. This is because we have scaled the age profiles to match the aggregate, Penn-World-Table values of consumption and labor income for the year 2010, while NTA has country-specific base years (1996 for Brazil, 2002 for China, 2004 for India, 2005 for South Africa, and 2000 for Korea).

CHAPTER 4

Demography, Economic Growth, and Capital Flows

Richard N. Cooper

4.1 Introduction

We are living through a demographic revolution. Longevity continues to increase throughout most of the world, at a rate of more than two years a decade. Birth rates continue to fall throughout most of the world, from their global peak in the mid-1960s, but with large differences from country to country. For both quite different reasons, the world population is ageing rapidly, with the median age (half older, half younger) rising from 29 years in 2010 to a projected 36 years in 2040. Thus while the world's population will grow by an additional 2 billion between 2010 and 2040, its geographical and age structure will change dramatically. Some countries, most notably Russia, Japan, and Germany, are already experiencing a decline in total population, despite increasing longevity. Many others, especially in Europe and East Asia, can be expected to grow only slowly. Some of the poorest countries, particularly in sub-Saharan Africa but also including Afghanistan, Yemen, and Guatemala, continue to grow rapidly in population. Among the rich countries, the United States stands out as experiencing more rapid population growth; and among the emerging markets, China stands out as ageing with exceptional rapidity.

What are the possible implications of these changes for economic growth, especially in developing countries? The linkage between demography and growth goes back at least two centuries to Thomas Malthus. Around 1800, Malthus claimed that growth in standards of living could never be more than temporary, since human fecundity would lead to procreation and survival such that the standard of living would be again driven down to bare subsistence, at which deaths would equal births.

Malthus could hardly have chosen a worse time to put forward his pessimistic hypothesis, since the following century, in sharp contrast to its

predecessors, experienced a huge increase in income per capita, first in Britain and then in western Europe and North America, by a factor of three in Europe between 1820 and 1913, according to Maddison (2001, p. 264). During the twentieth century this process of growth spread to most other parts of the world, and the twenty-first century may see the process become universal.

Where did Malthus go wrong? Arithmetically he went wrong by underestimating the rate of growth of labor productivity, which managed to stay ahead of the rate of population growth. The latter was indeed high, as foreseen by Malthus; Britain's population more than doubled between 1820 and 1913, from 21 to 46 million. But productivity growth was even higher, permitting a continuing rise in per capita output and income, hence in average standard of living. The growth in productivity in turn was due to a very large accumulation of capital (stimulating Karl Marx's major work by the same title), combined with technical and organizational change. In the world of Malthus (and his friend David Ricardo), a large growth in the ratio of capital to labor would have depressed the return to capital and been self-limiting. But the decline in return to capital was only mild because of improvements in technology (including both new products and improved processes of production) and in organization for the production and distribution of goods. Incomes rose, creating demand for the additional products thus created.

As incomes rose, birth rates eventually fell, defying Malthus' prediction. So while European development was initially accompanied by large increases in population, such growth gradually declined and in a few cases actually became negative, while output continued to grow.

Galor (2011) has integrated Malthusian population theory with modern growth theory. He emphasizes especially the desire for education in reducing natality. New technology often required skills to function efficiently, raising the demand for education. The need for education increased the cost of large families, producing a smaller desired number of children. This effect was reenforced by a rise in wages for women, which in turn increased the opportunity cost of having children. After examining the evidence, Gabor minimizes the importance of several other hypotheses for the sharp drop in natality that began in Europe in the late nineteenth century.

What of the future? This chapter will address the implications of projected demographic changes in the coming decades on economic growth under four headings, reflecting four different channels through which demographic changes might influence growth: labor force, savings, investment, and public sector spending.

4.2 Labor Force

Output per capita for any country is influenced by what fraction of the population is working and by how productive workers are. The working population in turn is influenced by the age structure of the population, the social role of women, years typically spent in school, and the conventional age of retirement from the labor force. By convention, the working age is taken to

be aged 15–64, presuming people enter the labor force at age 15 and leave it at age 65. This corresponds roughly to practice in many countries. But with higher incomes, young people increasingly stay in school beyond age 14. And with better health and greater longevity, along with less physical exertion in the workplace, many people are able to work beyond age 64, although that is not yet widely practiced.

The ratio of youth plus aged to working age population [(0–14)+(65+)/(15–64)] is often called the dependency ratio, meaning that those of working age must support a larger population including the young and the old. It is also possible to distinguish between young dependents and old dependents, as will be done below. As birth rates drop, the number of children declines relative to the number of adults. If birth rates drop rapidly enough, before the working-age population moves into old age, the total dependency ratio will drop and the country experiences a "demographic dividend," meaning that the ratio of the working-age population to the total population rises. This process creates the potential for a rise in output per capita for a given labor force. In addition, participation rates (those who could work who are actually working) could rise, especially women who under the circumstances need to spend less time caring for children. Both of these factors lead to a rise in per capita output (and income). The age profile of a country is often depicted as a pyramid, with young people at the bottom and the oldest people at the top. As birth rates decline, the pyramid eventually becomes an oval, with a bulge of working-age people in the middle. As longevity increases and the working-age population moves into retirement, the oval eventually comes to resemble a rectangle.

How much difference might such a demographic dividend make? Bloom et al. (2010) have calculated the impact of projected demographic change to 2040 on the world labor force, assuming that age and gender labor force participation rates of 2000 continue to apply in 2040. On this assumption, the world's labor force will rise by 2.1 percentage points of the world's population, from 46.5 percent in 2000 to 48.6 percent in 2040. They further calculate that if income per worker grows at the same rate it did in the period 1960–2000, per capita growth of the world economy (on the basis of 97 countries for which income data are available) will remain unchanged at 1.9 percent. This apparent constancy, however, conceals an important compositional effect. Rich countries (members of the OECD before its recent enlargements) experienced their demographic dividend during the earlier period, growing at 2.8 percent a year. In the period 2000–40, on the assumptions made regarding growth per worker and labor-force participation rates, they will grow at only 2.1 percent a year. Many developing countries, in contrast, will experience their demographic dividend in the coming period, and therefore can expect to see an increase in growth rates.

Dependency ratios can be expected to decline significantly in many developing countries in the coming years. Basically, all countries are ageing, but the decline in natality will outweigh the increase in the aged in most developing countries, while the opposite is true in the rich countries. In Latin America

and the Caribbean, for instance, the dependency ratio (defined to include persons over 60) reached its peak of 97 dependents per 100 persons of working age in 1965 and declined steadily until it reaches 60 around 2020 before rising again as populations age. So much of the demographic dividend in Latin America has already been experienced, with less than a decade to go (Saad in Cotlier, 2011, pp. 59, 63, 67, and 73). Crudely, the decline in dependency ratio has added nearly 0.6 percentage points to the economic growth of Latin America over the period 1965–2005. Of course there is much country-by-country variation around this overall pattern, with Cuba (1991) and Brazil (2007) already having passed their low dependency points and Guatemala not expected to do so until after 2050. China, for instance, enjoyed a major demographic bonus over the past three decades, adding about 0.4 percent annually to China's growth rate before allowing for increases in age-specific labor force participation; this came to an end in 2012.

In addition to raising the number of working-age adults relative to young and old dependents, demographic change may lead to some changes in behavior. Concretely, women with fewer children may enter the labor force on a full- or part-time basis. Bloom et al. (2009) estimate that on average an additional birth reduces a woman's labor supply by almost two years during her reproductive life, with of course considerable variation across countries and some variation by the age of the mother. Those near traditional retirement age may stay longer in the labor force insofar as they are living longer, healthier lives; and the physical burdens of many jobs decline. Fewer children may permit children to stay longer in school, reducing the labor force on that account, but improving its quality on completion of school. Experience in rich countries suggests that children do spend more time in school (and hence join the labor force at a later age). In general, however, workers have not delayed their retirements. This is partly because in many countries retirement is obligatory to qualify for the national pension, and the pension is sometimes sufficiently generous (after allowance for taxation) that working for pay no longer seems worthwhile. For example, in Germany (where the pension is based on life-time income, with a "replacement ratio" of 71 percent) men in the late 1980s retired on average at age 58.5, despite a statutory retirement age of 65, because it was actuarily attractive to do so, and less than 2 percent of men worked beyond age 70 (Boersch-Supan in Poterba, 1994, p.228).Germany has more recently altered its pension scheme to discourage such early retirement; and average retirement age has risen to 60.

These demographic changes merely create potential. "Working" implies productive activity. The society and economy must be capable of absorbing the potential additional workers productively. An alternative is unemployment or low-productivity partial employment, such as occurs in many poor countries today. Effective male participation rates vary greatly from country to country, and female participation rates by even more. But output per capita will show some more rapid growth for a while simply as a result of a decline in birth rates, because income stays on its previous trajectory and population grows more slowly.

4.3 Saving

Under the life-cycle hypothesis of income and consumption, individuals and families attempt to smooth their consumption over their lives even while earnings are concentrated during their working lives. This typically implies dissaving while people are young, as children or even as young adults, and in old age, offset by net saving during the years of employment. This hypothesis implies what may be called the plain vanilla effect of the demographic dividend on saving: aggregate saving should rise as the ratio of workers to dependents rises. If this incremental saving is used for productive investment, it represents an additional channel by which demographic change may affect the rate of economic growth.

A word needs to be said about saving, since several different concepts exist, each valid for certain purposes. Saving in the system of national income accounts is defined as the difference between personal disposable income (income after taxes) and household expenditure, augmented by any saving in the business and government sectors of the economy. From a household point of view, saving is money that is put aside and available for future use, including any capital gains on investments (corrected for inflation), including housing, which do not enter into national income. From an economist's point of view, saving involves deferring current consumption for the sake of higher future income for one's family, including children. Thus educational expenditures are considered "consumption" in the national accounts, but often they are the best investment a family can make in the future of its children. Some preventive health expenditures fall into the same category.

With longevity increasing almost everywhere, and with retirement ages changing more slowly or not at all, one would expect saving to increase during working years to provide sustenance for longer periods of retirement. Bloom et al. (2003b, p. 330) have indeed found increased aggregate saving in an analysis of 68 countries over the period 1960–94, with an average increase in longevity of ten years, increasing the aggregate savings rate by 4.5 percentage points. Of course, older residents may eventually draw on their savings, so this effect might not be present in a stationary population; but it is observable during the long transition while the population is still ageing.

There is some empirical support for the life-cycle hypothesis, but it is much looser than the theory would suggest, and in some respects evidence contradicts the hypothesis. Testing it seriously would require data on large numbers of families throughout their life-cycle. Such information in general does not exist. Rather, countries carry out income and expenditure surveys of households, noting their differing characteristics, at a particular moment in time, producing a cross-section of information. Such surveys may be repeated over time, although not typically with the same respondents. Not surprisingly, such surveys have been done for a longer period of time in the rich countries, and most of the analysis of households to date is available for the rich countries (Harris, 2006; Poterba, 1994).

With a rapidly changing economic environment, for example brought about through steady economic growth, each age cohort will have experienced different economic circumstances; for example, young adults having started with higher incomes and different consumption patterns than their parents and grandparents. It is therefore not possible to infer life-cycle behavior from cross-section data on family incomes, expenditures, and assets, since each age cohort will have different experiences and expectations about the future. Nonetheless, it is the information we have, and we can infer some things about age-related income and expenditure patterns.

Here are some generalizations drawn largely from detailed studies of Britain, Canada, Germany, Italy, Japan, and the United States found in Poterba (1994). First, as expected, family earned income shows a marked humped pattern as a function of age of the head of household: it rises from young adulthood, peaks around age 50, and declines first gradually and then more sharply as the head of household becomes older, past retirement age. Second, family consumption (defined largely in terms of expenditure, not counting purchases of assets) also shows a marked humped pattern, although less steep than that of income. Thus there is some smoothing of income by age, but much less than the life-cycle hypothesis would suggest. If families are controlled for family size (e.g., as children leave the home, or spouses die), the consumption hump becomes more flat, as expected, but still reveals a hump in middle age. Putting these two generalizations together, saving is not as great in the working years as it might be thought to be, but dissaving in the younger and older years is also less than full consumption smoothing would require.

A third generalization is that dissaving in old age does not, on average, take place. Elders continue to save, that is, they consume less than their disposable income (which by then probably includes pension income). Nor do they liquate assets. It is unclear whether this is to leave bequests or to support grandchildren, or whether it is precautionary saving given an increasing but uncertain longevity and the possible need for large medical expenses in old age. But this fact suggests that ageing by itself need not reduce national savings—or at least private savings, not counting the possible burden of age on the public sector.

Not surprisingly, these generalizations are sensitive to income levels. Those in the lowest or even the second lowest income quartile tend to dissave in old age—indeed, in the lowest quartile during much of life, suggesting either that the low income is transitory or that public transfers are significant for this group.

A fourth generalization is that housing practices seem to play an important role in determining savings behavior, and differ substantially from country to country. In Britain, Canada, and the United States, for instance, people tend to buy homes at a relatively young age (late 20s or early 30s) and are supported by a well-developed mortgage market, so they can borrow to cover the purchase. Home ownership is much lower in Germany, where housing is more expensive and tends to be purchased later in life. Italians want home-ownership, but

must save much as young adults in order to buy homes in their 30s or early 40s. Japanese rely on financial help from older relatives to purchase homes, which are expensive in the major cities; this is one of the motivations for saving late in life. In recently urbanized China, there is a new phenomenon: the male-female gender imbalance is so great among young adults (118:100) that choosy females insist that prospective husbands already have a satisfactory place to live. So saving rates are high among young urbanized males (contrary to the life-cycle hypothesis), who also may look to relatives for financial assistance (Wei and Zhang, 2009, document the influence of the local gender imbalance on household savings rates).

The bottom line is that an increase in the ratio of working age to total population should also increase national savings, and there is evidence that this effect is present in a number of countries, but household savings behavior is influenced by many elements and local factors will be important in determining both the change in magnitude of savings and whether they will be used in growth-enhancing ways, or mainly for housing (which enters as investment in the national accounts, but has low yield as imputed rents).

4.4 Investment

Young adults need capital to function in modern society. Apart from education (which is counted as consumption in the national accounts) they need housing for themselves and new family, with its various accessories such as furniture and appliances. Young adults also need to be equipped with capital associated with their employment—structures, equipment, perhaps working capital.

Demand for new housing comes from three sources: the replacement of old or obsolete units; new units to accommodate the mobility of the population, especially one that is urbanizing rapidly; and new units to accommodate new family formation. A rapid growth in the number of young adults requires corresponding additions to the stock of housing, often initially substandard in many developing countries. Timing is influenced inter alia by cultural factors. In Italy, for instance, it is common for young adults to continue to live with their parents until they marry, or even afterward, and to buy housing only when they have saved enough to make large payments.

Urbanization also requires additions to the housing stock, even as some rural housing may be vacated or abandoned. And growth in income leads people to demand more and better quality housing space. Urban construction to satisfy this demand is also an important source of employment, especially for low-skilled workers.

In emerging markets, urbanization and upgrading together account for the majority of demand for new housing. China, for instance, has seen more than 20 percent of its population urbanize over the past 30 years. New household formation has been quantitatively less important. Nonetheless, declining birth rates, with a 20–30-year lag, will result in a declining demand for housing, other things being equal. In a mature economy with sturdy

houses and low geographic mobility (think of Germany), a declining number of young adults could conceivably reduce demand for new housing to negligible levels. In reality, not all houses are sturdy, some are torn down to make room for commercial or infrastructure development, and at least some people will want to move. But changes in the number of young adults will in general affect the aggregate investment requirements for housing. With a lag, declining birth rates will result in reduced demand for housing—more than compensated, in many developing countries, by the continued movement from rural to urban areas.

4.5 Public Sector

In all rich countries, and increasingly also in emerging markets, governments have undertaken to provide pensions and medical care to old persons, and some provide health care to the entire population. The state also often provides compensation to unemployed persons and welfare in cash or in kind to many poor people. The simple life-cycle hypothesis is greatly complicated by these roles of the state, usually extensive but rarely complete. State pensions reduce or even eliminate the need for household saving for retirement during one's earning years; and state health care and medical and welfare programs reduce the need for saving against unforeseen but possibly expensive contingencies, such as a period of unemployment or a medical condition that is expensive to treat. Of course, such government programs need to be financed and often give rise to special taxes on payroll earnings. So saving occurs, but it is compulsory and operates through government budgets, and is not necessarily or even typically translated into real investment. Some programs operate on a pay-as-you-go basis, whereby contributors in any year finance the recipients of payments in that year. Others build up reserves, so a retiree's pension is paid (at least in part) from his/her own earlier payroll contributions and the earnings thereon. Still others, most notably Singapore, build up individual provident accounts from each resident based on compulsory contributions and the earnings thereon. It is possible, indeed common, that government programs reduce private savings for the reasons above, but do not compensate with corresponding increases in public savings. Baily and Kirkegaard (2009, p. 209) report that 79 percent of cash incomes of those over 65 in 17 OECD countries comes from the public sector, or 65 percent net of taxes, the remainder being from current earnings or private investment income. (These figures do not include the provision of medical care, usually in kind.) Financing of future state financial commitments, such as pensions, is often put off until the time for payment arrives.

4.6 Putting It Together

Discussion of the influence of age on saving is greatly assisted by the development of an internally consistent system of national transfer accounts (NTA) by Ronald Lee and Andrew Mason (2011). The NTA attempts to record,

for a given country and a specific period of time, all the transfers that occur across age brackets, whether through public or private channels. It can thus estimate, for any particular country-year, the net saving by age of the population. They calibrate their various estimates based largely on applying information from household expenditure surveys to the national accounts of each country, to labor earnings in the 30–49 age bracket, typically the years of highest labor income. This permits comparison of the profiles across countries, where wage levels may be very different.

The starting point is a typical family, where labor income and consumption are recorded by age, resulting in intra-family transfers in every country examined from current wage-earners to children and to elder retirees. Wage earners can also save out of their labor income, purchasing assets of various kinds. All asset ownership is attributed to the head of household, the main wage earner. Assets accrue income (including implicit rent on owner-occupied housing), which can support higher consumption within the family or be saved.

Income and/or expenditure are taxed in all countries, and the revenues are used to provide public goods or transfers to households. (All corporate assets and earnings are imputed to households, which are the fundamental units of society.) Some public expenditures, such as national defense, are not linked to age and are assumed to be uniformly distributed across ages. Others, such as education and health expenditures, are age-specific and are designated as public transfers to particular age groups. Taxes are levied mainly on consumption, labor income, and income on assets, and thus can in principle be allocated by age, the bulk of which usually falls on the peak wage years and the assets that are assumed to belong to the head of household. Thus it is possible to build a profile for each country-year of the transfers, positive and negative, across age groups.

This age profile can then be multiplied by the age structure of the population to get aggregate intergenerational transfers, private and public, for the particular country. If we assume that the underlying transfer profile remains constant over time (a strong assumption if the time interval is significant), we can calculate changes in transfers as the age profile of the country changes.

A methodological warning: cross-section data that appear in the NTAs do not represent cohort panel data, which are of greater interest: how the profile of earnings and consumption change over the life of a particular age cohort, such as all those born in 1950. This potential lack of correspondence will be particularly great if average earnings have risen over time, which has been the case for most countries over the past half century, and if government transfer policies have changed significantly over time, in general becoming more generous to elder people through pensions and health care. But we can still learn something by comparing the cross-section data across countries with different levels of per capita income.

Lee, Mason, and their associates have estimated the age-transfer profiles in the early 2000s for 23 countries drawn from around the world: Europe, Latin America, Asia, Africa, and the United States. Although countries differ

significantly in age structure, in per capita income, and in size and scope of government, some marked similarities can be observed after calibrating to labor income in the peak earning years, ages 30–49. The typical family shows net intra-family transfers from the earnings years (ages 25–59) to younger and older members of the family. These transfers are reenforced by public transfers in the same direction from wage earners (the prime taxpayers) to the young—mainly through the provision of public schooling—and to the old—mainly through public pensions and health care. After a period of young adulthood, household saving falls short of earnings on assets, permitting transfers out of asset income as well as out of labor income. Contrary to the life-cycle hypothesis, while elders consume some earnings on assets, they do not draw down their assets, that is, dissave. Rather, they continue to save, and in many countries to transfer resources to younger members of the family.

Table 4.1 Economic and fiscal support ratio

Country	*2010 Economic support ratio*	*2040 Economic support ratio*	*2040 Fiscal support ratio (2010 = 1.0)*
Africa			
Kenya	0.63	0.75	u
Nigeria	0.69	0.87	u
Asia			
Japan	0.78	0.64	0.79
China	0.94	0.83	0.83
India	0.88	0.97	u
Indonesia	0.97	1.01	1.09
Philippines	0.83	0.94	1.14
S. Korea	0.94	0.76	0.83
Taiwan	0.92	0.73	0.84
Thailand	0.97	0.87	1.04
Latin America			
Brazil	0.84	0.83	0.77
Chile	0.94	0.88	0.77
Costa Rica	0.93	0.91	0.83
Mexico	0.95	0.98	0.92
Uruguay	0.85	0.87	0.95
Europe and USA			
Austria	0.9	0.73	0.78
Finland	0.82	0.72	0.85
Germany	0.83	0.66	0.79
Hungary	0.86	0.77	0.83
Slovenia	0.76	0.59	0.75
Spain	0.9	0.71	0.78
Sweden	0.78	0.7	0.88
USA	0.89	0.81	0.9

Note: Economic support ratio is the ratio of effective producers to effective consumers. Fiscal support ratio is the ratio of effective taxpayers to public program beneficiaries.
u = unavailable.

Source: Lee and Mason (2011), Tables A2–A3.

Perhaps not surprisingly, there is a greater difference across countries among public transfers than private. Total revenues (relative to GDP) tend to rise with per capita income (the United States is a partial exception). The rise in revenues in turn is associated with a rise in age-related transfers, particularly to the elderly, who tend to live longer but also rely less for sustenance on younger family members than is the case in poorer countries. Brazil is an outlier among emerging markets, with exceptionally large public transfers to the elderly.

Table 4.1 compares year 2010 with projections to 2040 for both ratio of effective number of producers to effective number of consumers (columns 2 and 3) and effective number of taxpayers to effective number of beneficiaries from public programs (column 4, relative to 2010 set at 1.0 for all countries). It can be seen in column 2 that there was considerable variation across countries in 2010, ranging from 0.97 in Indonesia and Thailand to 0.63 in Kenya. Over the next 30 years there is a significant rise in the support ratio in Nigeria (exceptionally high, as many children move into adulthood and birth rates are assumed to decline), Kenya, India, and the Philippines, and a modest increase in Indonesia, Mexico, and Uruguay. All other countries show a decline in support ratio, especially great in Japan, Korea, Taiwan, Austria, Germany, Slovenia, and Spain. The relative fiscal burden is expected to decline in Indonesia, Philippines, and Thailand, and to rise in all other countries, especially great in Japan, Brazil, Chile, Austria, Germany, Slovenia, and Spain.

4.7 Investment Again

Lindh and Malmberg (in Clark et al., 2009) have examined the impact of countries' age structures on investment for 20 OECD countries over the period 1960–94, grouping age into five categories. They find that gross investment (as a share of GDP) rises with young adults (ages 15–29), falls with early middle age (30–49), rises with later middle age (50–64) and early retirement (65–74), and falls sharply with older retirees (75+) (pp. 172–3). Some of their regressions include economic growth, the relative price of capital goods, and lagged investment as control variables. The pattern described is robust over several specifications for the regressions, but the overall explanatory power is weak, both statistically and economically, except for older retirees. The authors then break down investment into several components, separating housing and inventory accumulation from private business fixed investment. As expected, young adults (ages 15–29) had a positive effect on housing investment, albeit a small one, and old retirees had a strong negative effect (p. 174). Late middle age (50–64) had a statistically significant effect on private business fixed investment, perhaps reflecting a relatively larger managerial decision-making class. More surprisingly, young retirees (65–74) had a statistically significant effect on the accumulation of inventories, reflected also in the trade balance (discussed below), perhaps reflecting changes in postretirement consumption patterns and the associated restocking.

The Lindh-Malmberg results run only through 1994. I have updated their empirical work through 2008 but dropped the 1960s both for practical reasons (ease of data availability) and for conceptual reasons (extensive controls on capital movements during the 1960s in most OECD countries). The results show a significant rise in explanatory power (e.g., the adjusted R2 rises from 0.26 to 0.62 for the key result), a general rise in the magnitude of the estimated coefficients, and a shift from young retirees as the most important age group for investment to later middle age (the managers). Table 4.2 reports the key results.

Lindh and Malmberg do a comparable estimation for national saving. They find that the strongest and most statistically significant group for saving, not surprisingly, is the late middle-aged, while young retirees make a negative contribution. But surprisingly (in the perspective of the life-cycle saving hypothesis), young adults and old retirees are also significant savers. But the explanatory power is very low.

Results for the period 1970–2008 have much greater explanatory power. Young adults add significantly to national savings, as do late middle-agers in lesser degree, while retirees, both young and old, detract from national savings, as shown in table 4.2.

Table 4.2 Investment and savings determinants

	Gross investment rate 1970–2008			*National saving rate 1970–2008*		
Gross investment or saving rate	*1*	*2*	*3*	*1*	*2*	*3*
Growth		**0.31**	**0.4**		**0.383**	**0.281**
		4.71	10.95		5.32	7.4
Relative price of investment		0.027	0.008		–0.031	–0.013
		1.4	1.57		1.71	1.94
Lagged investment rate			**0.881**			**0.853**
			39.85			33.2
Age share 15–29	**0.351**	0.2	0.009	**0.352**	**0.43**	0.019
	2.1	1.06	0.19	2.36	3.02	0.43
Age share 30–49	**0.538**	0.355	0.019	0.04	0.124	–0.057
	2.39	1.53	0.35	0.18	0.55	0.86
Age share 50–64	**0.596**	**0.582**	**0.161**	0.276	0.298	–0.012
	2.18	2.13	2.65	1.07	1.17	0.15
Age share 65–74	0.296	0.37	0.043	**–0.575**	**–0.495**	**–0.184**
	1.3	1.67	0.75	2.23	1.99	2.24
Age share 75+	–0.214	–0.256	0.098	**–1.41**	**–1.227**	–0.074
	0.59	–0.69	1.1	4	3.81	0.78
Adjusted R-square	0.604	0.618	0.922	0.767	0.782	0.94
chi(5) test of age variable	2.17	1.95	2.5	12.3	11.64	2.23
p-value	0.056	0.085	0.029	0	0	0.049

Note: Fixed country and fixed time effects. T-ratios are below estimated coefficients.

Source: Own elaboration.

4.8 Current Account

The difference between national saving and domestic investment is the current account—current transactions with the rest of the world. To the extent there are regular relationships between age groups and savings and investment, there will also be a regular relationship between age groups and the current account. Lindh and Malmberg estimates suggest such a pattern (p. 179). There is no net impact on the current account by young adults (investment effects just offsetting savings effects), a modest positive impact for early middle age (when saving exceeds investment), disappearing by late middle age, becoming negative in young retirement (as investment exceeds savings) and positive in late retirement.

Reestimating for the 20 OECD countries over the period 1970–2008 confirms the negligible impact on the current account (strictly, the balance on goods and services) of the share of young adults, but also finds a negligible effect for young middle-agers (30–49) and old retirees. In contrast, age groups 50–64 and 65–74 have a strong and statistically significant negative impact on the current account, especially the former group, as shown in table 4.3.

Comparable estimates for more recent periods (1980–2008; 1990–2008) show a similar pattern, albeit with less statistical significance, except for young adults, who now produce a positive effect on the current account, although not significant at the 5 percent level, as shown in table 4.3. To sum up, there is no age-related statistical significance for 1990–2008—the period of highest globalization and large intercountry capital movements. And there is a negative impact on the current account of the ages 50–74 over the entire period, due to the disproportionate influence of these groups on investment (exceeding the rise in savings for late middle-agers).

These results seem to contradict—or at least do not support—those of Speller et al. (2011), who claim that current account positions for the G20 countries most closely vary with savings (rather than investment) and that the strongest demographic influence on savings is the share of the population in the age bracket 40–59 (the "prime savers"). They claim this age bracket has already peaked for the United States, Germany, the United Kingdom, and China; but the peak comes around 2025 for Japan and later still for emerging markets other than China. Other things being equal, this suggests a future rise in the current account position of many emerging markets, and a fall in that of rich countries other than Japan.

A recent paper by Gudmundsson and Zoega (2014) approach the same issue in a somewhat different way. They first do simple correlations between age-group shares (at five-year intervals) and the current account positions for 1995–2009 across 57 countries, including rich and poor. The peak correlation is 0.3 for the age group 35–39. The lowest correlations are -0.15 for ages 20–24 and -0.08 for 65+, suggesting that on average a high ratio of young adults or of retirees lowers the current account, while a high ratio of early middle-agers raises it. A high ratio of children (0–14) or of older

Table 4.3 Current account determinants

	1971–2008			*1980–2008*			*1990–2008*		
Trade balance/GDP	*1*	*2*	*3*	*1*	*2*	*3*	*1*	*2*	*3*
Growth		−0.067	**−0.157**		0.243	**−0.169**		0.38	−0.1
		0.31	2.76		1.19	2.56		1.71	1.51
Relative price of investment		−0.062	**−0.023**		−0.061	−0.015		0.008	−0.026
		1.25	2.39		1.03	1.33		0.1	1.53
Age share 15–29	−0.127	0.194	0.057	0.495	0.746	0.641	1.078	0.94	0.202
	0.3	0.45	0.74	0.93	1.35	0.7	1.4	1.15	1.18
Age share 30–49	−0.611	−0.285	−0.023	−0.648	−0.317	−0.102	−0.495	−0.419	0.228
	1.11	0.53	0.25	1.04	0.48	0.9	0.49	0.37	0.75
Age share 50–64	**−2.176**	**−2.089**	**−0.31**	−1.361	−1.307	**−0.426**	−1.383	−1.188	−0.134
	2.29	2.18	2.43	1.51	1.48	2.94	1.04	0.94	0.34
Age share 65–74	**−1.433**	**−1.464**	0.236	−1.525	−1.578	0.355	1.14	1.52	0.819
	2.06	2.02	1.19	1.71	1.72	1.36	0.93	1.25	1.46
Age share 75+	−0.424	−0.231	−0.164	−0.348	−0.123	−0.198	0.535	0.326	−0.026
	0.47	0.24	1.15	0.41	0.14	1.11	0.61	0.33	0.15
Lagged trade balance			**0.937**			**0.975**			**1.026**
			22.22			32.67			22.76
Adjusted R-square	0.285	0.277	0.919	0.26	0.266	0.912	0.549	0.552	0.939
chi(5) test of age variable	2.21	2.09	1.72	1.5	1.55	2.01	2.33	2.6	2.92
p-value	0.052	0.065	0.129	0.187	0.173	0.076	0.042	0.025	0.014

Note: Fixed country and fixed time effects. T-ratios are below estimated coefficients.

Source: Own elaboration.

middle-agers (55–59) leaves the current account unchanged, with more-or-less smooth lines connecting these points at five-year intervals.

Gudmundsson and Zoega then run regressions for 1980–2009 for the 57 countries, but with only three age groupings: 0–24; 25–64; 65+. They get results of high statistical significance but low explanatory power (adjusted R2 = .13–.22) unless fixed country effects are introduced, which raises the R2 above 0.5. High ratios of both young and old reduce a current account surplus or increase a deficit. They then use their estimated coefficients to adjust actual current account positions (relative to GDP) in 2005–09, the era of large "global imbalances." Interestingly, in their results, both Japan and Germany, two countries with large current account surpluses, would have run even larger surpluses if they had had a more typical age structure, that is, fewer persons over age 65, whereas China's surplus would have been 5.37 percentage points lower. The large US deficit would have been over two percentage points lower if it had had a typical age structure.

4.9 An Illustrative Simulation

The discussion above suggests that there are many channels through which demographic change can influence a country's growth rate—by affecting the quantity and quality of its labor force, and by affecting saving, investment, government expenditure, and the current account. A number of the effects point in opposite directions: some clearly tend to increase growth, others tend to reduce it (at least for a while), and still others have an ambiguous effect. The net outcome will therefore depend not only on identifying the channels of influence, but also their relative magnitudes.

Such an exercise has been undertaken by Ashraf et al. (2011). Their results will be summarized here since they capture well several channels of influence and (on their assumptions) their relative magnitudes. They start with a notional self-contained Nigeria (a country with a relatively high birth rate of over 5 children per woman in 2010) and postulate that through some kind of intervention the birth rate is lowered by one child per woman, spread over her reproductive life, and held at the lower level indefinitely. An alternative simulation follows the lower UN projection of Nigeria's population, which postulates a birth rate lower by 0.5 child per woman than in the UN medium projection, which itself assumes declining natality. On their base case the economically active population (ages 15–64) rises in steady state (reached after about 80 years) from 55.5 percent of the population to 59.2 percent, after rising irregularly higher during the transition to steady state. The young population (ages 0–14) falls from nearly 41 percent to 35.5 percent in steady state.

Ashraf et al. postulate a standard Cobb-Douglas production function with constant returns to scale, three identified factor inputs (capital, quality adjusted labor, and a fixed factor "land"). The capital stock evolves from a fixed saving rate out of total national income less depreciation at a fixed rate. Household saving thus continues so long as a person has income, and does not follow the life-cycle hypothesis. The quality-adjusted labor force reflects

both formal education and work experience and is drawn from the active population by age-specific participation rates. The economy is closed and has no public sector.

The channels whereby a decline in birth rate can influence per capita income in this simulation are increases in the number of potential workers per capita (lower dependency rates), higher participation rates of those workers (affected here by reduction in duties of child care as well as by higher average age), increases in average education of the labor force as schooling becomes more affordable for fewer children, increases in experience of the labor force as its average age rises, increases in the capital stock per worker, and lower diminishing returns to the fixed factor of production.

Lower birth rates are assumed to reduce child care and allow increased participation by women in the labor force, assumed to be by half a year per marginal child in the simulation (an approximation based on empirical data from the Philippines); age-specific labor force participation rates are drawn from Nigerian data. Lower birth rates will also permit more education. Based on empirical data from Bangladesh, Ashraf et al. assume that following a drop in fertility of one child per woman, educational attainment will rise by 0.65 years and that each additional year of schooling will increase output per worker by 10 percent a year on the assumption that the average level of schooling is between 5 and 8 years.

The simulation shows that income per capita rises by 30 percent 75 years after the reduction in natality, or by 0.35 percent annually over this period. The relative importance of the different channels varies over time. The rise in per capita income begins soon after the natality "shock," as does increased labor force participation by women. The reduced dependency ratio accounts for 90 percent of the impact in the first 15 years. The other channels take effect more gradually, as the newborns move into the labor force and as growth in capital stock become significant with higher income. After 50 years, the reduced dependency ratio accounts for 35 percent of the gain in per capita income, increased capital per worker for 23 percent, increased schooling for 19 percent, and a decline in diminishing returns to the fixed factor (the Malthus effect) for 10 percent. On the assumptions made in the simulation, increased experience and changes in participation rates of the economically active population have small effects, possibly because the labor force remains quite youthful even after the postulated decline in birth rates. Per capita income continues to grow over time thanks to continued capital accumulation and diminished Malthus effect: after 100 years per capita income will rise about 20 percent, with capital accumulation accounting for 26 percent of the increase and the Malthus effect for 22 percent, while the reduced dependency ratio accounts for 25 percent and increased schooling for 15 percent.

The simulation results of course depend on the particular quantitative assumptions made. The long-term results not surprisingly are quite sensitive to the assumption made about savings out of incremental income (which in a closed economy are assumed to lead to capital formation), to the initial

share of the fixed factor ("land") in factor incomes, and to the possibilities for substituting labor or capital for the fixed factor over time. Higher savings will lead to greater capital accumulation and higher per capita income. A higher share of income going to the fixed factor will imply more sharply diminishing returns, and hence higher gains resulting from a decline in fertility. And greater substitution possibilities for the fixed factor will reduce the gains from lower fertility. These varying Malthus effects only show up significantly after 50 years or so after the fertility shock. The income shares of nonreproducible factors of production (agricultural land and subsoil resources) are typically under 10 percent for rich countries (resource-rich Australia, Canada, and Norway are exceptions), but they are often above 20 percent in developing countries (Caselli and Freyer, 2007), suggesting a larger long-term impact than in the base case simulation, which assumes an income share of 10 percent for the fixed factor.

Opening the economy to international borrowing or lending at a fixed world interest rate would increase the rise of per capita income in the early years following the fertility shock, as additional labor force participation could be accommodated by imported capital, but would be reduced relative to the base simulation in the longer run as the domestic returns to capital declined to the world level and the additional savings would be exported rather than lead to higher domestic capital formation.

This simulation is highly stylized, postulating an instantaneous drop in fertility from 5.3 to 4.3 children per woman of reproductive age, distributed by age of the Nigerian female population, compared with a population of constant fertility, age structure, and mortality. It permitted isolation and quantification of various channels of influence of fertility on per capita output and income. An alternative simulation takes as its baseline UN population projections to 2050, where in the medium variant, total fertility is assumed to decline gradually from 5.3 to 2.4 children per reproductive woman, and compares it with the UN low fertility variant, which assumes a greater but gradual decline in fertility, reaching 1.9 children per reproductive woman by 2050, assumed by Ashraf et al. to be constant thereafter. Thus in contrast to the main simulation, this one assumes a baseline of declining fertility on which is superimposed an even steeper decline in fertility that reaches 0.5 child per woman after 40 years. The results are qualitatively similar to those of the main simulation. Per capita income after 40 years is 12 percent higher with the lower fertility, just under 0.3 percent a year. Because the incremental fertility decline is spread over several decades, the change in the dependency ratio is a relatively more important part of the story than in the main simulation, as are the gains from child-care reduction. As in the main simulation, the relative importance of reduced dependency declines over time and yields primacy in the longer run to increased capital stock.

These simulations assume that the decline in fertility is exogenous, unrelated to changes in other economic and social variables. But, in fact, there are important linkages and feedback. One of the most important ones is the relationship between declining fertility, rising per capita income, increased

education (particularly for women), leading in turn to a further decline in fertility. Lutz and Samir (2011) report that in the 29 developing countries for which they have data, lower birth rates are clearly associated with more education of mothers, the only exception being Indonesia, where children per woman were slightly higher for mothers with primary education or secondary education than for those with no education. Infant mortality also declines significantly when mothers have more education.

This simulation has the great merit of indicating how complex the influence of changes in natality on growth can be and how their relative influence can vary over time. It would be a mistake, however, to make generalizations from a simulation based on Nigeria, a country where reducing the high birth rate leads to higher income, to other countries. China, for instance, has a much lower birth rate, indeed below replacement rate, thanks to the policy of one-child only. It is quite possible that raising China's birth rate would increase growth, since female labor force participation is already high (children are often cared for by grandparents) and where an ongoing current account surplus would easily permit the additional domestic investment required to supply an increased labor force with capital.

4.10 Summary and Conclusions

There are theoretical grounds for expecting a country's age structure to influence its current account and its growth rate through its influence on savings, investment, and the labor force. There is some empirical support for influence on the current account, but it is simply one of many influences and is often overwhelmed by other factors. Moreover, any country's current account position is determined by developments in all countries, so demographic developments in one country alone can never be decisive. This fact makes projecting the outlook over several decades extremely difficult; in principle it would require a full-fledged model involving the age-specific influence on savings and investment in each country and their interactions. Mutatis mutandis is far different from ceteris paribus.

With a globalized capital market, saving can and often does take place outside the originating country. But when saving is motivated by the need for future income, preservation of principal usually takes precedence over yield. Therefore, savings often flow to countries with demonstrated strong property rights and fair settlement of disputes, even when expected yield is lower than it might be elsewhere. And, of course, central banks invest in the United States or in the Eurozone insofar as they wish to augment their official reserves of dollars or euros. Institutional factors thus play an important role in the allocation of savings and investment.

What can be said about the future of international capital flows, given the differential demographic changes of the next few decades? Unfortunately, little with confidence. The empirical evidence on past influences of demographic change on national savings and investment, hence on net international capital flows, is too weak and even contradictory to permit confident

projections. We can say with reasonable plausibility that the trade balance of Japan, as the world's most aged society, will decline and even become negative. But its current account balance will remain positive for some years thereafter because of the earnings on large net claims on foreigners built up over several decades. Eventually that is also likely to become negative, and the Japanese will begin to liquidate their foreign claims. But that time may be long in coming since saving often continues into old age.

More generally, rich countries are ageing more rapidly than poor countries. (The United States is an exception among rich countries, but it is a low saver. China is an exception among poor countries, but it is a high saver.) A conventional view is that as this happens, poor countries will become net savers in the coming decades, while rich countries will become net dissavers, leading to net capital flows from poor countries to rich countries. We have already seen some of that happen, although the picture is mixed on both sides of the ledger. But systematic empirical support for this view is weak and contradictory. Old societies do not always dissave, and countries enjoying the peak of their demographic dividend, and even a large number of prime savers, where an increase in saving is typically observed, may also experience extensive investment, absorbing the higher national saving and even more, resulting in net capital inflows. And of course, as was already noted, what actually happens to any country depends not only on its circumstances, but also on developments in its trading partners.

With respect to economic growth, it is safe to say that countries entering a period of demographic dividend, when the potential labor force grows relative to the total population, have the possibility for a modest increase in their rate of economic growth for a period of time. Whether they convert this potential into reality depends on their ability to mobilize efficiently the prospective new workers and provide them with the wherewithal for productive work.

Table 4.A1 Some simulations

	Per capita	*Consumption following baby boom in period 1 (it includes "children")*					
Economy, Period	*Children*	*Parents*	*Mid-Aged*	*Seniors*	*Total C*	*Production*	*Current Account*
Closed, paygo	0.5	1	1	1	3.5	3.5	n/a
1	0.486	0.972	0.972	0.972	3.45	3.45	
2	0.5	1	1	1	3.65	3.65	
3	0.514	1.028	1.028	1.028	3.85	3.85	
4	0.5	1	1	1	3.85	3.85	
Closed, non-paygo	0.5	1	1	1	3.5	3.5	n/a
1	0.468	0.935	1	1	3.45	3.45	
2	0.5	1	1	1	3.65	3.65	
3	0.5	1	1.1	1	3.85	3.85	
4	0.5	1	1	1	3.85	3.85	
Open, non-paygo	0.5	1	1.33	1.33	4.17	3.5	0
1	0.5	1	1.33	1.33	4.22	3.45	–0.1
2	0.5	1	1.2	1.33	4.15	3.65	0.167
3	0.5	1	1.33	1.2	4.32	3.85	0.134
4	0.5	1	1.33	1.33	4.58	3.85	0

Source: Author's elaboration.

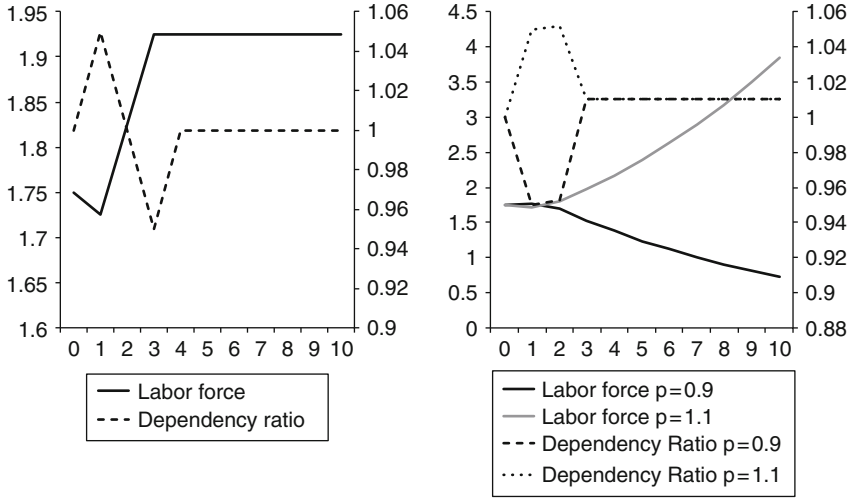

Figure 4.A1 Simulation exercises

CHAPTER 5

Emerging Economies and the Reform of the Global Monetary System

José Antonio Ocampo

5.1 The Major Issues

The recent global financial crisis placed the issue of global macroeconomic and financial stability at the center of the world agenda. The first of these objectives may be understood as guaranteeing an adequate supply of liquidity at the international level and the coherence of the domestically determined macroeconomic policies (regional in the case of the Eurozone monetary policy), particularly those of major countries. The second may be understood as a coherent set of rules that helps prevent as well as better manage financial crises when they do occur.

The need to strengthen financial regulation and supervision has been a clear priority in recent years. Under the coordination of the Financial Stability Board (FSB), re-regulation of finance has been going on in the industrial world, though plagued with delays in implementation, insufficient coordination, and political economy pressures to weaken the reform efforts. The emerging economies had undergone similar processes after their own financial crises, which was no doubt one of the reasons why they were able to avoid domestic financial meltdowns during the recent global crisis, with the exception of some emerging economies of Central and Eastern Europe that had not been involved in past efforts to strengthen regulation.

Two remarkable absences from this agenda have been the links between regulation of domestic finance and regulation of cross-border capital flows, and the lack of initiatives to introduce a formal international debt workout mechanism. The first of these issues has been dealt with, nonetheless, in the framework of the IMF. The second was the subject of attention after the 1994 Mexican and, particularly, the sequence of emerging country crises that started in East Asia in 1997. The most important initiative was the 2001–02 IMF proposal to create a Sovereign Debt Restructuring Mechanism.

Although it failed, one important outcome of the discussion at the time was the rapid spread of collective action clauses in debt contracts. This issue has been broadly ignored during the recent crisis, with the exception of the inclusion of collective action clauses in all Eurozone debt issues starting in 2013.

The global architecture for macroeconomic stability, the focus of this chapter, has not received a similar attention. Such architecture includes the global reserve system (the definition of what currencies play the role of international currencies, and the way international liquidity is provided), and the management of the macroeconomic linkages among different economies, each of which pursues its own macroeconomic policy. The latter may be understood as involving at least three separate issues: the consistency in the way different national authorities (regional in the case of the Eurozone) run their macroeconomic policies, the exchange rate system, and rules on cross-border capital flows.

There were significant concerns with rising global imbalances prior to the crisis and escalating US net liabilities with the rest of the world. Although some saw important implications for global financial stability in these trends, few saw a significant problem in the global monetary system as such;[1] some even saw it turning into a stable "Second Bretton Woods" (Dooley et al., 2003). Rising global imbalances led to the IMF initiative to launch a multilateral consultation on this issue in 2006, which did not render any significant results.

In turn, some voices were heard in the early phase of the crisis to reform the global monetary system, the most prominent being those of the Chinese central bank governor (Zhou, 2009) and the Commission of Experts convened by the president of the UN General Assembly on Reform of the International Monetary and Financial System and chaired by Joseph E. Stiglitz (United Nations, 2009b)—referred to below as the Stiglitz Commission. These initiatives have not been followed up. So, the most significant trends since the crisis have been the largest issue of Special Drawing Rights (SDRs) in history, which took place in 2009, the Mutual Assessment Process (MAP) launched by the G-20, and the aforementioned debates on capital account management that took place in the IMF board in 2011 and 2012, leading to adoption of an "institutional view" by the IMF Board in November 2012

Broadly speaking, the global monetary system that emerged in Bretton Woods had five distinctive features: (i) a global reserve system based on a dual gold-dollar standard (gold exchange standard); (ii) a system of fixed exchange rates, but adjustable under "fundamental disequilibrium"; (iii) convertibility for current account transactions, but the possibility of managing capital flows to insulate economies from speculative capital flows; (iv) official balance of payments support, but limited in size, as it was supposed to finance only current account deficits; and (v) monitoring of member countries' policies through Article IV consultations, which were nonetheless weak vis-à-vis major countries –and thus lacked "evenhandedness," to use IMF terminology—and effectively no macroeconomic policy coordination or even consultation.

In turn, after the unilateral decision by the United States to abandon the first of these rules in 1971 and the failure of the effort to create a new system in the Committee of Twenty negotiations that took place in 1972–74 (Williamson, 1977), it evolved into the current international monetary "*non*-system." The major attributes can be said to be: (i) a global reserve system essentially based on an inconvertible (fiduciary) dollar but open to the competition from other reserve currencies, and with sporadic issues of a global reserve currency, the SDRs, which had been created in 1969; (ii) freedom for each country to choose the exchange rate regime they prefer, as long as they avoid "manipulating" their exchange rates, a term that has never had a clear definition, thus making this the clearest case of a nonsystem; (iii) a significant degree of capital account liberalization, though maintaining the capacity of countries to regulate capital flows; (iv) step-by-step increase in the size of official balance of payments support, capturing the rising demands created associated with capital account crises; and (v) ineffective macroeconomic surveillance, as in the past, and limited policy coordination, which essentially takes place outside the IMF (in the G-7 and now in the G-20).

From the point of view of emerging economies, this new system continued to marginalize them from sharing in reserve creation, except through the minority participation in the issuance of SDRs and the possibility that the Chinese renminbi will gradually become one of the global reserve currencies. Rather, as we will see in section 5.2, they are disproportionally forced to accumulate foreign exchange reserves as "self-insurance," which imply a transfer of resources to reserve-issuing countries. They were also marginalized from macroeconomic policy cooperation, until the creation of the G-20 at the leaders' level in 2008. Although all countries kept the prerogative of regulating capital flows, many emerging economies liberalized their capital accounts. In this context, the lack of a stable international monetary and financial system meant that they became subject to strong risks associated with the deepening of financial globalization without adequate safety nets in the form of adequate emergency IMF financing.

This chapter reviews the elements of this global monetary nonsystem and its effects on emerging economies. The next section looks at the major problems of the global reserve system. This is followed in section 5.3 by an analysis of global imbalances and the interlinked issues of macroeconomic policy cooperation, the exchange rate system, and capital account regulations. Section 5.4 briefly draws some conclusions.

5.2 The Global Reserve System

The Flaws of the System

The basic deficiencies of the current global reserve system are associated with three problems that were identified in a sequential way in the policy debate.[2] The first was emphasized by Keynes (1942–43) during the discussions that preceded the creation of the Bretton Woods institutions. The central issue, in

his view, is that the system generates a *recessionary bias*[3] due to the asymmetric burdens of adjustment to payments imbalances that deficit and surplus countries face: whereas the former must adjust, particularly when financing dries out during crises, surplus countries do not face a similar burden. As Keynes emphasized, this problem is a characteristic of all global monetary systems that we have known through history. He therefore proposed one that would correct such asymmetry, an International Clearing Union, which was not accepted in the negotiations that followed. Its best manifestation during the recent crisis has been the asymmetric adjustment in the Eurozone: whereas Greece, Ireland, Portugal, and Spain reduced their current account deficits by 8–14 percentage points of GDP between 2008 and 2013, Germany's surplus remained stagnant as a proportion of GDP and The Netherlands' surplus has actually increased.[4]

The second problem is associated with the use of a *national* currency as the major *global* currency. It was formulated in the 1960s by Triffin (1961 and 1968) and it is thus widely known as the *Triffin dilemma*. The essential problem is that the provision of international liquidity requires that the country supplying the reserve currency should run balance of payments deficits, a fact that may eventually erode the confidence in that currency. While the major risk at the time was the threat that US gold reserves would dwindle, the problem is significantly different today. As figure 5.1 shows, its particular manifestations is the alternation of periods in which the United States runs increasing current account deficits with others in which such deficits tend to be corrected. This is accompanied by significant cycles in the real exchange rate of the US dollar, which implies that the currency at the center of the system has a very unstable value. It has also been accompanied by a long-term

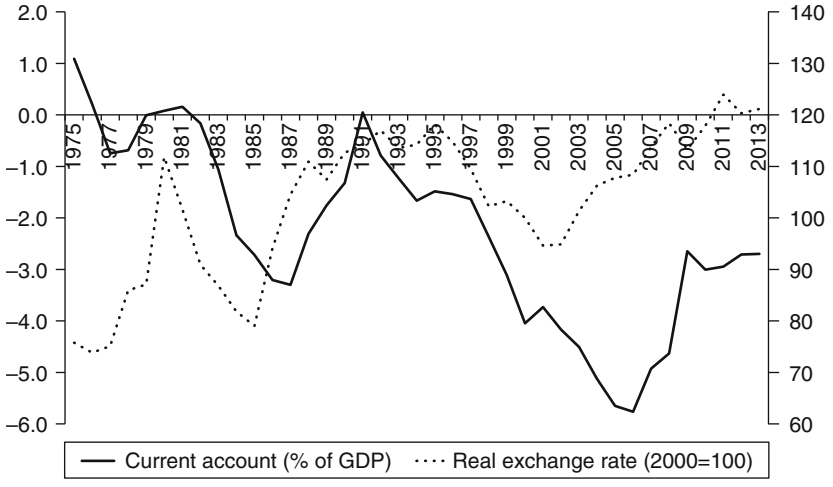

Figure 5.1 US current account (left) and the real exchange rate (right)

Source: IMF, International Financial Statistics. The real exchange rate is depicted here to show an increase when there is a real depreciation (the opposite convention to that used by the IMF).

tendency of the United States to run current account deficits, which have been reflected in a rising net external liabilities of the United States since the mid-1980s.

The first flaw of the system and the instabilities generated by the second have severely affected emerging economies. The first implies that large current account deficits and exchange rate appreciation during capital account booms are sources of severe risks as they are strong predictors of vulnerability to the succeeding crisis. The basic problem in this regard is associated with the financing of these deficits in the face of the segmentation of the global financial market between risky and nonrisky borrowers, in which the latter are subject to greater volatility in risk spreads, availability and maturity of financing (see section 5.3).

The attempt by emerging and developing countries to mitigate these risks has given rise to the third flaw of the system: its *inequity bias.* Indeed, in the face of strong boom-bust cycles of global finance, emerging and developing countries reacted by building up a large amount of foreign exchange reserves to "self-insure" themselves against crises and increase the policy space to undertake countercyclical macroeconomic policies. Such policies involve accumulating reserves to absorb part of what countries consider "excess" capital inflows, and to manage an eventual "sudden stop" in external financing. A similar policy leads countries facing terms of trade booms to absorb part of the windfall gains through the accumulation of foreign exchange reserves and fiscal resources in sovereign wealth funds. Since foreign exchange reserves are invested in safe industrial countries' assets, and particularly US government securities, reserve accumulation by these countries is nothing else than lending to reserve issuing countries—and, particularly, the United States—at low interest rates. This is what generates the inequity of the system.

The magnitude of the problem is clearly reflected in figure 5.2. Whereas most countries held reserves equivalent to small proportions of GDP up to the 1980s, emerging and developing countries started to accumulate large amounts of reserves in the aftermath of crises, and particularly of the emerging economies' crisis that started in East Asia in 1997. By 2007, middle- and low-income countries excluding China held reserves equivalent to between 19 and 27 percent of GDP, depending on the specific category of countries we look at The accumulation of reserves by China and the Gulf countries were by then twice as high relative to their GDPs. In contrast, high-income countries tended to reduce their reserve levels, if we exclude Japan. We will return to this issue in the next section in relation to the analysis of global imbalances.

Massive self-insurance through foreign reserve accumulation has helped mitigate the vulnerability of emerging and developing countries to crises. The development of domestic bond markets after the Asian financial crisis has also contributed to reducing these vulnerabilities by making governments less dependent on external financing. Both led to the reduced perception of risk, reflected in the low spreads between 2004 and 2007, the reduced vulnerability to the global financial crisis, and the return of ample financing

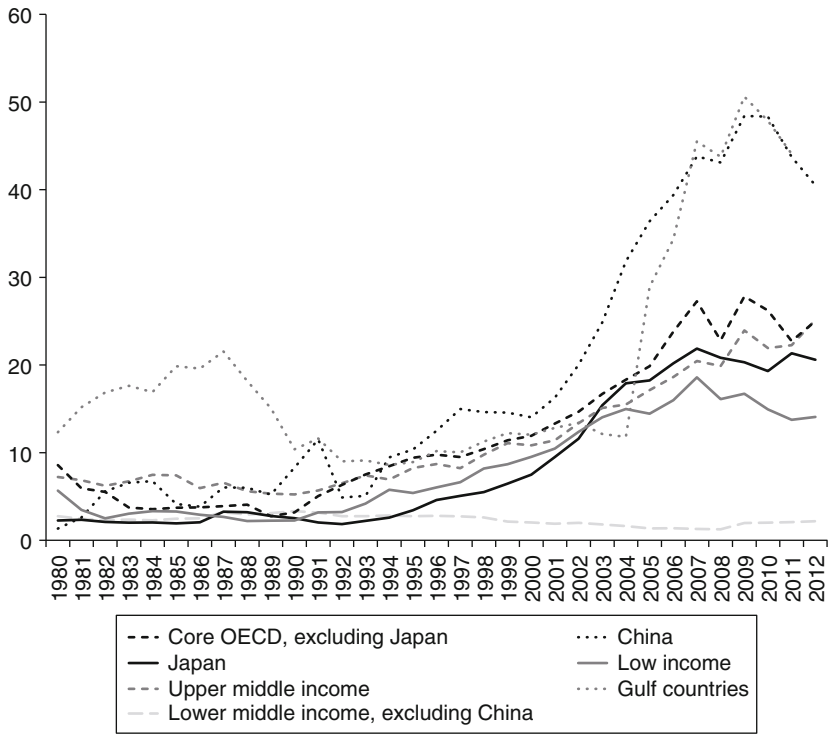

Figure 5.2 Foreign exchange reserves by level of development (% of GDP)

Source: Total reserves minus gold series, World Bank, World Development Indicators, based on information from the IMF. The 2000 World Bank classification is adopted rather than a more recent one as it reflect much better the relative standing of different countries and regions of the world during the whole period covered in the graph.

at low costs to emerging economies since mid-2009. Although this may be understood as a reflection of reduced financial market segmentation, the fact that its counterpart is massive self-insurance indicates that market segmentation is still a feature of the global economy, but one that can be mitigated by prudential policies.

In any case, given the dominance of the United States and other developed countries in global finance, historical evidence seems to indicate that the policies adopted by advanced economies to stabilize financial markets is critical for the length of the downward phase of the capital account cycle. So, the massive interventions after the collapse of Lehman Brothers were critical for the return to more normal financial conditions in a relatively short time period (about a year). The same is true of the massive support to Mexico after its December 1994 crisis (a few months). In contrast, weak action after the August 1982 Mexican moratoria and the first stages of the East Asian crisis in the second semester of 1997 led to protracted crises in emerging markets (eight and six years, respectively).

It is important to add that, although self-insurance has a strong rationale for individual countries, and indeed helped many emerging and developing countries withstand the recent global financial turmoil, it is the source of a major "fallacy of composition": if its counterpart is current account surpluses, particularly in major emerging economies, they contribute to the generation of global imbalances.

Reforming the System

There are potentially many ways to reform the system. The most ambitious would be to go back to Keynes' International Clearing Union or to create a Global Reserve Bank,[5] but negotiating the creation of a new global institution would be a very difficult task. So, there are essentially two possible reform paths. The first and, in a sense, inertial solution would be to let the system evolve into a true multicurrency arrangement. The second would be to fulfill the aspiration set in the IMF Articles of Agreement in 1969 of "making the special drawing right the principle reserve asset in the international monetary system" (Article VIII, Section 7 and Article XXII), as well as the instrument for funding IMF emergency financing during crisis. This second path is probably the best long-run arrangement. In practice, however, these two alternatives can be combined and such combination may be politically more acceptable for the current issuers of reserve currencies, particularly for the United States.

As was already indicated, under the current system, other currencies can compete with the dollar as an international means of payments and reserve assets. However, this competition has been relatively weak. According to the IMF data on the composition of allocated foreign exchange reserves, in late 2013, 61.2 percent were held in US dollars, 24.4 percent in euros, and the rest in other currencies. Additionally, over 80 percent of foreign exchange transactions are managed in US dollars. The recent crisis has thus clearly shown that the "network externalities" in the use of money continue to favor the US dollar, and that there is no alternative in today's world to the market for US Treasury securities in terms of liquidity and depth.

This is consistent with several recent evaluations of the role of alternative currencies. The euro has continued to be the secondary global reserve currency, showing resilience in this regard despite the recent Eurozone crisis. On the other hand, for several years China has adopted a policy of internationalization of the renminbi. However, the possibility of a larger role for the renminbi depends on several conditions that can only materialize in the long term: deep and liquid domestic financial markets, a flexible exchange rate, and, more generally, a liberalization of financial and foreign exchange markets that Chinese authorities are not willing to adopt and which may, in fact, be counterproductive for the Asian giant at the present stage (Yu, 2012).

The basic advantage of a multicurrency arrangement is that it allows reserve holders—notably, as we have seen, emerging economies—to diversify the composition of their foreign exchange reserve assets, and thus to

counteract the instability that characterizes all individual currencies under the current system. In this regard, however, exchange rate flexibility among alternative reserve currencies would be an advantage but also a potential cost. The first feature would make the system more resilient than the fixed gold-dollar parity that led to the collapse of the original Bretton Woods arrangement. However, if central banks around the world actively substitute among currencies to enjoy the benefits of diversification, this could increase exchange rate volatility among major reserve currencies, and would thus require the creation of a "substitution account" to facilitate the exchange for SDRs of reserves in the currencies the central banks do not want to hold. This alternative has been suggested to manage the instability of the US dollar since the 1970s, but it has not been adopted due to the complexities involved in determining who would bear the potential costs of such mechanism.

However, aside from diversification to manage the instability of the US dollar exchange rate, this reform would not address any of the other deficiencies of the current system. The benefits from the reserve currency status would still be captured by industrial countries and eventually by China, so the system would continue to be inequitable. It would not solve the recessionary bias of the current system either, nor would it reduce emerging and developing countries' demand for self-insurance. Finally, in the light of the growing demand for reserves, the dominance of the US dollar could worsen the net external liability position of the United States and associated problems highlighted by the Triffin dilemma.

The alternative, which may also be seen as a complementary reform route, would be to place at the center of the system the only truly global reserve asset that the world has created: the SDRs. This system should fulfill the criteria set by the Chinese central bank governor: "an international reserve currency should first be anchored to a stable benchmark and issued according to a clear set of rules, therefore to ensure orderly supply; second, its supply should be flexible enough to allow timely adjustment according to the changing demand; third, such adjustments should be disconnected from economic conditions and sovereign interests of any single country" (Zhou, 2009).

Under current rules, the IMF makes allocations of SDRs on the basis of a long-term global need, and with the purpose of supplementing existing reserve assets. So far there have been four general SDR allocations: the original one, in 1970–72, for SDR 9.3 billion; a second in 1979–81 for SDR 12.1 billion; a third proposed in 1997, partly to allocate SDRs to members that had joined after 1981, was not effective until the Fourth Amendment of the IMF Articles of Agreement (of which it was part) was approved by the US Congress in 2009; and a fourth, and the largest in history, for US$250 billion (SDR 161.2 billion) agreed by the G-20 in 2009 as one of the measures to boost international liquidity during the global financial crisis. Allocations are made according to IMF quotas, and therefore are much larger for high-income countries. Table 5.1 indicates that the share of high-income countries has gradually declined over time, but was still over 60 percent in 2009, with the falling share of OECD countries partly compensated by the rise of

Table 5.1 SDR allocations by level of development (in millions of SDRs)

	Allocations (in milion SDRs)			*Share in total allocations*		
	1970–72	*1979–81*	*2009*	*1970–72*	*1979–81*	*2009*
High income: OECD	6,796	7,906	109,095	73.6	65.8	59.7
United States	2,294	2,606	30,416	24.8	21.7	16.7
Japan	377	514	11,393	4.1	4.3	6.2
Others	4,125	4,786	67,286	44.7	39.8	36.8
High income: non-OECD	17	127	3,372	0.2	1.1	1.8
Gulf countries	0	78	2,057	0.0	0.7	1.1
Excluding Gulf countries	17	49	1,315	0.2	0.4	0.7
Middle income	1,507	2,758	55,062	16.3	22.9	30.1
China	0	237	6,753	0.0	2.0	3.7
Excluding China	1,507	2,521	48,309	16.3	21.0	26.4
Low income	913	1,226	15,125	9.9	10.2	8.3
Total allocations	9,234	12,016	182,653	100.0	100.0	100.0

Source: IMF, International Financial Statistics. For country classifications, see notes in figure 5.2.

high-income non-OECD countries. Middle-income countries have increased their share but, in contrast, low-income countries have seen their share fall.

SDRs are defined by the IMF as an "international reserve asset."[6] However, under the current rules, countries have to pay interest on allocations of SDRs, but receive interest on holdings. In this sense, SDRs are peculiarly both an asset and a liability. Moreover, since countries that use them make net interest payments to the Fund, they should perhaps really be considered as an overdraft facility. The use of SDR allocations is quite active and works rather smoothly, with developing countries making a frequent use of them as did industrial countries at different conjunctures (Erten and Ocampo, 2013).

Proposals for more active SDR allocations follow two different approaches: issuing them in a countercyclical way (Camdessus, 2000; Ocampo, 2002; United Nations, 1999) and making regular allocations, reflecting the additional global demand for reserves (United Nations, 2009b, Ch. 5). The two approaches can be complementary, as regular allocations could be withheld during booms until the world economy goes into a downturn, following preset criteria. Most estimates indicate that allocations for the equivalent of US$200–300 billion a year would be reasonable,[7] but even such allocations would only increase the share of SDRs in non-gold reserves to somewhat above 10 percent in the 2020s, indicating that they would still largely complement other reserve assets.

Even if the world moves moderately in this direction, a more active use of SDRs would go a long way to reduce the three major problems of the current system. First, it would partially free the international monetary system from the vagrancies of having to depend on the monetary policy of the leading country, and the associated seigniorage would accrue to all IMF members.

Second, by issuing SDRs in a countercyclical way, new SDR allocations during crises would have the potential of reducing the recessionary bias associated with the asymmetric adjustments of surplus versus deficit countries. Third, SDR allocations could reduce the need for precautionary reserve accumulation by developing countries and would represent a lower cost of building self-protection than accumulating international reserves through borrowing or building up current account surpluses.

Perhaps the most important and simplest reform would be to finance *all* IMF lending and in fact to make all IMF operations with SDRs, thus making global monetary creation similar to how central banks create domestic money. This idea was suggested by the IMF economist Jacques Polak (1979). According to his proposal, IMF lending during crises would create new SDRs, but such SDRs would be automatically destroyed once such loans are paid for. The alternative I have suggested would be to treat the SDRs not used by countries as deposits in (or lending to) the IMF that could then be used by the institution to lend to countries in need (Ocampo, 2010). Either of these proposals would involve eliminating the division between the so-called General Resources and the SDR accounts that is an inheritance of the debates of the 1960s, which makes SDRs a relatively limited instrument of global monetary cooperation (Polak, 2005, Part II).

The use of SDRs to finance IMF programs would help consolidate the reforms of the credit lines that have been introduced during the recent financial crisis, particularly the creation of contingency credit lines (notably the Flexible Credit Line) and the much larger levels of financing relative to quotas. It would eliminate the need for the IMF to get financing from its members in the form of the "arrangements to borrow" or the bilateral credit lines that have been actively used in recent years. It would also eliminate, in fact, the need to adopt quota increases, and would eliminate the need for the IMF to manage multiple currencies, most of which are useless for its main operations. Agreement on quotas would still have to be set to determine the size of access to Fund facilities as well as voting rights. In any case, for this reform to reduce the demand for "self-insurance," it is essential that the size of IMF credit lines, their conditionality, and the stigma associated with borrowing from this institution be overcome.

Following the discussions of the 1960s and early 1970s, there are also ways of including a "development link" in SDR allocations and in the way they are used by the international community. One mechanism would be to include a criterion of demand for reserves in SDR allocation. A simple solution, suggested by Williamson (2010), would be to allocate a certain proportion to emerging and developing countries (say around 80 percent), and then assigning the shares of the allocation to individual countries within each category (emerging and developing and industrial countries, respectively) according to IMF quotas. Another would be to design mechanisms by which unutilized SDRs are used to provide or, as we would prefer, *leverage* financing for development, for example, by allowing unused SDRs to be used to buy bonds from the multilateral development banks or institutions

that provide global public goods (such as climate mitigation and adaptation) (United Nations, 2009b).

Allocation rules could also be made to help correct the asymmetry between surplus and deficit countries. For example, countries with large surpluses and/or excessive reserves could be penalized by suspending their right to receive SDR allocations. Of course, the definition of "excessive reserves" would have to take into account the exceptional demand for reserves by developing countries.

Some analysts have suggested that a reform along these lines would require an increasing demand for SDRs, which can only come from its transformation into an asset held by the private sector (Eichengreen, 2007; Kenen, 1983; Padoa-Schioppa, 2011). However, such private use of SDRs could generate problems of its own, particularly speculative changes in the demand for this global reserve asset. It would also face strong opposition to the reform of the system by the United States. For these reasons, it may be better to think of a mixed system in which national or regional currencies continue to play the major role in private transactions, and the SDR performs the functions of reserve asset and medium of exchange in transactions among central banks.

As was already pointed out, under a mixed system that mixes SDRs with a multicurrency arrangement, a "substitution account" should be created, allowing central banks to exchange for SDRs the holdings of specific reserve assets. This account could also be seen as a transition mechanism of an ambitious reform effort (Kenen, 2010b). An essential issue is how to distribute the potential costs of this mechanism, the problem that blocked its adoption three decades ago. However, these costs are not necessarily very high. Simulations by Kenen (2010a) based on historical data for 1995–2008 indicate that those costs would have been small during that period.

The most desirable and viable reform involves, therefore, moving to a fully SDR-based IMF with a clear countercyclical focus. This would include countercyclical *allocations* of SDRs and countercyclical IMF *financing*, made entirely in SDRs. It would also involve designing criteria for SDR allocations that take into account the very different demand for reserves by industrial versus emerging and developing countries. The introduction of a substitution account would in fact make the SDR complementary to a multicurrency system, a fact that would make the reforms more attractive for the United States. This mix is probably the best practical option for moving forward.

5.3 Macroeconomic Cooperation

Global Imbalances

Macroeconomic policy is perhaps the best example of the tension between the strength of globalization and the persistence of policies that continue to be mainly national (regional in the case of the Eurozone). The net result is that the world lacks a mechanism that guarantees the consistency of the macroeconomic policies adopted by the major economies, including the country that issues the major reserve asset.

The main challenges of macroeconomic policy coordination are managing global imbalances. The world economic system has generated massive current account imbalances since the 1997 Asian crisis and, particularly, during the 2003–07 boom (figure 5.3). The main manifestations were the US deficit, with a moderate correction at the end of the boom thanks to the depreciation of the dollar (see figure 5.1 again). In turn, the European Union went from running a current account surplus in 2002–04 to a deficit at the end of the boom. However, this was a reflection of sharply diverging trends: a massive increase in the German surplus, but also that of other economies (Sweden, The Netherlands, and Austria), together with rising deficits in the "peripheries"—both the Western (notably Spain, Greece, Portugal, and Ireland, in that order) and the Central and Eastern ones (Poland, Bulgaria, Hungary, and the Baltic countries)—and in France, Italy, and the United Kingdom.

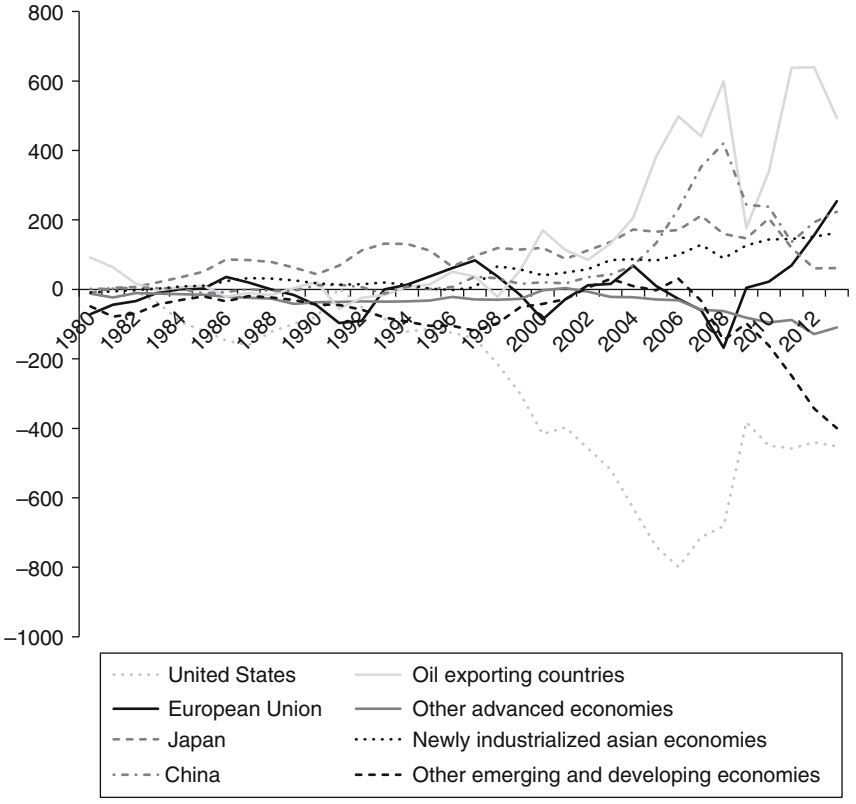

Figure 5.3 Current account balances (billion US dollars)

Notes: Oil exporting countries: Angola, Bahrein, Iran, Iraq, Jordan, Kuwait, Lybia, Omar, Qatar, Russia, Saudi Arabia, United Arab Emirates and Venezuela Emerging Asian Economies: Hong Kong, Republic of Korea, Singapore, and Taiwan POC.

Source: IMF, International Financial Statistics.

The counterpart to these deficits was massive and rising surpluses in China, the oil exporting countries and, to a lesser extent, Japan and the other East Asian emerging economies. Other emerging economies also went from a deficit at the time of the Asian crisis to a surplus at the end of the boom. But broadly speaking, the dominant characteristic of global imbalances in the run up to the global financial crisis was the massive US deficits to absorb the surpluses of most emerging economies, particularly of East Asia and the oil exporting countries.

The crisis led to major changes in these trends. In particular, the US deficit fell significantly and the European Union went from a deficit to a large surplus position. The latter reflected, in turn, a sharp recessionary adjustment of deficits in its peripheries (with only Poland experiencing an expansionary adjustment) while maintaining the large German and Dutch surpluses (those of Austria and Sweden moderated significantly). The oil exporting countries experienced first a short-term reduction in its surplus but then became the major global source of payments surpluses in 2011–12. The result is that the pressure to adjust in the opposite direction fell on emerging and developing countries. The Chinese surplus was cut by half and the non-East Asian developing economies went from running a surplus to a significant deficit in 2013. Japan also experienced a small correction of its surplus.

As these trends indicate, there is no single cause of global imbalances. Furthermore, they reflect both structural as well as short-term phenomena. The strong pressure for the United States to run persistent deficits is, of course, the main structural factor, and it is related to the Triffin dilemma. The surplus of oil exporting countries is another structural feature, though it also has cyclical dimensions. Other structural phenomena are the surpluses of East Asia, including Japan, which can be interpreted alternatively as the result of high levels of industrial competitiveness or of high savings rates. However, one of its major sources, the undervaluation of the Chinese renminbi, had a policy origin but has experienced a significant correction.[8]

The asymmetric adjustments that characterize the global monetary system are clearly at work and represent the most important short-term phenomenon after the outbreak of the crisis. The correction of the deficits in the different European peripheries is the most important feature. On the other hand, non-oil emerging economies outside East Asia are now under pressure to run current account deficits. As past history indicates, these deficits generate significant risks for these economies.

I should add the global deficiency in aggregate demand that has characterized the global economy during the recent crisis to these problems. As we will see, the G-20 initially responded to this aggregate demand deficiency with relatively coordinated expansionary macroeconomic policies, but this was very soon replaced by policy divergence, with several countries moving in the direction of austerity.

Overall, therefore, we see at work, since the Asian crisis, the three different deficiencies of the international monetary system: the asymmetric pressures on deficit versus surplus countries to adjust, the Triffin dilemma, and the

demand for self-insurance by emerging economies. Two additional phenomena have also played an important role: the deficiencies in global aggregate demand since the outbreak of the global financial crisis, and the complexity of the recycling of surpluses of oil producing nations in the new era of high oil prices.

Macroeconomic Policy Cooperation

To manage these complex issues, the world counts with insufficiently developed mechanisms of macroeconomic policy dialogue and cooperation. The IMF is the major instrument of cooperation of a multilateral character. Article I.i of the Articles of Agreement defines as its first purpose: "To promote international monetary cooperation through a permanent institution which provides the machinery for consultation and collaboration on international monetary problems." In practice, however, most mechanisms of macroeconomic cooperation have operated outside the IMF and have not been particularly effective. They include the ad-hoc agreements of the 1980s among the leading industrial economies, in particular the Plaza and Louvre accords of 1985 and 1987, the major focus of which was to facilitate an orderly depreciation of the US dollar and an appreciation of the Japanese Yen. The dialogue then shifted to the G-7. This tradition was kept until the recent crisis, when the G-20 decided in Pittsburgh at the September 2009 meeting to self-designate itself as "the premier forum for our international economic co-operation." It is complemented by the informal coordination among leading central banks, which has been critical since the outbreak of the subprime crisis in the United States in mid-2007. Macroeconomic cooperation has thus taken place predominantly through these mechanisms of "elite multilateralism" rather than through the formal multilateral organization that the world has created for that purpose.

G-20 cooperation was successful in the initial phase of the crisis, when it assumed the form of a "Keynesian consensus," which led to fairly coordinated expansionary monetary and, to a lesser extent, expansionary fiscal policies. Its major success was averting a new Great Depression. However, in relation to fiscal policies, the consensus broke down in the June 2010 G-20 Toronto meeting, when it became clear that there was a deep division between countries that continued to defend expansionary policies to face the weakness of aggregate demand, and those that placed the priority on fiscal austerity to guarantee public sector debt sustainability. The consensus on monetary policy has been more persistent, except for the temporary lapse of the European Central Bank, which partly reversed its monetary stimulus in 2011 before shifting again to an expansionary policy at the end of that year. The need for continued monetary stimulus in the advanced economies has generated, of course, a major contrast with the situation of emerging economies that continue to be relatively strong and therefore need less accommodative monetary policy. This generated a strong incentive to shift capital toward the emerging world, generating strong monetary and exchange pressures, partly

corrected since the announcement of a gradual reduction of US Fed asset purchases ("Fed tapering") in May 2013.

The MAP launched in 2009 in Pittsburgh to implement the "Framework for Strong, Sustainable, and Balance Growth" is the major instrument of macroeconomic policy cooperation. In a two-step process that took place in Paris and Washington in February and April, 2011, the G-20 finance ministers and central bank governors agreed on what are "the persistently large imbalances that require policy action": "(i) public debt and fiscal deficits; and private savings and private debt (ii) and the external imbalances composed of the trade balance and net investment income flows and transfers, taking due consideration of exchange rate, fiscal, monetary, and other policies" (G-20, 2011a). This was followed by the determination of the indicative guidelines against which each of the indicators would be assessed, which are explicitly "not targets" but "reference values" that determine which countries would be subject to an in-depth review. For this purpose, the ministers and governors determined that a complementary use would be made of economic models with statistical analysis based on each country's historical trends, a comparison with other countries at similar level of development, and all G-20 members (G-20, 2001b). It was agreed that economies that show large imbalances in at least two indicators and represent more than 5 percent of G-20's GDP at either market or PPP prices should be subject to particular scrutiny of the associated imbalances.

In practice, the main technical support is provided by the IMF, which was asked "to assess the coherence, consistency, and mutual compatibility of G-20 members' policy frameworks." This involves three different activities: assessing the individual countries' submissions, aggregating them to assess their mutual consistency, and making policy recommendations (IMF, 2011c). This is reflected in regular analyses by the Fund that are presented simultaneously to the G-20 and the IMF board. This activity, which is defined as "technical assistance" to G-20 members, generates an obvious tension between the truly multilateral character of the Fund and the specific ownership of the MAP by the G-20. In principle, a better institutional model was the consultation on multilateral imbalances that were launched in 2006 in the framework of the IMF, with participation of a subset of key countries but responsible to the whole membership. However, it led to no significant results, because it lacked ownership by the leading countries.

The G-20 activities have been combined with a proper IMF activity; strengthening of surveillance, both multilateral and bilateral. Indeed, it can be said that this, together with the significant modernization of credit lines, have been the two major innovations in the Fund work since the outbreak of the crisis, with that of surveillance having perhaps the most important global implications. Multilateral surveillance includes the use of the major IMF publications: the *World Economic Outlook* (and associated regional outlooks), the *Global Financial Stability Report*, the new *Fiscal Monitor*, and the *Consolidated Multilateral Surveillance Report*. They also include reports that link bilateral and multilateral surveillance, particularly the "spillover

reports" for the "systemic 5" (United States, United Kingdom, Eurozone, Japan, and China) and the pilot "External Sector Reports" assessing global imbalances, the first of which was issued in July 2012. This report aims at analyzing beyond exchange rates to consider a detailed examination of current accounts, reserves, capital flows, and external balance sheets. We can add to this list of the links between bilateral and multilateral the reports to the G-20. In turn, the major instrument of bilateral surveillance continues to be the Article IV Consultations. Its major changes are the more in-depth consideration of financial issues and the more "candid" assessments of major economies. As part of the modernization of Fund surveillance, in 2010 it was also decided that 25 jurisdictions with systemically important financial sectors must be subject to Financial Sector Assessments Programs (FSAP).

It is quite clear that the world had never developed an elaborate system of surveillance and macroeconomic policy dialogue such as this one. It is also true that there has been an improvement in "evenhandedness" of different IMF members, and in fact the more systemic economies are now subject to particular attention. However, the system that has been put in place continues to rely essentially on a mix of surveillance and peer pressure, both of which have a weak capacity to induce change, as reflected in the limited effect that IMF criticism has had on individual countries' (or regions') policies: the limited practical attention to the spillovers generated by expansionary monetary policies in the developed countries on emerging markets and associated "currency wars," as well as the incapacity to moderate fiscal austerity in the Eurozone or to force China to appreciate its exchange rate at a faster rate. So, at a future stage, it may be essential to move to more specific targets for specific macroeconomic indicators. This is what I suggest below in relation to the exchange rate.

The Exchange-Rate "Nonsystem"

Exchange rate stability was an essential element of the Bretton Woods arrangement. This objective was thus explicitly incorporated into the IMF's Articles of Agreement, but was also seen as crucial to guarantee another purpose, "to facilitate the expansion and balanced growth of international trade." The arrangement opted, therefore, for a system of fixed but adjustable pegs, which worked well for more than a quarter century, with some flexibilities (e.g., Canada usually managing a flexible exchange rate and several Latin American countries moving into crawling pegs in the second half of the 1960s). The system initially included the principle that modifications of the exchange rate parities would have to be subject to consultation, but this never worked in practice. Given the centrality of exchange rate policies in the history of the IMF, this is perhaps the area in which the international community should look for better forms of macroeconomic cooperation.

The major problem after the breakdown of the original arrangement in the early 1970s is, however, that it was followed by a *non*system, as all countries are essentially free to choose any exchange rate regime they prefer. The only

constraint, according to Article IV of the IMF Agreement is that countries should "avoid manipulating exchange rates or the international monetary system in order to prevent effective balance of payments adjustment or to gain an unfair competitive advantage over other members." This is also the center of the June 2007 decision on bilateral surveillance, which replaced the 1977 decision on surveillance of exchange rate policies that had been adopted after the collapse of the Bretton Woods arrangement. The essential problem is, of course, that the IMF has failed to determine what "manipulation" means.

The centrality of exchange rates is derived for their effects on international trade, as is their central role in correcting payments imbalances; we can add that exchange rate movements may also reflect divergence in other macroeconomic policies. In relation to the first issue, a major concern is that there is no mechanism linking world trade and exchange rate rules. This is paradoxical, given the fact that exchange rate movements can generate stronger effects on trade than the painstaking negotiations on trade rules. For this reason, some have suggested that exchange rate issues should be brought into WTO dispute settlement (Matoo and Subramanian, 2008), but this may end up weakening one of the few successful mechanisms of its kind at the international level. This decision would also leave aside the fact that exchange rates have many other macroeconomic effects aside from those on trade, which is why they should be under the IMF jurisdiction.

In relation to other objectives, the exchange rate nonsystem has also failed to meet two additional purposes set in the IMF Article of Agreement: to "lessen the degree of disequilibrium in the international balance of payments," and "to promote exchange stability." One basic reason for that is that exchange rate movements are essentially determined in the contemporary world by financial flows, which may follow boom-bust patterns and lead to high levels of volatility that have in both cases little relation with "macroeconomic fundamentals." This indictment is extensive to exchange rates among major currencies, all of which have experienced a significant level of "excess volatility" since the global financial crisis.

The system could therefore be improved by introducing elements that enhance the capacity of exchange rate to contribute to correcting global imbalances and to provide a reasonable level of stability. Returning to fixed exchange rates among major currencies is, of course, impossible, given the magnitude of capital flows, but also inconvenient, since exchange rates must serve also to adjust different priorities of macroeconomic policies. The best is probably a system of reference rates among major currencies, which has been suggested by Williamson (2007), among others. This implies that major countries would follow some form of managed floating around multilaterally agreed parities or bands. One of the advantages of such a system is that it would also give some guidance to markets, which may help avoid extended periods of deviation from equilibrium. Interventions in not only foreign exchange markets but also other macroeconomic policies would support the movement of exchange rates toward the agreed parities or bands (i.e., reinforce

depreciation if the currency is perceived to be overvalued and appreciation if it is undervalued). Intervention rules would provide an implicit definition of what "manipulating" the exchange rate means.

In this framework, the process leading to the determination of exchange rate parities would have to take into account all macroeconomic determinants of the exchange rate, and would thus summarize a significant amount of information. A simpler approach would be to look directly at payments imbalances, and particularly at *current* account disequilibria which, as we know, is equivalent to looking at saving-investment imbalances.

Even better would be to look at payments imbalances among countries together with global macroeconomic imbalances—that is, measures of the global output (employment) gaps and inflationary or deflationary pressures. Furthermore, they could include the broader set of indicators chosen by the G-20 for its MAP. In any case, complexity may not be a good starting point for an incipient process. For that reason, a simple set of indicators may be better. This is why the reference exchange rate proposal is a good idea, complemented with information on current account deficits and global output gaps.

Capital Account and Prudential Regulations

The central role that capital flows play in determining exchange rates and exchange rate volatility brings into attention an additional leg of international monetary reform: the management of capital flows. This issue links with the broader concerns with financial stability, which the recent crisis placed under the responsibility of the FSB. Paradoxically, however, *cross-border* finance was left entirely out of the FSB agenda. It was, nonetheless, taken up by the IMF.

The essential problem is that capital flows, like finance in general, are highly volatile and pro-cyclical. According to IMF (2011b, ch. 4), capital account volatility has increased over the past three decades and tends to be higher in emerging market economies than in advanced economies. Bank and other capital flows are more volatile, followed by portfolio debt flows, but the volatility of foreign direct investment (FDI) has increased and is now similar to that for portfolio debt flows—perhaps reflecting the fact that financial FDI (borrowing by subsidiaries from a parent banks or firms) has tended to increase. In turn, some of the major determinants of net flows to emerging economies are monetary conditions and risk perception in the advanced economies, generating significant net flows when interest rates are low and there is low risk aversion. Moreover, portfolio decisions in industrial countries may be entirely delinked from demand for capital by emerging and developing countries and can have severe effects given the relative sizes of capital markets. So, a small change in portfolio allocation in the former can have major repercussion on the latter.

This recent IMF analysis comes, of course, in addition to massive evidence that financial markets are pro-cyclical and are highly segmented by

risk categories. At the international level, this generally implies that emerging economies and developing countries are classified as riskier borrowers, and are subject to strong cyclical swings in net flows, risk spreads, and availability of long-term financing. These cyclical swings are, in turn, one of the major determinants (and perhaps *the* major determinant) of business cycles in emerging economies. These countries face further problems that their domestic financial markets are significantly more "incomplete" and are plagued by variable mixes of currency and maturity mismatches in portfolios, and that their capital markets are shallower and, as indicated, small relative to the magnitude of the speculative pressures they face.

Under the leadership of the FSB, and also of national and regional (European) initiatives, there has been a significant move to reregulate finance in recent years. This includes the new regulatory standards for banks known as Basel III, which increase the capital and, particularly, the core capital requirements, and add a countercyclical capital cushion, a maximum leverage, and strong liquidity requirements. This has been complemented by stronger regulations for the most systemically important institutions ("too big to fail"), stricter rules on links between banks and capital markets and on derivative operations, and rules on the so-called shadow banking system. Stronger supervision has also been put in place, including a common supervisory system in the European Union, as well as global standards on insurance and capital markets. There have been, however, some delays in adopting the new regulatory frameworks and some political economy pressures that have already led to the softening of banks' liquidity requirements.

Strengthened financial regulation will tend to reduce risk-taking, particularly by banks, displace cross-country flows toward capital markets (as past Basel regulations did), and may leave loopholes in regulation that facilitate the active market participation of agents that behave in a more speculative manner. The net effect is unclear and hinges on the balance between the two forces that have been at work in recent years: the balkanization of finance that was unleashed by the recent global financial crisis (which can also be understood as increased "home bias" and perhaps an emerging financial protectionism) versus the correction of the financial excesses that characterized the precrisis financial world. The result so far has been a significant reduction of cross-border flows, but this has been dominated by intra-European flows, leading to a resegmentation of European financial markets. In contrast, capital flows to emerging markets have experienced a strong recovery and for some regions and countries now surpass precrisis levels (Lund et al., 2013). Rather than insufficient finance, the problem for emerging markets may be the pressure that large capital flows exert to increase current account deficits, as reflected in the previous analysis of global imbalances. This implies that emerging markets have become the new ground for risk taking and underscores the central role of the debate on capital account regulations.

This debate has taken place largely in the IMF, though also in part in the G-20 in late 2011. The earlier official IMF documents (IMF, 2011a and 2012b) presented a positive view of regulation of inflows by recipient

countries (capital flow management measures, [CFMs], in Fund terminology), but had a critical view of regulations on outflows. In the first case, they recognized that regulations improve the liability structure of countries by reducing the share of more volatile flows and increasing the policy space for restrictive monetary policies, though they may be ineffective in reducing the total size of inflows and to modify the exchange rate. These documents took into account a large-scale research effort undertaken by the Fund in recent years to evaluate the effectiveness of capital account regulations (see, in particular, Habermeier et al., 2011 and Ostry et al., 2010 and 2011).

On the basis of these analyses, the Fund proposed in 2011 some guidelines on the use of regulation on capital inflow (IMF, 2011a, box 1). These guidelines correctly pointed out that capital account regulations should be recognized as part of the "macro-prudential" family of regulations and should be seen as a complement and not a substitute for an appropriate macroeconomic policy. However, they tended to see regulations as a sort of "intervention of last resort," once other macroeconomic options had been exhausted: allowing the exchange rate to appreciate, accumulating foreign exchange reserves, adopting restrictive fiscal policies, and lowering the domestic interest rate (a paradoxical recommendation, given that the objective is to reduce the aggregate demand effects of capital inflows). The guidelines also indicated that preference should be given to regulations that do not discriminate according to the residence of the agents involved.

These guidelines were considered to be excessively restrictive by many analysts, who rather conceived of capital account regulation as part of the normal toolkit of macroeconomic interventions that should be used simultaneously with other macroeconomic policies to both limit excessive capital inflows and avoid domestic overheating and exchange rate overvaluation.[9] These views see capital account regulations as a continuum of macro-prudential regulations that include strictly domestic regulations (those that affect domestic assets and liabilities in the domestic currency), those that relate to the use of assets and liabilities denominated in foreign currencies in the domestic financial system, and those that regulate cross-border capital flows as such. The particular mix between these three forms of macro-prudential regulations depends on the authorities' policy objectives and the characteristics of the domestic financial system of the countries involved (Ocampo, 2011; Ostry et al., 2011). These alternative views recognized that capital account regulations are a complement to macroeconomic policy and that they should be as part of the normal toolkit rather than as interventions of last resort. This more pragmatic view is also implicit in the framework on this issue adopted by the G-20 (2011c).

These debates served in late 2012 as the basis for the discussion and approval (with some dissents, particularly that of Brazil), of the IMF's institutional view on liberalization and management of capital flows (IMF, 2012b).[10] This view recognizes that "There is no presumption that full liberalization of capital flows in an appropriate goal for all countries at all times," and that liberalization "needs to be planned, timed and sequenced." It also indicated

that capital account regulations on inflows can be useful in managing the risks associated with large inflows, with language now less inclined to posing them merely as interventions of last resort. However, it also underscored that they should be "targeted, transparent, and generally temporary." It also now agreed that regulations on outflows can be useful in crisis conditions, but again should be temporary. Finally, in both cases, regulations should avoid discrimination based on residence, a condition that may be impossible to fulfill, as agents demands assets and liabilities in different currencies based on residence. And, finally, although it recognized that push factors are important, and that the source countries should "better internalize the spillovers from their monetary and prudential policies," it gave no guidelines as to actions that they should undertake to avoid inducing large capital outflows toward emerging economies.

This institutional view is certainly more nuanced than previous IMF positions on the subject, but it should be understood as a "half step" rather than a "U-turn" in the direction of reregulating cross-border capital flows. From the IMF perspective, this institutional view would be used for policy advice, but it is not expected to be used in Article IV Consultations and does not eliminate the capacity that countries have to regulate capital flows according to the IMF Articles of Agreement. It is also expected to "foster a more consistent approach to the design of policy space for CFMs under bilateral and regional agreements," including OECD rules and free trade agreements.

5.4 Conclusions

This paper highlights several elements of a development-friendly agenda for international monetary reform. In terms of the global reserve system, the most desirable reform involves moving to a fully SDR-based IMF with a clear countercyclical focus. This would include countercyclical allocations of SDRs and countercyclical IMF financing, made entirely in SDRs. In the first case, it could include criteria for SDR allocations that take into account the demand for reserves by industrial versus emerging and developing countries. In turn, the use of SDRs to finance IMF programs would help consolidate the reforms of the credit lines that have been introduced during the recent global financial crisis, particularly the creation of contingency credit lines and the much larger levels of financing relative to quotas. The introduction of a substitution account by which central banks can exchange for SDRs the reserves in currencies they do not want to hold would make the latter a complement to the multicurrency reserve system that may be emerging.

From the point of view of macroeconomic policy cooperation, the major issues are counteracting the deficiencies in global aggregate demand and avoiding building up large global imbalances. The latter require, in turn, the need to move to a system of reference exchange rates among major currencies. In terms of global imbalances, the most troublesome issue since the global financial crisis has been the pressure being faced by non-oil emerging economies outside East Asia to run deficits, with large capital inflows

being the most important transmission mechanism. Past history indicates that current account deficits generate risks for these economies. Managing these pressures requires, therefore, recognizing the role that capital account regulations play as a complement to countercyclical macroeconomic policy and prudential regulations, and thus as part of a normal policy tool rather than as interventions of last resort.

Needless to say, this agenda should be matched by governance reforms, which should include the design of a more representative apex organization than the G-20, stronger "voice and participation" of developing countries in the Bretton Woods Institutions and the FSB, and a multilayered architecture with active participation of regional and sub-regional institutions. The analysis of these reforms exceeds, however, the scope of this chapter.

Notes

1. Some exceptions were Ocampo et al. (2007, ch. 4) and Stiglitz (2006, ch. 9).
2. A fuller discussion of these issues can be found in two previous papers of the author (Ocampo, 2010 and 2011).
3. I prefer this term to "deflationary," which is generally used in debates on this issue, as this pressure is more likely to be reflected today in economic activity than in price deflation.
4. Estimated with data from IMF (2013).
5. This is Stiglitz' (2006, ch. 9) proposal.
6. See, for example, http://www.imf.org/external/np/exr/facts/sdr.htm
7. See a survey of different estimates in Erten and Ocampo (2013).
8. Part is due to nominal appreciation but even more so to relative wage movements, which are not generally captured in traditional estimations of real exchange rates.
9. See, for example, the contributions to Gallagher et al. (2012).
10. See a critical analysis in Gallagher and Ocampo (2013).

PART III

On Challenges and Opportunities for Emerging Economies

CHAPTER 6

Macroeconomic Effects of the Demographic Transition in Brazil

Ricardo D. Brito and Carlos Carvalho

6.1 Introduction

Brazil is a relatively young, prominent developing country undergoing what is expected to be a fast demographic transition. Owing to a decline in the mortality rate, the Brazilian population increased significantly between 1940 and 1970. In the 1940s, the annual population growth rate was around 2.4 percent, rising to 3.0 percent in the 1950–60s, as life expectancy rose from 44 to 54 years. According to Carvalho (2004), the so-called demographic transition in Brazil started in the 1970s, with a sudden fall in the fertility rate. The latter kept decreasing since then, leading to important differences between the actual age distribution of the population and its so-called stable-equivalent.[1] At the same time, longevity kept increasing. By 2010, population growth had fallen to only 1.0 percent per year, life expectancy had reached 74 years, and the economically active population had grown from 56 percent to 64 percent of the total population (between 1980 and 2010).

According to recent forecasts, population growth is expected to fall further, entering negative territory around 2050. A useful summary of the population's age structure, the *total dependency ratio*—the size of the population that is economically inactive to the size of the labor force—has been falling continuously since the peak attained around 1965. That ratio is now expected to hit bottom within the next ten years, before increasing again to reach a level close to its historical peak by the end of this century.[2]

It is well known that demographic developments may have important macroeconomic consequences. In particular, increases in longevity and decreases in population growth – which are features of modern demographic transitions such as the one Brazil is undergoing—have important implications for savings decisions, capital accumulation, and, ultimately, economic growth and

well-being. Such "ageing processes" may also present important challenges for public finances, depending on social security arrangements. In turn, because such arrangements are important determinants of consumption-savings decisions, they also shape the way in which demographic developments influence the macroeconomy.[3]

In this chapter, we study the macroeconomic effects of the demographic transition in Brazil. A common way to analyze the potential effects of demographic developments on the economy is to focus on the possibility of so-called demographic dividends arising during a demographic transition. The *first demographic dividend* starts after a fall in fertility leads the labor force to grow relatively faster than the overall population, thus spurring per capita income. At a later stage, lower fertility leads to lower labor force growth, while increases in longevity drive higher the population share of the elderly. As a result, the dependency ratio increases again and reverses the first dividend (FD). Brazil is close to the end of its first demographic dividend: the labor force should soon start growing less than the overall population. We thus focus on the possibility of a *second demographic dividend* arising during the remainder of Brazil's demographic transition. The second demographic dividend may arise if, facing the prospects of an extended period of retirement, individuals decide to increase the pace of asset accumulation (Mason and Lee, 2007). This leads to either larger domestic capital stock or larger foreign asset holdings. In either case, domestic income ends up being higher.

Whether or not a second dividend (SD) materializes during the ageing process depends crucially on the extent to which individuals need to save for retirement, which in turn depends on social security and other institutional and cultural arrangements. At first pass, the current social security system does not bode well for the prospects of a meaningful second demographic dividend in Brazil. According to Turra et al. (2011), the Brazilian social security system is particularly generous toward the elderly. Because Brazil is a developing country with a (still) young population, one could expect public transfers to be directed to children. Instead, as in older, developed Western countries, social programs to the elderly dominate public transfers, while children's well-being depends largely on individual household efforts. This arrangement certainly affects households' incentives to save for retirement.

However, in an open economy, lack of domestic savings need not hold back the pace of capital accumulation, which can be financed with foreign savings. All else equal, the existence of differences in the intensity, pace, and timing of demographic transitions across countries should influence the direction and size of international capital flows. Whether or not capital will flow to Brazil during the remainder of its demographic transition thus depends, among many other things, on its demographic developments relative to those elsewhere in the global economy.

To study how public policies and differential demographic developments vis-a-vis the world might interact to produce or prevent a second demographic dividend in Brazil, we use a small-scale, two-country, general-equilibrium overlapping generations (OLG) model, based on Gertler (1999) and

Ferrero (2010)—with the "foreign country" representing the rest of the (more developed) world. We keep the open economy dimension of Ferrero (2010) and reintroduce social security systems, as in Gertler (1999). The framework allows us to model differential demographic trends, social security systems, fiscal policies, retirement ages, and so on, and to study the role of demographics and policies in shaping a second demographic dividend in Brazil. To isolate the role of demographic developments in Brazil and abroad from other factors that can impact the variables of interest, these developments are the only forces driving the economies from one steady state to another. We also study the importance of international capital flows, by contrasting results for open- and closed-economy versions of the model.

Our results suggest that, given the current social security system, a small second demographic dividend would arise in Brazil if it remained relatively closed to trade in goods and assets. Opening up under current social security arrangements turns out to be a losing proposition in that respect. However, scenarios in which current social security arrangements are maintained produce incredible paths for some variables, such as expenditures with public pensions and taxes as a share of Gross Domestic Product (GDP). This is due to the fact that maintaining the very high replacement rates currently in place in Brazil becomes unsustainable as the country starts to age fast in the next couple of decades.

Motivated by these results we then entertain "reform scenarios," in which growth in expenditures with public pensions is contained. We first analyze a "bold" reform scenario in which expenditures with public pensions are frozen as a share of GDP, and the replacement rate has to adjust endogenously to balance the budget. This produces a more meaningful second demographic dividend in Brazil, irrespective of whether the economy is open or closed to trade. In fact, in this case, becoming more integrated with the world economy arguably becomes a winning proposition.

However, the bold reform scenario is arguably unrealistic, since it involves defaulting on "contracts" that are currently in place. Hence we consider a more gradual reform scenario, in which the replacement rate in Brazil is lowered to the level that prevails in the OECD over a 25-year period. This brings us back to a situation in which a closed economy might arguably deliver a larger SD.

We conclude that a meaningful SD is unlikely to materialize in Brazil. The main culprit is a generous social security system that considerably undermines households' incentives to save for retirement. We grant that there exist reforms that would be able to spur a meaningful SD, but our results indicate that they would need to be too aggressive to appear feasible.

Our work is related to two intersecting literatures. The first uses large-scale OLG models to study social security systems, evaluate policy reforms, and perform counterfactual analyses. Examples include Imrohoroglu et al. (1995), Attanasio et al. (2006, 2007), and Krueger and Ludwig (2007). In work applied to Brazil, Barreto (1997), Barreto and Oliveira (2001), and Ellery Jr. and Bugarin (2003) compare the pay-as-you-go social security scheme with a fully savings-funded system.

The second literature studies the macroeconomic effects of demographic developments. Examples include Ferrero (2010), Mason and Lee (2007), and Albrieu and Fanelli (2013). Like the last two papers, we focus on the second demographic dividend. Relative to these two papers, our work differs in that we rely on a framework in which the consumption-savings decisions that are key to the second demographic dividend are *endogenous*. In other words, we emphasize what demographers call the *behavioral* dimension of the SD. We present a quantitative analysis of the effects of the demographic transition on households' consumption-saving decisions, and its implications for asset accumulation, current account dynamics, and capital flows.

Our work is closest to Attanasio et al. (2006, 2007). They use a large-scale, two-country, general-equilibrium OLG model to study the effects of demographic developments on the macroeconomy, with a focus on social security. Both papers take a "North-South" perspective, and calibrate the model to data for the "More Developed Regions" and "Less Developed Regions" defined according to the UN's classification.[4] In particular, Attanasio et al. (2006) take the point of view of developing economies to study the macroeconomic implications of differential demographic transitions and social security systems in the North and in the South. However, Brazil does not fit their typical developing economy, which features relatively more favorable demographic trends going forward and much lower replacement rates than in the North.

6.2 The Analytical Framework[5]

As in Gertler (1999) and Ferrero (2010), the economic actors in the model are households, firms, and the government. Individuals are born workers and supply inelastically one unit of labor while in the labor force.[6] Income is either consumed or saved using the available assets: physical capital, government bonds, and foreign assets (in the open-economy versions of the model). Retirees consume out of their wealth and social security benefits. Goods-producing firms are perfectly competitive and produce the homogeneous consumption good. The government consists of a fiscal authority that takes government consumption and social security spending as given and relies on lump-sum taxes and one-period debt to satisfy its budget constraint. In our quantitative analyses we also consider cases in which expenditures with public pensions as a share of GDP are exogenously fixed and the replacement rate adjusts endogenously to balance the budget.

We consider the effects of changes in demographic parameters in an otherwise perfect-foresight environment. The only source of uncertainty that may potentially affect agents' behavior stems from idiosyncratic retirement and death risk. This approach isolates the effects of demographics on the macroeconomic equilibrium, and is thus suitable for our goals. For brevity, below we present the structure of the domestic economy. The foreign economy is analogous.

6.2.1 Households and Life-Cycle Structure

At any given point in time, individuals belong to one of two groups: workers (w) or retirees (r). At time $t-1$ workers have mass N^w_{t-1} and retirees have mass N^r_{t-1}. Between periods $t-1$ and t, a worker remains in the labor force with probability ω_{t-1} and retires otherwise. If retired, an individual survives from period $t-1$ to period t with probability γ_{t-1}. In period t, $(1-\omega_{t-1}+n_{t-1})N^w_{t-1}$ new workers are ready to work. This life-cycle structure implies the following law of motion for the aggregate labor force:

$$N^w_t = (1-\omega_{t-1}+n_{t-1})N^w_t + \omega_{t-1}N^w_{t-1} = (1+n_{t-1})N^w_{t-1}. \quad (1)$$

According to equation (1), n_{t-1} corresponds to the growth rate of the labor force between periods $t-1$ and t. The number of retirees evolves according to

$$N^r_t = (1-\omega_{t-1})N^w_{t-1} + \gamma_{t-1}N^r_{t-1}. \quad (2)$$

From equations (1) and (2), we define the (elderly) dependency ratio $(\psi_t \equiv N^r_t / N^w_t)$, which summarizes the relevant demographic dimension of the model, and evolves according to

$$(1+n_{t-1})\psi_t = (1-\omega_{t-1}) + \gamma_{t-1}\psi_{t-1}. \quad (3)$$

Workers supply one unit of labor inelastically, while retirees do not work. Preferences for an individual of group $z = \{w,r\}$ are defined recursively, based on a non-expected utility family (Epstein and Zin, 1989; Kreps and Porteus 1978), and imply risk neutrality:

$$V^z_t = \left\{(C^z_t)^\rho + \beta^z_t[E_t(V_{t+1}|z)]^\rho\right\}^{\frac{1}{\rho}}, \quad (4)$$

where C^z_t denotes consumption and V^z_t stands for the value of utility in period t. Retirees and workers have different discount factors to account for the probability of death:

$$\beta^z_t = \begin{cases} \beta\gamma_t & \text{if } z = r, \\ \beta & \text{if } z = w. \end{cases}$$

The expected continuation value in equation (4) differs across workers and retirees because of the different possibilities to transition between groups:

$$E_t\left\{V_{t+1}|z\right\} = \begin{cases} V^r_{t+1} & \text{if } z = r, \\ \omega_t V^w_{t+1} + (1-\omega_t)V^r_{t+1} & \text{if } z = w. \end{cases}$$

The analytical tractability of this life-cycle model comes from the fact that the transition probabilities ω and γ are independent of age and of the

time since retirement. With standard risk-averse preferences, however, the associated "retirement lottery" generates too strong a precautionary savings motive for young agents. Risk-neutral preferences with respect to income fluctuations eliminate this problem (Farmer, 1990; Gertler, 1999). Freedom to calibrate the coefficient of intertemporal substitution ($\sigma \equiv (1-\rho)^{-1}$) then allows us to obtain a reasonable response of consumption and savings to changes in interest rates.

Households consume a homogeneous final good C_t and allocate their wealth in physical capital K_t, bonds issued by the government B_t, and foreign assets F_t. Households rent the capital stock to goods producers at a (world) real rate $R_{W,t}$ plus the cost of depreciation $\delta \in (0, 1)$. Government bonds B_t also pay a gross nominal return $R_{W,t}$.

Retirees

An individual born in period j and retired in period τ chooses consumption $C_t^r(j,\tau)$ and assets $A_t^r(j,\tau) \equiv K_t^r(j,\tau) + B_t^r(j,\tau) + F_t^r(j,\tau)$, for $t \geq \tau$ to solve

$$V_t^r(j,\tau) = \max \left\{ (C_t^r(j,\tau))^\rho + \beta\gamma_t [V_{t+1}^r(j,\tau)]^\rho \right\}^{\frac{1}{\rho}} \tag{5}$$

subject to

$$C_t^r(j,\tau) + A_t^r(j,\tau) = \frac{R_{W,t-1}}{\gamma_{t-1}} A_{t-1}^r(j,\tau) + D_t(j,\tau), \tag{6}$$

where $D_t(j, \tau)$ is the retiree social security benefit.

At the beginning of each period, retirees turn their wealth over to a representative mutual fund, which invests the proceeds in available assets (K_t, B_t, F_t) and pays back a fair premium over the market return equal to $1/\gamma_{t-1}$ to compensate for the probability of death (Blanchard, 1985; Yaari, 1965). Investment decisions are made at the end of each period.

The consumption Euler equation for the retiree yields that consumption is a fraction $\epsilon_t \pi_t$ of total wealth

$$C_t^r(j,\tau) = \epsilon_t \pi_t \left(\frac{R_{W,t-1} A_{t-1}^r(j,\tau)}{\gamma_{t-1}} + S_t(j,\tau) \right), \tag{7}$$

where $S_t(j, \tau)$ is the total present value of the retiree's future social security benefits $D_{t+v}(j, \tau)$

$$S_t(j,\tau) = \sum_{v=0}^{\infty} \frac{D_{t+v}(j,\tau)}{\prod_{s=1}^{v} R_{W,t+s-1}/\gamma_{t+s-1}} = D_t(j,\tau) + \frac{S_{t+1}(j,\tau)}{R_{W,t}/\gamma_t} \tag{8}$$

and the marginal propensity to consume satisfies a first-order nonlinear difference equation

$$\frac{1}{\epsilon_t \pi_t} = 1 + \gamma_t \beta^{\sigma} R_{W,t}^{\sigma-1} \frac{1}{\epsilon_{t+1} \pi_{t+1}}. \tag{9}$$

From equations (6) and (7), asset holdings evolve according to

$$A_t^r(j,\tau) + \frac{\gamma_t S_{t+1}(j,\tau)}{R_{W,t}} = (1-\epsilon_t \pi_t)\left(\frac{R_{W,t-1} A_{t-1}^r(j,\tau)}{\gamma_{t-1}} + S_t(j,\tau) \right).$$

Finally, we can also show that the value function for a retiree is linear in consumption

$$V_t^r(j,\tau) = (\epsilon_t \pi_t)^{\frac{\sigma}{1-\sigma}} C_t^r(j,\tau) \tag{10}$$

Workers

Workers start their life with zero assets. We write the optimization problem for a representative worker born in period j in terms of total assets $A_t^w(j) \equiv K_t^w(j) + B_t^w(j) + F_t^w(j)$. Specifically, such worker chooses consumption $C_t^w(j)$ and assets $A_t^w(j)$ for $t \geq j$ to solve

$$V_t^w(j) = \max \left\{ (C_t^w(j))^{\rho} + \beta \left[\omega_t V_{t+1}^w(j) + (1-\omega_t) V_{t+1}^r(j,t+1) \right]^{\rho} \right\}^{\frac{1}{\rho}} \tag{11}$$

subject to

$$C_t^w(j) + A_t^w(j) = R_{W,t-1} A_{t-1}^w(j) + W_t N_t^w(j) - T_t(j), \tag{12}$$

and $A_j^w(j) = 0$, where W_t is the real wage, $N_t^w(j)$ is the measure of cohort j, and $T_t(j)$ is the total amount of taxes paid by workers in that cohort. The value function $V_{t+1}^r(j,t+1)$ is the solution of the retiree problem (5)–(6) above and enters the continuation value in the dynamic program, since workers have to take into account the possibility that retirement occurs between periods t and $t+1$.

The complete solution to a worker's optimization problem is described in detail in Gertler (1999) and Ferrero (2010). Workers' consumption is a fraction of total wealth, defined as the sum of financial and nonfinancial ("human") wealth

$$C_t^w(j) = \pi_t (R_{W,t-1} A_{t-1}^w(j) + H_t(j) + S_t^w(j)), \tag{13}$$

where $H_t(j)$ denotes the present discounted value of current and future real wages net of taxation

$$H_t(j) \equiv \sum_{\nu=0}^{\infty} \frac{W_{t+\nu}(j)N^w_{t+\nu}(j) - T_{t+\nu}(j)}{\prod_{s=1}^{\nu} \Omega_{t+s} R_{W,t+s-1}/\omega_{t+s-1}} = W_t(j)N^w_t(j) - T_t(j) + \frac{\omega_t H_{t+1}(j)}{\Omega_{t+1} R_{W,t}}, \tag{14}$$

and $S^w_t(j)$ is the total present value of the future social security benefits the worker can expect during retirement

$$S^w_t(j) = (1-\omega_t)\epsilon_{t+1}^{\frac{\sigma}{1-\sigma}} \frac{S_{t+1}(j,t+1)}{\Omega_{t+1} R_{W,t}} + \omega_t \frac{S^w_{t+1}(j)}{\Omega_{t+1} R_{W,t}}, \tag{15}$$

where $S_{t+1}(j,t+1) = \dfrac{S_{t+1}}{\psi_{t+1} N_{t+1}}$ and S_{t+1} denotes the present value of future social security benefits of all retirees alive at time $t+1$.

As for retirees, workers' marginal propensity to consume π_t also evolves according to a first-order nonlinear difference equation:

$$\frac{1}{\pi_t} = 1 + \beta^{\sigma} (\Omega_{t+1} R_{W,t})^{\sigma-1} \frac{1}{\pi_{t+1}}. \tag{16}$$

The adjustment term Ω_{t+1} that appears in (14)–(16) corresponds to

$$\Omega_{t+1} \equiv \omega_t + (1-\omega_t)(\epsilon_{t+1})^{\frac{1}{1-\sigma}},$$

and augments the discount rate $R_{W,t}$ relative to the infinite-horizon case. In the definition of nonfinancial wealth equation (14), the term $\Omega_{t+1} R_{W,t}/\omega_t$ constitutes the real effective discount rate for a worker.

The dynamics of asset holdings can then be obtained from the worker's budget constraint and the consumption function as in equation (13)

$$A^w_t(j) + \frac{\omega_t (H_{t+1}(j) + S^w_{t+1}(j))}{\Omega_{t+1} R_{W,t}} = (1-\pi_t)(R_{W,t-1} A^w_{t-1}(j) + H_t(j) + S^w_t(j)).$$

Finally, as for retirees, workers' value function is also linear in their consumption

$$V^w_t(j) = (\pi_t)^{\frac{\sigma}{1-\sigma}} C^w_t(j). \tag{17}$$

Aggregation

The marginal propensities to consume of workers and retirees are independent of individual characteristics. Hence, given the linearity of the consumption functions, aggregate consumption of workers (C_t^w) and retirees (C_t^r) have the same form as equations (7) and (13)[7]

$$C_t^w = \pi_t(R_{W,t-1}A_{t-1}^w + H_t + S_t^w) \tag{18}$$

$$C_t^r = \epsilon_t\pi_t(R_{W,t-1}A_{t-1}^r + S_t) \tag{19}$$

where A_{t-}^z is the total financial wealth that members of group $z = \{w,r\}$ carry from period $t-1$ into period t; H_t is the aggregate value of human wealth, evolving according to

$$H_t = W_tN_t^w - T_t + \frac{\omega_tH_{t+1}}{(1+n_t)\Omega_{t+1}R_{W,t}}; \tag{20}$$

S_t is the present value of future social security benefits of all retirees alive at time t

$$S_t = D_t + \frac{\hat{S}_{t+1}N_t^r}{R_{W,t}/\gamma_t} = D_t + \frac{S_{t+1}\psi_t}{(1+n_t)\psi_{t+1}R_{W,t}/\gamma_t}, \tag{21}$$

with D_t for the total social security payments for retirees in period t, $\hat{S}_{t+1} = \frac{S_{t+1}}{N_{t+1}^r} = \frac{S_{t+1}}{\psi_{t+1}N_{t+1}^w}$ for the value of social security at $t+1$ per beneficiary; and S_t^w is the present value of future social security benefits that all workers alive at time t can expect during retirement

$$S_t^w = (1-\omega_t)\epsilon_{t+1}^{\frac{1}{1-\sigma}}\frac{\hat{S}_{t+1}N_t^w}{\Omega_{t+1}R_{W,t}} + \omega_t\frac{\hat{S}_{t+1}^wN_t^w}{\Omega_{t+1}R_{W,t}} \tag{22}$$

$$= (1-\omega_t)\epsilon_{t+1}^{\frac{1}{1-\sigma}}\frac{S_{t+1}}{(1+n_t)\psi_{t+1}\Omega_{t+1}R_{W,t}} + \omega_t\frac{S_{t+1}^w}{(1+n_t)\Omega_{t+1}R_{W,t}}, \tag{23}$$

with $\hat{S}_{t+1}^w = \frac{S_{t+1}^w}{N_{t+1}^w}$ for the value of future social security that workers alive at $t+1$ can expect during retirement per beneficiary.

The aggregate consumption function C_t is the weighted sum of equations (19) and (18). If $\lambda_t \equiv A_t^r/A_t$ denotes the share of total financial wealth A_t held by retirees, the aggregate consumption function is

$$C_t = \pi_t[(1-\lambda_{t-1})R_{W,t-1}A_{t-1} + H_t + S_t^w] + \epsilon_t\pi_t(\lambda_{t-1}R_{W,t-1}A_{t-1} + S_t) \tag{24}$$

The distribution of assets across cohorts is a state variable that keeps track of the heterogeneity in wealth accumulation due to the life-cycle structure.

Aggregate assets for retirees depend on the total savings of those who are retired in period t as well as on the total savings of the fraction of workers who retire between periods t and $t + 1$

$$A_t^r = R_{W,t-1} A_{t-1}^r + D_t - C_t^r + (1 - \omega_t)(R_{W,t-1} A_{t-1}^w + W_t N_t^w - T_t - C_t^w). \quad (25)$$

Aggregate assets for workers depend only on the savings of the fraction of workers who remain in the labor force

$$A_t^w = \omega_t (R_{W,t-1} A_{t-1}^w + W_t N_t^w - T_t - C_t^w). \quad (26)$$

The law of motion for the distribution of financial wealth across groups obtains from substituting expressions in equations (18) and (26) into equation (25)

$$(\lambda_t - 1 + \omega_t)\frac{A_t}{\omega_t} = (1 - \epsilon_t \pi_t) R_{W,t-1} \lambda_{t-1} A_{t-1} + D_t - \epsilon_t \pi_t S_t \quad (27)$$

Equation (27) relates the evolution of the distribution of wealth λ_t to the aggregate asset position A_t.

6.2.2 Production

The economy is competitive and producers combine labor and capital rented from both workers and retirees to produce according to a standard Cobb-Douglas labor-augmenting technology

$$\Upsilon_t = (X_t N_t^w)^\alpha K_{t-1}^{1-\alpha}, \quad (28)$$

where $\alpha \in (0, 1)$ is the labor share and the technology factor X_t grows exogenously at rate x_{t-1} between $t - 1$ and t

$$X_t = (1 + x_{t-1}) X_{t-1}.$$

The firms choose N_t^w, I_t to solve

$$V(I_{t-1}, K_{t-1}) = \max_{I_t, K_t} \left[(X_t N_t^w)^\alpha K_{t-1}^{1-\alpha} - W_t N_t^w - I_t + \frac{V(I_t, K_t)}{R_{W,t}} \right] \quad (29)$$

subject to capital adjustment costs

$$K_t = (1 - \delta) K_{t-1} + \left[1 - \frac{\phi}{2}\left(\frac{I_t}{I_{t-1}} - \mu_t \right) \right] I_t. \quad (30)$$

The first-order conditions for labor, capital, and investment are

$$W_t = \frac{\alpha \Upsilon_t}{N_t^w} = \alpha X_t^{\alpha} \left(\frac{K_{t-1}}{N_t^w} \right)^{1-\alpha}, \tag{31}$$

$$q_t R_{W,t} = (1-\alpha)\frac{\Upsilon_{t+1}}{K_t} + (1-\delta) q_{t+1}, \tag{32}$$

and

$$\begin{aligned} & q_t \left[1 - \frac{\phi}{2}\left(\frac{I_t}{I_{t-1}} - \mu_t \right)^2 - \phi \left(\frac{I_t}{I_{t-1}} - \mu_t \right) \frac{I_t}{I_{t-1}} \right] \\ & = 1 - \frac{\phi q_{t+1}}{R_{W,t}} \left(\frac{I_{t+1}}{I_t} - \mu_{t+1} \right) \left(\frac{I_{t+1}}{I_t} \right)^2. \end{aligned} \tag{33}$$

Trivially, if $\phi = 0, q_t = 1$, and $(R_{W,t} - 1) = (1-\alpha)\frac{\Upsilon_{t+1}}{K_t} - \delta.$

6.2.3 Social Security and Fiscal Policy

The government runs a social security system that makes total pension payments D_t to the population of retirees, determined by a replacement rate d_t applied to the average wage that retirees alive at t received when they were active workers

$$D_t = N_t^r \cdot d_t \cdot \overline{W_t^r}, \tag{34}$$

where $\overline{W_t^r} = \frac{W_t}{(1+x_{t-1})(1-\gamma_{t-1})^{-1}}$ and $(1-\gamma_{t-1})^{-1}$ is the average retirement period when the survival probability is γ_{t-1}.[8]

In order to finance the aforementioned social security payments and a given stream of consumption G_t, the government issues debt B_t and levies lump-sum taxes. The flow government budget constraint is

$$B_t = R_{W,t-1} B_{t-1} + (G_t + D_t - T_t). \tag{35}$$

Iterating equation (35) forward and imposing a no-Ponzi condition yields the following intertemporal budget constraint:

$$R_{W,t-1} B_{t-1} = \sum_{v=0}^{\infty} \frac{T_{t+v}}{\prod_{s=1}^{v} R_{t+s-1}} - \sum_{v=0}^{\infty} \frac{G_{t+v}}{\prod_{s=1}^{v} R_{t+s-1}} - \sum_{v=0}^{\infty} \frac{D_{t+v}}{\prod_{s=1}^{v} R_{t+s-1}}. \tag{36}$$

In most of our analyses we assume that the ratio of government spending to GDP is constant ($G_t = g\Upsilon_t$). We also impose a fiscal rule that requires the government to keep debt constant as a fraction of GDP ($B_t = b\Upsilon_t$). Hence, taxes adjust endogenously to satisfy the government's budget constraint. Later we consider alternative policy configurations.

6.2.4 Asset Markets and International Capital Flows

The structure of the foreign economy, whose variables are denoted with an asterisk, is analogous to the one described above. Total assets for the domestic economy are the sum of the capital stock K_t, government bonds B_t, and the net foreign asset position F_t:

$$A_t = K_t + B_t + F_t. \tag{37}$$

In addition, the trade balance (NX_t) is given by:

$$NX_t = \Upsilon_t - (C_t + I_t + G_t). \tag{38}$$

International capital flows equalize asset returns across countries ($R_{W,t}$), and thus net foreign assets evolve according to:

$$F_t = R_{W,t-1}F_{t-1} + NX_t. \tag{39}$$

where $R_{W,t-1}$ is the world interest rate between $t - 1$ and t that clears the international capital market:

$$F_t + F_t^* = 0. \tag{40}$$

6.2.5 Equilibrium

Given the dynamics for the demographic processes $\{n_{t-1}, n^*_{t-1}, \gamma_{t-1}, \gamma^*_{t-1}\}$; the targets of government consumptions g, g^*; the retirement probabilities $\{\omega_{t-1}, \omega^*_{t-1}\}$ and replacement rates $\{d_t, d^*_t\}$; and the growth rates of productivity $\{x_{t-1}, x^*_{t-1}\}$, a competitive two-open-economy equilibrium is a sequence of quantities $\{C^r_t, C^w_t, C_t, A^r_t, A^w_t, A_t, \lambda_t, H_t, S_t, S^w_t, \Upsilon_t, K_t, I_t, F_t, B_t, T_t\}$, $\{C^{r*}_t, C^{w*}_t, C^*_t, A^{r*}_t, A^{w*}_t, A^*_t, \lambda^*_t, H^*_t, S^*_t, S^{w*}_t, \Upsilon^*_t, K^*_t, I^*_t, F^*_t, B^*_t, T^*_t\}$, marginal propensities to consume $\{\pi_t, \epsilon\}, \{\pi^*_t, \epsilon^*_t\}$ and prices $\{R_{W,t}, \Omega_t, \Omega^*_t, W_t, W^*_t\}$ such that:

1. Retirees and workers maximize utility subject to their budget constraints, taking the interest rate and wages as given, as outlined in subsections and.

2. Goods producers maximize profits subject to their production possibilities, taking the interest rate and wages as given, as outlined in subsection.
3. Given the policy choices of $g, g^*, \omega_t, \omega_t^*, d_t, d_t^*$, policy makers choose taxes and debt issuance to satisfy their budget constraints, as in subsection.
4. The markets for labor, capital, and goods clear. In particular, the worldwide resource constraint is

$$Y_t + Y_t^* = C_t + I_t + G_t + C_t^* + I_t^* + G_t^*. \tag{41}$$

In the closed economies configuration, the two regions are completely independent and, instead of one (world) interest rate, there are two different interest rates $\{R_t, R_t^*\}$. When solving the model, we rewrite it in terms of normalized variables that assure stationarity (i.e., $z_t = Z_t / (X_t N_t^w)$) for any variable Z_t that grows with technology and the labor force).

6.2.6 Demographic Dividends in the Model

We use the framework described above to define a series of demographic variables of interest—especially the first and second demographic dividends. We do so by mapping objects in the model to the variables defined in Albrieu and Fanelli (2013) and Mason and Lee (2007).

The support ratio is given by the ratio of the effective number of producers to the effective number of consumers:

$$SR_t = \frac{EN_t^w}{EN_t} = \frac{W_T N_t^w}{\frac{C_T^W}{N_T^W} N_t^w + \frac{C_T^r}{N_T^r} N_t^r + \frac{G_T}{N_T} N_t}, \tag{42}$$

where we have included government consumption in computing the effective number of consumers. In equation (42), T is a base period, which we retain to facilitate comparisons of our simulations with studies that followed the National Transfers Account (NTA) methodology (Lee et al., 2008; Mason et al., 2009). For practical purposes, T will be the first year in our simulations.

The first demographic dividend corresponds to the period during the demographic transition in which SR_t is increasing—that is, the period in which the number of effective producers increases faster than the number of effective consumers. Given that W_T, $\frac{C_T^w}{N_T^w}$, $\frac{C_T^r}{N_T^r}$, and $\frac{G_T}{N_T}$ are fixed in a base period, the first demographic dividend thus defined only depends on the evolution of the composition of the population. In our model, this is

summarized by the (elderly) dependency ratio ($\psi_t \equiv N_t^r / N_t^w$). Hence, we can write

$$SR_t = \frac{W_T}{\frac{C_T^w}{N_T^w} + \frac{C_T^r}{N_T^r}\psi_t + \frac{G_T}{N_T}(1+\psi_t)}.$$

Thus, in some sense the first demographic dividend is somewhat "mechanical"—strictly so if demographic developments are exogenous.

As argued by Mason and Lee (2007), a second demographic dividend is also possible if the ageing population increases the pace of asset accumulation to face an extended retirement period. While the FD is transitory, the SD can lead to a permanently higher level of consumption. However, the SD is far from automatic, given that households may not have the incentives to increase savings—in particular, whether or not a SD arises might depend on the public policies in place.

Following Albrieu and Fanelli (2013), we also compute the so-called adjusted support ratio:

$$ARS_t = SR_t \frac{HI_t}{HC_t}, \tag{43}$$

where $HI_t = \frac{W_t}{W_T}$ and $HC_t = \frac{(C_t^w + C_t^r + G_t)/N_t}{(C_T^w + C_T^r + G_t)/N_T}$ are, respectively, the proportional increase of real wages and of per capita consumption. Loosely speaking, the SD amounts to consumption increasing more than labor income—that is, HC_t increasing faster than HI_t.

To formalize the concept of the second demographic dividend, Mason and Lee (2007) suggest the use of a measure of total consumption per effective consumer:

$$\frac{TC_t}{EN_t} = \frac{TC_t}{EN_t^w} SR_t = c_t \frac{W_t}{W_T} SR_t, \tag{44}$$

where total consumption is $TC_t = (C_t^w + C_t^r + G_t)$ and $c_t = \frac{TC_t}{W_t N_t^w}$ is what the authors refer to as the consumption ratio—the ratio of total consumption to labor income. That is, total consumption per effective consumer can be decomposed as (i) the product of the total consumption per effective worker and the support ratio, or (ii) the product of the consumption ratio, the wage index, and the support ratio.

According to Mason and Lee's (2007) definition, the second demographic dividend in a small open economy is the rate of growth of consumption relative to labor income—that is, the rate of growth of c_t in the second equality of equation (44) (Mason and Lee 2007, p. 14). However, as the authors point

out, this definition does not take into account possible general equilibrium effects on wages and interest rates.

Mason and Lee (2007) suggest that a more comprehensive measure of the second demographic dividend is the growth rate of consumption per effective consumer in excess of the growth rate of the support ratio—that is, the rate of growth of $\frac{C_t}{EN_t^w}$ in the first equality of equation (44).

Given that our model accounts for the general equilibrium effects of the demographic transition on wages and interest rates, we define the second demographic dividend as the growth rate of consumption per effective worker, $\left[d\left(\frac{C_t}{EN_t^w}\right)\Big/ dt\right]\Big/ \frac{C_t}{EN_t^w}$—which equals the growth rate of consumption per effective consumer in excess of the growth rate of the support ratio. This measure differs from Mason and Lee's (2007) definition of the SD in a small open economy precisely because it accounts for the changes in real wages induced by the demographic transition.

6.3 Quantitative Analysis

We are interested in the macroeconomic implications of demographic developments in Brazil relative to those in the global economy (which we proxy with aggregates for OECD countries). We treat such developments as exogenous, and calibrate time-varying parameters to simulate the demographic transitions implied by recent demographic projections. In our scenarios, demography is the only exogenous force driving the economies from one steady state to another. The only other factors that can affect the transition path are changes to public policies.

6.3.1 Calibration

We take 2010 to be the initial steady state. In table 6.1 we report demographic projections of the United Nations (2011) that we use in our simulations. Recall that the relevant population growth rates in our model are the growth rates of the labor force. We assume that workers join the labor force at age 20, and proxy labor force growth with population growth 20 years earlier. The UN provides projections for four different fertility variants (i.e., for high-, medium-, low-, and constant-fertilities). Among them, we choose to use the medium fertility scenario.[9] Panels 6.1.A and 6.1.B show the United Nations' (2011) projections until 2100 for population growth (assuming medium fertility) and life expectancy. Notice the negative population growth rates projected for Brazil after 2040 (panel 6.1.A). These projections imply that after growing from 195 million people in 2010 to close to 225 million in 2040, the Brazilian population will decrease by almost 0.5 percent per year, reaching 180 million by the end of the twenty-first century. Because our simulations extend into 2200 for steady-state calculation purposes, we

Table 6.1 Demographic prospects, 1990–2100

Major group or country	*1990–2010*	*2010–2035*	*2035–2060*	*2060–2085*	*2085–2100*
Panel 1.A: Annual rate of population change (percentage—medium-fertility variant)					
World	1.31	0.89	0.44	0.16	0.07
More developed regions	0.38	0.21	0.02	0.02	0.08
Brazil	1.32	0.54	–0.11	–0.49	–0.52
Panel 1.B: Life expectancy at birth (both genders combined) (years)					
World	66.0	71.4	75.5	78.6	80.6
More developed regions	75.3	79.5	82.7	85.6	87.7
Brazil	69.9	75.9	79.3	81.8	83.6

Source: United Nations, Department of Economic and Social Affairs, Population Division (2011). World Population Prospects: The 2010 Revision. Files 20 and 5–1.

assume that population growth rates converge to zero from 2100 to 2150, and stay at zero from then on.[10]

Panel 6.1.B shows that life expectancy should increase both in Brazil and in more developed countries, without considerably narrowing the gap between the two. From 2100 to 2150, we assume that life expectancy increases annually by half of what is expected in the 2090–2100 period; and increases by one-quarter of this value from 2150 to 2200.

Given the population growth and life expectancy prospects just described, Brazil in 2010 is a country that is getting to the end of its first demographic dividend, when the support ratio reaches its peak, to enter a phase where a SD is possible if the population accumulates enough assets while ageing (Giambiagi and Tafner, 2010).

Table 6.2 reports parameter values and initial demographic conditions used in the model simulations of our scenarios. Given the assumption that workers are born at age 20, the initial nonretirement and survival probabilities (ω_{2010} and γ_{2010}) target the current average retirement age of 63 in both Brazil and the OECD, and average longevities of 74 (Brazil) and 78 (OECD). For the relative size of the populations in the initial steady state we rely on United Nations (2011). To calibrate the relative productivities in the steady state we resort to OECD (2012), which estimates that Brazil's multifactor productivity level was 46.8 percent of the OECD group level average in 2010.

Finally, table 6.3 presents preference, technology, and policy parameters. Preference and technology parameters are taken from Gertler (1999) and Ferrero (2010). With respect to government consumption, we assume it to be a steady 20 percent of the GDP for both economies. The government debt to GDP ratio is also fixed, at 60 percent for the OECD economies and 40 percent for Brazil, in accordance with 2010 levels. In most of our analyses we assume that such levels for government consumption and debt/GDP remain constant. Together with public pension replacement rates of 70 percent and 42 percent, these values result in current public pension spending to GDP ratio of approximately 10.2 percent in Brazil and 9.2 percent in the OECD in

Table 6.2 Parameter values and initial conditions—demographics and technology

		Brazil	*OECD*
Average retirement age	$20 + 1/(1 - \omega)$	63.00	63.00
Nonretirement probability	ω	0.9767	0.9767
Average longevity	$20 + 1/(1 - \omega) + 1/(1 - \gamma)$	74.00	78.00
Survival probability	γ	0.9091	0.9329
Population growth rate (%)	N	1.57	0.43
Dependency ratio	$\psi = (1 - \omega)/(1 + n - \gamma)$	0.22	0.33
Relative population size	N	0.1894	1
Technology growth rate (%)	x	0.00	0.00
Relative productivity	X	0.4683	1

Source: Authors' elaboration.

Table 6.3 Preference, technology, and policy parameters—baseline scenarios

		Brazil	*OECD*
Discount factor	β	0.98	0.98
Elasticity intertemporal substitution	σ	0.5	0.5
Labor share	α	2/3	2/3
Depreciation rate (%)	δ	10	10
Government consumption (% GDP)	G	20	20
Government debt (% GDP)	B	40	60
Replacement rate (%)	D	70.00	42.10

Source: Authors' elaboration

2010—not too far from IMF (2011a) estimates, which place public pension expenditures in that year at 9.5 percent of GDP in Brazil and 8.7 percent of GDP in the OECD.[11] Our policy assumptions in the *Baseline* scenarios imply that taxes are endogenous and vary to satisfy the government's budget constraint. We entertain alternative specifications when we study policy reforms.

Before we turn to our quantitative results, it is worth recalling that our model abstracts from the childhood period. Hence, strictly speaking, the demographic developments that we model can be summarized by the evolution of the (elderly) dependency ratio. This is a reasonable simplifying assumption given our focus on Brazil, where the increase in the elderly dependency ratio in the medium-fertility scenario is projected to account for more than 100 percent of the increase in the total dependency ratio until 2100. However, one may worry that this simplification would overstate the effects of the demographic transition relative to a model that could capture the evolution of both the elderly and the child dependency ratios. It turns out that in our calibrated model, the increase in the dependency ratio from 2010 to 2100—of roughly 36 percentage points—comes very close to matching the increase in the total dependency ratio projected by the UN for the same period—of 39 percentage points. Hence we think the simple model with only workers and retirees should allow for a sensible analysis of our research question.

6.3.2 Results

We present our analyses in the form of alternative scenarios, which combine different assumptions about the economic environment, and different policy specifications.[12] Relative to the economic environment, the key issue is whether we treat the economies as open or closed to trade in goods and assets. We entertain three alternatives: closed economies, open economies, and initially closed economies that open up for trade in goods and assets. Finally, in terms of policies, we focus on different social security reforms. In particular, we analyze policies that involve an exogenous declining path for the replacement rate as well as scenarios in which expenditures with public pensions are effectively "frozen" as a share of GDP, and the replacement rate must adjust endogenously to the new policy.

Our use of "demographics only" scenarios is similar in spirit to that of Albrieu and Fanelli (2013). The main difference is that they assume that per capita consumption and GDP growth observed between 2000 and 2010 will repeat (exogenously) in the future, whereas in our analyses those variables are endogenous and consistent with each scenario entertained. In that sense our approach is closer to Attanasio et al. (2006, 2007).

Demographics

In our scenarios the dynamics are driven only by the demographic transitions in the two economies, and by changes in public policies. Figure 6.1

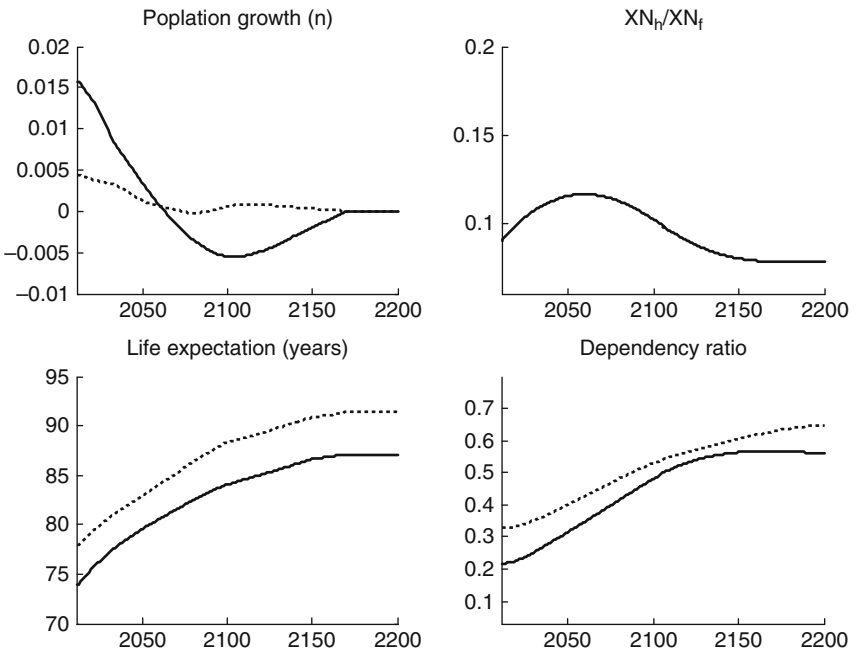

Figure 6.1 Demographic trends in Brazil (solid line) and OECD (dotted line)

Source: Authors' elaboration.

presents the paths for population growth and "ageing" that we feed into the model (first column). These paths imply the two diagrams in the second column. We present the alternative policy scenarios in subsequent sections.

Baseline Scenario: Closed Economies

Figure 6.2 presents the dynamic paths for various variables in the two economies under the assumption of no trade in goods or assets. This *Baseline closed-economy* scenario is our benchmark in this chapter, and henceforth we use baseline to refer to all scenarios in which the current social security systems remain in place. This is in contrast with subsequent scenarios in which we entertain social security reforms.

In the absence of productivity growth and keeping the social security incentives unchanged, ageing implies declining paths for GDP and consumption per capita in both economies. The generous public pension system in Brazil drives the associated public expenditures above 25 percent of GDP in the new steady state, and the required financing leads to a dramatic increase in tax revenues, of almost 20 percent of GDP. Interest rates in Brazil are much higher than in the OECD, in accordance with the different levels of capital per worker.

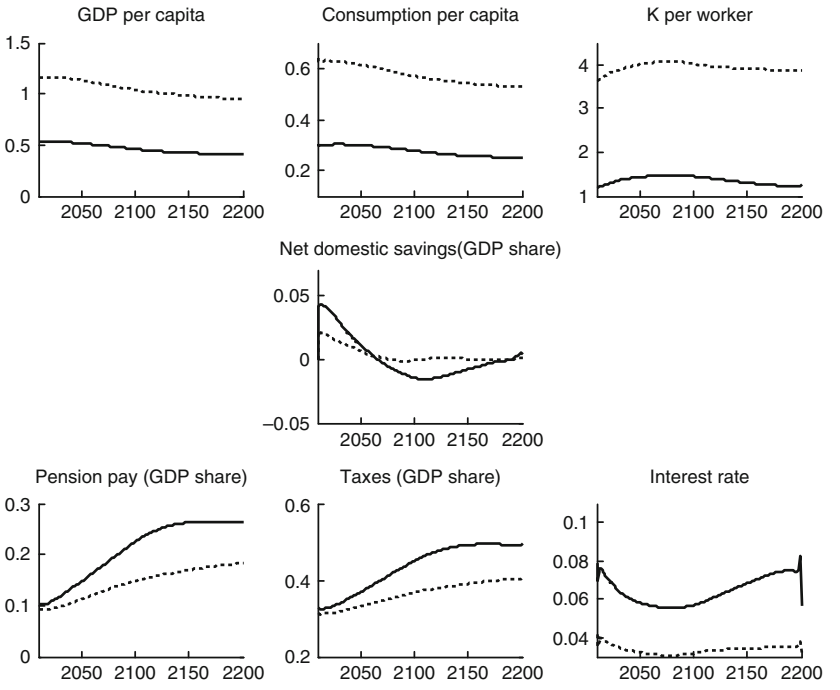

Figure 6.2 Baseline closed scenario—Brazil (solid line) and OECD (dotted line)

Source: Authors' elaboration.

In figures 6.3 and 6.4 we present the paths for the first and second demographic dividends, as well as a few other variables that are helpful in understanding the composition effects in the former and the behavioral effects in the latter. Whenever we present separate paths for workers and retirees, solid and dashed lines correspond to, respectively, Brazilian workers and retirees, while dotted and dash-dot lines correspond to, respectively, OECD workers and retirees.

The adverse dynamics of the first demographic dividend (figure 6.3, chart (3,1)) are directly implied by the composition effect of demographic developments (figure 6.1, chart (2,2)). In terms of the second demographic dividend, prospects are essentially neutral for the OECD, and alternate from slightly positive for many decades (reaching at most 0.20 percent, for a short time period) to slightly negative in the subsequent decades for Brazil (figure 6.3, chart (3,2)). This yields a slightly upward hump-shaped profile for total consumption per (effective) worker (figure 6.3, chart (2,2)). But even in the positive phase, the SD is not enough to offset the negative effect of the FD, and total consumption per (effective) consumer falls (figure 6.3, chart (2,1)).

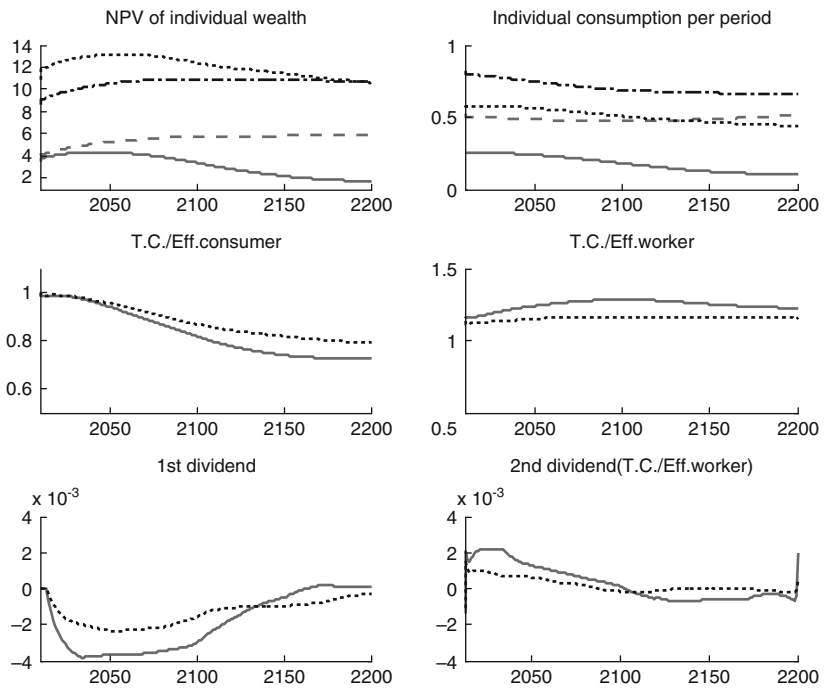

Figure 6.3 Baseline closed scenario—Brazil (solid and dashed lines) and OECD (dotted and dash-dot lines)—demographic dividends

Source: Authors' elaboration.

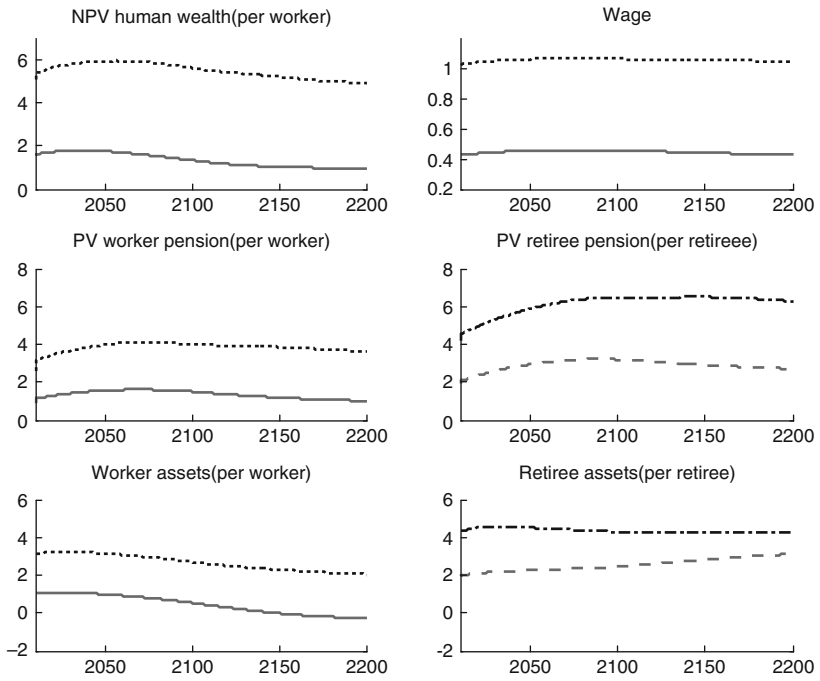

Figure 6.4 Baseline closed scenario—Brazil (solid and dashed lines) and OECD (dotted and dash-dot lines)—wealth decomposition

Source: Authors' elaboration.

The two top diagrams of figure 6.3 shed light on the behavioral effects underlying the SD. While in the OECD the net present value (NPV) of workers' wealth is slightly overtaken by retirees' over time (dotted and dash-dot lines, respectively, in figure 6.3, chart (1,1)), in Brazil, retirees' wealth increases and workers' wealth decreases (solid and dashed lines, respectively). In the long run, Brazilian workers own essentially zero assets (figure 6.4, chart (3,1)), and retirees are the only asset owners (figure 6.4, chart (3,2)). Retirees consume more than workers in both regions, but over time this difference widens in Brazil (figure 6.3, chart (1,2)).

Closed versus Sudden Opening[13]

To understand the role of the closed economy assumption, in figures 6.5 and 6.6 we compare the results for Brazil presented in the previous section (dotted line) with a scenario in which the economies suddenly open up to trade (solid line) in goods and assets at time zero (i.e., in 2010). Due to the relative size of the two economies, the OECD dynamics are much more similar in the two scenarios (closed and open economies). The reason is that trade and capital flows to and from Brazil are small relative to the size of the OECD block. Hence we only present results for Brazil. Whenever we present

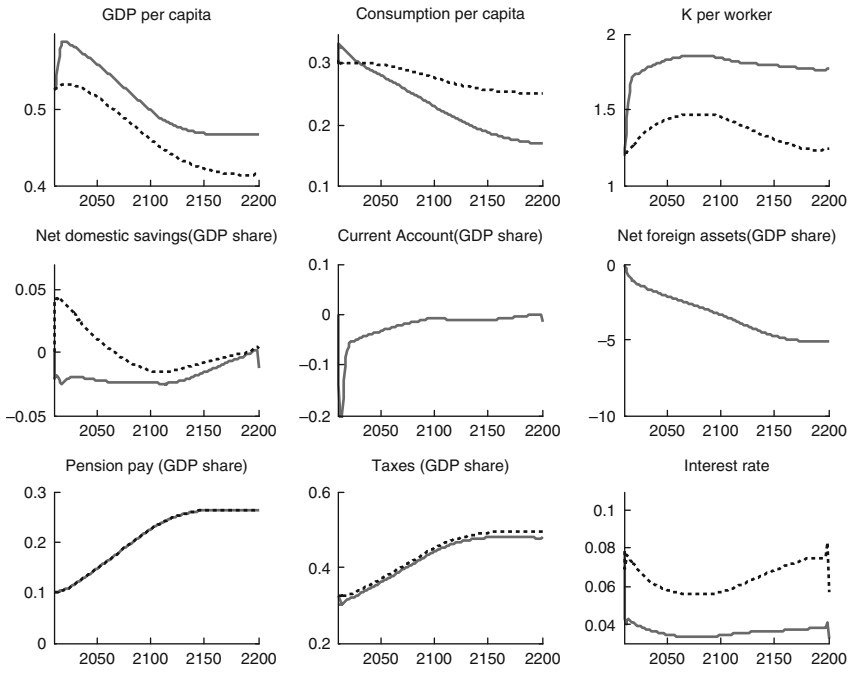

Figure 6.5 Brazil Baseline—sudden opening (solid line) × Brazil closed (dotted line)
Source: Authors' elaboration.

separate results for workers and retirees, solid and dashed lines correspond to, respectively, workers and retirees under the open economy assumption, while dotted and dash-dot lines correspond to, respectively, workers and retirees under the closed economy assumption.

Opening up the economy leads to an immediate drop in interest rates in Brazil to international levels as foreign capital flows massively into the country (compare charts (3,3) in figures and 6.2 and 6.5). Consumption per capita spikes and domestic savings plummet. Brazil starts to run sizeable current account deficits, which eventually bring the country's net foreign asset position to a staggering –5 times GDP.[14]

Under the current social security systems, the second demographic dividend in Brazil is more favorable if the economy is relatively closed (see figures 6.6. and 6.7). A high replacement rate disincentivizes savings. Low interest rates in the case of open economies reinforce this effect. Counting on generous future pensions provided by the government and facing lower interest rates that increase the present value of pensions and human capital, Brazilians consume an even higher share of their income and accumulate fewer assets. The net foreign asset position becomes extremely negative, leading to a huge external imbalance against the OECD. Finally, taxes have to increase dramatically to afford high pensions to a fast-ageing population.

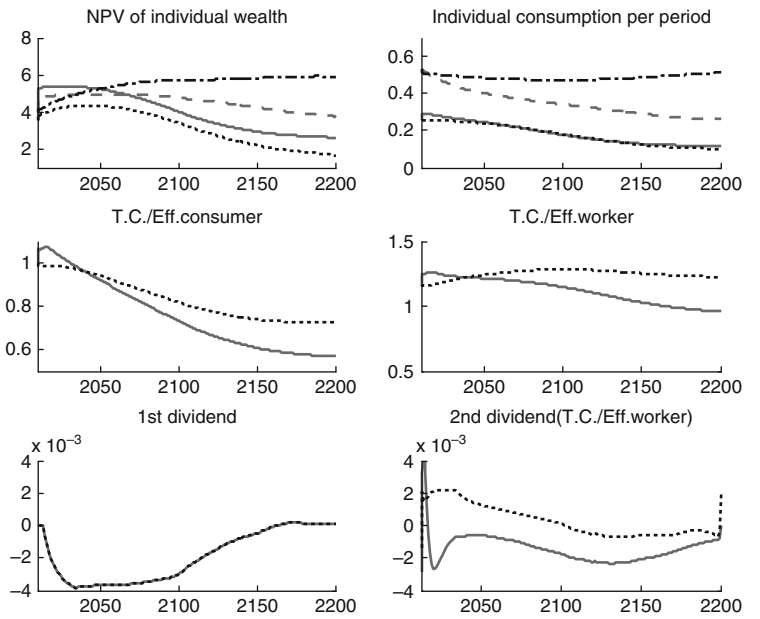

Figure 6.6 Brazil Baseline—sudden opening (solid and dashed lines) × Brazil closed (dotted and dash-dot lines)—demographic dividends

Source: Authors' elaboration.

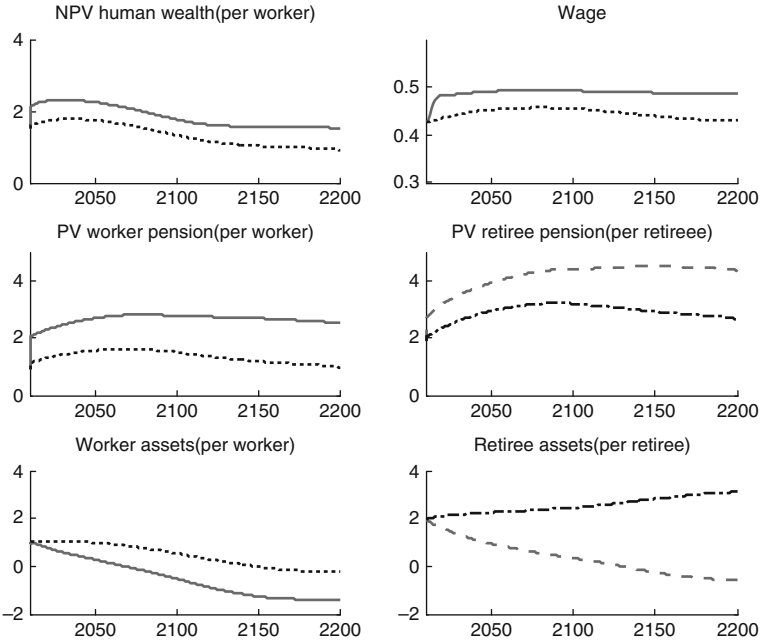

Figure 6.7 Brazil Baseline—sudden opening (solid and dashed lines) × closed (dotted and dash-dot lines)—wealth decomposition

Source: Authors' elaboration.

Many of the results implied by the baseline scenarios are highly implausible. Some of them have to do with assumptions about the environment, such as the economies turning completely open to trade and foreign investments, which cause huge capital flows. Such negative net foreign asset positions of multiple times GDP would almost certainly not materialize, due to the risks of expropriation and default. Likewise, and perhaps most important, due to the assumption that the generous replacement rate of the Brazilian system will remain constant even though the population will soon start ageing fast, all scenarios generate paths for the tax burden that are also incredible. Although this argument is outside the model, an increase in taxes of 20 percent of GDP would most likely be politically infeasible and create strong incentives for tax evasion through "deformalization" of production activities. The extreme nature of some of the outcomes of the baseline scenarios motivate our analyses of reform scenarios, to which we turn next.

Reform Scenarios

We start by looking at the effects of a social security reform that changes the rules governing public pensions in a quite radical way. Specifically, we study scenarios in which the government announces that expenditures with public pensions will no longer increase as a fraction of GDP, and the replacement rate has to adjust automatically to balance the budget. We name this a *Bold* reform. This is, of course, an extreme reform assumption. In particular, it would entail defaulting on contracts currently in place. Nevertheless, we believe that this exercise is useful because it highlights the potential effects of social security reforms in a stark way. Subsequently we entertain a more realistic, gradual social security reform.

Bold reform: We present results for Brazil only, starting with closed economies in figures 6.8–6.10. Relative to the baseline closed-economy scenario, in the bold reform scenario GDP per capita and capital per worker increases significantly. Savings are higher and interest rates drop dramatically—eventually reaching levels that are slightly lower than in the advanced economies (compare charts (3,3) in figures 6.2 and 6.8). Pension expenditures are essentially capped at their initial level of 10 percent of the GDP and, as the population ages, the replacement rate falls, reaching 26 percent in 2200.

The reform entails an important shift in the paths of the present value of wealth of workers versus that of retirees (figure 6.1, chart (1,1), solid line versus dotted line for workers, and dashed line versus dash-dot line for retirees). This arises mainly from the increase in the net present value of human wealth (figure 6.13, chart (1,1)), but also because of workers' increased desire to save for retirement (figure 6.13, chart (3,1)).

The second demographic dividend is sizeable in the bold reform scenario, reaching approximately 0.20 percent per year for almost 50 years, and remaining above the baseline closed-economy scenario into the next century. In this comparison, it becomes clear that behavioral and general equilibrium effects matter for the magnitude of the SD. The increase in the NPV of workers'

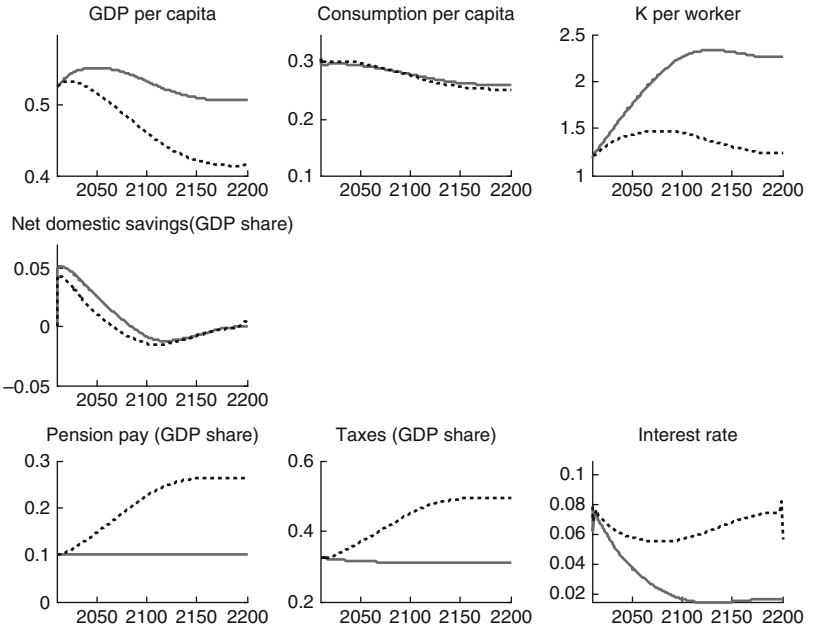

Figure 6.8 Brazil closed—bold reform (solid line) × baseline (dotted line)

Source: Authors' elaboration.

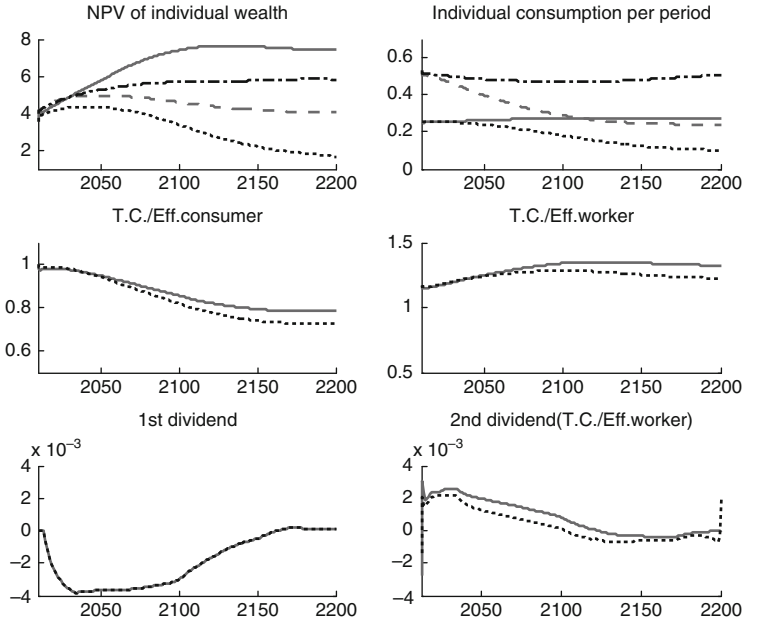

Figure 6.9 Brazil closed—bold reform (solid and dashed lines) × baseline (dotted and dash-dot lines)—demographic dividends

Source: Authors' elaboration.

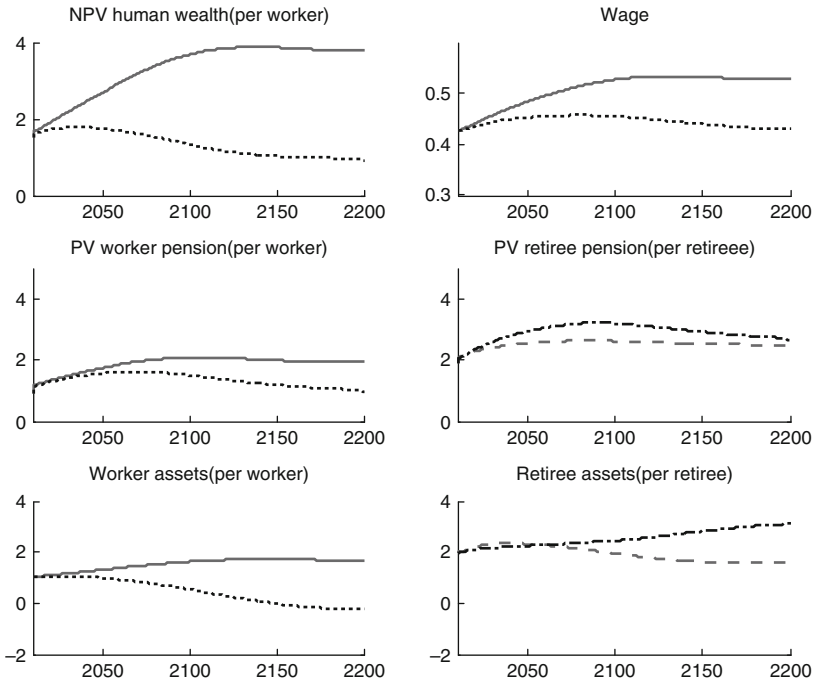

Figure 6.10 Brazil closed—bold reform (solid and dashed lines) × baseline (dotted and dash-dot lines)—wealth decomposition

Source: Authors' elaboration.

wealth more than compensates the reduction in the present value of retirees' wealth, and total consumption per effective consumer is also higher. In the long run, workers and retirees end up with approximately the same per capita consumption (figure 6.12, chart (1,2)).

Next, in figures 6.11–6.13, we compare the effects of reforming social security and suddenly opening up the economy at the same time (in solid and dashed lines) against the baseline closed-economy scenario (in dotted and dash-dot lines). When the economy opens up and social security is reformed, interest rates drop and capital builds up dramatically. In this scenario, Brazilians eventually face a lower replacement rate than OECD citizens, and have stronger incentives to save for retirement. As Brazil moves into current account surpluses—after a period of extremely large current account deficits—Brazilians accumulate around 2:8 times the country's GDP in net foreign assets.

The initial sudden fall in the propensities to consume is more than compensated by the increase in the present value of wealth of both workers and retirees, who end up consuming more in the very short run. But as soon as retirees' consumption drops, the SD falls below the closed-economy case for a couple of decades, to become (and remain) higher after 2050. Except for a period of high savings between 2030 and 2080, total consumption per effective consumer is significantly higher than when the economy remains

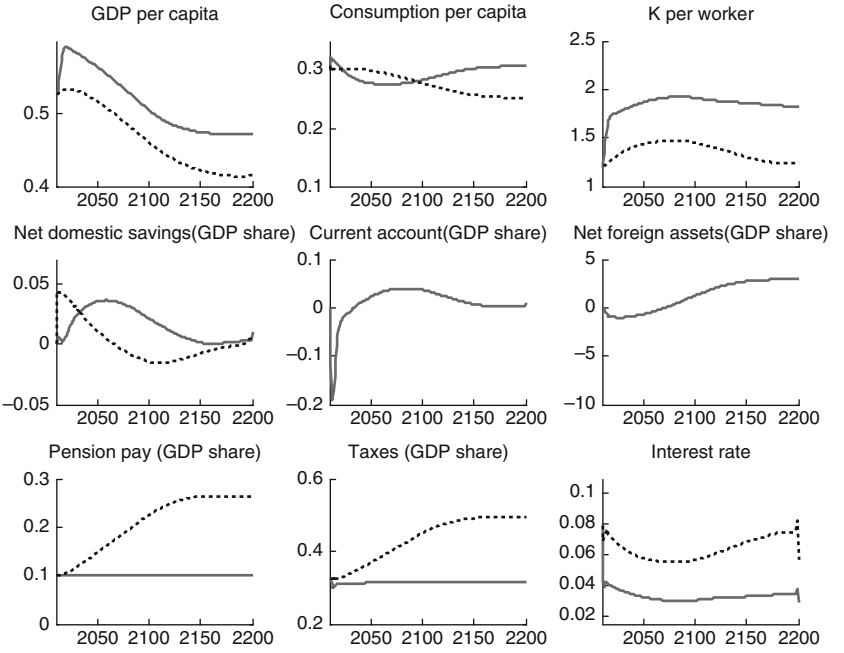

Figure 6.11 Brazil—Bold reform with sudden opening (solid line) × Baseline closed (dotted line)

Source: Authors' elaboration.

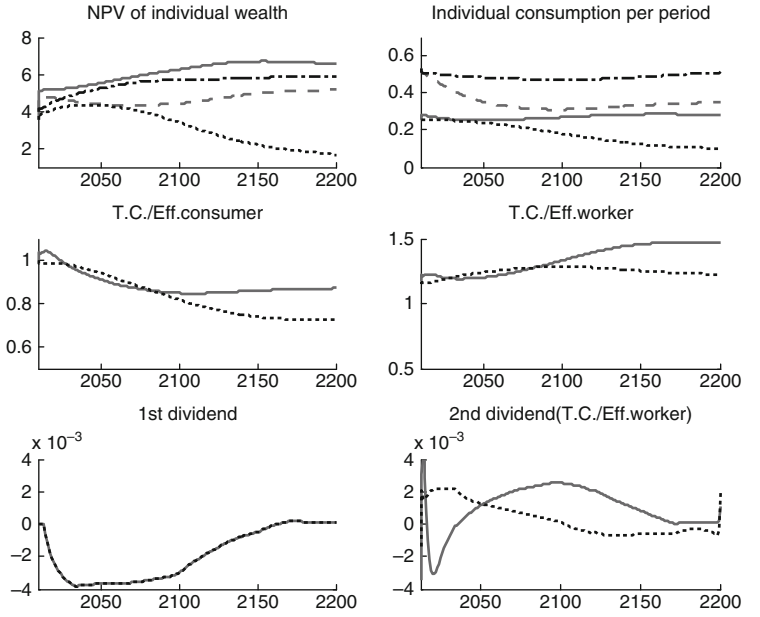

Figure 6.12 Brazil—bold reform with sudden opening (solid and dashed lines) × baseline closed (dotted and dash-dot lines)—demographic dividends

Source: Authors' elaboration.

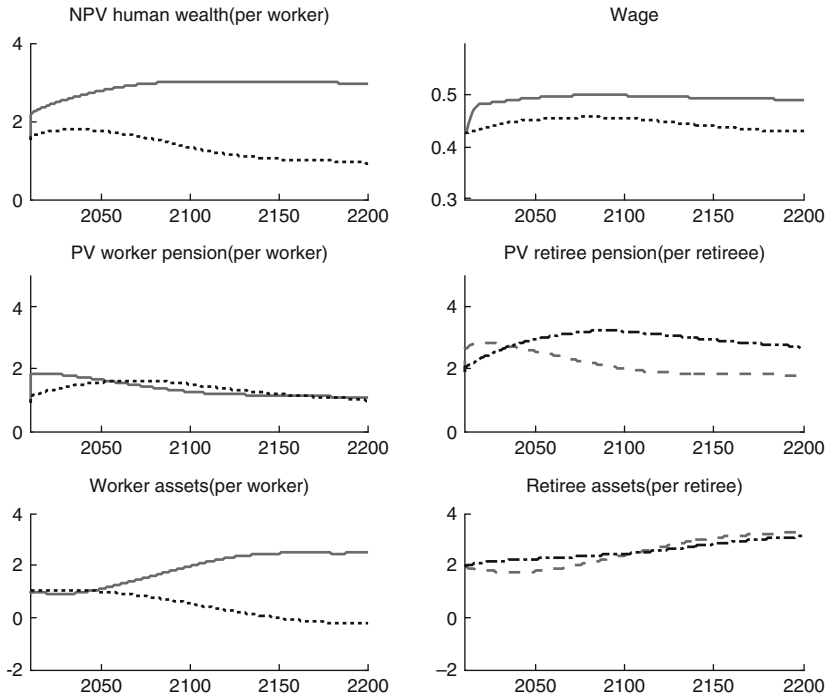

Figure 6.13 Brazil—bold reform with sudden opening (solid and dashed lines) × baseline closed (dotted and dash-dot lines)—wealth decomposition

Source: Authors' elaboration.

closed (including the case in which the social security is reformed). The fact that current retirees enjoy an increase in the NPV of their wealth and lose less consumption with a simultaneous opening of the economy makes one think about the political economy aspects of policies that involve social security reforms and trade liberalizations. We return to this issue at the end of this chapter.

Gradual Reform: The bold reform scenarios analyzed previously are useful to illustrate the fact that a meaningful second demographic dividend might be possible in Brazil, especially if the economy opens up as social security is reformed. But that is too extreme a reform, as it essentially amounts to capping pensions as a share of GDP in an economy that will soon embark on a fast ageing process. In this section we entertain a more plausible, gradual reform.

What stands out in the baseline scenarios with no reform is not as much the current level of expenditures with public pensions, but their projection as the Brazilian population starts to age fast going forward. Given the extremely high replacement rate of 70 percent, expenditures with pensions will eventually skyrocket to north of 25 percent of GDP e.g., chart (3,2) in

figures 6.2, 6.5, and 6.8). Hence, we consider scenarios in which the current replacement rate is reduced gradually over a period of 25 years to reach the OECD level of 42 percent by 2035. We name this the *Gradual* reform scenario.

As before, we start with a comparison of the baseline scenario with the gradual reform scenario under the assumption of closed economies (figures 6.14 and 6.16), followed by a situation in which Brazil implements the gradual reform and opens up to trade in goods and assets (figures 6.17 and 6.19).

Although there are nonnegligible differences relative to the bold reform case, some of the results under a gradual reform are similar. The perspective of declining replacement rates going forward creates a strong incentive to save. Even in a closed-economy scenario, interest rates in Brazil decline to essentially international levels. As a share of GDP, pensions and taxes decline initially because of the decreasing replacement rate, and then increase again after 2035 because of the increasing dependency ratio. They stabilize, respectively, around 16 percent and 37 percent of GDP.

The reform increases the NPV of human wealth and reduces the present value of retirees' pensions relative to the baseline scenario (see figure 6.15). The increase in the NPV of workers' wealth more than compensates the effects on retirees' wealth, and total consumption per effective consumer ends up higher. Overall, relative to the bold reform, this scenario certainly appears more palatable for retirees.

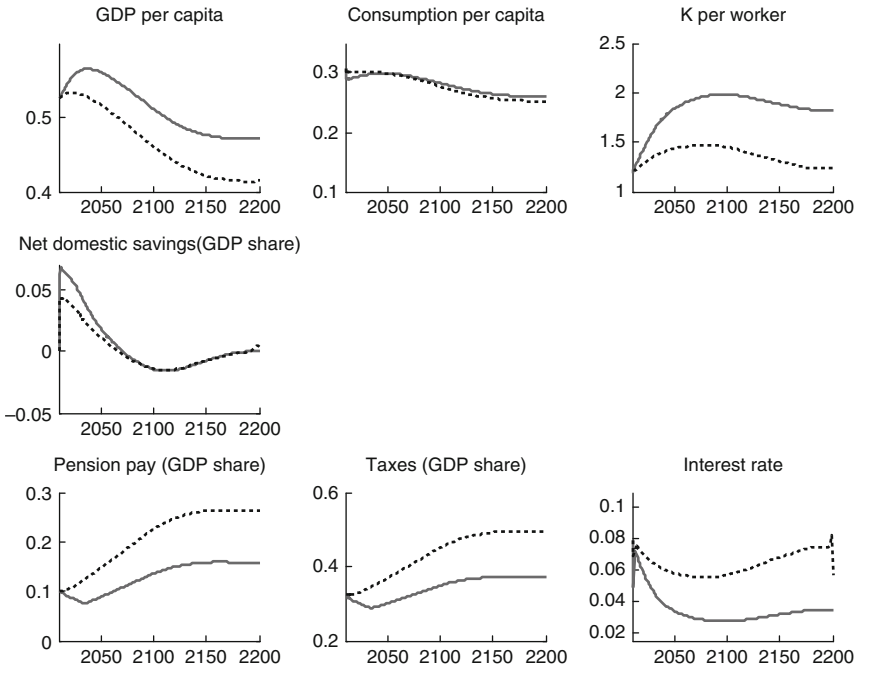

Figure 6.14 Brazil closed—gradual reform (solid line) × baseline (dotted line)

Source: Authors' elaboration.

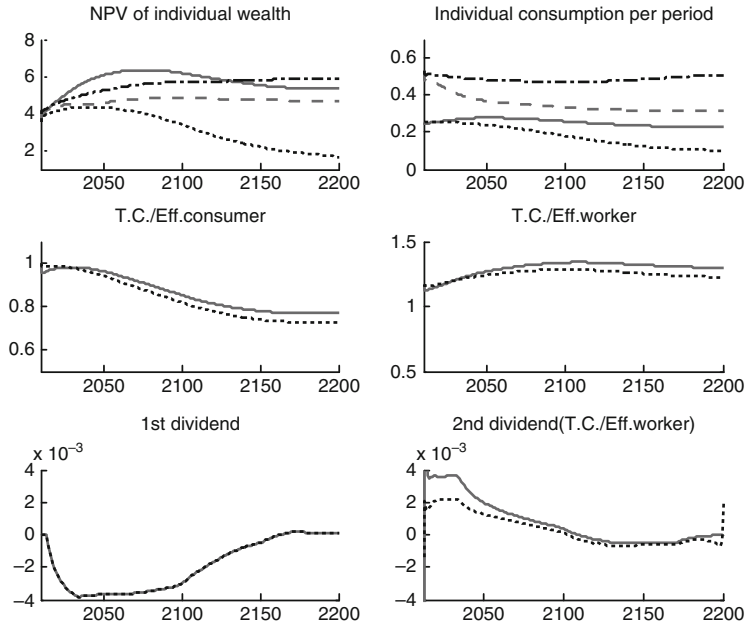

Figure 6.15 Brazil closed—gradual reform (solid and dashed lines) × baseline (dotted dash-dot lines)—demographic dividends

Source: Authors' elaboration.

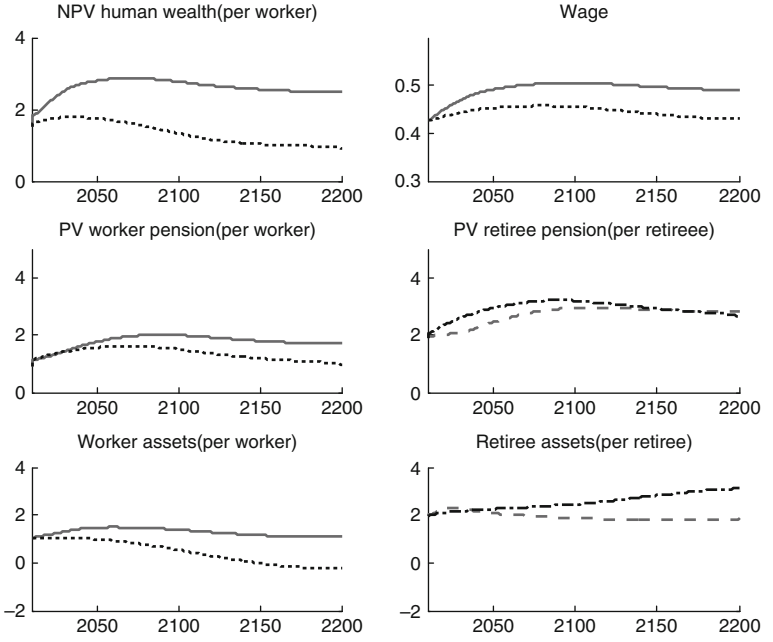

Figure 6.16 Brazil closed—gradual reform (solid and dashed lines) × baseline (dotted and dash-dot lines)—wealth decomposition

Source: Authors' elaboration.

If the gradual reform starts at the same time as the economy opens up for trade (figures 6.17–6.19), interest rates go down and capital accumulates faster in the beginning. After a brief period of large current account deficits, Brazil eventually moves into mild current account surpluses and accumulates the equivalent of 50 percent of GDP in net foreign assets. The SD, highly positive in the first few years, is lower than in the baseline closed-economy scenario after a while. It then becomes higher again sometime before 2050, and remains higher thereafter. The general equilibrium effects on wages are also significant. This confirms that taking into account such effects might be important in scenarios in which social security is reformed.

Overall, it appears that the gains from opening up the economy at the onset of the gradual social security reform are not as clear cut as in the bold reform scenario. Perhaps this is not too surprising. Previously, we highlighted that without reforms the SD is likely to be larger if the economy is more closed. In contrast, the bold scenarios show that opening up to trade might be beneficial for the prospects of a second demographic dividend if social security is revamped aggressively. Loosely speaking, the gradual reform scenarios fall in between. Hence opening does not look as attractive a proposition as under an aggressive social security reform.

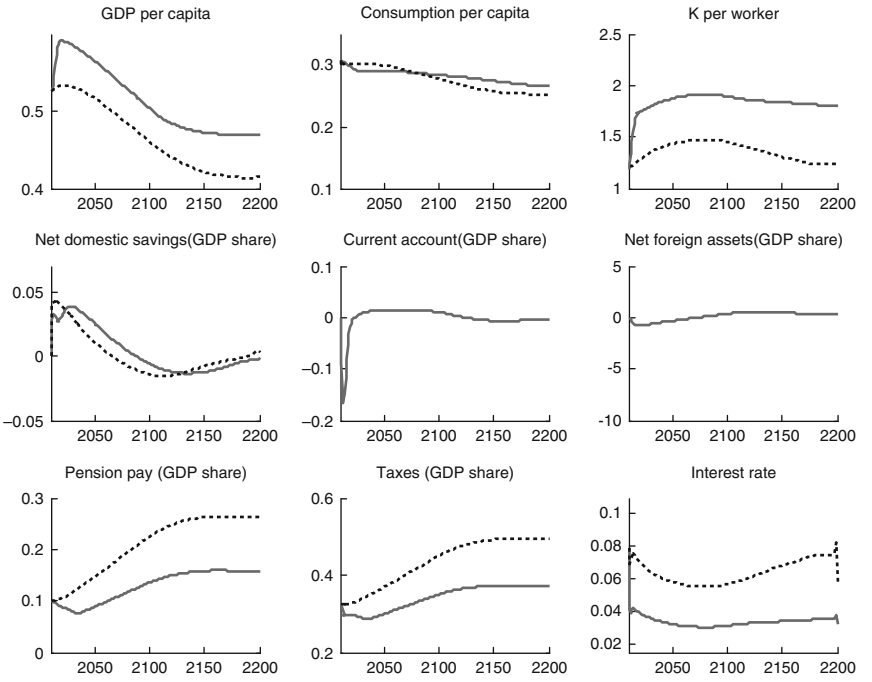

Figure 6.17 Brazil—gradual reform with sudden opening (solid line) × baseline closed (dotted line)

Source: Authors' elaboration.

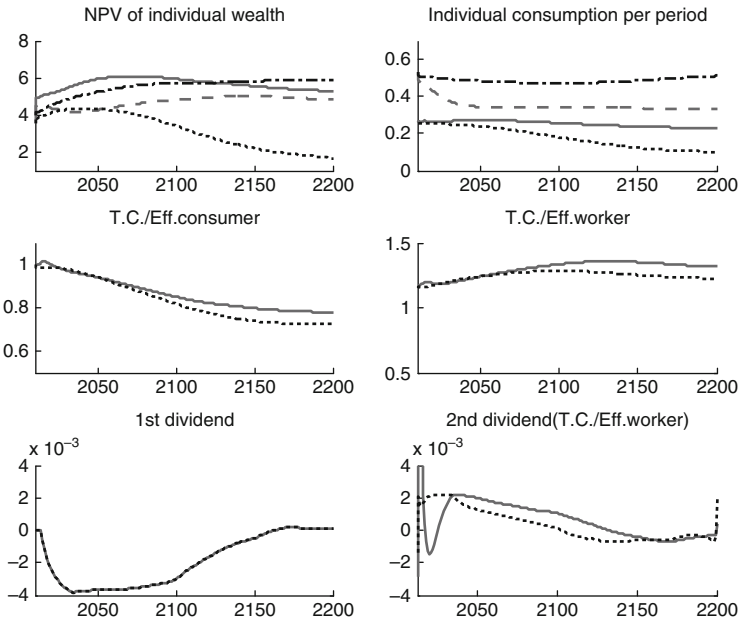

Figure 6.18 Brazil—gradual reform with sudden opening (solid and dashed lines) × baseline closed (dotted and dash-dot lines)—demographic dividends

Source: Authors' elaboration.

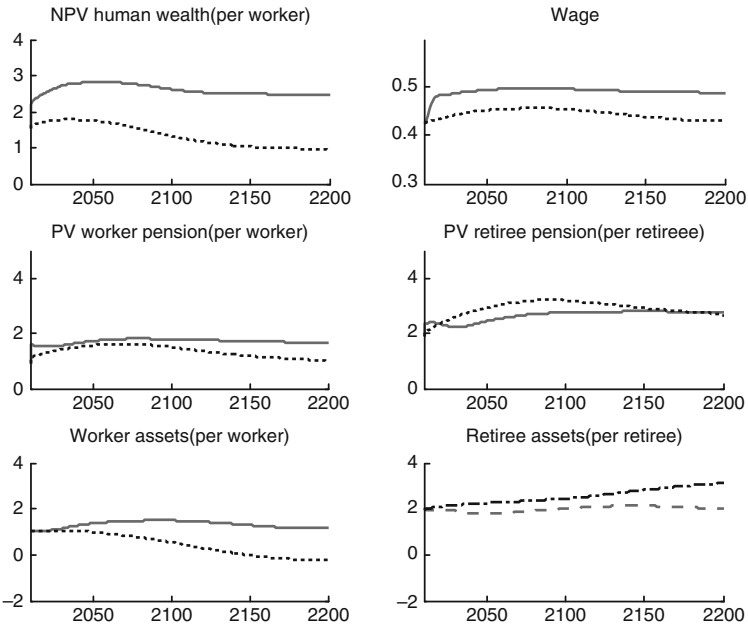

Figure 6.19 Brazil—gradual reform with sudden opening (solid and dashed lines) × baseline closed (dotted and dash-dot lines)—wealth decomposition

Source: Authors' elaboration.

6.4 Conclusions

We use a small-scale, two-country, general-equilibrium OLG model to study how public policies and differential demographic developments in Brazil vis-à-vis the developed world might interact to produce or prevent a second demographic dividend in Brazil. Our results suggest that, given the current social security system, a small second demographic dividend might arise if Brazil remains relatively closed to trade in goods and assets. Opening up under current social security arrangements turns out to be a losing proposition in that respect.

However, scenarios in which the current social security system remains in place produce incredible paths for expenditures with public pensions and taxes as a share of GDP. This is due to the fact that maintaining the very high replacement rates currently in place in Brazil becomes unsustainable as the country starts to age fast in the next couple of decades. To some extent, the average replacement rate in Brazil is high because average income is relatively low. The social security system currently in place aims to provide at least one minimum wage to every retired citizen older than 65, or a certain pension (also indexed to the minimum wage) determined as a function of former contributions to the social security system. To the extent that the average income in Brazil increases (due to factors not included in our model), the replacement rate will fall somewhat. But along this transition—even if it happens eventually—the disincentives to save will be in place, reducing the scope for a meaningful second demographic dividend. Moreover, given current rules, it appears more likely that expenditures with pensions will become unsustainable, than that Brazil will grow its way out of this liability.

Motivated by these results, we entertain reform scenarios, in which growth in expenditures with public pensions is contained. We consider a bold reform scenario in which public pensions are frozen as a share of GDP, and the replacement rate has to adjust endogenously to balance the budget, and a more gradual reform scenario, in which the replacement rate in Brazil is lowered to the level that prevails in the OECD over a 25-year period. We also interact these reforms with liberalizations that open up the economy to trade in goods and assets. The bold reform produces a meaningful second demographic dividend in Brazil, irrespective of whether the economy is open or closed to trade. In fact, in that case becoming more integrated with the world economy arguably becomes a winning proposition. This reform scenario is arguably unrealistic, however, since it involves defaulting on contracts that are currently in place, given social security rules. Unfortunately, under a more gradual reform, keeping the economy relatively closed might arguably deliver a larger SD.

While our model brings discipline to a quantitative analysis of some of the macroeconomic effects of the demographic transition in Brazil, it is of course highly stylized. Hence it should only be seen as a guide to richer discussions—and possibly quantitative analyses—that factor in important dimensions that were left out of our framework and policy exercises. Nevertheless,

we can always step outside the model to discuss a few important issues and relate our analysis to other contributions in this volume.

As Cooper (this volume) points out, the Brazilian case does not quite fit the stereotype of other developing economies where demographic developments appear to be much more favorable, and where social security systems are less generous than in richer, more developed economies (Attanasio et al., 2006). In these cases, opening up to trade in goods and assets would appear to be beneficial, in that it would allow those countries (and the developed world as well) to benefit from the trading opportunities brought about by the differential demographic developments. Younger, poorer countries can benefit from capital deepening, whereas older, richer countries can benefit from a higher return on capital, and sustain higher future consumption. In these cases, the issue of whether the countries attracting substantial amounts of capital have the financial infrastructure and the institutions to deal with them becomes important (CEDES, 2012; Ocampo, 2013). Here, again, Brazil does not quite fit the stereotype. In comparison with many other developing economies, Brazil has relatively deep financial and capital markets (De Mello and Garcia, 2012).

Relative to the issues discussed in the previous paragraph, our analysis suggests that in the case of Brazil other challenges might be more important. For example, our results suggest that opening up with an eye on the gains from trade due to differential demographic developments only makes sense if the country reforms its social security system. In that context, our model abstracts from important challenges that are likely to arise in practice. One such important challenge has to do with the political economy dimension of reform. Almost inevitably, retirees lose, while workers gain. Thus, reform proposals should face stronger opposition as the dependency ratio increases. This reasoning should be informative of reform strategies that have a higher likelihood of success. They should obviously try to be as bold as possible—if they are to spur a meaningful SD—but at the same time they have to be gradual to the extent necessary to make reforming feasible. A possible reform satisfying both criteria would be to announce a change in rules to a new "bold regime," while preserving current rules for those alive (or already participating in the labor market). A quantitative analysis of such a reform is certainly feasible, and appears worth undertaking in future research. In any case, one can ascertain that the political economy reasoning certainly calls for reforming sooner rather than later.

Notes

We thank Ramiro Albrieu, Pablo Comelatto, José María Fanelli, Martin Rapetti, Marcelo Santos, Cassio Turra, and seminar participants at EBE 2013, CEDES/UBA, and Insper for valuable comments and discussions. Felipe Alves and Felipe Mazin provided research assistance.

1. The stable-equivalent population is the underlying population that would emerge if the fertility and mortality rates remained constant for a long period of time.
2. United Nation's World Population Prospects: The 2012 Revision. The total dependency ratio is computed as the ratio of the sum of the population aged 0–14 and that aged 65+ to the population aged 15–64.

3. It is also well known that economic developments may affect demographic trends (Galor, 2011). In this paper we take demographic developments to be exogenous and study their macroeconomic consequences.
4. According to the UN's classification, the group of "More Developed Regions" is composed of North America, Europe, Japan, Australia, and New Zealand. The group of "Less Developed Regions" includes Africa, Asia (except for Japan), Latin America and the Caribbeans, plus Melanesia, Micronesia, and Polynesia.
5. We follow Gertler's (1999) and Ferrero's (2010) presentation closely, maintaining a social security system as in Gertler (1999) and analysing open economies as in Ferrero (2010). We then use the model to define demographic objects of interest—in particular the first and second demographic dividends, following Albrieu and Fanelli (2013), and Mason and Lee (2007).
6. Our model thus abstracts from childhood, as in Gertler (1999) and Ferrero (2010). We return to this issue when we detail the calibration on which we base our quantitative analysis.
7. Note the algebra for the aggregate variables: $A^r_{t-1} = \sum_{j,\tau} A^r_{t-1}(j,\tau), A^w_{t-1} = \sum_j A^w_{t-1}(j), T_t = \sum_j T_t(j), \sum_{j.\tau} D_t(j,\tau) = D_t, H_t = \sum_j H_t(j), S^w_t = \sum_j S^w_t(j)$ and $S_t = \sum_{j,\tau} S_t(j,\tau)$. And, provided $W_t(j)$ is independent of individual - specific characteristics (i.e., equal to $W_t \; \forall \; j$): $\sum_j W_t(j) = N^w_t W_t$.
8. Of course, the formula for $\overline{W^r_t}$ does not correspond exactly to the actual average wage that retirees alive at *t* earned as workers, and should thus be seen as a tractable approximation that corrects for productivity growth.
9. Among the four scenarios, the high fertility variant is the only one that does not predict a significant decrease in the Brazilian population in the second half of this century.
10. Besides the uncertainty associated with the UN's demographic projections toward the end of its horizon (2100), the reader should keep in mind that the results for our simulations at very long horizons are likely to depend on those terminal assumptions. They should thus be taken with more grains of salt than usual.
11. Given the simplified nature of the social security system in the model, it is no surprise that the values do not match the data exactly. One way to eliminate the existing discrepancies would be to allow freedom in picking replacement rates to match the data on expenditures with public pensions.
12. Recall that the results for our simulations at very long horizons are likely to depend on the "terminal assumptions" that are needed for steady state calculation purposes.
13. In an extended working paper version we consider scenarios in which the two economies are treated as open from the outset. All of our substantive conclusions go through. Results are available upon request.
14. According to Lane and Milesi-Ferretti (2007), from 1970 to 2011, Brazil's NFA/GDP has varied in the range of –58 percent and –15 percent. In 2010, it was estimated to be –39.8 percent. It thus appears that the closed economy assumption is a better approximation of the degree of openness of the Brazilian economy—that is why it is our baseline scenario.

CHAPTER 7

China's Premature Demographic Transition in Government-Engineered Growth: Macroeconomic Insights and Policy Implications

Harry X. Wu, Yang Du, and Fang Cai

7.1 Introduction

In this chapter we investigate China's demographic transition and discuss its financial and macroeconomic implications against the background of government-engineered growth. It should be emphasized from the very beginning that we do not take China's demographic transition for granted. Rather, we consider China's demographic transition as a premature process of a coherent part of China's development strategy that was adopted in the early 1950s and carried out thereafter throughout both its planning and reform periods. In our analysis, we pay particular attention to the "cost" of the government's forceful and substantial interventions in both demographic transition and resource allocation that aim to achieve a faster catch up with the advanced economies.

This chapter is structured as follows. Section 7.2 examines China's premature demographic transition from an East Asian perspective and explains it as a coherent part of the government's catch-up strategy. Using reconstructed macro indicators, section 7.3 investigates the likely impact of the first demographic dividend on China's growth. Using both macro data and data from household surveys, section 7.4 explores financial implications in line with the life-cycle hypothesis. This is followed by section 7.5, which examines savings and investment and the current accounts along with China's rapid demographic transition. Section 7.6 conducts an empirical study on the effect of ageing upon savings. Finally, section 7.7 concludes the study.

7.2 China's Premature Demographic Transition: Evidence and Argument

China's demographic transition is premature because its population has aged abnormally fast with respect to the level of income. This has been described as a process of "getting old before becoming rich" (Cai, Y., 2008). In this section, we first examine China's demographic transition from the East Asian perspective and then explain it against the background of the government's catch-up strategy.

China from the East Asian Perspective

We compare China with its East Asian neighbors who share a similar cultural background. First, to account for the stage of development of all the economies in comparison we use a constant-price purchasing power parity (PPP) measure for per capita income (TCB, 2013). Based on this, we use international demographic statistics from the United Nations (DESA, 2011) to examine the ageing process.

In table 7.1, the child dependency ratio is defined as the group aged 0–14 to the group aged 15–64, ageing index is defined as the group aged 60+ to the group aged 0–14, the share of the working-age population is equal to the group aged 15–65 to total population, and the share of potential young workers is defined as the group aged 20–29 to the group aged 15–64.

We find that at the income level of around PPP $2,000 per capita, China's ageing index already reached 0.32 (1995), much higher than its East Asian counterparts. At this income level, however, Japan's ageing index was 0.22 (1950) and South Korea's was merely 0.13 (1969). In about 15 years, all the economies in table 7.1 reached the per capita income level of PPP $6,000, virtually by a similar rate of per capita income growth at about 7.5 percent per annum. However, China aged fastest among these economies. By the end of this period, China's ageing index increased to 0.70 (2010), compared to Japan's 0.38 (1965), South Korea's 0.24 (1986), and Taiwan's 0.25 (1983). In fact, China was already much older than its East Asian neighbors at the time when they doubled their per capita income from PPP$6,000 to PPP$12,000, that is, Japan in 1977, Taiwan in 1993, and South Korea in 1995 (table 7.1).

China's premature demographic transition may be easily attributed to Deng's harsh "one child per couple" policy implemented in 1980 (figure 7.1). However, it should be noted that China's Great Famine in 1959–61, following the disastrous failure of Mao's feverish Great Leap Forward (GLF, 1958–59), and the government's LLF policy implemented in 1973 (standing for "later marriage, longer intervals between two births, and fewer children") also played a very important role. The Great Famine not only directly caused 30 to 40 million premature deaths (Banister, 1987; Becker, 1998; Coale, 1984; and Dikötter, 2010), unprecedented in peacetime history, but also caused severe malnutrition to those survived. The post-famine baby boom

Table 7.1 Demographic transition vis-à-vis income growth: China compared with other East Asian economies

Per capita GDP in US$ (1990 PPP)	*China*	*Japan*	*S. Korea*	*Taiwan*	*China*	*Japan*	*S. Korea*	*Taiwan*
	Child dependency ratio				**Ageing index**			
2,000	0.441$^{(94)}$	0.593$^{(50)}$	0.782$^{(69)}$	–	0.319$^{(94)}$	0.218$^{(50)}$	0.128$^{(69)}$	–
4,000	0.310$^{(05)}$	0.470$^{(60)}$	0.581$^{(78)}$	0.588$^{(76)}$	0.551$^{(05)}$	0.294$^{(60)}$	0.166$^{(78)}$	0.164$^{(76)}$
6,000	0.269$^{(10)}$	0.379$^{(65)}$	0.443$^{(86)}$	0.478$^{(83)}$	0.703$^{(10)}$	0.375$^{(65)}$	0.238$^{(86)}$	0.245$^{(83)}$
12,000	n.a.	0.361$^{(77)}$	0.323$^{(95)}$	0.371$^{(93)}$	n.a.	0.498$^{(77)}$	0.441$^{(95)}$	0.421$^{(93)}$
	Share of working-age population				***Share of potential young workers***			
2,000	0.652$^{(94)}$	0.597$^{(50)}$	0.543$^{(69)}$	–	0.309$^{(94)}$	0.280$^{(50)}$	0.279$^{(69)}$	–
4,000	0.698$^{(05)}$	0.641$^{(60)}$	0.609$^{(78)}$	0.608$^{(76)}$	0.211$^{(05)}$	0.276$^{(60)}$	0.295$^{(78)}$	0.291$^{(76)}$
6,000	0.714$^{(10)}$	0.680$^{(65)}$	0.662$^{(86)}$	0.645$^{(83)}$	0.227$^{(10)}$	0.261$^{(65)}$	0.310$^{(86)}$	0.316$^{(83)}$
12,000	n.a.	0.674$^{(77)}$	0.705$^{(95)}$	0.678$^{(93)}$	n.a.	0.246$^{(77)}$	0.270$^{(95)}$	0.263$^{(93)}$

Notes: See text for the definition of the indicators. Figures in the superscripted brackets refer to the year of measurement, for example, (50) = 1950 and (94) = 1994, and so on except for (05) and (10) in the case of China which refer to 2005 and 2010, respectively.
n.a.: not applicable.

– : not available.

Source: Authors' calculation based on population data of DESA (2011) except Taiwan. Taiwanese population data are from *Statistical Yearbook of the Republic of China 2012*. Data on per capita GDP in 1990 PPP are from TCB (2013).

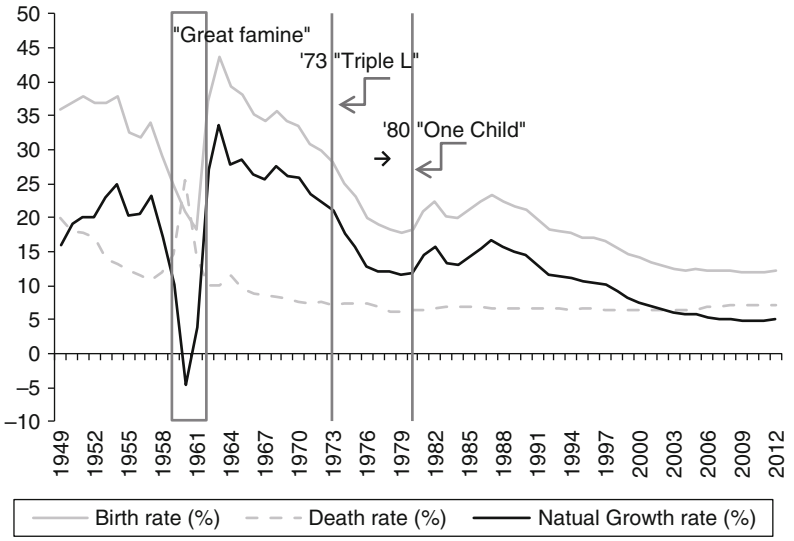

Figure 7.1 Impacts of the "Great Famine" and birth control policies on China's demographic transition

Source: Authors' elaboration based on data from the National Bureau of Statistics of China.

in 1963–71 as labeled in some studies (Oizumi, 2011) was compensatory in nature. It could not even fully make up for the potential losses due to two factors: first, there were tens of millions of premature deaths of childbearing-age women in the Great Famine and second, the childbearing-age women who survived the famine were in poor health because of severe malnutrition.

Note that the women entering their childbearing age in the 1970s were subsequently affected by the so-called LLF policy, which was by no means less significant than the one child policy. According to Wang and Mason (2005), at the time of implementing the one child policy in 1980, which lasted for less than a decade, China's total fertility rate (TFR) had already been more than halved from 5.8 children per woman in 1970 to 2.3 in 1980, almost reaching the replacement TFR of 2.1. Thus, it did not appear to be wise to adopt the more stringent one child policy in 1980, which not only significantly affected the fertility of the childbearing-age women of the post-famine baby boomers who entered the best childbearing age (20–35) from the early 1980s, but also affected the next generation's women who began to enter their childbearing age from the early 2000s. The joint effects of the one child policy and the LLF policy have distorted China's age structure by substantially reducing the number of births. According to Retherford et al. (2005), by the end of the twentieth century, China's TFR had dropped to about 1.6 per woman.

The impact of the famine and the joint policy effects can be examined by the abnormally low share of young-age population (aged 0–14) in China compared to other East Asian economies (table 7.1). Also controlling for the initial level of per capita income at PPP$2,000, we can see that China's

share of aged 0–14 was only 29 percent (1994), much lower than that of Japan's 35 percent (1950) and South Korea's 42 percent (1986). This is also reflected by China's abnormally low child dependency ratio, which was 0.44 (1994) compared to 0.59 in Japan (1950) and 0.78 in South Korea (1969). Moving toward the income level of per capita PPP$6,000, all the economies experienced a rapid decline in this ratio, but China declined faster. Table 7.1 shows that with this income level, China's child dependency ratio was 0.27 (2010), compared to Japan's 0.38 (1965), South Korea's 0.44 (1986), and Taiwan's 0.48 (1983). The annualized rate of change is –3.4 percent for China, –2.9 percent for Japan, and –3.1 percent for South Korea (calculated using the time span indicated).

This abnormally low share of aged 0–14 group substantially reduced the share of potential young workers (aged 20–29), an important indicator of the sustainability of workforce growth. Table 7.1 shows that from the level of per capita PPP$2,000 to PPP$6,000, China experienced a significant decline in the share of aged 20–29 from 0.31 to 0.23 (with the total working-age population equal to one), whereas in Japan it only slightly reduced from 0.28 to 0.26. In the case of South Korea and Taiwan, however, it increased from 0.30 to 0.31 and from 0.29 to 0.32, respectively.

In figure 7.2, using data from China's four population censuses (1982, 1990, 2000, and 2010), we first show the impact of the post-famine baby boomers who were born between 1962 and the implementation of the LLF policy in 1973 on the 'labor market' in 1982 as young workers, and then we indicate at what ages this 10-year cohort finally entered the 2010 census. As

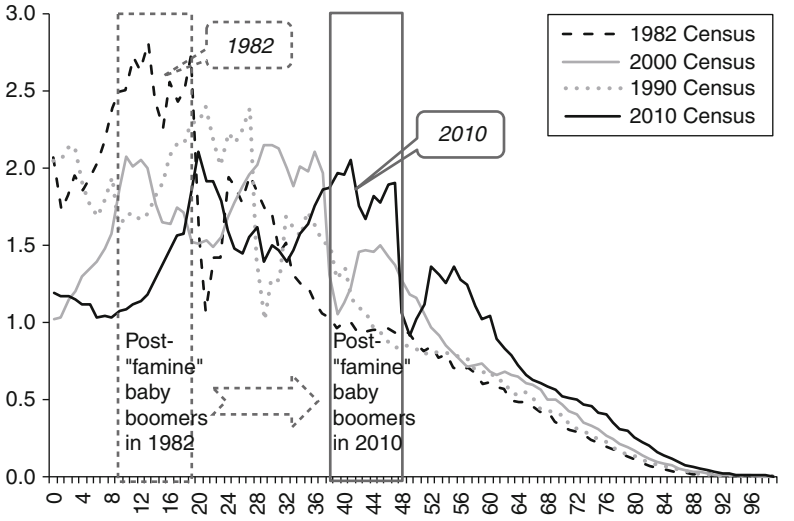

Figure 7.2 Post-"Great Famine" baby boomers as reflected by China's four population censuses

Source: Population census data for 1982 are from CPY (1985, Table 6), for 1990, 2000, and 2010 are from NBS (1992, Table 3–8; 2002, Table 1–2; 2012, Table 3–1).

clearly suggested by the dynamics of the age structure, when this cohort fully retires in two decades, there will be no cohort of a similar scale in the Chinese workforce.

China's "Demographic Window"

Following the notion as used in this research project that the "demographic window" opens when those under 15 years of age have fallen permanently under 30 percent of the total population while those aged 65 years and over are still relatively few, we show in figure 7.3 (on the right-hand-side scale) that China's demographic window approximately began in the mid-1980s because its children's share had fallen permanently under 30 percent of the population from 1985, and ended in the mid-2010s because its elderly share will be permanently over 10 percent of the population from 2014. In other words, at the end of this research period, China will have just completed its 30-year-long "window of opportunity" period. This timing is earlier than what many may have imagined. However, this window period coincided with the onset of China's industrial reform.

One way to measure the potential "demographic dividend" is subtracting the growth rate (in percent) of the total population from that of the working-age population. It is potential because it does not consider the actual numbers employed. Besides, it also assumes that labor productivity remains unchanged.

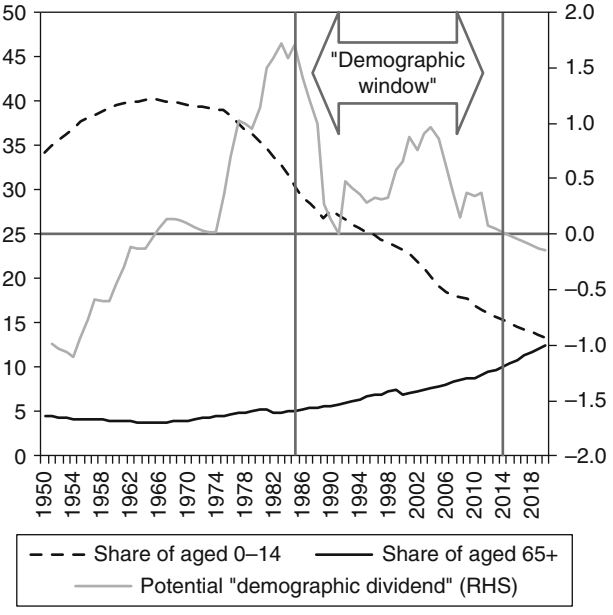

Figure 7.3 Identifying China's "demographic window" period

Sources: Authors' estimation using the life table approach with census data (see figure 7.2). UN data (DESA 2011) and household survey data.

Figure 7.3 shows that the potential demographic dividend began to exist as early as the mid-1960s. It rose quickly from the mid-1970s as the children's share of the population started to decline dramatically. However, until the late 1970s the "dividend," if realized, seemed to have been substantially offset by the high share of children in the population. The notch of the dividend curve between the early 1980s and the early 2000s apparently reflects the effect of the famine on the slowdown of the working-age population growth.

What Has Made China an Outlier?

China's premature demographic transition, or abnormally earlier and faster ageing process, cannot be better understood without comprehending the role of the Chinese government. Under central planning, the government heavily intervened and became involved in resource allocation in order to facilitate the development of selected industries that were deemed crucial for a faster catch up with the West, although it was not in line with China's comparative advantage (Lin et al., 1996). China's industrialization plan was financed by forced savings through various channels and ensured by institutional arrangements. However, the forced savings was first challenged by severe food shortages in the rural area following the drastic failure of the GLF campaign, with the consequent starvation and death of tens of millions, followed by a huge demand pressure for food during the post-famine baby boom decade (1962–72). Therefore, the subsequently implemented strict and harsh birth control policies were by nature to solve the problem of insufficient savings.

In this regard, the birth control policies were an inherent part of China's government-engineered growth strategy to raise savings by forcefully reducing the number of births per childbearing woman. This enabled China to reap its first demographic dividend well ahead of time. Nevertheless, the earlier harvesting of the first demographic dividend is no free lunch. As examined earlier, its cost is a much earlier ageing process with respect to the income level by international standards. This policy mistake cannot be easily corrected because the ageing process is almost nonreversible even if it is very premature.

An often less emphasized, if not completely ignored, fact is that this premature demographic transition has substantially shortened China's time horizon to industrialize the economy. This means that China has to be more efficient and productive than what the normal demographic conditions imply. It is, hence, very crucial for China to more efficiently use its first demographic dividend and timely accomplish its long dreamed catch up before the earlier ageing process starts eating away at savings.

7.3 Demographic Dividends and Economic Growth in China

Exploring China's First Demographic Dividend

In exploring China's first demographic dividend, we should account for labor productivity, that is, measuring the "pure gain" in GDP from the increase

in the number of employed due to the age structural effect assuming there is no change in output per worker. Let us first define per capita GDP as Υ / N (Υ stands for GDP and N for the total number of population). Since $\Upsilon / N = (L / N)$ x(Υ / L) (L stands for the total number of employment), we can decompose the growth of per capita GDP into two effects, that is, the growth of labor productivity (y) and the difference between the growth of the total number of employment (l) and the growth of the total number of population (n). The economy will gain a demographic dividend from the increase in the total number of employment that exceeds the increase in the total number of population ($l - n$). This can be expressed in the following equation:

$$g = y + (l - n). \tag{7.1}$$

Based on equation (7.1), in table 7.2 we examine the annual growth of population, employment and GDP and, hence, the derived first demographic dividend for China for different periods under central planning and during economic reform.

Note that there are two working-age groups presented in the table in annual growth rate, of which one is defined as the international standard group of aged 15–64 population and the other is defined as the group of aged 20–59 aiming to more closely reflect the labor participation reality in China. It may be more appropriate to start this alternative measure from age 18 rather than 20, but we are constrained by limited data, especially for the planning period. The ending age 59 is based on the administratively regulated retirement age of 50 for females and 60 for males who are weighted more than females. Besides, for female public servants the ending age is 55 and for senior professionals (especially those in education, healthcare, and scientific research) it is 60 or over. The ratio of the alternative narrow measure to the standard measure of working-age population can be used as an approximate indicator of China's labor participation rate.

As table 7.2 shows, China experienced its most rapid population growth in 1966–71 by 2.77 per annum. This explains why the government introduced the LLF policy in the early 1970s. The LLF policy quickly brought the natural growth rate down to 1.92 in 1972–77 and the subsequent one-child policy in 1980 further lowered it to 1.42 in 1978–91 and further to 1.01 in 1992–2001. From the mid-1960s, the growth of the working-age population began exceeding that of total population. This trend was strengthened through the 1970s and 1980s. If using the group of aged 20–59 as the measure of the working-age group to more closely reflect the labor participation in the Chinese reality, it became even more pronounced and continued through the 1990s. This clearly reflects the shifts of age groups over time (see figure 7.2).

Whether a demographic window of opportunity for an economy can bring about the first demographic dividend depends on whether there are supportive institutions that allow the full use of the abundant manpower in the

Table 7.2 Changes in population, employment, per capita GDP, and labor productivity in China (% p.a.)

	Population (age group in years)			*Total numbers employed*[2] (l)	*GDP*	*GDP per capita* (g)	*GDP per person employed* (y)	*First demographic dividend* (l-n)
	Total (n)	*15–64* (w1)	*20–591* (w2)					
Planning: [3]								
1952–1965	1.75	1.22	1.09	2.89	4.3	2.5	1.4	1.1
1966–1971	2.77	2.89	2.38	4.10	5.2	2.4	1.1	1.3
1972–1977	1.92	2.28	2.75	4.90	3.4	1.4	−1.5	2.9
1952–1977	*2.04*	*1.87*	*1.80*	*3.66*	*4.3*	*2.2*	*0.6*	*1.6*
Reform: [3]								
1978–1991	1.42	2.53	2.74	3.22	6.3	4.8	3.0	1.8
1992–2001	1.01	1.46	1.80	0.41	7.0	6.0	6.6	−0.6
2002–2007	0.59	1.38	1.27	1.21	10.3	9.7	9.0	0.7
2008–2012	0.49	0.60	0.83	0.74	6.5	5.9	5.7	0.2
1978–2012	*1.03*	*1.75*	*1.94*	*1.71*	*7.2*	*6.1*	*5.4*	*0.7*

Note: 1. This refers to our alternative narrow working-age group designed to reflect the labor participation reality in China. See text for more information.

2. Numbers employed are standardized by hours worked (Wu, 2014).

3. The division of sub-periods is based on major policy regime shifts and external shocks. See Wu (2014) for details.

Sources: Population data are official estimates (NBS 2011, p.93 with updates). Working-age population data are reconstructed based on censuses using the life-table approach. GDP (in 1990 prices) and employment data are adopted from Wu (2014), adjusted for inconsistencies and flaws and standardized based on hours worked.

economy's comparative advantage for income growth. The employment rate is perhaps the simplest but most meaningful indicator of whether the economy is taking advantage of the window of opportunity. In the China case, in the long absence of reliable labor participation and unemployment measures, we can gauge China's unemployment status by comparing the numbers employed with the size of the alternative narrow measure of working-age population (20–59). This guesstimated result is presented in figure 7.4 along with the annual changes in total population, the standard measure and the alternative, narrower measure of working-age population, and employment (by natural numbers).

The so-estimated unemployment rate in figure 7.4 is perhaps the first of its kind, though by no means accurate. This is because it assumes that the standard measure of working-age people under 20 and over 59 were not employed and ignores the disguised unemployment under the labor planning system as well as any data fabrication for propaganda purposes. Nonetheless, it is just indicative enough for our purpose. Simply put, if the growth of employment is strong enough to draw more people from the rest of the standard working-age population under 20 and/or over 59 (thus, the unemployment rate becomes negative), it means that the economy is successful in a more sufficient use of its abundant labor appearing in the window period. On the other hand, if the alternative, narrower measure of working-age population (20–59) cannot be fully employed, the actual unemployment could be worse.

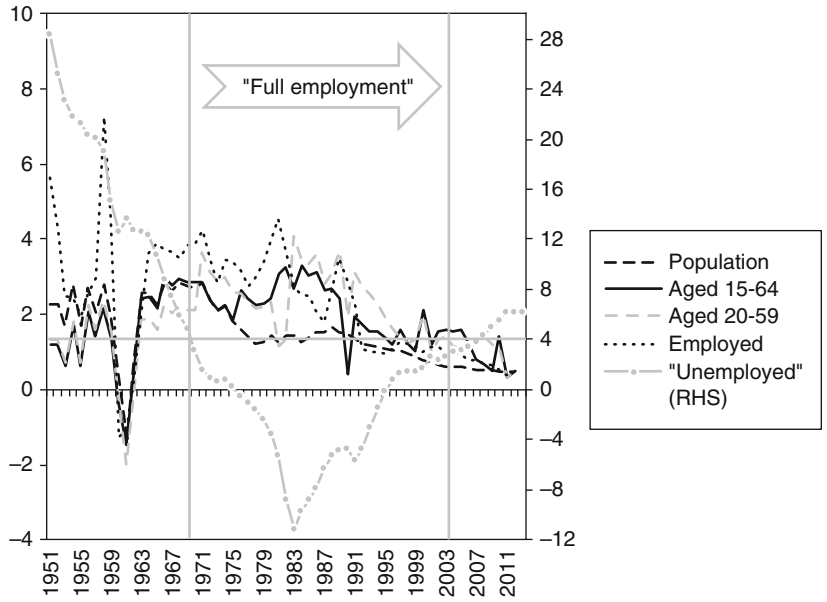

Figure 7.4 Gauging annual changes in China's unemployment

Source: Authors' calculation based on table 7.2.

Figure 7.4 shows that China had severe unemployment problems in the 1950s and 1960s, but experienced a "full employment" period from the end of the 1960s to the early 2000s. If using the conventional 4 percent as the "natural unemployment rate" (marked on right-hand-side scale) and taking into account likely disguised unemployment under central planning, one may conclude that the reform period did not have a real unemployment problem until the global financial crisis in 2008. In particular, the negative unemployment rate between the mid-1970s and the mid-1990s clearly indicates that the economy used more labor than the narrowly defined alternative working-age population of 20–59. This is apparently corresponding to the period in which China harvested its first demographic dividend as presented in table 7.2 and also depicted in figure 7.5.

By applying equation (7.1) we can decompose per capita GDP (g) into labor productivity (y) and the first demographic dividend ($l - n$) (table 7.2). The results show that China began enjoying its first demographic dividend from the 1950s. On average, there was more demographic dividend reaped in the central planning period (1.6 percent per annum) than in the reform period (0.7). The peak period was in the 1970s (2.9 in 1972–77) and was followed by the 1980s (1.8 in 1978–91). Nevertheless, the first dividend suddenly and unexpectedly became negative in 1991–2001 (–0.6). There

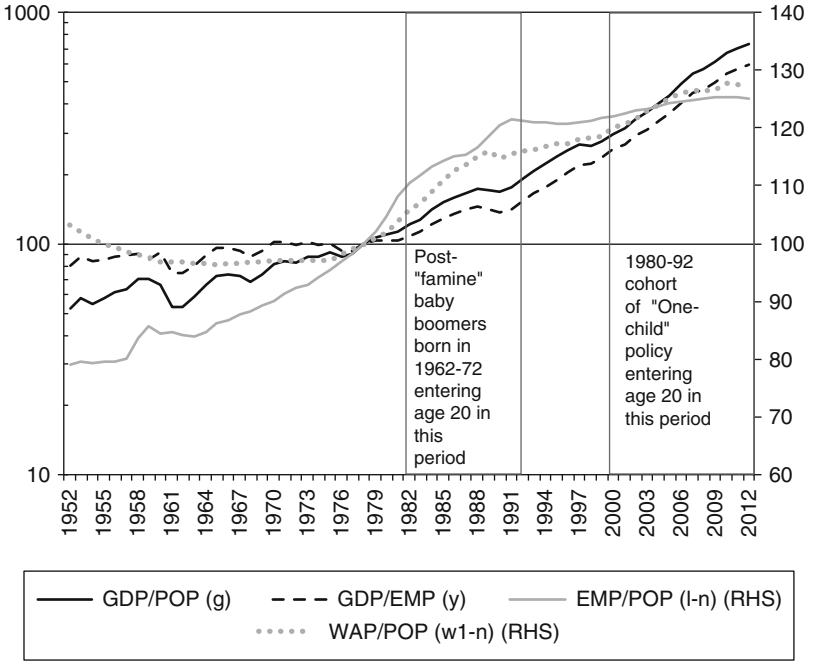

Figure 7.5 Exploring China's first demographic dividend

Note: WAP stands for the standard measure of the working-age population at 15–64.

Source: See detailed calculations in table 7.2.

were two underlying factors that were likely responsible for this observation. One is a sharp decline in the growth of the working-age population aged 15–64 (from 2.53 to 1.46 percent per annum, table 7.2) and the other is the state sector reform that for the first time since the adoption of central planning in the early 1950s seriously tackled the chronic problem of labor redundancy or overstaffing. In fact, the growth of employment substantially slowed down from 3.2 percent per annum in 1978–91 to merely 0.4 percent in 1992–2001.

Moreover, a closer examination of the mild resurgence of the first demographic dividend following China's WTO entry, along with the continuous decline in the growth of the working-age population, suggests that this resurgence could hardly alter the underlying trend of the declining demographic dividend in China from the 1990s. Figure 7.5 illustrates that from the mid-2000s the growth of per capita GDP has been almost fully attributed to the growth of labor productivity. That is, the *l-n* curve has flattened out after the mid-2000s (note that the curves in figure 7.5 are not directly comparable because they are presented in different scales).

It is also insightful to examine the relative change between the working-age population (aged 15–64) and the total population, or $w - n$ as the differential of the two growth rates. Compared with the ratio of employment to total population $l - n$, this ratio can be used to indicate the potential demographic dividend (indexed based on 1978, figure 7.5). Apparently, the actual and potential demographic dividends did not follow a similar trend. We argue that the misalignment between the two curves may be used to gauge policy problems that resulted in the loss of the potential demographic dividend. In fact, from the late 1990s the growth of the potential demographic dividend has been faster than the growth of the bonus reaped. Government-engineered rapid capital deepening might have wasted the potential demographic dividend while also causing the loss of efficiency (which will be discussed in section 7.5).

This observation, based on our systematically reconstructed macroeconomic data, may enhance the ongoing debate on whether China is approaching or will soon reach the Lewis turning point (LTP) (Lewis, 1954; Also see Cai, F., 2008a and 2010; Cai and Wang, 2009; Garnaut and Huang, 2006; Minami and Ma, 2010; Yao and Zhang, 2010). Based on table 7.2, if judged by the growth of employment (0.74 percent per annum) in the most recent period 2008–12 in our examination compared with either the growth of total population (0.49) or the growth of the standard measure of the working-age population (0.60), one can firmly conclude that China has indeed passed the LTP while nearly exhausting its first demographic dividend (0.2). However, if judged by the growth of the narrow measure of the working-age population (0.83), one may say that China is perhaps halfway through the LTP because the growth of the potential labor supply is still faster than that of the demand for labor. Yet, the difference is rather trivial (0.09 = 0.83–0.74). Therefore, Cai's conjecture that the arrival of the LTP in China and the end of China's first demographic dividend could happen at a similar time is

supported by this investigation (Cai, 2010). Nevertheless, we do not rule out that the actual process could have been more complicated than what can be measured here because of various distortions due to the government's long interferences in demographic transition and economic activities.

7.4 China's Demographic Transition and Life-cycle Financial Implications

In this section, based on the life-cycle income assumptions, we take advantage of the recent rounds of the Urban Income and Expenditure Survey conducted by the China National Bureau of Statistics (NBS) for 2003, 2005, 2007, and 2009 (UIES database kept at IPLE, 2013) to examine changes in China's life-cycle production and consumption profiles and their financial implications.

China's Life-cycle Production and Consumption Profiles

Against the background presented in figures 7.3–7.5, we now examine China's life-cycle production and consumption profiles for urban households. With data limitation, when Wang and Mason (2005) explored the pattern, they could only rely on an earlier UIES data set for 2000. Thus, they were not able to observe the dynamics of the pattern over the recent decade. We can take advantage of the updated UIES data for four benchmarks—2003, 2005, 2007, and 2009—which allows us to examine if the life-cycle production-consumption pattern of China's urban households changed over this time span. In the calculation, the labor income and consumption per head are deflated by the official consumer price index compiled by NBS. This is to make the two indicators comparable over time. The life-cycle production-consumption pattern of China's urban households in real terms is presented in figure 7.6.

There are several features of the profiles that are worth noting. First, as shown in Wang and Mason (2005), we have found the similar shapes of the life-cycle income and consumption profiles for China's urban households, that is, an inverted U shape for the life-cycle income curve and a relatively flat life-cycle consumption curve.

Second, when looking at the age structure, the age group with a life-cycle deficit actually changed over time. For example, in 2003 the group with a higher labor income than consumption per capita was aged between 27 and 52. This group has enlarged to include those aged between 24 and 58 in 2009. This implies that the life-cycle production and consumption profile could vary over time by improving the labor productivity and labor participation rates. Consequently, the life-cycle deficit can change without a change in age structure.

Third, the trajectory of the gap between consumption and labor income growth is quite significant even if the duration of observation is only six years. Obviously, the increase in the gap mainly came from the growth of labor

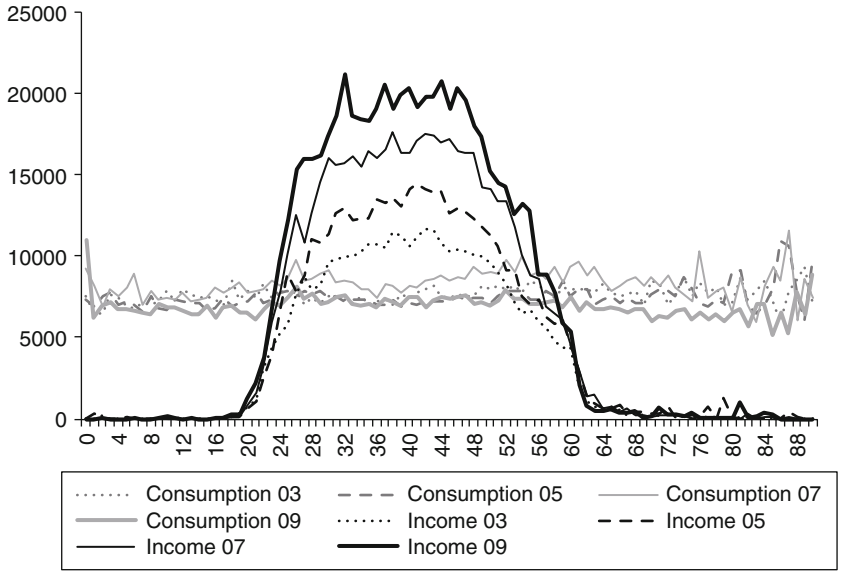

Figure 7.6 Life-cycle production and consumption profile in urban China

Note: Labor income and consumption per head by age is denoted in 2003 prices.

Source: Authors' computation based on NBS urban household survey data (UIES-IPLE, 2013).

income across ages whereas the level of consumption stayed at a similar level. This suggests that the "scale" effect associated with the growth in consumption and labor income per capita may amplify the demographic effect.

Support Ratio and Life-cycle Deficit

We conduct two exercises to explore the trajectories of China's support ratio and life-cycle deficit, with one using the UIES data and the other using our reconstructed national data. First, following Wang and Mason (2005) and Mason and Lee (2006a), we need to define the effective number of producers (L) and the effective number of consumers (N) as the sum of their natural numbers at each age weighted by age-specific per capita income (γ_a) and per capita consumption (ϕ_a), respectively. The results are indexed by two time variables: t representing the point at which the agents are formulating plans and taking decisions and z standing for the time horizon considered in the decision-making process. This can be expressed in the following equation:

$$SR_{t,z} = \frac{L_{t,z}}{N_{t,z}}. \tag{7.2}$$

where $L_{t,z} = \sum_{a=0}^{\Omega} \gamma_a X_{at,z}$ and $N_{t,z} = \sum_{a=0}^{\Omega} \phi_a X_{at,z}$ with $X_{at,z}$ standing for the size of each age cohort a maximized at age Ω.

Next, to capture the scale effects associated with the increase in the size of the population and with the growth in per capita income and consumption, we define the proportional increase of L and N between the base year b and the year $t + z$ as $HL_{t,z} = L_{t,z}/L_b$ and $HN_{t,z} = N_{t,z}/N_b$, respectively. Thus, the scale-effect-adjusted *SR* or *SRA* can be given as:

$$SRA_{t,z} = SR_{t,z}\frac{HI_{t,z}}{HC_{t,z}} = SR_b\frac{HL_{t,z}}{HN_{t,z}}\frac{HI_{t,z}}{HC_{t,z}}. \tag{7.3}$$

where $HI_{t,z}$ and $HC_{t,z}$ are, respectively, the proportional increase in the per capita labor income index and the per capita consumption index between the base period and $t + z$. The consideration of the scale effects will be particularly useful to identify a number of factors that condition the economy's ability to benefit from the two potential demographic dividends and, hence, preparing for the ageing process.

With this scale-effect-adjusted support ratio, we can define the aggregate life-cycle deficit (LCD) of the economy at time $t + z$ as the difference between the consumption of all cohorts ($C_{t,z}$) and total labor income as:

$$LCD_{t,z} = C_{t,z}(1 - SRA_{t,z}). \tag{7.4}$$

The expression of LCD is insightful not only because the trajectory of LCD is determined by the changes in total consumption and the scale-effect-adjusted support ratio, but also because the changes in the size of consumption or savings have a multiplicative impact on LCD that can leverage the variations in the support ratio induced by the demographic transition.

Using the UIES data we calculate both *SR* and *SRA* for urban China. As shown in the left panel of figure 7.7, the two types of support ratios are similar, which may be due to limited data and incomplete sampling. Taking the γ_a and ϕ_a of each cohort as constant and the year 2009 as the base year, we can predict the support ratio for urban China up to 2030 assuming a constant ratio of $HI_{t,z} / HC_{t,z}$. This is to see the effect of the demographic transition[1] on the change of the support ratio. The right panel of figure 7.7 suggests that if there is no longer productivity improvement after 2009, the support ratio will peak in 2014 and then the first demographic dividend will disappear. Besides, the ratio of $HL_{t,z} / HN_{t,z}$ will also be less than 1 after 2009.

Although γ_a and ϕ_a of each cohort are assumed constant, the right panel of figure 7.7 gives rise to the importance of productivity improvement in China's future economic development. To sustain growth, China has to mainly rely on the scale effect associated with the growth of per capita income that should be determined by productivity enhancement.

As noted earlier, the scale effect is also associated with size of population. The right panel of figure 7.8 depicts the shifts of age cohorts in urban China from 2003 to 2009. With population ageing, the average ages of production group have evidently been increasing over time. We normalized the per capita labor income and per head consumption in the left panel as Wang and

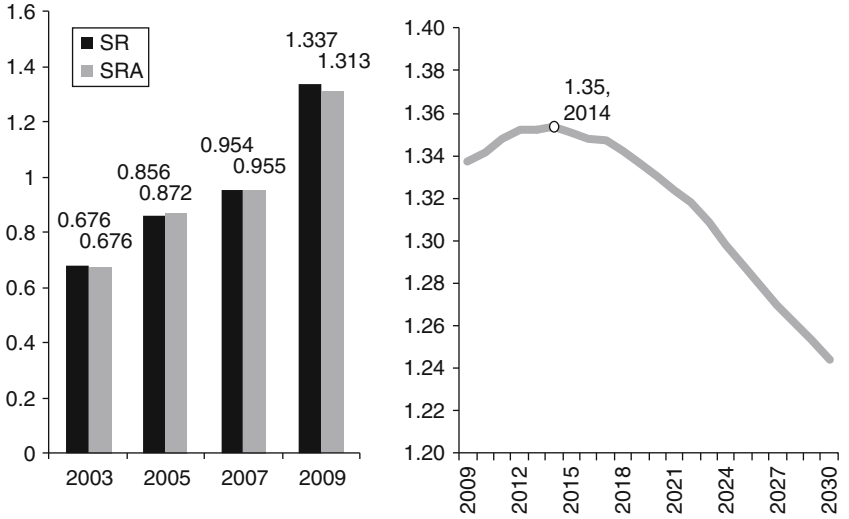

Figure 7.7 Changes in the support ratio and adjusted support ratios in urban China

Sources: The left panel is based on authors' computation using UIES data and the right panel is computed based on the same data and projections by authors (UIES-IPLE, 2013).

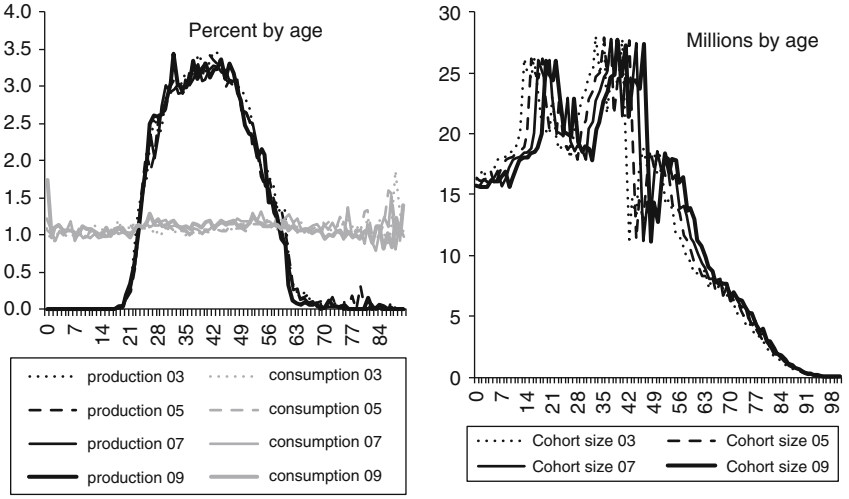

Figure 7.8 Variations in normalized consumption and production by age and changes in the size of age cohort in urban China

Sources: The left panel is based on authors' computation using UIES data and the right panel is computed based on the same data and projections by authors (UIES-IPLE, 2013).

Mason (2005) did. It is obvious that the pattern of the normalized incomes and consumption over the life cycle in the case of urban China is quite stable and the shape of age profiles is very similar to Figure 2 of Wang and Mason (2005). This implies that the changes in the support ratio in urban China have been dominated by the labor productivity improvement rather than the change in the number of effective consumers.

The above observations are based on recent urban household survey data from UIES which are limited. Next, we extend the examination back to the 1950s using our reconstructed economy-wide indicators. These data make the best use of four data sources: 1) the UIES data that provide approximate support ratios, 2) population census data that provide age structures, 3) the official flow of funds (FOF) data that provide control totals for labor compensation and private and public consumptions, and 4) the recently reconstructed income and employment accounts data in Wu (2014).

Following equations (7.1–7.3), the estimated SR, SRA, and LCD are depicted in figure 7.9. To see whether there is a clear scale effect, we benchmark the support ratios on 1985 which is the time China entered the demographic window period (see figure 7.3 and related discussion). To us the results are insightful and largely reflect reality. Figure 7.9 suggests that China's SRA began to overtake SR in the early 1990s. It accelerated rapidly but has stopped growing since the early 2000s, which was the time from which China no longer benefited from the first demographic dividend. One may have noticed that China's SRA was also higher than SR during

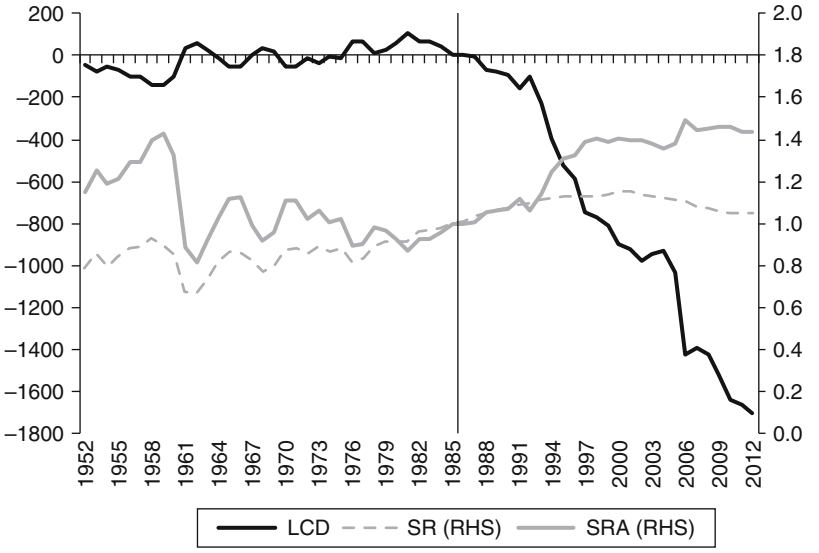

Figure 7.9 Estimated support rations and life-cycle deficit in China

Source: Authors' estimation using UIES data (UIES-IPLE, 2013), Flow of Funds Accounts (NBS, 2013), population census data (see figure 7.2) and the reconstructed national income and employment accounts data in Wu (2014).

the planning period, which is puzzling enough if we take China as a normal case. However, this substantiates our earlier point that China's heavy industrialization under central planning was supported by forced savings, which significantly suppressed consumption. Therefore, the LCD in the planning period should be considered atypical and incomparable with the LCD in the reform period, which began significant corrections to the previous distortions, especially those in labor compensation and consumption including the abandoning of the national rationing system on consumer goods.

The late 1980s also marked the turnaround of LCD from a positive value in the 1960s–1970s on average to a negative value. Clearly, LCD began a fast decline from the early 1990s and continued to the present, which makes China a very rare case with life-cycle surplus. China's atypically high savings rate (see section 7.5), together with the rapid growth of labor productivity, hence the rapid growth of labor compensation, explains this phenomenon. However, one should not ignore the effect of China's premature demographic transition that has artificially raised the effective number of producers while reducing the effective number of consumers.

Fiscal Support Ratio

The demographic transition has an important bearing on the government's fiscal position. The change in the first demographic dividend induces the change in LCD and, hence, the change in the government's fiscal position, which will lead to the change in the net transfer of government. In the case of China, it is of great interest to see if the rise of the demographic bonus and, hence, the improvement in LCD has increased the Chinese government's net transfer. This link can be examined by constructing a fiscal support ratio, FS. FS can be defined as the ratio between the number of effective "taxpayers" ($U_{t,z}$) and the number of effective recipients of transfers ($Q_{t,z}$). These variables are weighed by the tax burden (β_a) and the benefits received (α_a) of each cohort in the base year, normalized by yl_{mb} that is the per capita labor income of those aged 30–49 in the base year. Similar to the support ratio, this gives the fiscal support ratio:

$$FS_{t,z} = \frac{U_{t,z}}{Q_{t,z}} = \frac{\sum_{a=0}^{\Omega} \beta_a x_{at,z}}{\sum_{a=0}^{\Omega} \alpha_a x_{at,z}}. \tag{7.4}$$

This ratio can be adjusted by the overall growth of consumption and labor income. Let per capita tax payment and benefits between b and $t + z$ be denoted as $HT_{t,z}$ and $HG_{t,z}$ and the proportional increase in the effective number of tax payers and beneficiaries are $HU_{t,z} = U_{t,z}/U_b$ and $HQ_{t,z} = Q_{t,z} / Q_b$, respectively, so we can write:

$$FSA_{t,z} = FS_b \frac{HU_{t,z}}{HQ_{t,z}} \frac{HT_{t,z}}{HG_{t,z}}. \tag{7.5}$$

This follows that the government net transfer (τ) can be defined as the difference between transfers received (G) and taxes paid (T) in terms of FSA and the evolution of the government expenditures:

$$\tau_{t,z} = G_{t,z}(1 - FSA_{t,z}). \tag{7.6}$$

In figure 7.10 we also use our own constructed data to estimate FS, FSA, and τ, just as in the case of estimating economy-wide SR, SRA, and LCD in figure 7.9. However, we are more constrained by the limitation of fiscal data; thus, we can only cover the period 1992–2010. Also, unfortunately, we have no age-specific data on taxation and transfer payment. After exploring the available data, we decide to use the age-specific income-consumption ratio as a proxy, assuming that, given the ratio, the age structural changes will affect the net transfers received by the population.

The trajectory of FSA suggests that from the late 2000s the rise in effective taxpayers (producers) slowed down. However, the government's net transfers reached an even more negative value, indicating that its fiscal position improved further. This somewhat mirrors the negative LCD observed in figure 7.7. Like LCD (figure 7.9), there seems to be no sign for the government's net transfer to change to positive soon. However, building up a nationwide social security system may reduce households' precaution savings, especially in rural areas, and increase net transfers. There are over 250 million migrant workers, yet most of them are not covered by the urban security system. Besides, there are over 600 million rural residents who are completely outside the state-run social security system. After years of appeals for such a

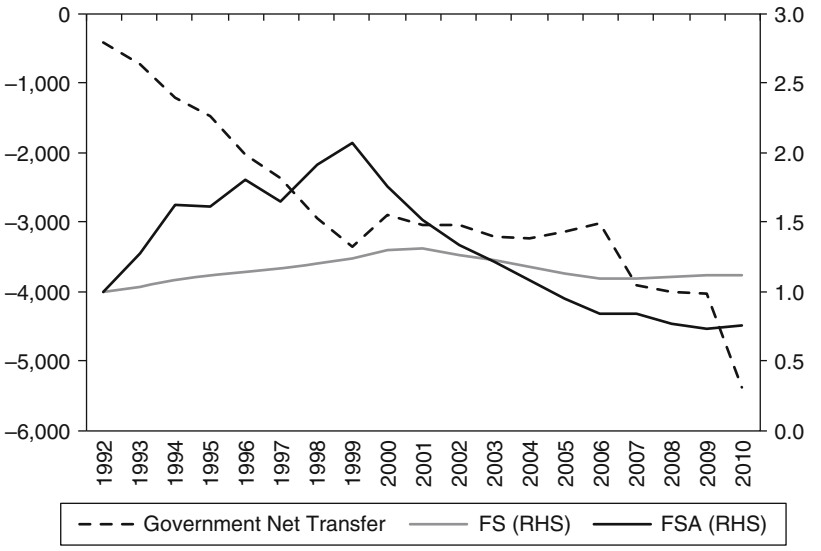

Figure 7.10 Estimated fiscal ratios and net government transfers in China

Source: See figure 7.9.

system by representatives of People's Congress, as well as nongovernmental organizations, the government is now moving toward that direction.

7.5 China's Savings, Investment, and Current Account Position

It is clear that along with the slowdown of the growth of the first demographic dividend since the 1990s, the output per worker has accelerated (table 7.2). This suggests that there must be a rapid capital deepening process at the same time. In this part of the study, we will first examine some key macroeconomic indicators, namely, changes in savings, investment, and capital stock in the economy and China's international position in terms of the current accounts balance.

Table 7.3 is designed to present some of China's key macroeconomic indicators that are highly related to the changes in savings for both the central planning and reform periods. If comparing the most recent period 2008–12 with the first period 1952–65,[2] we can see that China's savings rate nearly tripled from 21 to 62 percent of gross domestic expenditure (GDE). Indeed, the growth of savings outpaced the growth of national income (table 7.2) not only in the reform period (11.5 compared to 5.4 percent per annum) but also in the planning period (8.7 compared to 0.6 percent per annum). On the demand side, the investment of the economy grew almost at the same rate of that of savings, which consequently built up a net capital stock that drove a rapid process of capital deepening in the economy. A comparison between 1965 and 2012, the end points of the first and the last sub-periods, shows that China's capital-labor ratio (K/L) enjoyed an over 14-fold increase while China's capital-output ratio (K/Y) more than doubled.

Such a change was not accompanied by a deteriorating international position, thanks to the export-oriented strategy that was adopted at the time of reform and effectively tapped China's comparative advantage. China opened to foreign trade and direct investment from the end of the 1970s. Through several rounds of deregulations beginning with special economic zones, FDI rose dramatically from 30 to over 40 percent a year in the 1980s and 1990s, which was just the harvesting period of China's first demographic dividend (figure 7.5). The share of FDI in China's fixed asset investment was 3.8 percent in 1981 and peaked at 11.8 percent in 1996. Although the growth in FDI slowed down from the 2000s, it still maintained at around 75 billion US dollars per year on average in 2008–12 (NBS 2013, Table 5–4). From the mid-1990s, China entered a stage of continuously rising trade surplus from less than 20 billion US dollars in 1995 to 300 billion US dollars in 2008. However, the global financial crisis and its slow recovery halved the surplus to 150 billion US dollars in 2011. It is therefore easy to imagine a quick improvement in China's international position. China has certainly maintained a current account surplus since the mid-1990s (table 7.3). Nevertheless, it is not easy to understand China's exponential increase in the current account surplus right after China's WTO entry as depicted in panel A of figure 7.11, which could be anything but healthy.

Table 7.3 Changes in savings, investment, net capital stock, capital-output ratio (K/Y), and capital-labor ratio (K/L) in China

	Share of savings (GDE = 1)[1]	*Savings (% p.a.)*	*Investment (% p.a.)*	*FDI*[2] *(% p.a.)*	*Net capital stock (% p.a.)*	*K/L end-period (1990 yuan)*[3]	*K/Y end-period*	*Current account balance (bl. $)*[4]	
								End period	*Period average*
Planning.[6]									
1952–1965	0.21	9.5	8.7	n.a.	5.6	2,326	1.21	–	–
1965–1971	0.25	11.5	11.6	n.a.	6.7	2,745	1.32	–	–
1971–1977	0.29	4.2	4.4	n.a.	9.1	3,830	1.82	–	–
1952–1977	*0.24*	*8.7*	*8.3*	n.a.	*6.7*	*3.6*[5]	*2.3*[5]	–	–
Reform.[6]									
1977–1991	0.34	9.6	9.1	45.5	7.7	7,214	2.19	13.3	1.1
1991–2001	0.43	10.6	10.9	30.4	11.1	18,513	3.17	17.4	13.8
2001–2007	0.54	17.7	15.5	3.9	11.0	32,729	3.29	371.8	155.4
2007–2012	0.62	11.5	14.1	–8.2	11.6	55,214	4.17	201.7[2]	307.6[2]
1977–2012	*0.44*	*11.5*	*11.4*	*24.0*	*9.8*	*7.9*[5]	*2.4*[5]	*13.1*[6]	n.a.

Note: 1) Period average 2) Data ended in 2011 3) RMB yuan/$ = 4.78 in 1990 and = 6.77 in 2010 4) At current price 5) Annual percentage growth for the referred period 6) Annual percentage growth for 1982–2011.
n.a.: Not applicable.
– : Not available.
6) See note 3 of table 7.2.

Sources: Savings are estimated based on reconstructed expenditure accounts (Wu and Shea, 2008 with update). GDP, gross capital formation and net capital stock data are adopted from Wu (2014). All value measures are in 1990 constant prices unless indicated. See Table 2 for the sources of GDP (Y) and employment data.

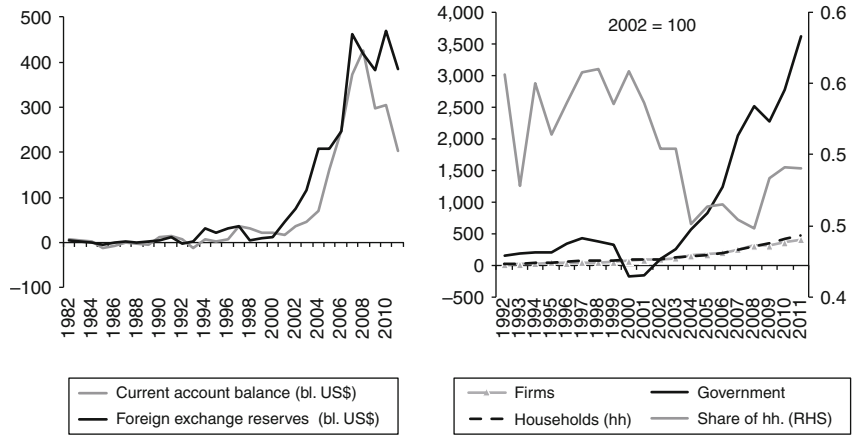

Figure 7.11 A) China's current accounts and foreign reserves and B) China's savings by sector

Sources: Balance of Payments and Flow of Funds Accounts, NBS (2012, pp. 90–91).

In panel B of figure 7.11, we also present the index of China's savings for different sectors, which immediately draws one's attention to the role of the government in savings and the decline of the share of households in national savings. The two panels are somewhat mirrored to each other to enhance our viewpoint about the role of the government. In a government-engineered growth, it is essentially the government rather than the private sector that creates both the supply of and the demand for savings (investment). It surely creates growth but in an inefficient way that is unlikely sustainable. Why and how has the government come back to the real play of the economy in the era of reform that aims to replace the command economy by market? Does the WTO play a role or is there also something to do with China's demographic transition?

Before investigating the demographic effect on savings, we should be well aware of the resurgence of the state sector. In a nutshell, China began to reform the economy from the end of the 1970s by deregulating and liberalizing small collective or privately owned manufacturing enterprises in labor-intensive industries, rather than dismantling state-owned enterprises (SOEs) by the shock therapy approach adopted in the former Eastern Bloc. This dual-track approach, typically in the area of pricing, has mixed effects. While improving efficiency, it also caused corruption. The 1980s ended in a political turmoil and the withdrawal of private and foreign investment. Thanks to Deng's call for bolder reform in 1992 that led to the official adoption of the "socialist market economy" and reform to SOEs. In a de facto privatization, most of small-sized SOEs were either sold or leased to private firms, whereas the large SOEs underwent a consolidation exercise.

The reform in the 1990s was followed by China's post-WTO entry at the end of 2001 that began a period with mixed changes. On the one hand,

joining the WTO generated a wider opening to foreign trade and direct investment, pushing China further toward the market system; but on the other hand, consolidated and enlarged state corporations, controlled directly by the central government, resurged, and meanwhile, growth-minded local governments became more involved in local business. This apparent retreat from the market principles was strongly motivated by the needs to shield the national interests from the international competition under the WTO umbrella. This trend was further enhanced by the unprecedented fiscal injection following the global financial crisis in 2008, which entirely benefited the central-controlled large SOEs. It, hence, had a strong crowing out effect on private enterprises and created uncertainties for households.

7.5 Ageing and Savings—An Empirical Inquiry

Despite the explosive growth of government savings since the 2000s, household savings have been accelerating over the entire reform period (figure 7.11). Our earlier discussion suggests that in addition to government engineering, China's premature demographic transition may also have affected the savings behavior through the early ageing of the Chinese population. This is of great interest in understanding the uniqueness of the China case in this project.

In the following econometric specification, we first consider a variable that may better capture the ageing effect. In the literature, the positive influence of longevity on savings is empirically evident (Bloom, Canning, and Sevilla, 2003; Yaari, 1965; Yakita, 2001; Zilcha and Friedman, 1985). In this exercise we opt to use the ageing index, defined as a ratio of those aged over 65 to those aged below 15, denoted as AYR, which captures a joint effect of the aged and young and the changes in their relative size. We expect AYR to be significantly positive. However, we do not expect the effect of ageing to be purely private. It should also capture the response of society as a whole to the rapid and premature ageing, including enterprises, authorities, and social organizations.

$$s_t = \beta_0 + \beta_1 AYR_t + \beta_2 PSR_t + \beta_3 MFR_t + \beta_4 y_{t-1} + \beta_5 IPI_t + \beta_6 s_{t-1} + \varepsilon_t. \quad (7.7)$$

Next, we consider the role of primary savers in the workforce. It is defined as the ratio of those aged 25–44 to those aged 20–59, denoted as PSR. The numerator is defined based on the age-specific income and consumption ratio (calculated from UIES database, Section 2), which shows the highest propensity to save. The denominator is the working-age population for the China case (see table 7.2). In the regression, we test the effect of weighted and non-weighted *PSR* in alternative models. The hypothetical sign of *PSR*, weighted or nonweighted, is positive.

Our third demographic variable is a gender ratio to capture the so-called boy effect on the rise of household savings for a competitive marriage market, an issue investigated by Wei and Zhang (2011) using micro data. We do not expect a significant effect of gender bias on savings with the time series

of macro data because of the lack of sufficient behavior variables that can be constructed using household information. However, it is useful to see if aggregate savings do respond to the changes of male-female ratio (MFR).

In the model, we use the change of labor productivity (y) with one-year lagging to capture both the income and government effects on savings. It is difficult to separate the government effect from the productivity effect because the latter is enhanced by capital deepening that is engineered by the government. An alternative to y is per capita GDP (g). Both should behave in a very similar way as they are usually highly correlated.

Furthermore, we add an investment goods price index (IPI) to control for its possible effect on savings (Mason and Kinugasa, 2005). Given possible problems in price data, we do not tend to assign a hypothetical sign for IPI. Thus, adding it is just exploratory. Ideally, we should have a relative price measure to capture the opportunity cost of holding money. Finally, we specify a lagged dependent variable to control for autocorrelation in the savings rate. The regression results with alternative specifications are reported in table 7.4, of which models 3 and 4 are preferred specifications.

First, the regression results show that the ageing effect represented by *AYR* is robust with the expected sign in all alternative specifications. After considering other specified variables and controlling for autocorrelation in the

Table 7.4 Empirical results of China's savings function (dependent variable: savings rate; sample period: 1983–2010)

	Model 1(a)	*Model 1(b)*	*Model 2(a)*	*Model 2(b)*	*Model 3*	*Model 4*
β_0	0.185***	0.183***	0.149***	0.131***	0.077**	–0.005
	(0.0050)	(0.0053)	(0.0464)	(0.0246)	(0.0327)	(0.5079)
β_1 *AYR*	0.858***	0.862***	0.858***	0.757***	0.484***	0.481***
	(0.0178)	(0.0174)	(0.0179)	(0.0489)	(0.1267)	(0.1307)
β_2 *PSR*			0.064			
			(0.0810)			
β_2 *WPSR*§				0.030**	0.026*	0.025*
				(0.0137)	(0.0127)	(0.0137)
β_3 *MFR*						0.078
						(0.4800)
$\beta_4\, y(-1)$	0.127**		0.124**	0.078	0.116**	0.118**
	(0.0546)		(0.0552)	(0.0552)	(0.0533)	(0.0563)
$\beta_4\, g(-1)$§		0.126**				
		(0.0579)				
β_5 *IPI*	–0.099***	–0.098***	–0.095***	–0.086***	–0.078***	–0.077***
	(0.0240)	(0.0243)	(0.0246)	(0.0231)	(0.0215)	(0.0221)
$\beta_6\, s(-1)$					0.334**	0.340**
					(0.1450)	(0.1530)
Adj. R^2	0.991	0.991	0.991	0.992	0.994	0.993
F-statistic	1024	1000	756	893	850	677
DW	1.722	1.691	1.715	1.555	1.748	1.750

Notes: § Refers to an alternative measure to the variable given in equation (7.5); see text for details. ***Indicates the coefficient is significant at 1percent, ** at 5 percent and * at 10 percent.

Source: Authors' elaboration.

dependent variable, the model is stable and *AYR* is almost able to explain half of the change in the savings rate. As discussed earlier, we do not expect the effect of ageing upon savings to have been purely private. Rather, it should have also captured the response of society as a whole, government and non-government, to the rapid and premature ageing through savings (and investment). This empirical result is perhaps the first of its kind to suggest that China's premature demographic transition has indeed had a significant bearing on China's abnormally high savings rate since the 1990s. We can also say that China's growth has surely and significantly benefitted from its second demographic dividend.

We also find that the income-consumption weighted primary savers ratio *WPSR* is positive and significant but the nonweighted *PSR* is insignificant though still positive. Thus, *WPSR* is a better measure for the effect. Next, both the lagged labor productivity y and lagged per capita income g are positive and significant as expected. We keep $y(-1)$ in the final model because it is more stable than $g(-1)$ and easier to interpret the role of the government. The price effect, reflected by IPI, is negative and robust in all specifications. It suggests that this variable behaves as a good inflation indicator that is negatively related to real returns on savings, ceteris paribus. Besides, the gender variable, or the male-female ratio MFR, appears to be positive as expected following the sex ratio-household savings nexus hypothesis (Wei and Zhang, 2011) but unfortunately insignificant (model 4). Finally, adding the lagged dependent variable does help control for autocorrelation in the model (model 3 and model 4).

7.6 Ending Remarks

We begin this study with empirical evidence showing that China's demographic transition is clearly premature from the East Asian perspective. It was caused by the government's population policy implemented in the 1970s and 1980s that served the government's catch-up strategy through forced savings. We show that the premature demographic transition is a double-edged sword for the Chinese economy and society.

On the one hand, it has allowed China to benefit from an earlier demographic dividend that raised per capita income and savings. On the other hand, it has not only shortened China's time horizon for the catch up, which requires China to be more efficient in terms of using the savings, but also forced China into an earlier ageing process that further raises the pressure for a faster growth. Nevertheless, to achieve a faster growth, the government has maintained significant interventions in resource allocation. Although this has indeed ensured a faster growth so far, it has caused severe internal and external imbalances and serious efficiency losses.

The good news is that our empirical exercise clearly shows that China's earlier ageing has significantly contributed to its rapid rise in savings. Therefore, the wise policy choice should focus on how to quickly improve productivity by reducing state involvement in nonpublic-goods industries, removing

barriers to resource mobility and encouraging free enterprises. While promoting more market-oriented reforms, the authorities should also speed up the construction of financial institutions that can play an important role in improving the allocation of China's financial resources both domestically and internationally.

Notes

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1. Assuming the TFR level as 1.4, we predict the age cohorts by 2030. See Guo (2012), Yin et al. (2013) for a discussion of the fertility level in China.
2. We take an average of the period 1952–65 to bypass the early shocks due to the revolution and regime change and the Maoist GLF campaign and its disastrous failure. See the earlier discussion on the impact of GLF on the population.

CHAPTER 8

A Study of Demographic and Financial Changes in India

Pranab Kumar Das and Saibal Kar

8.1 Introduction

Over the last two decades countries like China, India, Brazil, South Africa, and the Russian Federation experienced sweeping changes in their economies. Despite the lack of synchronicity in the alleged cause of these economic reforms, they were all able to settle onto their respective growth trajectories. It is no wonder then that the global forums recognize these economic successes as defining the new economic order, despite the admission of critical internal disadvantages that continue to group these countries alongside other developing and transition economies. This chapter attempts to review the macroeconomic and financial conditions prevailing in India during this important transition period. The focus of this research, therefore, is to explore and observe the possible links and synergies between economic and financial developments functionally related to an important and yet relatively less emphasized factor, namely, the changing demographic pattern in India.

It has recently been acknowledged that the relationships between demography, growth, and distribution are quite different across countries mainly owing to asymmetric transition patterns in their population structure. Mindful of such possibilities and evidence, we attempt to relate demographic changes to the developments of the financial architecture in post-reform India and fill a void in this literature. It seems, broadly speaking, that the demographic asymmetry is also the source of a higher growth rate in some of the southern countries over a considerably long period, arguably owing to the so-called first and second demographic dividends. In an increasingly integrated global system of commodity and factor flows, gains from such growth are rarely restricted to these countries alone. Notwithstanding, the persistent savings-investment gap (Basu, 1997) continues to be a compelling source of

transactions between the north and the south with significant interlinkage effects spread out globally.

The plan of this chapter is as follows. In section 8.2 we offer the important macroeconomic characterizations for India, where the population growth, the savings patterns, the investment patterns, trade patterns, and capital inflows, all as part of the GDP are discussed in order to motivate the macroeconometric exercise that we conduct in section 8.3. A review of the literature reveals that studies in this area are generally scant, and especially so for India.[1] In this regard, the chapter aims to do justice to the two main objectives: one, the identification of the financial institutions that interact with demography and, two, the exploration of the relationship between specific macroeconomic variables, such as cross-border capital flows, the interest rate, and the changing demographic pattern. In the process, we investigate whether the overwhelming size of the unorganized sector in India can have interesting links to potential demographic dividends. In section 8.4 we show that capital flowing into the organized sector creates jobs in the unorganized sector via outsourcing and technology transmission, epitomizing the internationalization of production (Hanson, 2001). Note that the inflow of foreign direct investment (FDI) in the developing countries over the last few decades has also been one of the most vibrant instruments of global standardization, especially through sectoral spill overs. However, FDI has led both to production integration as well as fragmentation. Of these, production fragmentation allows firms to utilize cheaper factors, such as low-cost labor inputs along the value-added chain, leading to gains from specialization (Deardorff, 2005; and for outsourcing, see Helpman, 2006). Using recent survey data, we establish in section 8.4 that foreign investments in the organized sector may lead to outsourcing to unorganized sectors. Previous studies on interactions between organized and unorganized sectors following globalization (Guha-Khasnobis and Kanbur, 2006; Harriss, 1990; Marjit, 2003; and in particular, Siggel, 2010 for a review) do not make an attempt to relate that to the growing population and demographic dividends facing the country in question. In terms of demographic dividends, a high degree of informality in a country is not expected to raise productivity and economic benefits that may have to do with a larger working-age population. To make things worse, underdeveloped rural India still represents 68 percent of the population as a whole, suggesting that the demographic transition would only have considerable economic merit if the economic and financial conditions in rural areas improved significantly. In section 8.4 we further discuss that unless the capital constraints in the rural areas are overcome with significant alacrity, the entire discussion on the demographic dividends will be futile. These also constitute our predominant policy suggestions provided in section 8.5.

8.2 The Indian Perspective

We elaborate briefly on what the first and second demographic dividends imply for India. The much discussed rise in India's demographic dividend

means that the country's dependency ratio, as measured by the share of the young and the elderly as a fraction of the population, will come down more sharply in the coming decades. An increase in the share of the working age population implies that more workers in the productive age groups will contribute to the total output, generate more savings, accrue more capital per worker, and all of these would lead to higher economic growth. It is further expected that since demographic change is associated with a decline in fertility, the transition will be accompanied by greater female participation in the labor force. According to the India Population Census (2011) figures, the total population in India is 1.21 billion, which is expected to rise to 1.40 billion by 2026, mainly owing to an increase in life expectancy at birth for males and females from 65.8 and 68.1 years, respectively. These figures reported between 2006 and 2010 will rise to 69.8 and 72.3 years, respectively, in 2021–25. Second, a decline in the total fertility rate (TFR) from 2.6 to 2.0 is the main determinant of demographic dividends because a fall in TFR (with older generations having shorter life expectancies) implies a dramatic decline in the dependency ratio. The overall effect is considered a source of the demographic dividend for India. The implications of the demographic transition on age structure are further evident for the population below 20 years, for which the share in total population went down from 51 percent in 1970 to 41 percent in 2010 and may further decline to 22 percent in 2050. During the same period, the share of the total population under the age of 60 marginally increased from 5.5 percent to 8 percent. This will further rise and is expected to reach 22 percent in 2050. The large decline in the share of the population under 19 years of age has been associated with a substantial rise in the proportion of the working-age population (19–59 years) from 43 percent to 51 percent between 1970 and 2010 and is forecasted at a maximum of 56 percent by 2045.

Within India, not surprisingly, the distribution of population growth has been asymmetric. The rural population is still around 68 percent of the total population, whereas the urban population pattern is somewhat similar to comparable countries. Also, not unexpectedly, the windows of opportunities are proportionately more concentrated in the urban areas, such that the dwindling prospects in agriculture will perpetuate the rural-urban migration, characterizing the path of development for the last several decades. The interface between the financial systems as a whole, access to more productive economic activities, and the population distribution therefore needs a reevaluation.

Viewed over a three-decade horizon, the GDP growth rate in India (figure 8.1) hovered from 9 percent in 1977 to negative, and fairly low growth rates for most of the 1980s. In the post-reform (1991) period, while the country grew at a 6 percent rate in most years, by the year 2000, it crossed the 8 percent mark, and despite 4 percent growth rates in the following three years, it went up to 8 percent once again in 2004. Subsequently it grew at 9 percent and 10 percent rates until 2009 when the onset of global recession pushed it down to 4 percent once again. Nevertheless, and somewhat

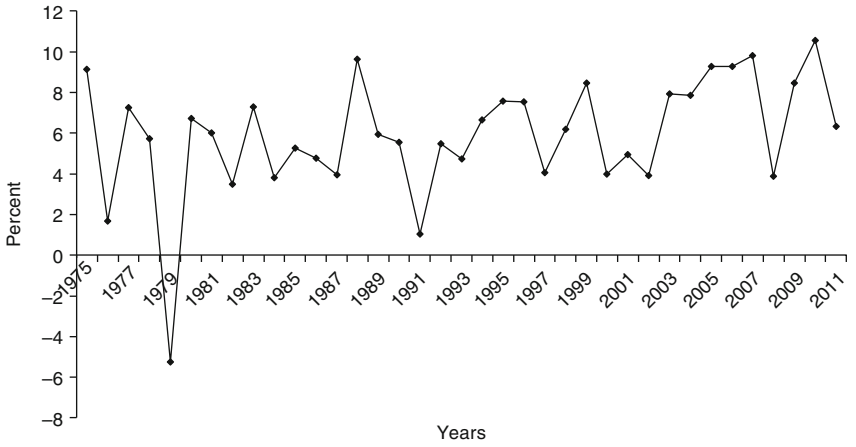

Figure 8.1 Real GDP growth rate for India: 1975–2012
Source: WDI, World Bank.

contrary to the global trend, India registered more than 10 percent growth even for 2011, beyond which however, the rate of growth caved in with revised estimates at 5.2 percent in 2013.

Since the focus of this chapter is about the demographic transition in India, figure 8.2 shows that the dependency ratio (defined as $\left[100 - \frac{labor\ force}{total\ population} \times 100\right]$) has been dropping steadily over time—a characteristic associated with the rising share of the 15–59-year-old population (see Albrieu and Fanelli, 2013 for a cross-country comparison and analysis). Since the base population is already high for countries like China and India, it is expected that the demographic dividends might be larger for these countries, provided that adequate opportunities through human capital growth and access to economic and financial activities are present. Notably, the dependency ratio for India fell to 50 in the year 2012.

The population growth rate stayed between 2.5 percent and 2 percent until the 1990s when it fell below 2 percent for the first time in 1993. The downward trend has continued since then with the growth rate at 1.5 percent in 2012. The population growth rate is still sufficiently high (despite a significant urbanization and the improvement in literacy rates) to expect a high rate of entry into the workforce. If the trend continues even for the medium run, one should expect the coexistence of young and ageing populations, the latter supported via transfers.

The relevance of the economic and financial institutions is unmistakable in such an environment. The bank-based financial system in India is expected to offer greater access to credit and allied facilities for sharing the economic and financial benefits of a growing labor force. Figure 8.4 suggests that the

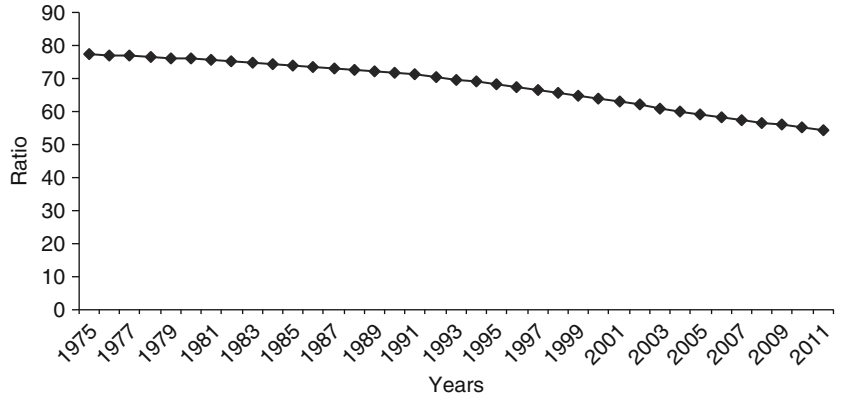

Figure 8.2 Dependency ratio for India: 1975–2012
Source: WDI, World Bank.

domestic credit flow in India rose from a meager 25 percent in 1975 to

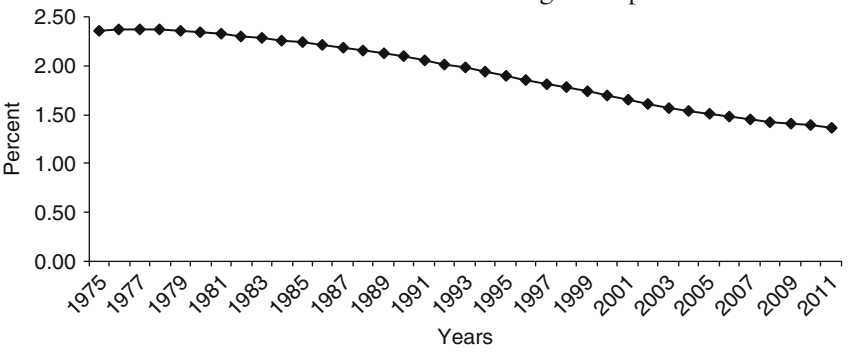

Figure 8.3 The population growth rate in India: 1975–2011
Source: WDI, World Bank.

almost 75 percent in 2012, which, given the GDP of India, is considerably large. It should also be noted that the outreach of the financial sector and the instruments of investment available thereof are in much better shape, at least as far as India's stock market activities are concerned (figure 8.5). India seems to be trading larger amounts in stocks, and after a peak in the year 2000 (same as China), the value is at a significantly high level (60 percent of GDP). These are suggestive of financial depth and vibrancy for a country in need of many other interventionist policies to rise to the level of the developed world. In fact, in recent times the role of the financial system in the growth process has experienced a renewed interest (Levine, 1997, 1999, 2004; Levine et al., 2000; and for India see Das and Guha-Khasnabis, 2005).

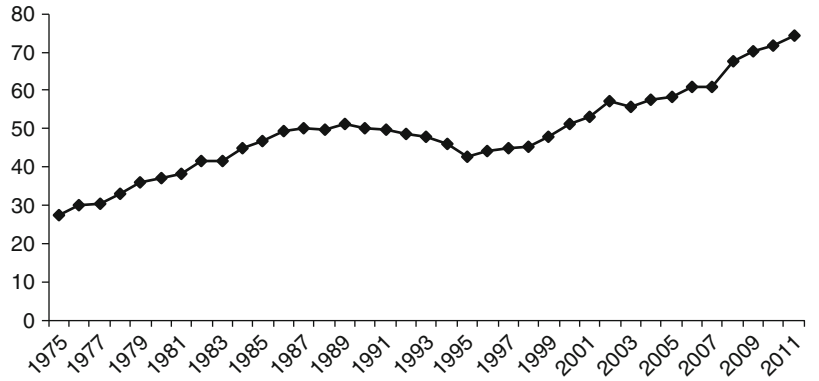

Figure 8.4 Domestic bank credit as a percentage of GDP
Source: WDI, World Bank.

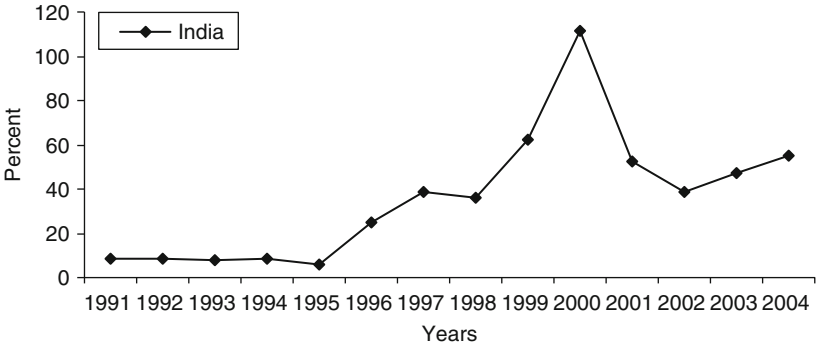

Figure 8.5 Total value of stocks traded in India
Source: WDI, World Bank.

Interestingly, during the same period, India leapfrogged to the world of service-sector-related activities. In fact, India's share of the service sector in its GDP has gone up to more than 50 percent, and in terms of the trade in services, India (at 8 percent of GDP by 2004, figure 8.6 and figure 8.7) is also doing better compared to some of the other countries in this group.

Note further that the inflow of northern capital seeking higher per unit return on the dollar invested is one of the major reasons for the sprawling service sector. The growth of financial intermediaries and the development of a well-functioning financial market are only natural derivatives of these complex interactions.

Section 8.3 uses cross-country financial flows as an important instrument to trace the demography-to-growth link. It seems that the sectoral

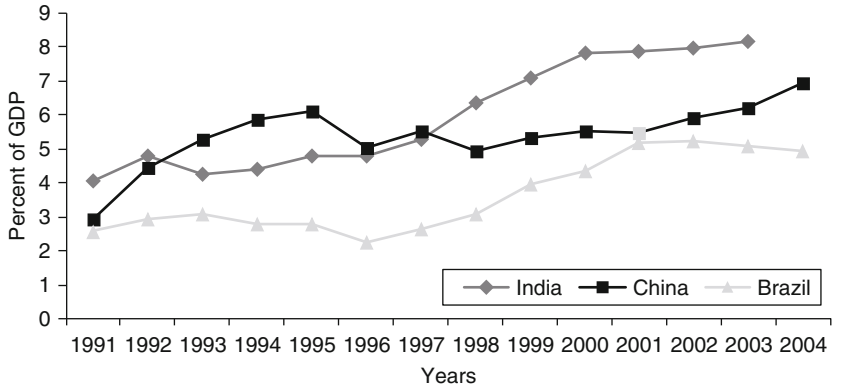

Figure 8.6 Trade in services as a percentage of GDP

Source: WDI, World Bank.

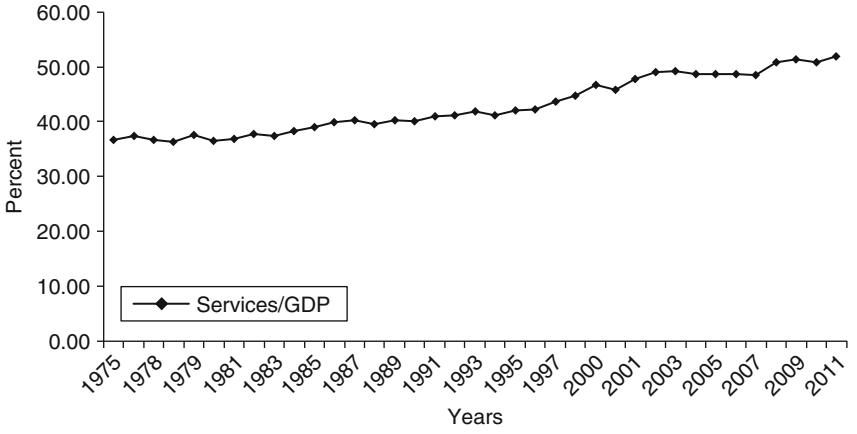

Figure 8.7 India's share of service sector in GDP

Source: Reserve Bank of India, handbook of statistics on Indian economy.

composition of foreign capital inflows has the largest share (19 percent) coming to the service sector and more specifically to the banking and finance sector (table 8.1). This is followed by construction (11 percent) and telecommunications (7 percent). The country-wise share of aggregate foreign capital inflow to India is as follows: Mauritius (38 percent), Singapore (11 percent), United Kingdom (9 percent), Japan (7 percent), and United States (6 percent).

In addition to the level and composition of capital inflows presented in table 8.1, we highlight that India is the largest recipient of migrant remittances. It has been argued before (Kar and Guha-Khasnobis, 2006) that higher levels of skill formation juxtaposed with a lack of opportunities in the

Table 8.1 Sectoral composition of foreign capital inflow to India Rs. Cr. (US$ million)

	Sector	*2011–12*	*2012–13*	*2013–14 (April–June 2013)*	*Cumulative Inflows (April 2000–June 2013)*	*% to total*
1.	Services sector **	24,656 (5,216)	26,306 (4,833)	5,319 (945)	177,595 (38,180)	19
2.	Construction: township, housing, built-up infrastructure	15,236 (3,141)	7,248 (1,332)	946 (167)	101,995 (22,248)	11
3.	Telecommunications (radio paging, cellular mobile, basic telephone services)	9,012 (1,997)	1,654 (304)	54 (10)	58,786 (12,866)	7
4.	Computer software and hardware	3,804 (796)	2,656 (486)	984 (171)	53,758 (11,738)	6
5.	Drugs and pharmaceuticals	14,605 (3,232)	6,011 (1,123)	5,442 (1,000)	54,322 (11,318)	6
6.	Chemicals (other than fertilizers)	18,422 (4,041)	1,596 (292)	623 (112)	41,118 (8,993)	5
7.	Automobile industry	4,347 (923)	8,384 (1,537)	2,845 (515)	42,015 (8,810)	4
8.	Power	7,678 (1,652)	2,923 (536)	669 (120)	36,805 (7,954)	4
9.	Metallurgical industries	8,348 (1,786)	7,878 (1,466)	634 (114)	35,448 (7,621)	4
10	Hotel and tourism	4,754 (993)	17,777 (3,259)	559 (101)	33,819 (6,732)	3

Note: 1.** Service sector includes financial, banking, insurance, nonfinancial/business, outsourcing, R&D, courier, technology, testing, and analysis.
2. FDI sectoral data have been revalidated/reconciled in line with the RBI, which reflects minor changes in FDI figures (increase/decrease) as compared to the earlier published sectoral data.

Source: Authors' elaboration.

industrial and related sectors in the country lead to a significant emigration of skilled and semi-skilled workers from India. A sizable number of these emigrants find jobs in the Middle East and generate the main source of inward remittances for India presently reported at US$ 65 billion. It is an integral part of the financial system that capital inflows can reduce the cost of capital and thereby increase the growth rate in the real sector (see, e.g., Giannetti et al., 2002, and Bagella et al., (2004) on the growth enhancing effect on the GDP). We accommodate the varying trajectories of labor and capital as discussed above in the following empirical structure relating economic growth, demographic changes, and the financial depth of India.

8.3 Demography and Growth: A Macroeconometric Model

The Framework

This section develops a macroeconometric model for India to explain the interactions between demographic changes, the development of the financial system, and international capital inflows. In the tradition of the macroeconometric modeling, following the influential work of Sims (1980), we build the model in a time series vector autoregression (VAR) framework.[2] The variables of interest in this model are the dependency ratio, financial depth, the real interest rate prevailing in India, and international capital flows to India. The variables are defined as:

DR = Dependency ratio = 100 – (population ages 15–64 [percent of total]) (vide IMF 2006)

FD = Financial depth = (bank deposits + stock market capitalization) / previous year's GDP

r = Interest rate = bank interest rate on lending adjusted for inflation,

FLOW = Capital inflow = (foreign direct investment + foreign institutional investment + NRI investment) / GDP

Data for dependency ratio is available from the World Bank database. Financial depth has been defined in various ways (Levine, 2004) and we have used an alternative definition of financial depth that better captures the features of the financial system in India. It is defined as bank deposits or private credit with or without market capitalization as a proportion of the previous year's GDP. However, the financial system outside the organized segment is not covered by this definition and neither is there any systematic financial data for units belonging to the unorganized sector. For the interest rate, on the other hand, we consider the government securities rate, which is a reasonable indicator of the short-run interest rate in the economy. The data run from 1980–81 to 2011–12, a total of 32 annual data points per series. The unavailability of some of the crucial indicators, such as insurance penetration

for longer time horizons (or quarterly data for shorter horizons) restricts our analysis to some extent. Moreover, data for the population changes, age profile, and work force/hours of work and so on are unavailable.

Descriptive Analysis

Figures 8.8 through 8.10 provide the yearly movements of the variables used in the econometric analysis. It is evident from figure 8.8 that the financial depth (as defined) has increased substantially over the years. There is a level change in financial depth in the early 1990s, then another in 2003, with a higher trend until 2007–08. Since 2007–08, however, the financial depth has shown a declining trend mainly owing to the fall in market capitalization in the aftermath of the global crisis, when the value of shares declined globally. However, when we use an alternative measure of financial depth, namely, bank deposit to lagged GDP, it does not show a declining trend. Needless to say, the improvement in financial depth came about because of the large-scale reforms in the financial sector initiated in 1991. The improvement in the financial depth is subsequently expected to reduce the extent of financial repression in the economy. This is also reflected in the observed fall in real interest rate (figure 8.9).

The third variable, namely, the inflows of international capital to India has three major components. Of these, the NRI deposits were allowed only from 1991. Figure 8.10 provides the movements of the three components as proportion of GDP over the years. Figure 8.10 shows increasing trends for the foreign institutional investments (FII), which is more volatile in nature owing to high sensitivity to short-run capital gains. In fact, the monthly movements

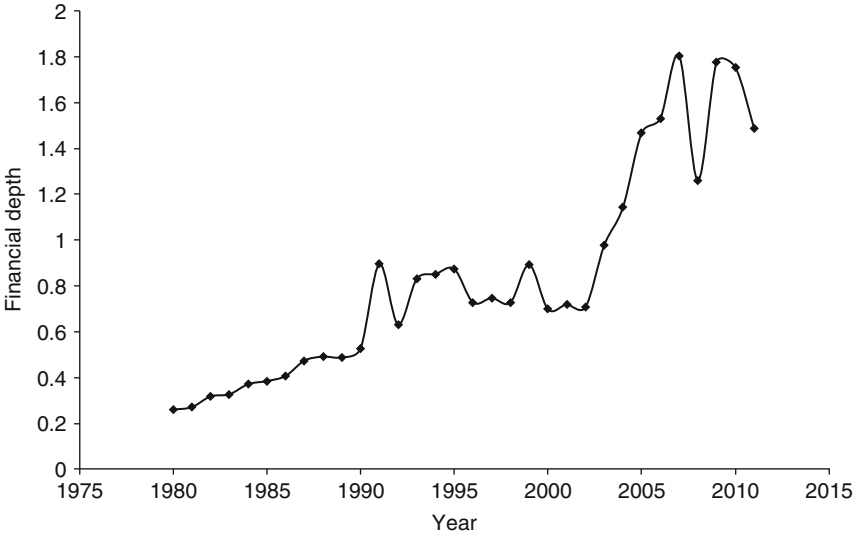

Figure 8.8 Financial depth

Source: WDI, World Bank.

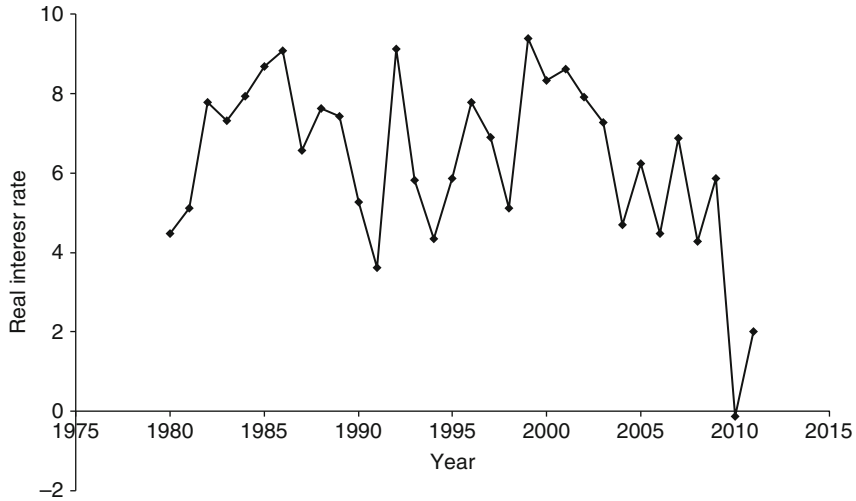

Figure 8.9 Real interest rate

Source: WDI, World Bank.

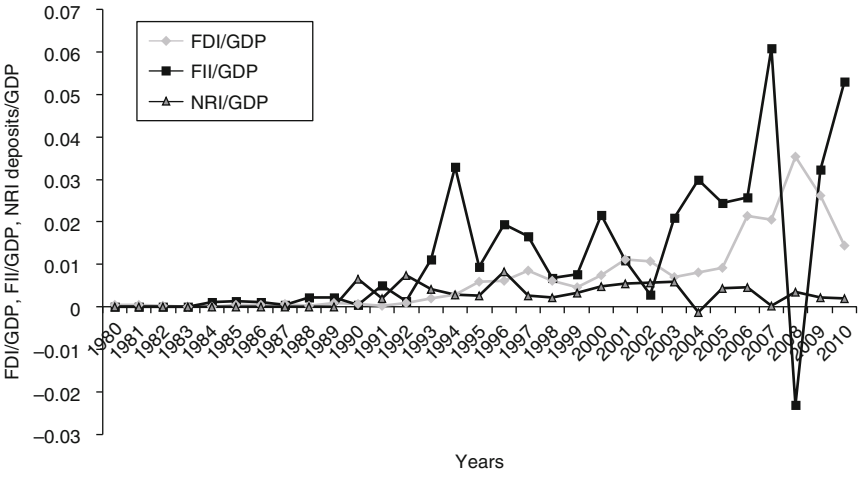

Figure 8.10 Share of FDI, FII, and NRI deposits in GDP

Source: WDI, World Bank.

of the FII reveal sharper volatility. FDI had a constant flow until 2004, following which it showed a rising trend that started declining from 2008.

Table 8.2a provides the descriptive statistics for the full sample period, while table 8.2b provides the same for the post-reform period. The mean values for the dependency ratio or interest rate are not different across the full sample period and the post-reform sub-periods. However, the mean values of financial depth and capital inflow are higher for the post-reform period.

Table 8.2a Descriptive statistics (full sample)

Variable	*Mean*	*SD*	*Skewness*	*Kurtosis*
DR	66.58	6.92	–0.31479	1.74
FD	0.84	0.463	0.2143	0.7772
r	6.306	2.16	–0.8886	3.823
FLOW	0.02315	0.0231	0.9658	3.001

Source: Author's elaboration based on data from the World Bank.

Table 8.2b Descriptive statistics (post-reform period)

Variable	*Mean*	*SD*	*Skewness*	*Kurtosis*
DR	62.36	5.1568	–0.00042	1.7119
FD	1.08	0.4103	0.65118	1.8766
R	6.043	2.3836	–0.82645	3.5428
FLOW	0.0357	0.02076	0.7957	2.5756

Source: Author's elaboration based on data from the World Bank.

We begin by presenting a robust Ordinary Least Squares (OLS) estimate for two crucial relations. First, we consider the relationship between aggregate growth rate and the dependency ratio. This is followed by the relationship between the aggregate growth rate and financial development. Table 8.3 reports the preliminary regression results between the growth rate of GDP (at factor cost and at constant 2004–05 prices) and the other two variables for the period 1980–81 to 2011–12. Since all three variables are found to be stationary, the statistical relations are meaningful in the sense of time series regression.[3] We report the regression results both for the current value and lagged values of the two regressors. The growth rate has a significant relation both with dependency ratio (negative) and financial development (positive). The relations are statistically significant (at a 1 percent level) and of the same sign both for the current and the lagged values of the respective variables. However, we did not find any significant relation between the growth rate and the interest rate. The results suggest that a meaningful econometric relation including causal relations between the dependency ratio, financial depth, interest rate, and capital inflow will have direct bearings on the growth rate of the economy.

Stationary Properties of the Data Series

Next we check for the stationary properties of the data. Table 8.4 provides the relevant test results. The graphical plot of the data series for the four variables shows that except for dependency ratio, other series report one or more structural breaks. Hence, we employed the Bai-Perron Test (Bai and Perron, 2003), which is the appropriate test when the number of breaks and the exact time of occurrence are both unknown. Except for the dependency ratio, the

Table 8.3 Regression of growth rate on dependency ratio and financial development (current and one year lag)

	Dependency Ratio (A)		*Financial Development (B)*	
	DR (1)	*DR (-1) (2)*	*FD (3)*	*FD (-1) (4)*
Coeff (t-value)	–0.14**	–0.16**	2.59**	2.56**
	(–3.12)	(–3.38)	(4.53)	(3.31)
R^2	0.23	0.27	0.30	0.28

Note: We did not report the estimate of constant.

Source: Authors' elaboration.

Table 8.4 Stationary properties of the variables

Variable	*Augmented Dickey-Fuller Test*	*Banerjee-Lumsdaine-Stock Sequential F-test*
DR	–8.939*	5924122.83*
FD	–3.115	74.00*
R	–3.948**	6.52*
FLOW	–5.653*	27.83*

Note: * and **stand respectively for significance at 1 percent and 5 percent levels.

Source: Author's elaboration based on data from the World Bank.

null hypothesis of structural breaks is not rejected for the other three variables.[4] Owing to the presence of multiple structural breaks in the series, the Dickey-Fuller or the Augmented-Dickey-Fuller (ADF) Tests are not appropriate for testing for unit root or nonstationarity in general. Instead, the BLS Test (Banerjee, Lumsdaine, and Stock, 1992) is the appropriate test statistic, which provides inference on nonstationarity of the time series data independent of the presence of break points. Further, among the three tests of BLS variety, we reported the sequential F-Test. Table 8.4 provides the results of unit root tests for both ADF and BLS test statistics. The table points out that the null hypothesis of unit root is rejected by both BLS and ADF in all the cases, albeit the later test does not reject the null hypothesis for financial depth. Overall, given the superiority of the BLS test, we rejected the presence of nonstationarity in the series.

Econometric Specification and Estimation Results

The macroeconometric model is specified in terms of the four variables as follows,

$$Ay_t = A_o + A_1 y_{t-1} + A_2 y_{t-2} + ... + A_p y_{t-p} + \beta x_t + \varepsilon_t \,. \qquad (8.1)$$

where, $y_t = (DR_t\ FD_t\ r_t\ FLOW_t)'$, A_0 = matrix of contemporaneous coefficients, A_i = vector of constants of order 4×1, = matrix of coefficients of the lagged variables, i = 1,..., p, each of order 4×4, β = vector of coefficients for the exogenous variables, and x_t = vector of exogenous variables, ε_t is the vector of disturbances for the set of structural equations, and $E(\varepsilon_t \varepsilon_t') = B$, variance-covariance matrix of the structural shocks.

$$\begin{aligned} y_t &= A^{-1}(A_o + A_1 y_{t-1} + A_2 y_{t-2} + ... + A_p y_{t-p} + \beta x_t) + + A^{-1}\varepsilon_t \\ &= \Pi_o + \Pi_1 y_{t-1} + \Pi_2 y_{t-2} + ... + \Pi_p y_{t-p} + \tilde{\beta} x_t + u_t \end{aligned} \quad . \qquad (8.2)$$

where, Π_j s $i = 1 \ldots., p$, are reduced form parameter vector / matrices and $\tilde{\beta}$ is the vector of reduced form parameter vector / matrices of exogenous variables. The relationship between reduced form disturbances and the corresponding variance-covariance matrix are given by

$$\begin{aligned} u_t &= A^{-1}\varepsilon_t \\ E(u_t u_t') &= \Sigma_u = A^{-1} B A^{-1'} \end{aligned} \quad .$$

The VAR is estimated in reduced form, and then structural form parameters are obtained via identification conditions. The estimated reduced form VAR is reported in table 8.5. A two-lag structure was found to be appropriate. We checked with the roots of the estimated VAR and found that all the eigenvalues lie inside the unit circle. This confirms the stability of the estimated VAR model. We also included time as an exogenous variable. The dependency ratio has the expected negative time trend. The time trend in the equations for interest rate and capital inflows are also negative with a high absolute value for the coefficient of the interest rate. There is, however, a dilemma in this context. Financial development reduces the interest rate,

Table 8.5 VAR estimation results

Variable→ *Lag*↓	DR	FD	r	FLOW
DR(-1)	1.916**	–0.623	–13.101**	–0.081**
DR(-2)	–0.940**	0.538	12.589**	0.075**
FD(-1)	0.056**	0.528*	0.75	0.027*
FD(-2)	0.008	0.674**	1.765	0.055**
r(-1)	0.004**	–0.032*	0.074	–0.002*
r(-2)	0.005**	0.021	0.167	0.001
FLOW(-1)	–0.106	–10.194**	–47.949	–0.699**
FLOW(-2)	0.261	–9.511**	24.202	–0.826**
Time	–0.019**	–0.044	–0.81*	–0.004*
RMSE	0.0131	0.1514	1.693	0.01

Note: 1.* implies significant at 5 percent ** at 1 percent.
2. Log likelihood = 171.72, SBIC = -6.913, Det (Sigma_ML) = 1.25e-10, N = 30.

Source: Authors' elaboration.

Table 8.6 Granger causality (Wald test)

Equation	*Excluded*	χ^2 *Test statistic*	*df*
DR	*FD*	7.842*	2
	R	18.79**	2
	FLOW	1.534	2
	All	19.36**	6
FD	*DR*	6.385*	2
	R	6.436*	2
	FLOW	18.19**	2
	All	24.41**	6
r	*DR*	7.907*	2
	FD	0.5968	2
	FLOW	3.96*	2
	All	20.78**	6
FLOW	*DR*	10.768**	2
	FD	18.14**	2
	R	8.348*	2
	All	34.434**	

Note: * implies significant at 5 percent and ** significant at 1 percent.

Source: Authors' elaboration.

which in turn is expected to raise domestic investment. Since international capital inflows are considered to supplement inadequate domestic investment, a reduction in the interest rate reduces capital inflows and creates a tension.

In addition, we test for Granger causality (table 8.6). The null hypothesis is that the estimated coefficients of lagged values of the other endogenous variables are jointly zero. The relevant test statistic is Wald Statistics. Except for the cases of capital inflows to dependency ratio, and financial depth to interest rate, the null hypothesis of no (Granger) causality is rejected at a 5 percent level (at a 1 percent level for others). The result that capital inflows do not Granger cause dependency ratio appeals to conventional wisdom. But the result that financial development does not Granger cause interest rate is interesting in the context of this paper. This means that there are stronger factors that affect the interest rate compared to the level of financial development as measured by financial depth in our model.

Finally, we estimate the structural model to find the nature of contemporaneous relations among the endogenous variables. For this, we imposed short-run restrictions for identification. Defining the B matrix as structural innovations, one can justifiably assume zero covariance between the four innovations; the principal diagonal of the A matrix is unity for normalization; the rest of the constraints are exclusion conditions on the coefficients of A and are estimated (see table 8.7). After several trial and errors, we found the appropriate structural form model as described by the estimated A matrix and B matrix in table 8.7. The symbols *, ** denote statistical significance at 5 percent and 1 percent, respectively.

Table 8.7 Identification matrix

$$A = \begin{bmatrix} 1 & -0.6445^{**} & -0.00669^{**} & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 3.9994^{*} & 1 & 0 \\ -0.19736^{*} & 0 & 0 & 1 \end{bmatrix}$$

$$B = \begin{bmatrix} 0.1362^{**} & 0 & 0 & 0 \\ 0 & 0.112713^{**} & 0 & 0 \\ 0 & 0 & 1.3972^{**} & 0 \\ 0 & 0 & 0 & 0.00808^{**} \end{bmatrix}$$

Source: Author's elaboration.

Our structural VAR model is overidentified with two more restrictions than are needed for identification. This version of the model is finally found to be the best in terms of several measures of goodness of fit. The likelihood ratio (LR) test of overidentifying restriction is not rejected at a 5 percent (or even at a 10 percent) level with a χ^2 value of 3.615 with df 2 and the probability, 0.164.

It follows that the dependency ratio is positively related to the interest rate and financial depth. The interest rate is negatively related to financial depth—a confirmation of the fact that financial development and the interest rate move in opposite directions, contemporaneously. On the other hand, the dependency ratio and capital inflows move together in contemporaneous time.

These allow us to plot the Structural Impulse Response Functions (SIRF) and Structural Forecast Error Variance Decomposition (SFEVD) for a horizon of ten years in figures 8.11 and 8.12, respectively. Figure 8.11 shows that a shock to dependency ratio marginally reduces the interest rate, which then rises but eventually converges to the earlier level. On the other hand, the impact of a structural shock to financial depth has greater impact in reducing the interest rate in the current period and the effect takes around five years to die down. Shock to capital inflows has a negative impact on the interest rate after two years, rises beyond it, and eventually converges to the initial equilibrium level from the fifth year onward. SIRFs in other cases report no impact. The panel for error variance decomposition, together with SIRF and coefficients of the A matrix, reveals that *FD* is exogenous in contemporaneous time. In other words, financial depth is not affected by the other contemporaneous variables. This is in conformity with its role as a policy variable, which is shaped by policy interventions from the government and other regulatory agencies, such as the Reserve Bank of India (RBI). Our results largely subscribe to the findings in Monnet and Quintin (2007), which suggest that

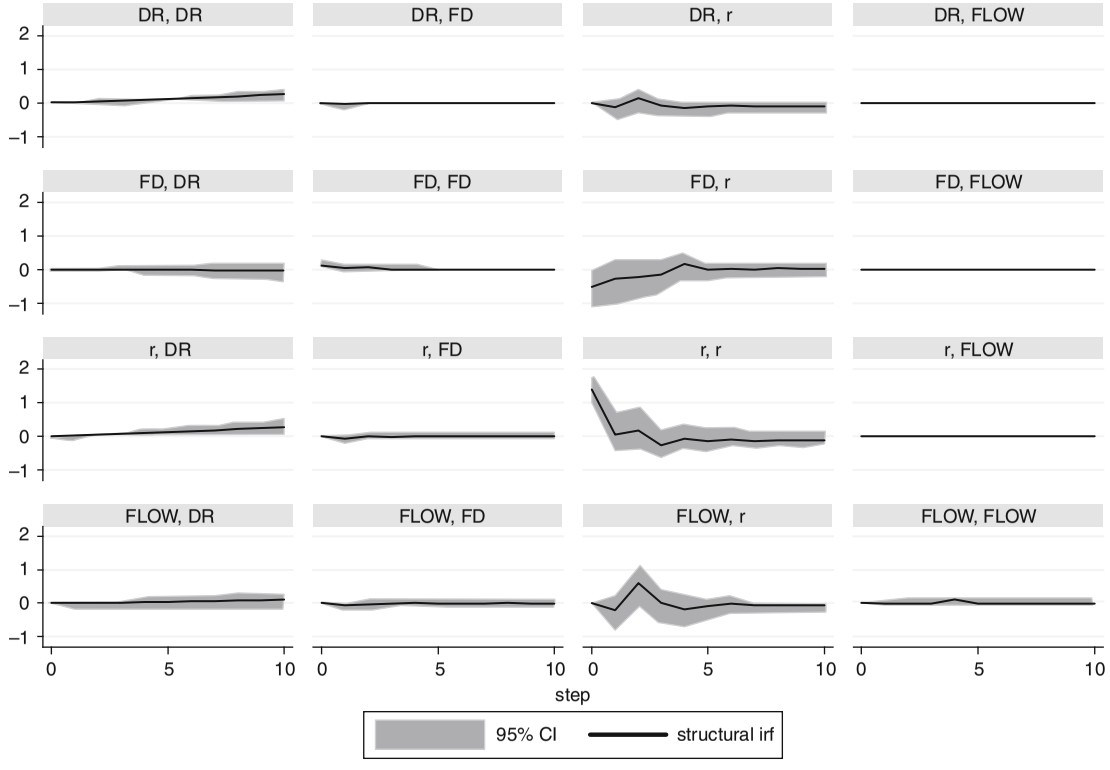

Figure 8.11 VAR results 1

Source: Authors' elaboration.

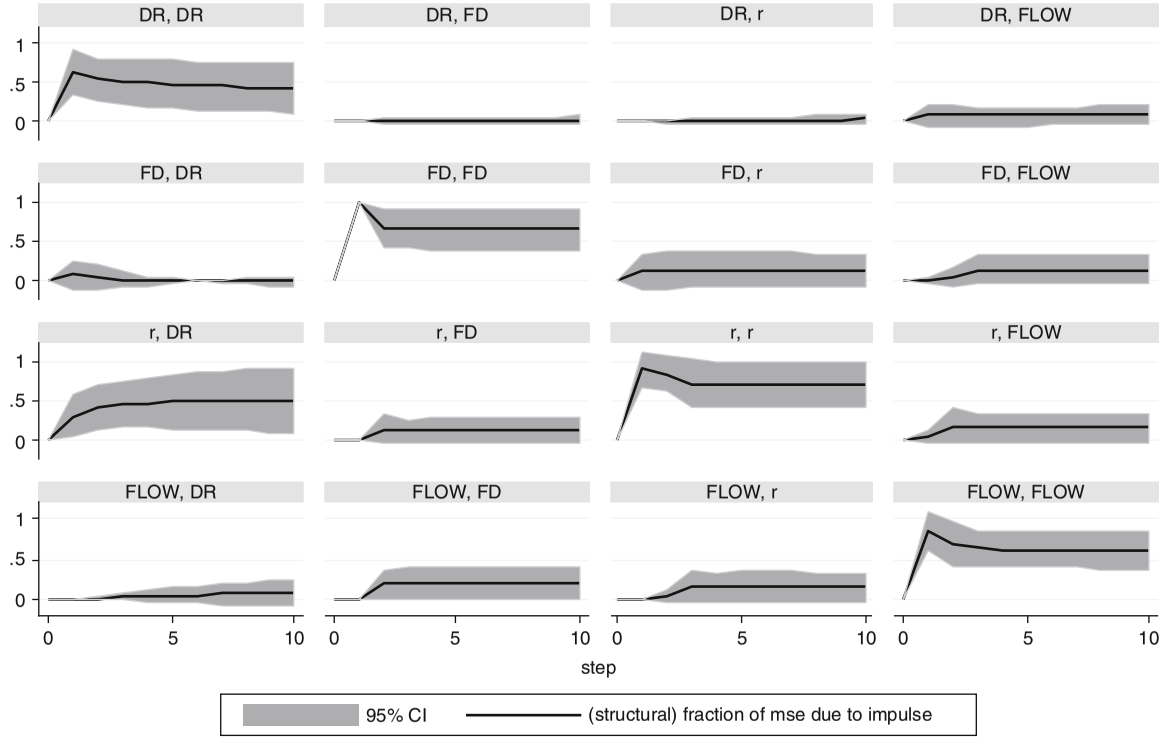

Figure 8.12 VAR results 2

Source: Authors' elaboration.

financial system architecture of any country at any point in time is the outcome of policy interventions in historical episodes. In a way, our results differ from Thakor and Song (2010) that built up the case for the comovement of different segments of the financial system, with banks preceding the stock market because of its efficiency in mitigating project risks in the early phase of growth.

The estimated econometric model establishes the roles of dependency ratio, financial development, and the interest rate channel on capital inflows. However, the rate of capital inflows is not very encouraging compared to other emerging market economies, particularly China and other East Asian countries, which are already going through the second phase of the demographic transition. The capital inflows to GDP ratio are 3.57 percent in the post-reform period with a very high degree of volatility. The source of volatility comes from a portfolio investment component, which we have discussed as a significant source. Consequently, a slight underperformance of the economy or rumors about policy shifts quickly create herd behavior among investors. Notwithstanding, these observations on the aggregate macroeconometric model fail to reveal adequate levels of intricate information on how the economy adjusts to demographic transitions.

In the case of growth and development driven by demography, as we have suggested in the introduction, the rate of investment has to increase to an unprecedented level, particularly when a country enters or is due to enter the second phase of the demographic window. This will enhance the rate of capital formation to permanently raise the labor productivity (Albrieu and Fanelli, 2013; Mason and Lee, 2006a, 2011 in general; and Ladusingh and Narayana, 2011 for India, in particular). The experiences with the recent development saga in East Asia suggest that a rate of investment exceeding 40 percent is warranted so that India may reap the benefits of the second demographic dividend. However, in contrast to the well-known two-gap model, it seems that there may be a stark inadequacy of international capital flows. This prompts us to look into domestic savings and investment as more feasible alternatives. In addition, the abundant stock of domestic investment sets a congenial atmosphere for international capital to flow in. We have used two measures of financial depth, namely, (i) the ratio of bank deposits to the previous period's GDP, and (ii) the ratio of bank deposits plus market capitalization to the previous period's GDP. These variables are plotted in figure 8.13 from 1980–81 to 2011–12, which shows that the financial depth is positively related to both the rate of savings as well as investment. The positive relation is more consistent when financial depth is measured in terms of bank deposits only. Since 1999–2000, all three variables have shown rising trends against time. When financial depth is measured by including market capitalization, its relationship with saving or investment fluctuate more than the other measure. After 2003–04, financial depth, including market capitalization, follows a marked departure from the earlier trend for a few years until the onset of the global financial crisis. During this period, the trend path of saving or investment does not show any change.

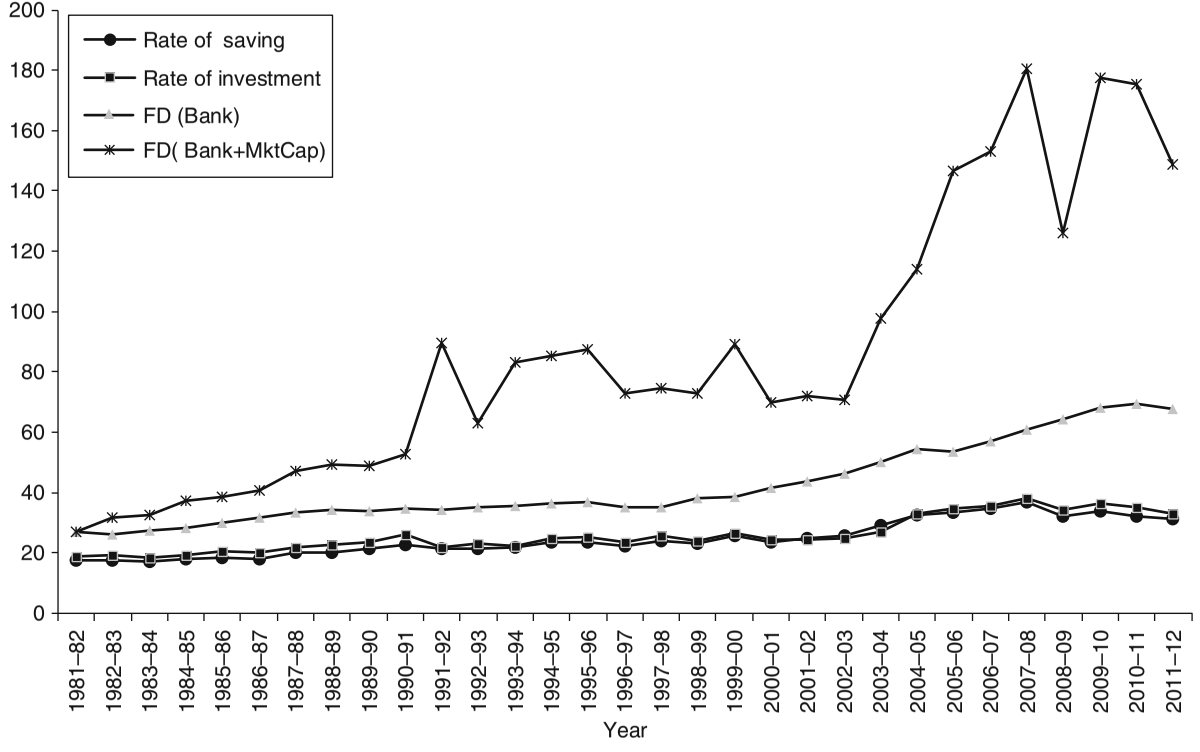

Figure 8.13 The rates of domestic saving, investment, and financial depth

Source: WDI, World Bank.

Table 8.8 engages in a detailed analysis of how the scope and returns from investment have responded over the period under consideration. Table 8.8 reports that the interest rates including a ten-year yield to maturity of government securities show declining trends. In India, the return on capital market instruments is measured by two indices—BSE-SENSEX and BSE-100 index. The first one is the most widely used, though its coverage is small (only a 30-scrip index). Hence, returns on an index with larger coverage (100-scrip index) are also reported. Index values realized show high annual returns until 2007–08. However, this is due more to secondary market rather than primary market transactions, which are a manifestation of speculative activities. After 2007–08, when the capital markets crashed globally, the index return in India also declined by 40 percent within a year.

Recent growth in India, especially during the reform period, has come about due to a very high growth in the service sector of which financial services (mainly banking and insurance) commanded larger contributions. The growth in value added has been very high, although growth in employment has been rather low. Older countries on the path of the demographic transition, such as the United States, Germany, the United Kingdom, Japan, and the relatively younger countries (but still older than India on the path of the demographic transition), such as China and other East Asian economies, have a much lower share in services. For India, the growth of the service sector entails the growth of self-employment and the growth of employment in the construction sector with a low level of earnings. Note that these would automatically suggest that India has not been the biggest beneficiary of the demographic dividend, typically because activities such as low quality self-employment practices and the involvement in construction and allied

Table 8.8 Overall financial indicators

Indicator	*1991–92*	*1994–95*	*1999–2000*	*2006–07*	*2011–12*
Return on govt. securities (% pa)	11.46	12.58	10.17	7.64	8.45
Bank deposit rate (% pa)	9.5	10	9.25	8	8.88
Bank lending rate (% pa)	16	15	13	10.75	10.75
Return on BSE-SENSEX (% pa)	81.22	33.26	40.78	45.89	–6.40
Return on BSE-100 Index (% pa)	68.54	33.74	56.99	40.16	–7.52
Market capitalization—All India (Rs. billion)	908.36	4354.81	9128.42	35450.4	62095.35
Total no. of new share issues	366	1591	69	114	49
Total no. of new debenture issues	145	121	10	3	0
Total value of new share issues (Rs. billion)	19.16	118.77	27.53	297.56	81.56
Total value of new debenture issues (Rs. billion)	42.75	88.71	24.01	8.47	0.00

Note: 1. Return on govternment securities is measured by yield to maturity of ten-year govternment securities. 2. Return on BSE-SENSEX and BSE-100 indices are calculated on the basis of annual average index value over months (April–March).

Source: Handbook of statistics on Indian economy, Reserve Bank of India (various years), And Prowess, CMIE.

activities account for a low level of productivity, leading to poor levels of saving and capital accumulation. In other words, the benefits of the second demographic dividend are unlikely without major policy interventions from the government. The dependence on foreign capital for fostering investments and growth implies increased exposure to speculative attacks and risk of economic turmoil that characterized the East Asian crisis.

Historically speaking, following the "take-off," the main source of growth in India has come from the growth of total factor productivity. Higher growth has come more from physical capital per worker, more human capital per worker, and higher total factor productivity. Although the growth of employment in the industries (registered sector) in India is the same as that in other Asian countries, growth in value added has been much less. The productivity of Indian industry has generally been low. Further, inadequate investment in infrastructure has led to the deceleration of the industries dependent on it. Important infrastructure-related inputs to industry, including energy, have been dismal (40 percent of all households in India still lack regularized energy supply) and neither the private sector nor large public investments in the sector have met this deficiency. It has been argued that the poor infrastructure facilities hinder the growth of private entrepreneurship and account for the poor performance of the economy in general. In this regard, the depth of the unorganized sector should be considered a disadvantage rather than an advantage if India is to engage its younger labor force in more productive activities. We suggest that the demographic dividend with a large number of workers entering the work force is in fact contributing to growth, although at the behest of the unorganized sector. Since the formal industrial sector does not create enough jobs and the service sector creates low-productivity jobs, the demographic dividends are unlikely to accrue in full. The unorganized sector might be lending invisible support (the government reports clearly acknowledge it without quantifying the formal-informal link, unlike here) for this process, albeit it is incapable of achieving the demographic dividend.

8.4 Capital Inflows and the Formal-Informal Production Linkages

From the year 2000, inflows of FDI have been promoted hugely in India, including permission for a 100 percent share with automatic approval in most sectors like textiles, paper, chemicals, drugs and pharmaceuticals, rubber and plastic, nonmetallic mineral products, metal products, machinery and equipment, and automobiles. Notably, all these products have a parallel production in the unorganized sector creating scope for outsourcing. We measure the effects of organized wages, technology, and FDI flowing into the formal sector on the gross value added (GVA) of the unorganized firms. We find that FDI coming into the organized sector results in a higher GVA of the unorganized sector. We also try to find a transmission mechanism through which FDI affects the informal sector. Table 8.9 depicts the degree and range of activities in the unorganized sector as per Census of India (2011).

Table 8.9 Labor input in the unorganized sector

Share of labour input in unorganized sector (%)	
	2004–05
Tabulation category/description	*Share of unorganised sector*
A: Agriculture aud forestry	99.9
B: Fishing	98.7
C: Mining	64.4
D: Manufacturing	87.7
E: Electricity, gas, watersupply	12.4
F: Construction	92.4
G: Wholesale and retail trade	98.3
H: Hotel and restaurants	96.7
I: Transport, storage, and communication	82.2

Source: Report of the Committee on Unorganized Statistics, MOSPI, 2012.

Data Sources

Annual data (2000–01 and 2005–06) for the organized sector were obtained from the Annual Survey of Industries (ASI) and that of the unorganized sector (2000–01 and 2005–06) from the National Sample Survey Organization (NSSO).[5] Annual data (1998, 1999, 2003, and 2004) for FDI were taken from the Department of Industrial Policy and Promotion, Government of India. Our main objectives are to find whether formal firms in India outsource to the unorganized sector and to subsequently test if technology in the unorganized sector interacts with FDI in the organized sector to raise GVA of the unorganized firms.

Proposition 1: With low growth of employment in the formal industrial sector and in the service sector, the larger employment growth is confined to the informal sector leading to partial benefits from the expected demographic dividend.

Proof: We derive the relations below.

We consider gross value added (GVA_i), the fixed assets (FA_i), wages ($Wage_i$) and technology ($Tech_i$), where i indexes the organized sector (OR) and the unorganized (UN) sector. These variables are characterized by standard definitions. We also consider the volume of FDI coming into the organized manufacturing industries as explanatory variables. Corresponding to the year 2000–01, we consider the volume of FDI inflows in the years 1998, 1999, and corresponding to the year 2005–06, we consider the volume of FDI inflows in the years 2003 and 2004. This is because FDI is less likely to have an effect on the industry parameters instantly. FDI has three components, namely, equity capital, reinvested earnings, and intracompany loans.[6] FDI flowing into the industries one year ago (FDI_{-1}) and two years ago (FDI_{-2}) is studied. Following Tybout (1997) and Bhaumik et al. (2006), we used the capital-labor ratio as a proxy for technology.

Econometric Specification and Results

We use a generalized least square (GLS) estimation technique to account for heteroscadasticity in the data and autocorrelation in the data for FDI. We have converted all the nominal variables of 2000–01 to real variables by deflating them with the wholesale price index of 2000–01 and the variables of 2005–06 by deflating them with the wholesale price index of 2005–06.[7] We also control for industry specific AR(1) in the data.

The model that we estimate is:

$$GVA_{UN} = \alpha + \beta_1 GVA_{OR} + \beta_2 Wage_{UN} + \beta_3 Wage_{OR} + \beta_4 FA_{UN} + \beta_5 FA_{OR} + \beta_6 Tech_{UN} + \beta_7 Tech_{OR} + \gamma_1 FDI_{-1} + \gamma_2 FDI_{-2} + \delta_1 Tech_{US} * FDI_{-1} + \delta_2 Tech_{US} * FDI_{-2} + \varepsilon_{it}$$

The interaction term plays a critical role. It shows how GVA_{UN} changes due to FDI inflow in the organized sector via technology transmission in addition to a direct effect. Therefore, the total effect of FDI on the unorganized sector's value added is an outcome of the comparison between the direction and magnitudes of $(\gamma_i\ \delta_i)$ in the previous equation.

$$\frac{\delta Y_{it}}{\delta L_{it}} = \gamma_i + \delta_i * Tech_{UN}$$

Proposition 2: FDI_{-1} and FDI_{-2} increases GVA_{UN}, although the positive impact of capital spillover falls with the passage of time.

Proof: The results of the GLS regression are presented in table 8.10. First, a one-unit increase in the GVA_{OR} significantly raises the GVA_{UN} at a 1 percent level of significance. This shows that as formal firms' valued added

Table 8.10 Results of GLS estimation

Dependent variable: Unorganized sector gross value added (GVAUN)		
Independent variables	*Coefficient*	*Std. Error*
GVA_{OR}	0.03*	0.003
FA_{UN}	0.61*	0.005
FA_{OR}	–0.15*	0.003
$Wage_{UN}$	–0.53*	0.030
$Wage_{OR}$	0.42*	0.04
$Tech_{UN}$	16.23*	4.3
$Tech_{OR}$	–3.20*	0.56
FDI_{-1}	0.19*	0.03
FDI_{-2}	0.17*	0.02
$(Tech_{UN})$* FDI_{-1}	1.67*	0.19
$(Tech_{UN})$* FDI_{-2}	1.92*	0.12
Constant	–17.14**	10.35

Note: * significant at 1 percent, ** significant at 10 percent.

Source: Author's calculations.

increases, the value added of the informal firms increases as well. The rise in FA_{OR} reduces GVA_{UN} significantly, that is, the higher the FA_{OR} the lower is the volume of jobs that the organized firms outsource. Within the unorganized sector, a one-unit rise in *FA* increases GVA_{UN} significantly. But an increase in real wages in the unorganized sector by one unit reduces the GVA_{UN} significantly, whereas a rise in real $Wage_{OR}$ increases GVA_{UN}. This conforms to the common perception that rising labor costs leads to production outsourcing. An improvement in the technology used in the organized sector reduces GVA_{UN} significantly, whereas an improvement in the technology of the unorganized sector raises its GVA. More importantly, both FDI_{-1} and FDI_{-2} increase GVA_{UN}, although the positive impact of capital spillover dampens over time.

The interaction term plays a critical role and provides the direction of the transmission mechanism by which FDI in the organized sector affects GVA_{UN} via outsourcing. The interaction terms show that a one-unit increase in FDI raises GVA_{UN} significantly through technology transfers. In other words, as FDI flows into the organized sector, these firms outsource a portion of their production to the unorganized sector along with technology inputs. This can take the form of more advanced and efficient equipment and production designs as anticipated by NCEUS (2009). The rise in GVA_{UN} is a direct outcome of this production outsourcing. The FDI-technology link is directly borne out in our empirical result. Moreover, the coefficient of the interaction terms, unlike that of FDI, increases over time. This might be because it takes time to adapt technology, but once adapted its effect is long term in nature.

Additionally, we also show that the per worker growth rate of emoluments in 11 out of 14 unorganized sector industries (except, coke, petroleum products and nuclear fuels, fabricated metal products, and office, accounting, and computing machinery) is either negative or less than that in the organized sector (table 8.11). The rise in labor costs, thus, could be a major reason for organized to unorganized production outsourcing, although the net effect may not be conducive to the merits of the demographic dividend.

The Rural Sector and Demographic Dividends in India

Notwithstanding, the prospects of demographic dividends in India could get even weaker unless the large rural sector is rapidly accommodated in the demography-financial sector-growth matrix. India, like many other developing and emerging economies, still has a fair share of the population living in the rural areas with limited and uneven growth experiences as compared to the country as a whole. This implies that while the growing urban areas in India benefited significantly from the growth and development impetus following the regime shift in economic policies in the country, the rural areas did not catch up at the socially desirable level. The financial deepening and the outreach of development outcomes have often been dismal for rural growth trajectories over a significant phase in recent history.

Table 8.11 Growth rates of emoluments per worker in organized and unorganized manufacturing between 2000–01 and 2005–06 (%)

Industry groups	*Organized sector*	*Unorganized sector*
Chemicals and chemical products	40	–52
Coke, petroleum products, and nuclear fuel	–8	20
Food products and beverages	21	–48
Motor vehicles, trailers, and semi-trailers	19	15
Machinery and equipments, nec	26	20
Textile products	17	–54
Electrical machinery and apparatus, nec	5	–25
Fabricated metal products	18	32
Rubber and plastic products	27	5
Paper and paper products	29	–65
Medical, precision and optical instruments	21	5
Leather and related products	22	–26
Office, accounting and computing machinery	25	39
Wood and wood products	56	–83

Note: nec = not elsewhere classified.
Source: Author's calculations.

It remains, however, that the rural areas have supplied disproportionately more population growth for the country and might be the continued source of rural-urban migration. This sub-section shows that the financial markets and institutions in major states and union territories (federally administered regions) have yet to link the predominantly agrarian rural economy to the larger growth and development issues. The consequences of this neglect are many. First, since the financial deepening in the rural areas is fairly low, one has to relocate the debate on rural-urban financial links in emerging economies back to the rural-urban migration patterns. Note that the rural population share is as high as 68 percent of the total population of the country. However, as data available from the Global Development Indicators, World Bank, show the population growth rate has mellowed significantly and currently registers 0.84 percent per annum (figure 8.14). Clearly, given the immense size of the population, any positive growth rate signifies a large addition to the existing population in the countryside. The question is, would this sizable workforce translate successfully into demographic dividends?

The answer as yet seems to be no. A glaring lack of access to bank and non-bank financial institutions in the rural and semi-urban areas in India leaves the field open to spurious and mostly illegal financial organizations that mobilize large amounts of savings (in small per capita amounts) and get involved in Ponzi-like schemes. The cooperative revolution has not been successful in many parts of the country either, unless it is both unique and productive in nature, such as the Gujarat Milk Cooperative Limited. The technology transfer between the formal and the informal sector, as was discussed above, could then be construed as a possible source by which the productive ensemble of rural workers should be made effective in generating considerable economic

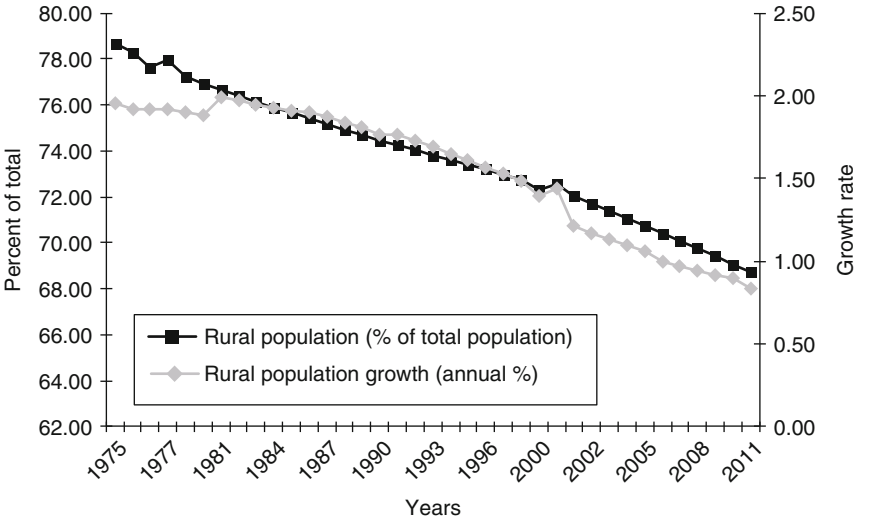

Figure 8.14 Rural population share in total population and annual growth rate
Source: World Bank (2012).

outputs. The role of the financial institutions in facilitating such activities should be remarkable in view of the potential returns from investments. Instead, the All India Debt and Investment Survey (AIDIS) by NSSO reveals that the loans taken from moneylenders in the total credit stock of rural households have increased from 17.5 percent in 1991 to 29.6 percent in 2002. This indicates an increase in indebtedness of rural households over the past decade to informal lending institutions. While this may also mean increased access to credit, AIDIS (1991) suggests that just 16 percent of rural households had outstanding formal loans. Based on the World Bank-NCAER Rural Financial Access Survey (2003), the corresponding number was 21 percent (Basu, 2006).[8] On the production side, however, Foster and Rosenzweig (2004) previously argued that whenever there has been a productivity increase in Indian agriculture, the consequently higher rural wage has discouraged rural industrialization. Thus, the supply-side effect could not be compensated by greater demand for local goods through the increased income effect.

8.5 Concluding Remarks

Any attempt to relate the demographic change to the financial architecture of a country remains incomplete without adequate emphasis on the activities in the labor market. In India, more than 90 percent of all labor market activities are confined to the unorganized sector. We developed an econometric exercise in section 8.3 wherein we showed that the capital inflows into the formal industrial and service sectors spills over to the unorganized

sector. The relation of this exercise to the demographic transition in India is direct. We discussed that the extant economic growth in India has bypassed the formal industrial sector in favor of large contributions from the service sector that does not generate as much employment as the industrial sector is capable of creating. At the same time, the formal industries have outsourced a significant amount of production to the unorganized sector in order to lower organizational costs and remain competitive in the face of steep competition from low-cost production in East Asia and China. Overall, the unorganized sector seems to have largely accommodated the growing labor force. Notwithstanding, the implications for the demographic dividend would still be weak because the low capital and technology intensity in the informal sector keeps the wages low, savings low, and the growth rate low. The breakaway from this trap is feasible if the large informal labor as well as the rural workforce can be inducted into more productive activities with the help of deep financial intermediation.

This was preceded by a fully laid out VAR model using the dependency ratio, financial depth, rate of interest prevailing in the country, and capital flows. We showed that financial development reduces the interest rate, which in turn is expected to raise domestic investment. On the other hand, international capital inflows are expected to supplement inadequate domestic investment. A reduction in the interest rate raises domestic investment, but reduces capital inflows. In fact, the recent (2013) currency devaluation in India is a by-product of the large trade deficit coupled with the withdrawal of investments from India in view of better prospects in the United States, where the repeal of public support as announced by the government raised (compared to India) interest rates for attracting fresh investments. Further, the estimated econometric model established the positive role played by the dependency ratio, financial development, and the interest rate affecting capital inflows. However, the rate of capital inflows did not seem very encouraging compared to other emerging market economies, particularly China and other East Asian countries, which are already going through the second phase of the demographic transition. Overall, our results suggest that in order to make the best out of the demographic dividends in India, the government needs to design measures to foster entrepreneurship in the formal domain, even if a large number of these turn out to be small- and medium-sized ventures. It has been suggested in umpteen numbers of previous works that the bureaucratic controls and corruption in India have been detrimental to start-up businesses in the formal sector, driving a large number of firms to informal activities. Despite a possible repetition of apparently inane policies (but using a recent study which shows that corruption does not raise informality in those states of India where per capita income is higher than a critical level; Dutta et al., 2013), we still suggest that measures to restrain corruption and therefore retaining firms in formal businesses may be an important step toward raising the level of demographic dividends.

Notes

1. However, Dyson (2008) offers a comprehensive survey on the general issues of demography and development processes in India. See also Visaria (2009), Devika (2008), Thapa et al. (2012), James and Subramanian (2003), Ladusingh and Narayana (2011).
2. Later works in this area are Kehoe (2006), Lutkepohl and Kratzig (2004), Stock and Watson (2001).
3. The stationarity of dependency ratio is discussed later. The ADF test for the growth rate of GDP is found to reject the null hypothesis of stationarity.
4. We deployed Bai-Perron Test for 3 to 4 break points.
5. The choice of years for industry data is restricted by availability of recent data for unorganized sector industries. NSSO uses the term Fixed Assets to imply Fixed Capital stock as in ASI.
6. Earlier data on FDI in India included only cash acquisition of equity and preference capital; it later followed the standard IMF definition.
7. The base year of the wholesale price index of both years is the same.
8. Chattopadhyay (2011) has shown that during the post-reform period, bank credit to agriculture has in fact declined, which has its negative impact on output.

CHAPTER 9

Demographic Transition, Growth, and Wealth in South Africa

Melvin D. Ayogu and Olumide Taiwo

9.1 Introduction

There is rising concern in South Africa that social security transfers and expenditure on public health may jeopardize the solvency of the public sector, thereby inducing macroeconomic and financial instability. Tito Mboweni, the immediate past Reserve Bank governor, warns of "a social revolution in South Africa similar to those in Portugal, Greece and Cyprus, where taxpayers protested in the streets when governments implemented budget cuts after over-committing on social expenditure" (Mboweni, 2013). For instance, within one and half decades since apartheid ended, social welfare spending has increased by 537.5 percent as a result of phenomenal growth in the number of welfare recipients from 2.4 million in 1996 to 15.3 million in 2011, and still rising. This growth in spending does not include expenditure on public health, which in itself is a significant line item in the budget, partly due to the public health treatment program in response to the HIV-AIDS.[1] Tito Mboweni points to growing unemployment (4.7 million in 1996 and 5.6 million in 2011) as an important factor in the phenomenal increase in the demand for public support.

In spite of (i) very high unemployment, (ii) the large proportion of young people in the pool of to-be-educated, (iii) the budgetary implications of public health care, and (iv) care for the many unemployed youth and the aged, the government nonetheless expresses confidence in the sustainability of public finance.[2] The National Treasury expects grant expenditure to stabilize at 3.3 percent of national income (GDP), well below expenditure on education (6.9 percent of GDP) and health (4 percent of GDP) (Paton, 2013). However, recent findings by the South African Institute for Race Relations (SAIRR) suggest a less sanguine view of the fiscal circumstances. According to the SAIRR study, more people in South Africa were receiving social grants than have jobs. Also, in the last decade, the nominal growth in welfare has

far exceeded the nominal growth in tax revenue (Baranowska, 2013). For instance, in 2001, the system offered a 330 percent guarantee of the welfare liability whereas in 2012 this cover had dropped to a gap of 10 percent meaning that the system is now able to offer a 90 percent cover calculated as the ratio of people in employment to those receiving welfare. Furthermore, the tax revenue in nominal rand value between 1994 and 2010 increased from R114 billion to R674 billion; equivalent to a 491 percent period increase. By contrast, the growth in the nominal rand value of welfare payments for the same period is 700 percent from R11 billion to R88 billion. The estimated welfare bill for the 2013/14 fiscal year is R113 billion and possibly more if all eligible persons were to benefit from the program (Nxumalo, 2013). "The National Development Plan (NDP) estimates that there are approximately 2.1 million children who are eligible for the child support grant but are not receiving it. If all eligible children received this grant, it would push social grant expenditure up by more than half a billion rand" (Jones, 2013).

So, the debate is joined with regard to the long- term solvency of public finance in South Africa. As expressed by the state, there is cause for optimism. In this chapter, we explore one basis for such optimism by considering transitions in the age structure or equivalently the demographic profile of South Africa as a potential source of hope.

9.2 The Demographic Transition

Demographic transition refers to the pattern of changes in fertility, mortality, and population growth that have been observed with great regularity around the world. Initially death rates and birth rates are high and roughly equal, generating low rates of population growth and relatively young population. Then follows a decline in death rates, but birth rates typically remain high, thus generating population growth and a younger population. Eventually birth rates fall, slowing the rate of population growth, and population average age begins to rise. The transition ends when birth rates and death rates have both stabilized at a new low level, implying a return to low (or zero) population growth (Leibbrandt, 2013). Although population growth rates are similarly low at the beginning and at the end of the timeline, the population is now old compared to the beginning of the transition.

Based on the history of countries from around the world, the demographic transition at some point enters a period commonly referred to as the demographic "window of opportunity." According to the United Nations, this opportunity arises in a country that is undergoing a demographic transition during "a period when . . . those under 15 years old have fallen permanently under 30 percent, but those 65 years and older are still relatively few" (United Nations, 2004). In essence, a country at this stage is endowed with a population that is largely at work or ready for work.

According to estimates from United Nations Population Division, the demographic window for South Africa is projected to open in 2015. Under the assumption of continuing medium fertility rate, it is projected that the

population aged 65 and above will reach 15 percent of the South African population by 2069, thus yielding a demographic window that lasts through 2015–2069. However, in contrast to the UN estimate, the National Planning Commission of South Africa claims that the country has entered the demographic window. According to the 2013 mid-year population estimates (Stats SA, 2013b), there are 52.98 million people living in South Africa of which 29 percent are under 15 years of age, 65 percent are of working age, and 6 percent are over 64 years. On this basis, South Africa is a "young nation' that has just entered its bonus period. Furthermore, it projects that this window of opportunity to harness the large working-age population into productive activities, in order to fund future ageing cohorts, will close before 2030. At that time, the number of South Africans over 64-years-old is projected to reach 4.4 million from the current count of 3.17 million.[3] Regardless of whose estimate is more reliable, the important and noncontroversial point here is that South Africa is a young nation and should ready itself to take full advantage of any resulting demographic opportunities (see figure 9.1). The arrival of the demographic window of opportunity coincides with South Africa's youth bulge that constitutes a sizeable proportion of its large labor force, a small ageing population, and relatively fewer children to support.

By design, a drop in fertility is essential to opening the demographic window of opportunity while an increase in longevity that raises the elderly population substantially can hasten its closure. Figure 9.2 shows the Total Fertility Rate (TFR) and Inverse Dependency Ratio (IDR) for South Africa from 1950 to 2010.

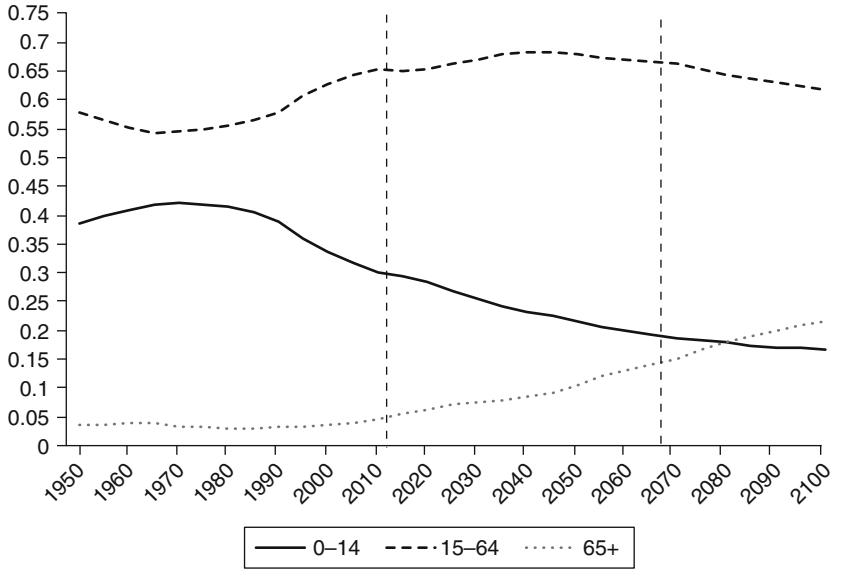

Figure 9.1 The demographic window DW (2013–69)

Source: Data from Stats SA and projections from the UN population data.

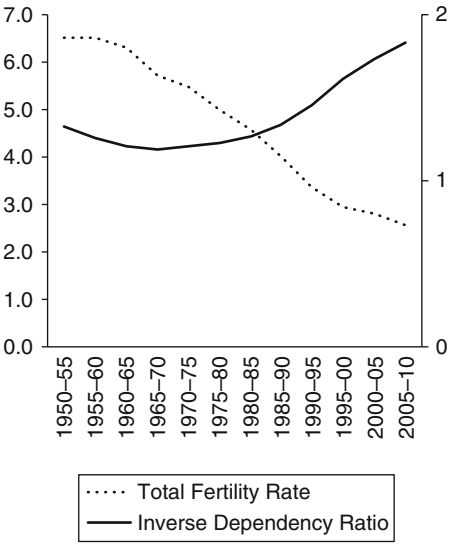

Figure 9.2 Fertility rate and inverse dependency ratio
Source: UN Population Data.

The TFR dropped from a high of 6.5 in early 1950s to 2.6 during 2005–10, implying that a substantial fertility decline preceded the opening of the demographic window. The IDR, which measures how many working-age persons are available to support dependent children and the elderly, initially dropped slightly from 1.3 to 1.2 between 1950 and 1970 but began to rise afterward until reaching a high of 1.8 in 2010. This population structure ensures sustainability of social welfare programs involving transfers from the working-age population to children and the elderly.

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The Demographic Dividends

The economic demography literature recognizes that the window of opportunity does not automatically translate into a bonus. The window needs to be properly exploited by means of a highly productive and gainfully employed workforce that is provided with sufficient incentives for wealth creation, in order to ensure that the future needs of the working population when they

age would have been covered from the wealth created during the bonus period. This would be a manifestation of the demographic dividend.

The demographic dividends can be illustrated by a simple decomposition of income per effective consumer at any given time:

$$y(t) = Y(t)/N(t) = Y(t)/L(t) \times L(t)/N(t)$$

If y_l (t) =Y(t)/L(t) is productivity per effective worker and S(t) = L(t)/N(t) is the ratio of effective workers to effective consumers—hereinafter support ratio—the growth of income per effective consumer g[y(t)] is the sum of the growth of productivity per worker g[y_l (t)] and the growth of support ratio g[S(t)]. In this setting, g[y(t)] is the gross demographic dividend, g[S(t)] is the first dividend (FD), and g[y_l (t)] is the second dividend (SD).

Accordingly, the FD is realized when effective workers or producers grow at a rate that outpaces the growth of effective consumers during the window of opportunity. As fertility declines while the elderly population remains very small in proportion to total population, the pool of workers expands and grows faster than the population, leading to the FD. However, the FD is not automatic; its realization depends largely on the availability of gainful employment for the growing workforce. Without gainful employment, the working-age population will swell as more people reach the working age, but they will not contribute to enlarging the population of effective workers or producers. Thus, the FD is a compositional effect derived from changes in population age distribution. It disappears as the demographic transition exits the window and the share of the elderly begins to rise.

In addition to the compositional effect that yields the FD, the second demographic dividend is a behavioral effect, the realization of which depends on the institutions and incentives that enable workers to anticipate the future, save, and build wealth. The increase in resource mobilization resulting from a realization of the FD can enable capital formation that is essential to raising productivity and thus is the source of the second demographic dividend. As the elderly share of the population begins to increase, and the support ratio begins to decline, forward-looking individuals become more mindful of the need to save and invest for old age. With an appropriate menu of saving instruments such as pension and other retirement schemes supported by appropriate policy environment, individuals begin to accumulate wealth.

Although for analytical convenience, it is suggested that "the challenge for developing countries is to get rich before getting old while the problem for advanced economies is to avoid becoming poorer as they age" (CEDES, 2012), in practice both challenges are strategic complements that matter to all countries, developing or developed. Thus each country must address the challenges in a coordinated approach of the kind emphasized in the thematic papers that are part of this volume—the point being that both types of economies will ultimately age and so must provide for the sunset days. This provision happens during the sunrise days and in a manner that anticipates the

sunset. Therefore, a plan to get rich before getting old that does not consider wealth preservation is incomplete. The need to manage properly the FD so that it translates into enduring wealth underpins the coordination challenge that requires both forward-looking behavior and appropriate commitment devices to lock in intertemporal life-cycle plans. Hence, it is said that institutions and finance are crucial in managing the economic consequences of the demographic transition and the ability to profit from the opportunities. For instance, in some economies, much reliance is placed on the public system; in others the bulk of the support may come from an extended family system and in yet other societies saving rates are raised as a means of providing for the future needs of the ageing population.

Demographic Asymmetries and Common Interests?

In general, it cannot be assumed that societies can provide for their ageing population successfully through transfer wealth, increased saving, or both. The success of the overall scheme cannot be taken for granted because outcomes also depend crucially on how these processes occur. For instance, it can depend on whether government accumulates enough assets to fund its own responsibilities, that is, future transfer payments without crowding out private saving by overtaxing workers thus affecting work incentives and the ability of individuals to fund optimal retirement plans. In the case where the government is able to fund future transfer payments and/or workers increase capital accumulation successfully, the resulting increase in capital intensity of the economy engenders a permanent increase in productivity, thus reinforcing the sustainability of the life-cycle wealth accumulation strategy.

However, where governance is weak or adequate institutions are lacking, the state may be unable to accumulate sufficient wealth for a variety of causes, such as poor tax compliance and/ or weak enforcement. In other cases, where private saving can be a solution, such resource mobilization potential may not materialize either due to financial markets being underdeveloped or portfolio diversification opportunities are limited because the economies are not linked to international markets. In the latter case, the risk-return profile of the economy's wealth portfolio may be suboptimal. Suboptimality of a country's wealth portfolio is only one aspect of the costs of obstructive macroeconomic policy. Sluggish global capital flows owing to weak international financial market linkages also means that richer and older economies may not be able to channel their surplus savings to young economies that are temporarily unable to accumulate sufficient capital to fund investment at levels required to fully exploit the first demographic bonus. Conversely, younger economies are unable to fully support global financial intermediation by promoting maturity transformation—helping older countries profitably transform their present income streams into future consumption bundles (future annuities). Presumably, there are common interests that lie in the mutually advantageous flow of capital arising from global asymmetries in demographic transition.

In a recent analysis, Albrieu and Fanelli (2013) explore the linkages among the macroeconomy, financial relations, and demography. In particular, these authors elaborate a methodological framework that allows us to examine the demographic literature and data through macroeconomic lenses, emphasizing that "under certain initial conditions, some natural trajectories for the life-cycle deficit and, hence, the stock of life-cycle wealth could be unsustainable." If, as defined by these authors, aggregate life-cycle deficit is the gap between domestic absorption and total labor income, then the ongoing debate in South Africa about revenue streams, the trend and scale of transfer payments, and the unemployment situation is indeed about the macroeconomic consequences of demographic transition. In plain practical terms, will South Africa be able to make hay while the sun shines? Can it adequately provide for the future, given the currently (nature's) favorable terms of wealth production?

To address these issues, the rest of the chapter is organized as follows. Section 9.3 examines the relationship between demographic transition and growth using national transfer data, and identifies important obstacles that may prevent or are preventing South Africa from taking advantage of the first demographic dividend. Section 9.4 analyzes South Africa's life-cycle wealth accumulation and its implications for solvency of the public sector. In section 9.5, we analyze the demand for, and the financing of life-cycle wealth. Summary and concluding remarks are in section 9.6.

9.3 The First Dividend: Demographic Transition and Growth

The first demographic dividend arises as a result of compositional changes in population conditional on the structural pattern of consumption and labor income, generally referred to as the economic life-cycle. The life-cycle reflects many features of the society, some of which are behavioral while others are not, as they influence the balance between access to financial resources and the material needs of the population by age. In addition to other factors, labor income by age is determined by labor force participation, job creation, employment rates including hours of work, as well as the earnings profile. On the consumption side, preferences, cultural norms, saving and borrowing rates, prices, as well as institutions regulating these components are important. The National Transfer Accounts (NTA) framework enables a construction of the profile of consumption and labor income and estimation of age-specific deficits. In combination with population data, the NTA enables an estimation of aggregate deficits.

The Life-cycle Deficit (LCD)

The NTA for South Africa forms the basis for estimating the life-cycle deficit (LCD). By design, the NTA "attempts to record, for a given country and a specific period of time, all the transfers that occur across age

brackets, whether through public or private channels. It can thus estimate, for any particular country-year, the net saving by age of the population" (Cooper, this volume). During young and dependent ages, individuals consume more than they produce and therefore generate LCDs. The same occurs among the elderly who are past the working age. On the other hand, members of the working-age population produce more than they consume and thus generate life-cycle surpluses. Figure 9.3 shows the age profile of per capita consumption and labor income obtained from the South African NTA, based on the 2005 Income and Expenditure survey (see www.ntaccounts.org).

There are three noteworthy observations from the profile. First, South Africans generate LCDs from birth through age 29, implying a deficit age bracket that overlaps extensively with the working-age bracket, which begins at age 15. This reflects, in large part, the incidence of low levels of labor force participation and high levels of unemployment that prevails among the youth population. As of 2005, labor force participation rate was 57.2 percent while the unemployment rate was 26.7 percent. By 2011, labor force participation rate was down to 54.4 percent and unemployment down to 24.9 percent. However, the drop in the unemployment rate is more a reflection of discouragement and nonparticipation in the labor force than increases in job creation rates.

Second, consumption is markedly sensitive to income in ways that confirm the observation by Thaler (1990) that the middle-aged consume too much compared to the pattern of consumption that would be predicted by the

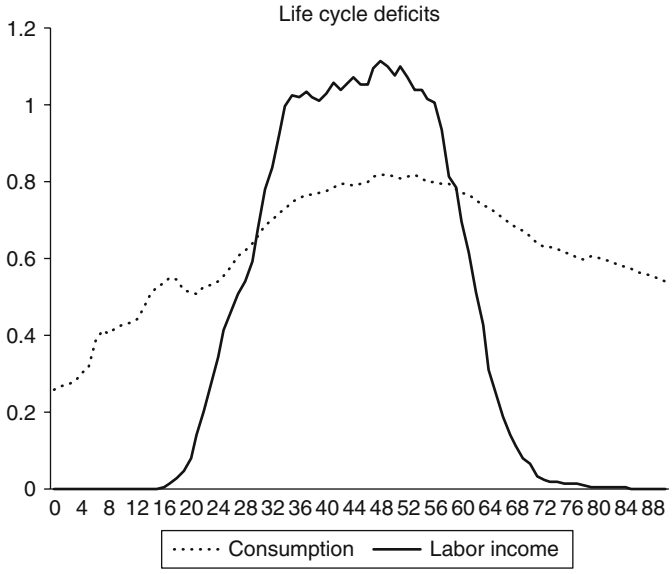

Figure 9.3 Consumption and labor income profile

Source: National Transfer Accounts.

life-cycle theory. Indeed, South Africa's profile is in stark contrast to those of Brazil, India, China, Japan, and Korea where consumption is only minimally sensitive to income among the middle-aged segment of the population (Albrieu and Fanelli, 2013). This is a reflection of the low rate of private saving. Gueorguiev et al. (2009) reported that national saving rates in South Africa decreased from an average of 26 percent of Gross National Disposable Income (GNDI) during 1960–85 to 15 percent in 2007. They showed further that national savings decreased by 1.8 percent between 1996 and 2007 as a net outcome of a large decline in private savings and a smaller increase in public savings. Private savings fell by 8.1 percent while public savings increased by 6.2 percent. They also found that private saving in South Africa is low by international standards. Compared to a panel that includes China, Vietnam, India, Poland, Korea, Russia, Romania, Bangladesh, Iran, and Turkey, private saving was 10 percent lower on average and fell by 4.9 percent more in South Africa during 1996–2007.

Third, on aggregate South Africa generates LCD, which implies aggregate private deficit. An increase in the LCD is one of the major factors that should exert pressure for financial development and innovation in order to address the demand for financial instruments for the purpose of transferring resources across the life-cycle (that is, implementation of life-cycle planning).

The First Demographic Dividend (FD)

Following Mason and Lee (2006a), we assess the FD through the support ratio (*SR*), which relates the effective number of producers (*L*) to the effective number of consumers (*N*) at successive periods in the course of demographic transition. Using the age-specific per capita labor income and consumption rates obtained in the NTA, represented by $\gamma(x)$ and $\varphi(x)$ respectively, as well as age-specific population data from the UN database, the support ratio is defined as

$$SR(t) = \frac{L(t)}{N(t)};\ L(t) = \int_0^{\Omega} \gamma(x) P(x,t)dx;\ N(t) = \int_0^{\Omega} \phi(x) P(x,t)dx$$

where $P(x,t)$ is the size of population aged x at time (usually year) t. We restrict the maximum age Ω to 90. Whereas our analysis covers periods earlier and later than 2005, we use the estimates of $\gamma(x)$ and $\varphi(x)$ available in the 2005 South African NTA for all the years covered in the analysis.[4] In this regard, we assume that the age-specific per capita consumption and income profile have not changed in the years before and would not change substantially in the years after 2005.

The growth rate of the support ratio is equal to the growth rate of the effective number of workers (labor) minus the growth rate of effective consumers, that is, $g[SR(t)] = g[L(t)] - g[N(t)]$. Figure 9.4 shows the growth of the *SR* during 1950–2010.

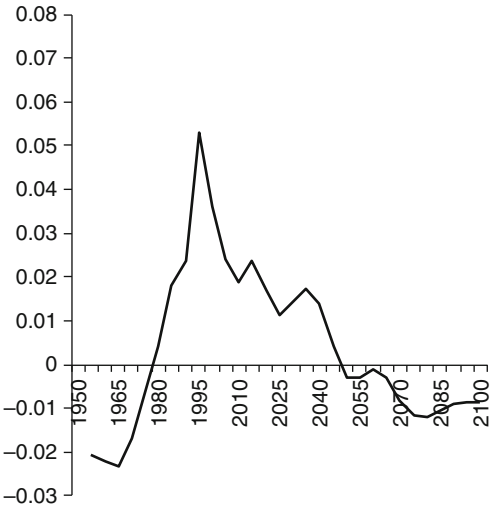

Figure 9.4 The first demographic dividend
Source: NTA data and UN population data and (medium fertility) projections.

The FD occurs when $g[SR(t)] > 0$, implying that the growth of effective producers exceeds the growth of effective consumers on a period-on-period basis. On the basis of figure 9.4 and by definition, South Africa began realizing the FD approximately in 1980, about 33 years before the demographic window of opportunity opened in 2013. Based on the analysis represented in figure 9.4, the FD will end by 2045, which is about 20 years before the window of opportunity is expected to close. Evidently the duration of the FD (total of 65 years) is longer than the window of opportunity (total of 52 years). Although new entrants will arrive in the labor market at decreasing rates, as fertility continues to fall and the transition progresses, the question of whether the FD will extend into the future depends totally on the labor market.

Prior to 1980, the share of children under age 15 in the population expanded from 38 percent in 1950 to a peak of 42 percent in 1970, a high point that was sustained almost through to 1980 before decreasing to 40 percent in 1985 and falling continuously thereafter. Due to the declining fertility rate, the FD grew dramatically to reach a peak of 5.3 percent in 1995. Thereafter the trend reversed, falling sharply to a low of 1.9 percent in 2010. This drop is plausibly associated with events that began immediately after the 1994 elections. Leibbrandt et al. (2005) noted that average real income of South African men and women fell by about 40 percent between 1995 and 2000. In explaining the pattern, they noted that the most plausible explanation is the incidence of emigration among the White population. The *Economist*'s report of April 21, 2005, noted that more than 250,000 Whites had left South Africa since 1994 and that most of them were young and talented. While the share of the elderly continued to grow at consistent rates,

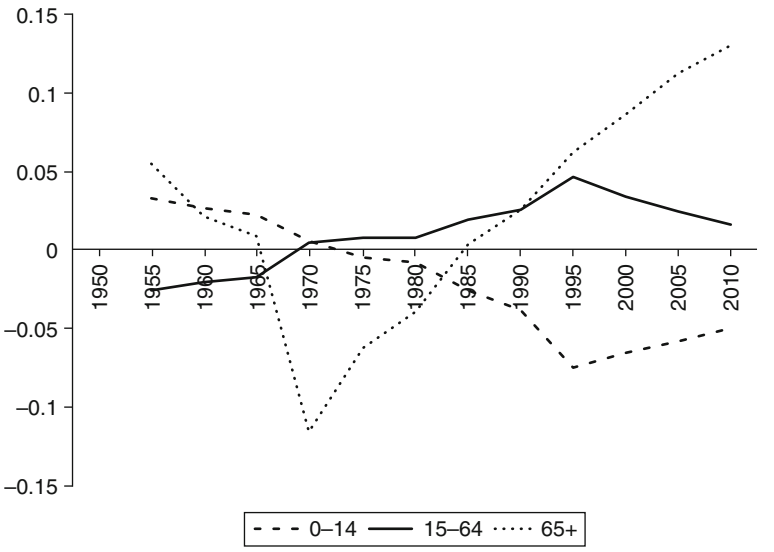

Figure 9.5 Growth of population shares

Source: Author's own elaboration using UN data.

it was the working-age population whose growth declined sharply in 1995 and continued to fall afterward (figure 9.5) and, therefore, accounted for the sharp decrease in the FD. [5]

As the elderly only consume but do not produce, the growth in their share of the population drove growth on the consumer side and is, therefore, partly responsible for the decline in the FD after 1995. By construction, the consumption and income profiles obtained in the NTA inherently reflect labor market conditions. Therefore, an increase in unemployment or nonparticipation rates above the 2005 level will reinforce the elderly effect of further eroding the FD. Thus, the FD may disappear before 2045.

Threats to FD: Employment and Labor Market

"Given fixed output per worker, labor force participation rates, and unemployment rates, a rise in the share in the working-age population will lead, as a matter of simple algebra, to an increase in per capita output, which gives rise to the first demographic dividend" (Mason, 2005). Based on the above postulate and the analysis in the preceding section, it is abundantly clear that the prospects for the FD depend considerably on employment and labor market conditions.[6] Therefore, in addition to the assessment based on the NTA data, it is pertinent to examine more closely employment and labor market conditions in South Africa. Table 9.1 summarizes some salient features of the country's demographic profile that are relevant for understanding the unemployment situation in South Africa's labor market.

Table 9.1 Salient demographic features of South Africa's labor market

Age group	*Labor-force share*	*Working-age population share*
15–34 (the youth population)	0.50	0.59
35–54	0.43	0.32
55–64	0.07	0.09
Youth-adult ratio	1.00	1.50

Source: http://www.gov.za/documents/download.php?f=165059; numbers computed from State of South Africa's Population Report 2000.

At 52 percent, South Africa's current age-dependency ratio is a vast improvement over the 63 percent status in 1996, just a little over a decade and half ago. The age-dependency ratio measures how many dependents are supported by each person in the working-age group. Since all persons outside the working-age group are not necessarily dependent and given that everybody in the working-age group are not necessarily gainfully employed, the age-dependency ratio differs from the economic dependency ratio. Nonetheless, it is considered a useful indicator of the potential social responsibility shouldered by the working-age group. The 2011 statistics show that the population in age group 15–34, typically considered as the youth population in South Africa's statistical and demographic lexicon, constitutes 59 percent of the working-age population, whereas the 35–54 and 55–64 age groups constitute 32 percent and 9 percent, respectively, of the population, resulting in a youth-to-adult ratio of 1:5 in the working-age population.

Clearly, a substantial asymmetry exists between the working-age population and the labor force in terms of age-group shares. The youth population accounts for half of the labor force, which is (9 percent) less than its share of the working-age population. The reverse occurs in the 35–54 age group that accounts for 43 percent of the labor force but has a higher share (11 percent more) than its proportionate share of the working-age population. The oldest segment of the working-age population, namely the 55–64 age group, is also relatively (2 percent) less represented in the labor force, thus yielding a youth-to-adult ratio of 1:0 in contrast with the 1:5 ratio in the working-age population.

To understand the impact of this demographic profile on the labor market, it is useful to appreciate that the post-apartheid labor market has undergone three different dynamic phases over the periods 1995–2001, 2001–06, and 2006–11. The labor force participation rate increased from 51.4 to 59.4 percent between 1995 and 2001 and has been decreasing since then, first to 58.0 percent by 2006 and further to 54.4 percent in 2011. The unemployment rate increased from 15.6 percent to 30.3 percent between 1995 and 2001 but declined thereafter until it reached 22.6 percent in 2006; then reversed trend and began increasing until reaching 24.9 percent in 2011.[7]

Barring data issues, these trends underlie an important narrative about the changing dynamics of the South African labor market.

First, we should note that the equal employment opportunity created with the end of apartheid in 1995 subsequently triggered a surge in labor market participation as described above. Second, as we seek to assess in this section, this increase in labor force in conjunction with demographic transition can potentially turn the apartheid dividend and demographic dividends into demographic liabilities for the state. Leibbrandt et al. (2010) analyzed data from household and labor force surveys and uncovered the following pattern of growth and decline in labor force participation over the period 1993–2008. These authors classify their findings by race, education level, and age group. Labor force participation changed by race as follows: +25.6 percent for blacks, +5.8 percent for Indians, –6.4 percent for Whites, –10.2 percent for Coloreds; by age group: +43.6 percent for age 16–24, +5.1 percent for age 25–54, and +4.0 percent for age 55–64; by education level: –5.0 percent for the uneducated; +10.8 percent for primary; +12.1 percent for incomplete secondary; +3.1 percent for secondary; and –0.6 for tertiary. Since 1995, changes in unemployment rates have been driven principally by the rate of labor force participation (supply-side factor) and skill-biased shifts in labor demand (demand-side factor), thus suggesting an imbalance in economic dynamics. Apparently economic growth is not generating job vacancies (derived demand for labor) fast enough to satisfy the demand for jobs from a surge in labor supply. Several studies (Bhorat, 2000 and 2003; Kingdon and Knight, 2007; Stats SA, 2012) attribute this economic disequilibrium partially to the inadequate supply of skills to match the needs of a transforming economy. For instance, whereas the fastest growing segment of the labor force has attained secondary education at best, most of the jobs created in the transforming economy require workers with tertiary education.

Rising unemployment associated with rising labor force participation during 1995–2001 largely reflects the influx of new workers, especially young black women, into the labor market. Because these workers are unskilled, most of them could only compete for the limited and rather decreasing supply of available unskilled jobs in the transforming economy. This class of job seekers contributed significantly to the increase in unemployment during the period (Leibbrandt et al., 2010). In the second phase (2001–06), unemployment decreased as labor force participation decreased, largely reflecting the onset of discouragement in the labor market. Many of the young black women who streamed into the labor market between 1995 and 2001 were already in long-term unemployment. In the face of prolonged unemployment and the lack of job prospects for their skill levels, discouragement began to set in, leading to withdrawal from the labor force. The third phase (2006–11) during which unemployment increased as labor force participation decreased reflects continued job losses, reflecting the inability of the economy to generate sufficient new jobs to replace past losses (Kerr et al., 2013), and the reluctance of otherwise new entrants to join the labor force. Therefore, the third phase can be characterized as a period in which the decrease in labor

force participation was largely attributable to a different manifestation of discouragement, namely nonparticipation.

Overall, the evidence (Banerjee et al., 2007; Burger and Yu, 2006; Fedderke and Mariotti, 2002; Hlekiso and Mahlo, 2006; Klein, 2012; Leibbrandt et al., 2005) suggests that wages do not seem to play a decisive role in the continuous increase in unemployment rates, particularly given that unionization rates remain low at 29 percent of employed workforce. Therefore, the continuous rate of job losses in sectors such as mining, manufacturing, agriculture, utilities, construction, and trade that typically employ large numbers of workers, particularly the net rate of job destruction among small firms traditionally considered as major sources of job creation, still await persuasive explanations. More recent labor force statistics, covering the fourth quarter of 2012, show that the labor force grew by 1.9 percent annually while employment grew at 0.6 percent only. Thus, labor force growth continues to outpace the growth of jobs. It would appear that although labor force participation and its demographic and racial profile were the principal drivers of unemployment during the early phase of post-apartheid, the reverse case whereby unemployment drives labor force participation took hold in latter phases. Currently labor force participation appears to be driven largely by the level of discouragement, leading to withdrawal and nonparticipation. The prevailing level of discouragement is in turn driven by the perceived general rate of unemployment arising from lack of jobs. The labor market is viewed now to be in a state where job creation spurs labor force participation and lack thereof engenders discouragement and, hence, a decrease in participation.

Of the various factors examined in the labor market literature on South Africa (Ardington et al., 2009; Christofides et al., 1997; Dibble, 1999; Hodge, 2002; Kaye and Jordan-Evans, 1999; Klasen, 2002; Klasen and Woolard, 2000; Klein, 2012; Posel et al., 2006; Rospabea, 2005; Szelwicki and Tyrowicz, 2009), it appears that the challenges of unemployment rest chiefly on (i) the shortcoming of urban development (including housing) policies and (ii) poor preparation for the transition of the economy toward high-skill economic activities. The former is responsible for the problem of spatial mismatch, while the latter accounts for skill mismatch and the misalignment between wages and productivity in the growing sectors of the economy. We should note that once we assume that there is limited scope for downward adjustment of current wages, perhaps because a majority of the wage earners are on living wages, then productivity must rise in order to resolve the misalignment between wages and productivity in the lead (that is, growing) sectors of the economy. In a nutshell, it appears that investment in human capital formation and skills redevelopment is required.

Additionally, the dynamics of South Africa's unemployment, discussed above, according to which the lack of jobs induces discouragement, which then leads to decreases in labor force participation has other troubling implications for LCD. In making the unemployment situation seem generally less severe than is actually the case, nonparticipation in the labor force

can lead to an underestimation of the scale of the wealth that needs to be accumulated by society (i.e., government, the private sector, or both) in order to compensate for a declining support ratio in the future. Since people make individual retirement plans based on knowledge that is closer to them (bequeath motives and family structure/responsibilities), it is plausible that when there is underestimation in the employment situation arising from the kind of phenomenon in point, the public (that is, government) is more likely to be the less informed party. A family member who drops out of the labor force is still a recognized future liability to his family even if in biasing the unemployment statistics downward, this fact may not be immediately obvious to the public.

9.4 Financial Implications of Demographic Transition: The Second Dividend (SD)

The FD dissipates principally as a result of growth in the share of the elderly in the population. However, anticipation of population ageing that will lead to decline in the support ratio can be a strong incentive to grow life-cycle wealth, thus leading to the SD. So what are the prospects for South Africa's life-cycle wealth accumulation and ability to nurture this nest egg? The NTA data enable us to project demographic profiles onto macroeconomic platforms by defining and generating analytically useful transforms as elaborated in Albrieu and Fanelli (2013).

Adjusted Support Ratio (ASR)

The support ratio (SR) yields information about the potential for reaping the FD. However, the use of the measure in examining the SD requires adjustment of the consumption and income profiles of the NTA to accord with overall evolution of aggregate consumption and income indices. To achieve this, we scale up the support ratio to obtain the adjusted support ratio, which in turn depends on growth of labor income per worker (approximated by growth of per capita GDP) and growth of per capita (final) consumption. The unadjusted and adjusted support ratios are presented in figure 9.6. Three points are noteworthy from the curves. First, although the support ratio has been rising since around the 1980s, the entire curve consistently lies far below one and does not reach that level until the end of the FD. Thus, consumers will effectively continue to outweigh producers substantially in the economy. The support ratio is actually lower when adjusted in line with the trajectories of per capita income and consumption. This implies that demand for government transfers will become a permanent feature of South Africa.

Second, although the trajectories of the curves do not differ significantly, the ASR is more volatile than the SR, reflecting the impact of macroeconomic instability in aggregate income-consumption profile prior to the 1990s. Third, the fact that the curves are upward sloping implies that South

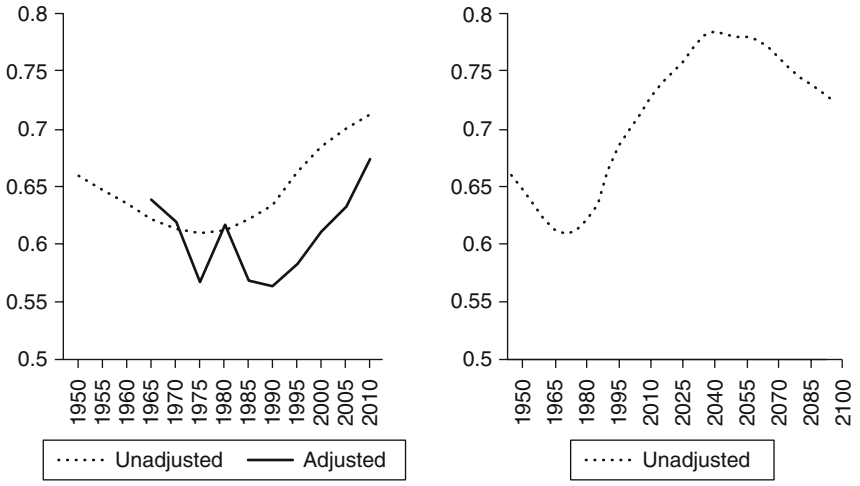

Figure 9.6 Support ratios

Source: NTA, UN population data, WDI, and conference board data.

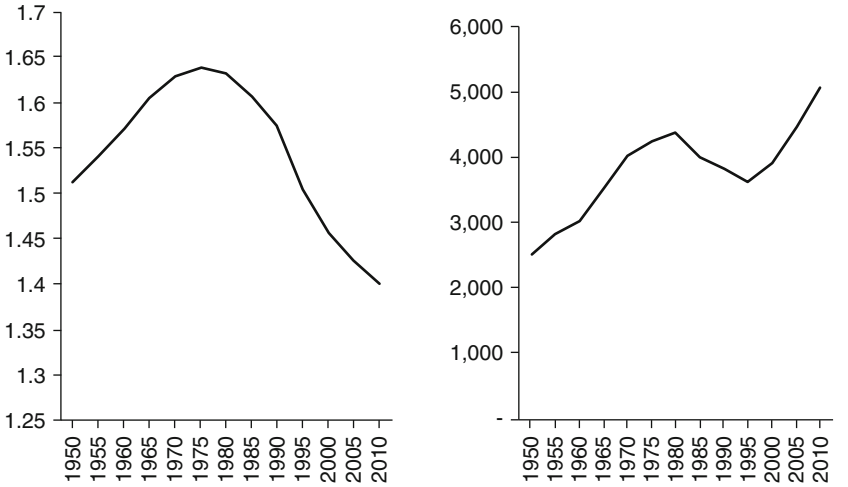

Figure 9.7 Consumption to labor income ratio and per capita GDP

Source: NTA data and the Conference Boards.

Africa actually contributes to, rather than dampens, global financial imbalances. Rising support ratios are indicators of the FD. Other things being equal, the relative growth of producers over consumers should strengthen the income trajectory and lead to a decline in the ratio of consumption to labor income.

A fair assessment of whether the SD will materialize can be obtained by examining the trajectory of the consumption to income ratio. The trajectory

of the consumption/labor income profile presented in figure 9.7 mirrors the trajectory of per capita GDP until 1995 when per capita GDP began to rise while the consumption/income ratio continued to fall. It (the trajectory) thus suggests that consumption increased faster than income during periods of economic boom but declined faster than income during downturns, reflecting a procyclical consumption pattern for South Africa.[8]

There are several potential explanations for the break in similarity between the curves after 1995, such as the decline in the share of children in the population, the decrease in the dependency ratio, and the increase in disposable income. However, rising disposable income seems to be the most plausible factor, given the rising share of the elderly in terms of growth of their share in the population post-1995. The increase in disposable income ceteris paribus should raise the level of savings more or less. But the level of consumption-to-income ratio remains very high in peer comparison terms (observed levels in Brazil and India) suggesting that the FD will not have a large enough impact on savings. Even though South Africa remains within the demographic window of opportunity, a combination of low support ratio and high consumption rates will impede the second demographic dividend.

Aggregate Life-cycle Deficit (LCD)

The aggregate LCD of the economy is the excess of consumption (private and public) of all age cohorts over total labor income. By definition, the LCD is related to the support ratio. A rising share of the elderly in the population will reduce the support ratio and raise the LCD even if government engages in policies to keep the consumption-to-labor-income ratio at a fixed level. A sufficiently high rate of fertility decline could counteract the elderly effect and reduce the LCD or keep it constant while policy makers vigorously pursue income growth policies (see figure 9.8).

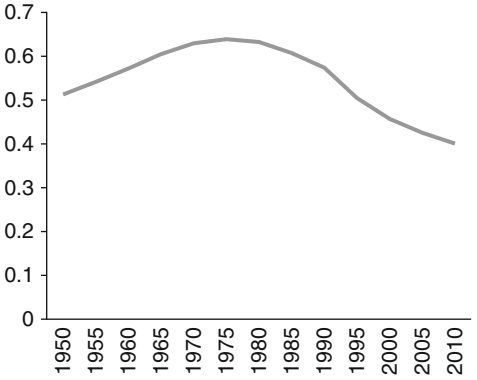

Figure 9.8 Life-cycle deficit to income ratio

Source: NTA data.

Life-cycle Public Transfer Flows and Fiscal Support Ratio

Figure 9.9 shows the age profile of per capita public transfer inflows (child, disability, and old-age grants) and outflows (taxes and fees used to fund the transfers) obtained from the South African NTA.

One important feature of the transfer flows is that the elderly seem to be paying taxes and fees from their earnings. Ordinarily, retirement benefits and old age grant recipients often pay very little or no taxes. However, figure 9.9 places the South African taxation system out of such culture.[9] The high incidence of taxation of the elderly has potential implications for the support ratio and for the sustainability of transfers in the future.

The fiscal support ratio (FSR) is useful in assessing the linkages between the support ratio (SR) and government budget as well as overall financial relationships. The FSR is a relationship between effective number of taxpayers and effective recipients of public transfers, whereas the adjusted fiscal support ratio (AFSR) is computed by scaling the FSR using the relative growth rates of per capita aggregate consumption and income indices.

The trend of FSR is similar to that of SR. However, the FSR is close to or higher that one while the SR is far below one. Indeed, effective taxpayers began to outstrip effective transfer recipients from 2000 as the FSR crossed the unit threshold. Although in terms of their share in the national population, the elderly outstripped the working age during this period, the profile of public transfers shows that the elderly continue to contribute substantially to taxation income. Thus, continual decrease in the share of children who are

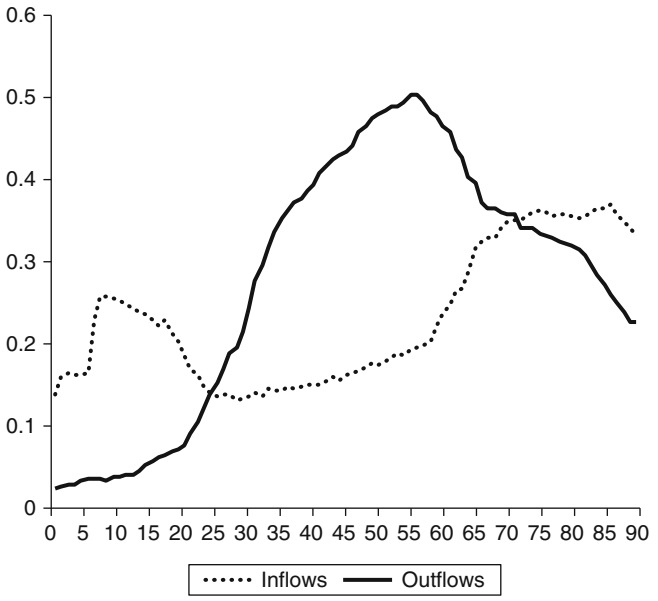

Figure 9.9 Public transfers

Source: National Transfer Accounts.

primarily consumers and transfer recipients, and taxes on old-age earnings ensure that the effective number of taxpayers continues to grow. Under the scenario of medium fertility, the fiscal support ratio continues to rise, reaching a peak in 2070 before it begins to decline gradually.

We observe from figure 9.10 that the AFSR followed the same trend as the FSR from around the 1990s, despite adjustments in the relative growth of per capita consumption and per capita GDP. This outcome is mainly due to similarities in the trajectories of consumption and income even though per capita consumption grew at a permanently lower rate than per capita GDP. Ideally, the FSR should be adjusted by the trajectory of per capita taxation

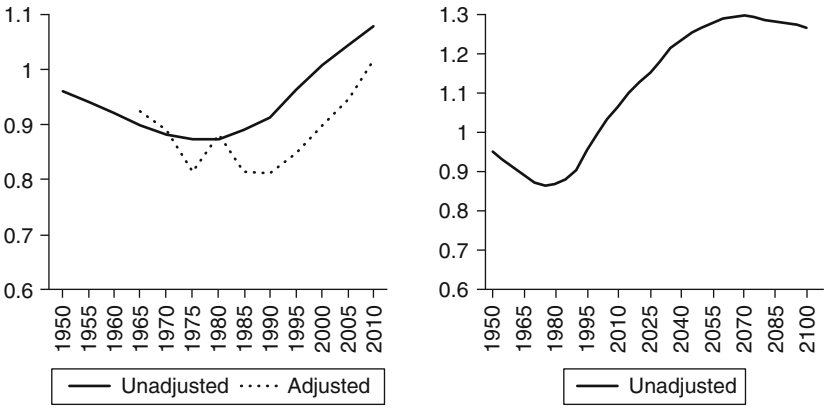

Figure 9.10 Fiscal support ratios

Source: NTA data and UN population data and (medium fertility) projections.

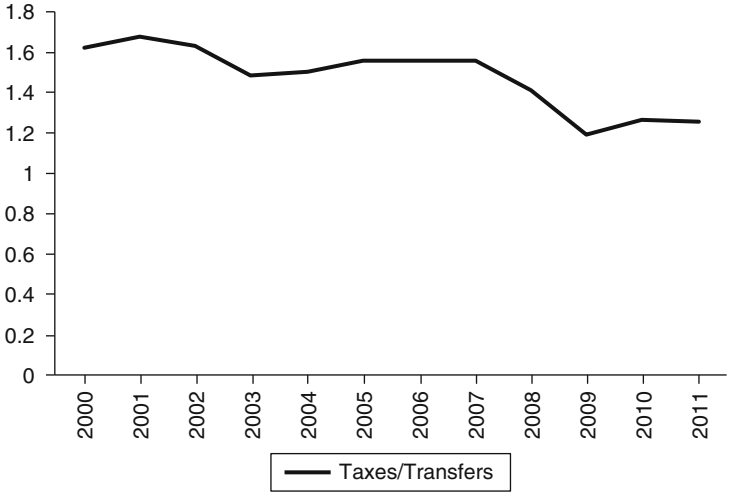

Figure 9.11 Trajectory of public transfers

Source: WDI.

and transfers from the national accounts. Nonavailability of these data for the entire span of the analysis prevents computation of the adjusted fiscal support ratio on that basis. However, the available data show that the ratio of government tax revenue to subsidies and transfers (figure 9.11) followed a downward trajectory since 2001, falling from 1.68 to 1.25 in 2011.

9.5 Demographic Transition and National Wealth

This section elaborates the role of demographic factors in aggregate portfolio allocation (i.e., the demand for life-cycle wealth and how that demand is financed) thus linking LCD, SR, as well as FSR to savings and national wealth. There are three spheres of influence, namely the private sector, the public sector, and the aggregate economy.

The Private Sector

Private savings is the sum of private capital income $\Upsilon_p(t)$ and net transfers from government $T(t)$ minus the LCD, $LCD(t)$:

$$S_p(t) = \Upsilon_p(t) + T(t) - LCD(t)\,. \tag{9.1}$$

Substituting equivalent expressions that capture the effect of demographic changes, (9.1) becomes

$$S_p(t) = \Upsilon_p(t) + G(t)(1 - AFSR(t)) - C(t)(1 - ASR(t)) \tag{9.2}$$

where $G(t)$ is transfers, $C(t)$is private consumption, $AFSR(t)$ and $FRS(t)$ are respectively adjusted fiscal support ratio and fiscal support ratio. In the private sector's budget constraint, savings must equal wealth accumulation in the form of additions to private capital $K_p\,(t)$, government bonds $B_p(t)$, and foreign assets held by residents $F_p(t)$. Therefore,

$$\begin{aligned} S_p(t) &= \Upsilon_p(t) + G(t)(1 - AFSR(t)) - C(t)(1 - ASR(t)) \\ &= \Delta K_p(t) + \Delta B_p(t) + \Delta F_p(t). \end{aligned} \tag{9.3}$$

However, saving and asset accumulation decisions are forward looking. We reflect this in terms of the time horizon of decision-making agents. We consider that the time horizon will be different for different age cohorts in the population and will depend on longevity expectations. We denote the population time horizon by Z and assume that it is a function of the average age of the population and life expectancy. We discount future asset accumulations in order to arrive at a discounted value of asset flows of future cohorts. The present discounted value of planned asset accumulation by the set of cohorts alive between time t and $t + Z$ is given by

$$A_p(t,Z) = A_p(t-1) + \sum_{z=0}^{z=Z}\Big[\Upsilon_p(t,z) + G(t,z)(1-AFSR(t,z))\Big]\theta_z - \sum_{z=0}^{z=Z}\big[C(t,z)(1-ASR(t,z))\big]\theta_z$$

where A_p is the stock of private wealth and θ is the discount factor. The last term of the right side of equation (9.3) is the value of life-cycle wealth that the same set of cohorts intends to demand between time t and $t + Z$,

$$LCW(t,Z) = \sum_{z=0}^{z=Z}\big[C(t,z)(1-ASR(t,z))\big]\theta_z = \sum_{z=0}^{z=Z}\big[LCD(t,z)\big]\theta_z \tag{9.4}$$

whereas the middle term is the transfer wealth that will contribute to this demand

$$TW(t,Z) = \sum_{z=0}^{z=Z}\big[G(t,z)(1-AFSR(t,z))\big]\theta_z \tag{9.5}$$

Consequently the amount of life-cycle wealth that the cohort alive between time t and $t + Z$ will demand is given by

$$LCW(t,Z) = \sum_{z=0}^{z=Z}[LCD(t,z)]\theta_z = \sum_{z=0}^{z=Z}\Upsilon_p(t,z)\theta_z + TW(t,Z) - [A_p(t,Z) - A_p(t-1)] \tag{9.6}$$

The Government

Public income is defined as the sum of income from the government's holding of foreign assets $F_g(t)$ and physical capital $K_g(t)$ less interest on public debt, $B(t)$. Public savings therefore is the difference between this income and net transfers:

$$S_g(t) = \Upsilon_g(t) - G(t)(1-AFSR(t)) = \Delta F_g(t) + \Delta K_g(t) - \Delta B(t) \tag{9.7}$$

In the presence of global demographic asymmetries, the government's time planning horizon will be different from that of the private sector. However, the time horizon will also be influenced by political economy variables, which are driven by the preferences of political elites. The decisions of these elites would be, in turn, shaped by the structure of political competition, thus rendering the government's time horizon endogenous. Sidestepping the interdependency issue for the moment, the forward-looking behavior of the government has a significant impact on the extent of allocation of savings between transfer wealth and asset accumulation, which clearly affects the realization of the SD.

Similar to the private sector, the stock of assets held by the government at the end of the planning horizon is given by

$$A_g(t,Z) = A_g(t-1) + \sum_{z=0}^{z=Z}\left[\Upsilon_g(t,z) - G(t,z)(1 - AFSR(t,z))\right]\theta_z. \qquad (9.8)$$

The Aggregate Economy

In the aggregate economy, total savings of the economy is the sum of private and public sector savings:

$$A(t,Z) = A_p(t-1) + A_g(t-1) = \sum_{z=0}^{z=Z}\left[\Upsilon_p(t,z) + \Upsilon_g(t,z)\right]\theta_z - LCW(t,Z) \qquad (9.9)$$

Thus, an increase in demand for life-cycle wealth will reduce the stock of assets at the end of the period unless compensated by an increase in earnings from foreign assets. To simplify, we have created a bigger picture by simulating the asset allocation path of the economy across 2000 to 2045. The figures for 2000–10 are actual data while those for 2015–45 are projections. The results are presented in figures 9.12 and 9.13.

The choice of the forecast horizon is based on the premise that the FD will disappear by 2045. The first set of projections labeled "baseline" reflects only the effect of demographic changes. That is, we simply use the UN population

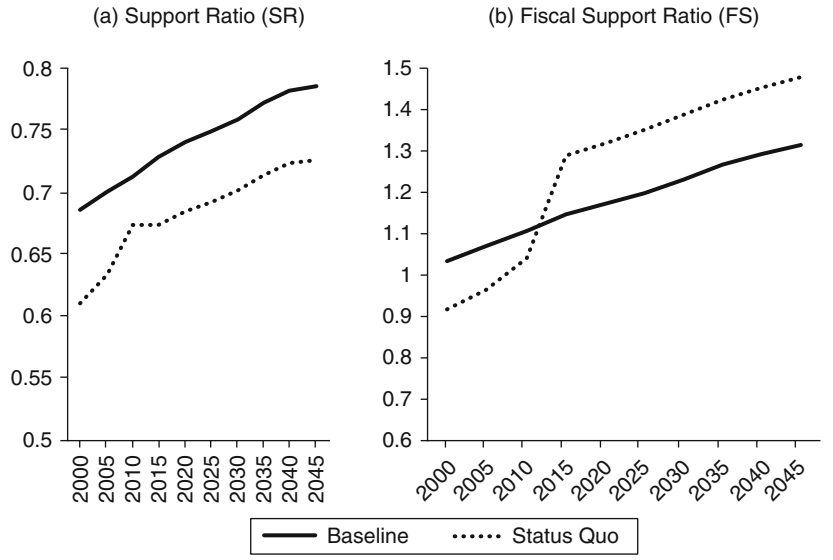

Figure 9.12 Support ratios

Source: NTA, UN population data, WDI, and conference board.

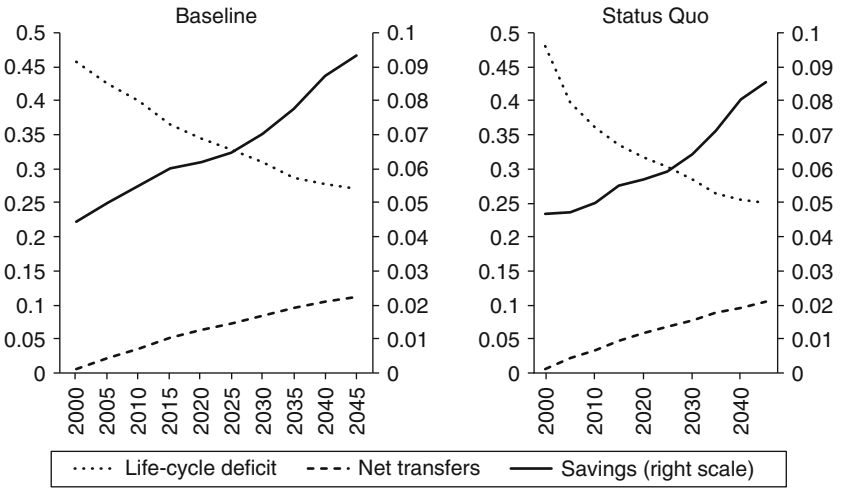

Figure 9.13 Forecast of macro variables. Figures are proportions of income (those beyond 2010 are projections)

Source: NTA, UN population data, and WDI.

projections (the medium fertility scenario) and the NTA to forecast the state of individual variables assuming that per capita income and consumption profiles are constant. Thus, we assume that unemployment rates and labor force participation rates will continue at the present rates into the near future. The second set of projections (in figure 9.12) labeled "status quo" considers the effect of technical progress in terms of macroeconomic outcomes. It assumes that the macroeconomic conditions, here captured by growth of per capita GDP and final consumption observed between 2000 and 2010, will repeat themselves in the future. Figure 9.12 presents the results for the support ratio (SR) and the fiscal support ratio (FSR).

1. The baseline scenario yields a rising SR that does not reach the threshold of one, ensuring that the private sector in South Africa will always generate LCDs. This will require either continuing government transfers or the expansion of the financial system to accommodate the consequent demand for deficit financing or both.
2. The status quo projections imply that if per capita income does not grow faster than the growth of consumption over the next few decades, the support ratio will fall and LCDs will expand, again requiring the government or the private sector to assume even more burden.
3. The key message here is that South Africa will have to speed up job creation efforts, and as a consequence, achieve high rates of income growth in order to reduce the rising levels of LCD.
4. The government should be alert to (i) a growing proportion of the population that will not contribute to employment income taxation

and (ii) a growing base of the elderly that will not contribute taxation income in the future.

5. Consequently the outflows curve in the life-cycle public transfers in figure 9.9 will shift downward. The fiscal support ratio will fall and the solvency of the public support system will be threatened (the Tito Mboweni thesis).

In conclusion, the South African demographic window of opportunity is driven principally by the youth population. But low skills and joblessness that altogether deprive the youth of opportunities for earning and saving effectively constrains the extent to which the demographic dividend is realizable. Indeed, the South African economy will be accumulating fewer resources for the future. In the absence of policies to alter the trajectory, the earnings profile would mean a pending pressure on the state for old-age benefits when, instead, individuals should be consuming their accumulated savings.

9.6 Summary and Conclusions

This study examined the effects of the evolution of the working-age population on per capita GDP, as well as the trajectory of wealth accumulation to fund retirement by the working-age population. The idea is that if society is sufficiently forward looking to "get rich before getting old" and "to avoid becoming poorer as they age" (CEDES, 2012), the resultant accumulated capital (to fund this eventuality) represents a permanent increase both in the capital intensity of the economy and worker productivity.

To assess the prospects of achieving the above macroeconomic and financial outcomes, we studied the conditions for realizing these demographic dividends and discovered that the South African demographic window of opportunity is driven principally by the youth population. However, widespread job requirements versus job seekers' skills mismatch and the resulting joblessness that altogether deprives the youth of opportunities for saving effectively constrains the extent to which the demographic dividends are realizable. Indeed, the South African economy will be accumulating fewer resources for the future. In the absence of policies to alter the trajectory, the earnings profile would mean a pending pressure on the state to fund old-age benefits when instead individuals should be consuming their accumulated savings. However, policies that alter life-cycle savings-consumption behavior and promote aggressive resource mobilization may be helpful in narrowing the funding gap.

It is important to note the potential impact of current public expenditure on the trajectory of labor income and the LCD. As noted in the introduction, expenditure on health and education makes up a substantial component of gross public spending. As these human capital expenditure components carry the potential to alter the quantity and the level of skill (quality) of labor in the future, they are crucial investment but are, nonetheless, classified as

consumption. This can be misleading or confusing in public discourse on financial prudence.

We would like to conclude by emphasizing that South Africa already allocates a sizable proportion of its budget to health, education, and housing but it would appear that tracking the quality of the spending has not kept up with the scale of the outlay. The marginal efficiency of public spending has not been a policy priority but ought to be emphasized, particularly given the likely future trajectory of FSR. This suggests that investing in efficient mechanisms for monitoring and evaluation (audit technologies) promises a high payoff. However, it is to be complemented with a credible law enforcement regime. Ideally, the enforcement regime should comprise the tracing, identifying, and recovery of stolen public assets. Compliance monitoring and enforcement are strategic complementarities in the fight against corruption. The widespread perception of corruption dampens national aspiration and impedes efforts to cultivate high saving propensity and the culture of tax compliance.

Notes

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1. Twenty percent of the adult population is infected with HIV AIDS (www.statssa.gov.za)
2. Statistics South Africa (Stat SA) in its quarterly Labor Force Survey estimates the number of unemployed people at 4.6 million inclusive of 100,000 people who joined the unemployment pool between the fourth quarter of 2012 and the first quarter of 2013 to place the unemployment rate officially at 25.2 percent. Using the expanded definition of unemployment that includes those who have stopped searching, the rate jumps to 36.7 percent. Statistics South Africa is an independent agency established by legislation to collect, produce, and disseminate official and other statistics including organizing and conducting population census; see www.statssa.gov.za. The agency's definition of unemployment is a person aged between 15–64 who was without a job in the week preceding the interview (survey) but who is searching and available to work or open a business (willing and ready to be gainfully employed).
3. These estimates range from 2.6 million to the upper bound of 3.1 million; the latter is based on (i) the mid-year estimate of total population in 2013 as released by Stats SA and (ii) a population ratio of 6 percent for those over 65 years old. We reckon that the demographic window of South Africa will last approximately 56 years from 2013 to 2069.
4. The NTA is available for 2005 only.

5. It is still not clear why this is the case. Is it due to a correction of the population undercount presumably practiced during the apartheid regime or could there be other equally plausible explanations?
6. The NTA was constructed using data for 2005. Thus labor market outcomes should be benchmarked against the conditions in 2005.
7. The unemployment rates have also been computed on a broad-based definition that eliminates the requirement of having actively searched for a job in the previous four weeks to qualify as being unemployed. This expanded definition implies that individuals who have been looking for jobs for a period less than four weeks will now be included in the unemployed category. On this basis, the labor force participation rates jumped to 60.3 percent in 1995 and 71.2 percent in 2005 while unemployment rates increased from 28.2 percent in 1995 to 41.1 percent in 2005.
8. This regularity presents an empirical challenge to proponents of the permanent income hypothesis but supports the hyperbolic consumption view. For more on this, see Angeletos et al. (2001). Their model is relevant here in highlighting dynamic inconsistencies that force hyperbolic consumers (most of us are) to grapple with "interpersonal strategic conflict." The issues raised by these authors are similar to those emphasized in Thaler (1990) in the context of life-cycle saving decisions and apply as well to a wide range of behavioral contexts including "procrastination, contract design, drug addiction, self-deception, retirement timing, and under-saving." In this chapter, it underscores the role of financial institutions in supplying perfect or near perfect commitment technology to assist economic agents in resolving interpersonal strategic conflict that militate against life-cycle wealth accumulation. In the South Africa context, the pro-cyclical consumption pattern can also be indicative of insufficient financial market integration (which may be preventing aggregate consumption smoothing). For more on this respecting South Africa, see Ayogu and Dezhbakhsh (2005).
9. It is quite conceivable that the South African exception is correcting for extreme wealth inequality from historical antecedents. Presumably the policy could be reversed in the distant future although its mitigating effect on fiscal pressure makes its persistence lucrative.

Bibliography

Acharyaa, R., and S. Kar. (2005). "Trade Liberalization, Migration and Poverty." Presented in the seminar Macroeconomic Policy Challenges for Low-Income Countries, Washington, DC: Global Development Network.

Aizenman J., and J. Lee. (2008). "Financial versus Monetary Mercantilism: Long-run View of Large International Reserves Hoarding." *The World Economy*, 31(5): 593–611, 05.

Albrieu, R., and J. M. Fanelli. (2013). "On the Macroeconomic and Financial Implications of the Demographic Transition." Paper presented in the IX meeting of the working group on Macroeconomic Aspects of Intergenerational Transfers, Faculty of Economics, University of Barcelona, June 3–8, 2013.

Angeletos, G., D. Laibson, A. Repetto, J. Tobacman, and S. Weinberg. (2001). "The Hyperbolic Consumption Model: Calibration, Simulation, and Empirical Evaluation." *Journal of Economic Perspectives*, 15(3): 47–58.

Ardington, C., A. Case, and V. Hosegood. (2009). '"Labor Supply Responses to Large Social Transfers: Longitudinal Evidence from South Africa." *American Economic Journal: Applied Economics*, 1(1): 22–48.

Ashraf, N., D. Karlan, and W. Yin. (2006). "Tying Odysseus to the Mast: Evidence from a Commitment Savings Product in the Philippines." *Quarterly Journal of Economics*, 121(2): 635–72.

Ashraf, Q., D. Weil, and J. Wilde. (2011). "The Effect of Interventions to Reduce Fertility on Economic Growth." NBER working paper 17377, August.

Ashton, Basil, Kenneth Hill, Allan Piazza, Robin Zeitz. (1984). "Famine in China, 1958–61." *Population and Development Review*, 10(4): 613–45.

Attanasio, Orazio, Sagiri Kitao, and Giovanni L. Violante. (2006). "Quantifying the Effects of the Demographic Transition in Developing Economies." *Advances in Macroeconomics*, 6(1) Article 2: 1–44.

Attanasio, Orazio, Sagiri Kitao, and Giovanni L. Violante. (2007). "Global Demographic Trends and Social Security Reform." *Journal of Monetary Economics*, 54: 144–198.

Ayogu, M., and H. Dezhbakhsh. (2008) "South Africa." In *Macroeconomic Volatility, Institutions and Financial Architectures: The Developing World Experience*, ed. J. M. Fanelli. New York: Palgrave Macmillan, 316–46.

Bagella, M., L. Becchetti, I. Hasan. (2004). "The Anticipated and Concurring Effects of the EMU: Exchange Rate Volatility, Institutions and Growth." *Journal of International Money and Finance*, 23: 1053–80.

Bai, J., and P. Perron. (2003). "Computation and Analysis of Multiple Structural Change Models." *Journal of Applied Econometrics*, 18(1): 1–22.

Baily, Martin Neil, and Jacob Funk Kirkegaard. (2009). *US Pension Reform: Lessons from Other Countries.* Washington: Peterson Institute for International Economics.

Banerjee, A., R. L. Lumsdaine, and J. H. Stock. (1992). "Recursive and Sequential Tests of the Unit Root and Trend Break Hypotheses: Theory and International Evidence." *Journal of Business and Economic Statistics*, 10(3): 271–87.

Banister, J. (1987). *China's Changing Population*. Stanford: Stanford University Press.

Baranowska, P. (2013). "More People on Benefits than employment in South Africa," The South African.com. http://www.thesouthafrican.com/news/more-people-on-benefits-than-in-employment.htm. Accessed July 7, 2013.

Barreto, F. (1997). "Três ensaios sobre reforma de sistemas previdenciários." PhD dissertation, Fundacion Getulio Vargas, EPGE/FGV/RJ, 1997.

Barreto, F., and L. Oliveira. (2001). "Transição para regimes previdenciários de capitalizaçãao e seus efeitos macroeconômicos de longo prazo no Brasil." *Estudos Econômicos*, 31: 57–87.

Basu, K. (1997). *Analytical Development Economics. The Less Developed Economy Revisited*. Cambridge, MA: MIT Press.

Basu, P. (2006). *Improving Access to Finance for India's Rural Poor*. Report No. 36448. Washington: World Bank.

Becker, G., and H. G. Lewis. (1973). "On the Interaction between the Quantity and Quality of Children." *Journal of Political Economy* 81(2): S279–88.

Becker, J. (1998). *Hungry Ghosts: Mao's Secret Famine*. New York: Henry Holt.

Bernanke, B. S. (2005). "The Global Saving Glut and the U.S. Current Account Deficit." Speech delivered for the Sandridge Lecture at the Virginia Association of Economists, Richmond. March 10, www.federalreserve.gov/boarddocs/speeches/2005/200503102/default.htm

Bernanke, B. S. (2007). "Global Imbalances: Recent Developments and Prospect." Speech delivered at the Bundesbank, Berlin, Germany. September 11 http://www.federalreserve.gov/newsevents/speech/bernanke20070911a.htm

Bhaumik, S. K., S. Gangopadhyay, S. Krishnan. (2006). "Reforms, Entry and Productivity: Some Evidence from the Indian Manufacturing Sector." IZA Discussion Paper 2086, Bonn.

Bhorat, H. (2000). "Decomposing Sectoral Employment Trends in South Africa." Development Policy Research Unit. School of Economics, University of Cape Town.Mimeo.

Bhorat, H. (2003). "The Post-Apartheid Challenge: Labor Demand Trends in the South African Labor Market, 1995–1999." Development Policy Research Unit, School of Economics, UCT working paper no. 03/82.

Blanchard, Olivier. (1985). "Debt, Deficits and Finite Horizons." *Journal of Political Economy*, 93: 223–47.

Blanchard, O., and G. M. Milesi-Ferretti. (2009). "Global Imbalances: In Midstream?"IMF, Staff Position Note, December 22.

Blanchard, O., and G. M. Milesi-Ferretti. (2011). "(Why) Should Current Account Balances be Reduced?" IMF, Research Department, March.

Bloom, D., and J. E. Finlay. (2008). "Demographic Change and Economic Growth in Asia." *Asian Economic Policy Review*, Japan Center for Economic Research, 4(1): 45–64.

Bloom, D., and J. Williamson. (1997). "Demographic Transitions and Economic Miracles in Emerging Asia." NBER working paper series, vol. w6268. Available at SSRN http://ssrn.com/abstract=226025

Bloom, D. E., D. Canning, and B. Graham. (2003). "Longevity and Life-Cycle Saving." *Scandinavian Journal of Economics*, 105(3): 319–38.

Bloom, D., D. Canning, and J. Sevilla. (2003). "The Demographic Dividend. A New Perspective on the Economic Consequences of Population Change." Rand Monograph Report 1274.

Bloom, David E. (2011). "7 Billion and Counting." *Science*, 333 (July 29): 562–69.

Bloom, David E., David Canning, and Guenther Fink. (2010). "Population Aging and Economic Growth." In *Globalization and Growth*, ed. Michael Spence and Danny Leipziger. Cambridge, MA: MIT Press.

Bloom, David E., David Canning, Guenther Fink, and Jocelyn E. Finlay. (2009). "Fertility, Female Labor Force Participation, and the Demographic Dividend." *Journal of Economic Growth*, 14: 79–101.

Boldrin, M., A. Khan, and L. Jones. (2005). "Three Equations Generating an Industrial Revolution?" Mimeo.

Bryant, R. C. (2005). "Asymmetric Demographic Transitions and North-South Capital Flows." Available at http://www.brookings.edu/~/media/research/files/papers/2006/5/globaleconomics%20bryant/200605.pdf

Bryant, R. C. (2006). "Asymmetric Demography and Macroeconomic Interactions Across National Borders." In *Demography and Financial Markets*, ed. Christopher Kent, Anna Park, y Daniel Rees. (Eds.). Proceedings of a conference held in Sydney on July 23–25, 2006, the G-20.

Buiter, H., and E. Rahbari. (2010). "Sovereign Debt Crisis Update." *Citi Economics, Global Economic Outlook and Strategy*, November 29, 2010.

Burger, R., and D. Yu. (2007). "Wage Trends in Post-Apartheid South Africa: Constructing an Earning Series from Household Survey Data." Development Policy Research Unit working paper 07/117.

Cai F., and D. Wang. (2005). "Demographic Transition: Implications for Growth." In *The China Boom and its Discontents*, ed. Garnaut and Song. Canberra: Asia-Pacific Press.

Cai, Fang. (2008). *Lewis Turning Point: A Coming New Stage of China's Economic Development*. Beijing, China: Social Sciences Academic Press.

Cai, Fang. (2010). "Demographic Transition, Demographic Dividend, and Lewis Turning Point in China." *China Economic Journal*, 3(2): 107–19.

Cai, Fang, and Meiyan Wang. (2009). "China's Process of Ageing before Getting Rich." In *The China Population and Labour Yearbook, Volume 1: The Approaching Lewis Turning Point and Its Policy Implications*, eds. Cai Fang and Du Yang. Leiden and Boston: Brill, 49–64.

Cai, Yong. (2008). "An Assessment of China's Fertility Level Using the Variable-r Method." *Demography*, 45(2): 271–81.

Callahan, Daniel, and Angela A. Wasunna. (2006). *Medicine and the Market*, Baltimore: Johns Hopkins University Press.

Camdessus, M. (2000). "An Agenda for the IMF at the Start of the 21st Century." Remarks at the Council on Foreign Relations, February, New York.

Cao, Shuiji. (2005). *The Great Famine: China's Population in 1959–1961* (Da Jihuang: 1959–1961 Nian de Zhongguo Renkou). Hong Kong Times International Press.

Carvalho, José Alberto M. (2004). "Crescimento populacional e estrutura demográfica no Brasil." Mimeo, Belo Horizonte: UFMG/Cedeplar.

Caselli, F., and J. Freyer. (2007). 'The Marginal Product of Capital,' *Quarterly Journal of Economics*, 122 (2): 535–68.

CEDES. (2012). "Asymmetric Demography, Financial Development, and Global Governance." Concept paper for the project "Asymmetric Demography and Global Financial Governance."

Chattopadhyay, S. (2011). *Impact of Economic Reforms on Distribution of Agricultural Credit in India*. Unpublished PhD thesis, Jadavpur University, Kolkata, India.

Chavan, P. (2005). "How 'Inclusive' are Banks under Financial Liberalisation?" *Economic and Political Weekly*, 4647–49.

Christofides, L. N., S. Thanasis, and R. Swidinsky. (1997). "Welfare Participation and Labor Market Behavior in Canada." *Canadian Journal of Economics*, 30(3): 595–621.

Claessens, S., G. Dell'Ariccia, D. Igan, and L. Laeven. 2010. "Cross-Country Experience and Policy Implications from the Global Financial Crisis." *Economic Policy. A European Forum*, 62 (April): 269–93.

Clark, G. (2001). "The Industrial Revolution as a Demographic Event." Mimeo, UC Davis.

Clark, Robert, Naohiro Ogawa, and Andrew Mason, eds. (2009). *Population Aging, Intergenerational Transfers and the Macroeconomy*. Cheltenham, UK: Edward Elgar.

Coale, Ashley J. (1984). *Rapid Population Change in China, 1952–1982*. Washington DC: National Academy Press.

Cooper, Richard N. (2014). "Demography, Economic Growth, and Capital Flows." this volume.

Cooper, Richard N. (2008). "Global Imbalances: Globalization, Demography, and Sustainability." *Journal of Economic Perspectives*, 22(3): 93–112.

Cotlear, Daniel, ed. (2011). *Population Aging: Is Latin America Ready?* Washington, DC: World Bank.

Cottarelli, Carlo, and Mario I. Blejer. (1992). "Forced Saving and Repressed Inflation in the Soviet Union, 1986–90—Some Empirical Results." *IMF Staff Papers*, 39(2): 256–86.

Cutler, J., J. Poterba, L. Sheiner, and L. Summers. (1990). "An Aging Society: Opportunity or Challenge?!" *Brooking Papers on Economic Activity* 1: 1–73.

Das, P. K., and B. Guha-Khasnabis. (2005). "Finance and Growth—An Empirical Assessment of the Indian Economy." In *Finance for Growth and Poverty Reduction*, ed. B. Guha-Khasnabis and G. Mavrotas. New York: Palgrave.

Davis, P. (2006). "How Will Ageing Affect the Structure of Financial Markets?" In *Demography and Financial Markets*, ed. Christopher Kent, Anna Park, and Daniel Rees. Proceedings of a conference held in Sydney on July 23–25, 2006.

Deardorff, A. V. (2005). "A Trade Theorist's take on Skilled Labor Outsourcing." *International Review of Economics and Finance*, 14(3): 259–71.

De Mello, J. M., and M. Garcia. (2012). "Bye, Bye Financial Repression, Hello Financial Deepening: The Anatomy of a Financial Boom." *The Quarterly Review of Economics and Finance*, 52: 135–53.

Dervis, K. (2012). "Convergence, Interdependence, and Divergence." *Finance and Development*, 49(3): 16.

DESA. (Department of Economic and Social Affairs, Population Division, UN). (2011). *World Population Prospects: The 2010 Revision*. Available at http://esa.un.org/wpp/Excel-Data/population.htm

Devika, J. (2008). "Post-Demographic Transition Research on Childcare in Kerala." *Economic and Political Weekly*, 43(5): 15–18.

Dibble, S. (1999). *Keeping Your Valuable Employees: Retention Strategies for Your Organization's Most Important Resource*. New York: John Wiley.

Dikötter, Frank. (2010). *Mao's Great Famine: The History of China's Most Devastating Catastrophe, 1958–1962*. London: Bloomsbury.

Dooley, M. P., D. Folkerts-Landau, and P. Garber. (2003). "An Essay on the Revived Bretton Woods System." NBER working paper no. 9971, September.

Drazen, A. (2000). *Political Economy in Macroeconomics*. Princeton: Princeton University Press.

Dutta, N., S. Kar, and S. Roy. (2013). "Corruption and Persistent Informality: An Empirical Investigation for India." *International Review of Economics and Finance*, 27: 357–73.

Dyson, Tim. (2008). *India's Demographic Transition and its Consequences for Development*. Golden Jubilee Lecture Series, Institute of Economic Growth, New Delhi.

Eichengreen, Barry. (2007). *Global Imbalances and the Lessons of Bretton Woods*. Cambridge: MIT Press.

Eichengreen, Barry, and Richard Baldwin. (Eds.). (2008). *Rescuing Our Jobs And Savings: What G7/8 Leaders Can Do To Solve The Global Credit Crisis*. London: CEPR: VoxEU.

Eichengreen, Barry, Donghyung Park, and Kwanho Shin. (2012). "When Fast Growing Economies Slow Down: International Evidence and Implications for China," Asian Economic Papers, 11, 42–87.

Eichengreen, Barry, Donghyung Park, and Kwanho Shin. (2013). "Growth Slowdowns Redux: New Evidence on the Middle-Income Trap." NBER Working Paper No. w18673.

Ellery Jr., Roberto G., Mirta N. S. Bugarin. (2003). "Previdência Social e Bem Estar no Brasil." *Revista Brasileira de Economia*, 57: 27–57.

Epstein, Larry, and Stanley Zin. (1989). "Substitution, Risk Aversion, and the Temporal Behavior of Consumption and Asset Returns: A Theoretical Framework." *Econometrica*, 57: 937–69.

EPW Research Foundation. (2007). "Rural Credit Structure Needs Genuine Revitalisation." *Economic and Political Weekly*, 42(20): 1802–08.

Erten, Bilge, and José Antonio Ocampo. (2013), "Building a Stable and Equitable Global Monetary System." In *Alternative Development Strategies for the Post/2015 Era*, ed. José Antonio Alonso, Giovanni Andrea Cornia, and Rob vos., New York: Bloomsbury, Chapter 9.

Fanelli, J. M. (2008). *Macroeconomic Volatility, Institutions and Financial Architectures*. Palgrave Macmillan.

Fanelli, J. M., and G. McMahon. (2005). *Understanding Market Reforms*. New York: Palgrave Macmillan.

Farmer, Roger. (1990). "RINCE Preferences." *Quarterly Journal of Economics*, 105: 43–60.

Fedderke, J. W., and M. Mariotti. (2002). "Changing Labor Market Conditions in South Africa: A Sectoral Analysis for the Period 1970–1997." *South African Journal of Economics*, 70(5): 830–64.

Feldstein, M., and C. Horioka. (1980), "Domestic Savings and Interdomestic Capital Flows." *Economic Journal*, 90: 314–29.

Ferrero, Andrea. (2010). "A Structural Decomposition of the U.S. Trade Balance: Productivity, Demographics and Fiscal Policy," *Journal of Monetary Economics*, 57: 478–90.

Foster, A., and M. R. Rosenzweig. (2004). "Agricultural Productivity Growth, Rural Economic Diversity, and Economic Reforms: India, 1970 2000." *Economic Development and Cultural Change*, 52: 509–42.

Gallagher, K. P., and J. A. Ocampo. (2013). "IMF's New View on Capital Controls." *Economic and Political Weekly*, 48(12) (March 23): 10–13. Available at http://www.epw.in/system/files/pdf/2013_48/12/IMFs_New_View_on_Capital_Controls.pdf

Gallagher, Kevin P., Stephany Griffith-Jones, and José Antonio Ocampo. (Eds.). (2012). *Regulating Global Capital Flows for Long-Run Development*, Boston: Boston University, Pardee Center Task Force Report, March.

Galor, O. (2005). "The Demographic Transition and the Emergence of Sustained Economic Growth." *Journal of the European Economic Association*, 3: 494–504.

Galor, Oded. (2011). *Unified Growth Theory*, Princeton: Princeton University Press.

Garnaut, Ross, and Yiping Huang. (2006). "Continued Rapid Growth and the Turning Point in China's Development." In *The Turning Point In China's Economic Development*, ed. Ross Garnaut and Ligang Song. Canberra: The Australian National University E-Press, 12–34.

Gertler, Mark. (1999). "Government Debt and Social Security in a Life-Cycle Economy." Carnegie-Rochester Conference Series on Public Policy 50: 61–110.

Giambiagi, Fabio, and Paulo Tafner. (2010). *Demografia: a ameaça invisível*. Elsevier: Rio de Janeiro.

Government of India. (1991). *National Sample Survey Organisation*, All India Debt and Investment Survey (AIDIS), Mumbai.

Government of India. (2002). *National Sample Survey Organisation*, All India Debt and Investment Survey (AIDIS), Mumbai.

Government of India. (2007a). *National Sample Survey Organisation*, Operational Characteristics of Unorganised Manufacturing Enterprises in India 2005–06, 62nd Round, Report No. 524(62/2.2/1).

Government of India. (2007b). *National Sample Survey Organisation*, Unorganised Manufacturing Sector in India: Input, Output and Value Added 2005–06, 62nd Round, Report No. 526(62/2.2/3).

Government of India. (2008). *A Report on the Success and Failure of SHG's in India—Impediments and Paradigm of Success*, Planning Commission of India, New Delhi.

Group of 20. (G-20). (2011a). "Communiqué, Meeting of Finance Ministers and Central Bank Governors." Paris, February 18–19.

Group of 20. (G-20). (2011b). "Communiqué, Meeting of Finance Ministers and Central Bank Governors." Washington D.C., 14–15 April.

Group of 20. (G-20). (2011c). "G-20 Coherent Conclusions for the Management of Capital Flows Drawing on Country Experiences." November 3–4. Available at http://www.g20.org/

Growth Commission. (2008). *The Growth Report: Strategies for Sustained Growth and Inclusive Development*. Mimeo.

Gudmundsson, G. S., and G. Zoega. (2013). "Can Differences in Age Structure Explain Global Imbalances?" *Economic Letters*, 123(2) (May): 183–86.

Gueorguiev, N., R. Ramcharan, A. Stuart, and B. Aydin. (2009) "South Africa: Selected Issues." *International Monetary Fund Staff Country Papers.*

Guha-Khasnobis, Basudeb, and S. M. Ravi. Kanbur. (Eds.). (2006). *Informal Labour Markets and Development*. Basingstoke: Palgrave Macmillan.

Guo, Zhigang. (2012). "Rethinking the Population Trend in China." *International Economic Review*, 92(6): 96–111.

Gupta, P., R. Hasan, and U. Kumar. (2008). "Big Reforms but Small Payoffs: Explaining the Weak Record of Growth in Indian Manufacturing." In *India*

Policy Forum, ed. S. Bery, B. Bosworth, and A. Panagariya. New Delhi: Sage, 5, 59–108.

Habermeier, Karl, Annamaria Kokenyne, and Chikako Baba. (2011). "The Effectiveness of Capital Controls and Prudential Policies in Managing Large Capital Inflows." IMF Staff Discussion Note SDN/11/14, August 5.

Haldane, A. (2010). "Global Imbalances in Retrospect and Prospect." Available at www.bankofengland.co.uk/publications/speeches/2010/speech468.pdf.

Hanson, G. H. (2001). "The Globalization of Production." NBER Report. Available at http://www.nber.org/reporter/spring01/hanson.html

Harris, Fred E. (Ed.). (2006). *The Baby Bust: Who Will Do the Work? Who Will Pay the Taxes?* Lanham, MD: Rowman and Littlefield.

Harriss, John C. (1990). "Linkages between the Formal and the Informal Sectors in Developing Countries: A Review of Literature." Working paper no. 50, *World Employment Programme*, Geneva, ILO.

Helpman, Elhanan. (2006). "Trade, FDI and the Organizations of Firms." *Journal of Economic Literature*, 44: 589–630.

Higgins, M. (1998). "Demography, National Savings, and International Capital Flows," *International Economic Review*, 39: 343–69. Available at http://www.newyorkfed.org/research/staff_reports/sr34.pdf

Higgins M., and J. Williamson. (1997). "Age Structure Dynamics in Asia and Dependence on Foreign Capital," *Population and Development Review*, 23: 261–93.

Hlekiso, T., and N. Mahlo. (2006). *Wage Trends and Inequality in South Africa: A Comparative Analysis*, Labor Market Frontiers, October, no. 8, pp. 9–16, South African Reserve Bank.

Hodge, D. (2002). "Inflation versus Unemployment in South Africa: Is there a Trade-Off?" *South African Journal of Economics*, 70(3): 193–204.

Hulten, Charles. (1978). "Growth Accounting with Intermediate Inputs." *Review of Economic Studies*, 45: 511–18.

Ianchovichina, E., and Lundström, S. (2009), "Inclusive Growth Analytics: Framework and Application." World Bank Policy Research working paper no. 4851.

Imrohoroglu, A., S. Imrohoroglu, and D. Jones. (1995). "A Life Cycle Analysis of Social Security." *Economic Theory*, 6: 83–114.

International Monetary Fund. (IMF). (2004). "World Economic Outlook. The Global Demographic Transition." September 2004.

International Monetary Fund. (IMF). (2005). "Households Balance Sheets." *Global Financial Stability Report*, April, Chapter 3.

International Monetary Fund. (IMF). (2006). *World Economic Outlook*. Washington, DC.

International Monetary Fund. (IMF). (2011a). "Recent Experiences in Managing Capital Inflows: Crosscutting Themes and Possible Policy Framework." February 14.

International Monetary Fund. (IMF). (2011b). "Review of the Fund's Involvement in the G-20 Mutual Assessment Process." May 13.

International Monetary Fund. (IMF). (2011c). *World Economic Outlook*. April.

International Monetary Fund. (IMF). (2012a). "The Financial Impact of Longevity Risk." *Global Financial Stability Report*, April, Chapter 4.

International Monetary Fund. (IMF). (2012b). *The Liberalization and Management of Capital Flows: An Institutional View*. November 14.

International Monetary Fund. (IMF). (2012c). "Liberalizing Capital Flows and Managing Outflows: Background Paper." March 16.

International Monetary Fund. (IMF). (2013). *World Economic Outlook*. October.
International Monetary Fund. (IMF). (2014). *Global Financial Stability Report*. April.
Ito, Keiko, and Harry X Wu. (2013). "Construction of China's Input-Output Table Time Series for 1981–2010: A Supply-Use Table Approach." Presented at the 2nd Asia KLEMS Conference, Bank of Korea, Seoul, August 22–23, 2013.
James, K. S., and S. V. Subramanian. (2003). "Towards a Demographic Transition." *Economic and Political Weekly*, 38, 12–13.
Jeromi, P. D. (2007). "Regulation of Informal Financial Institutions: A Study of Money Lenders in Kerala." Reserve Bank of India Occasional Papers, 28, 1.
Johnson, D. Gale, and Ronald D. Lee. (Eds.). (1987). *Population Growth & Economic Development: Issues and Evidence*. Madison, Wisconsin: University of Wisconsin Press, 1987.
Jones, Michelle. (2013). "More People on Welfare than Working." *IoL News*, June 28, 2013. Available at http://www.iol.co.za/news/south-africa/more-people-on-welfare/news/~
Kaboski, J., and R. Townsend. (2005). "Policies and Impact: An Analysis of Village-Level Microfinance Institutions." *Journal of the European Economic Association*, 3(1): 1–50.
Kar, S., and B. Guha-Khasnobis. (2006). "The Corporate Debt Market—A Firm-Level Panel Study for India." In *Financial Sector Development for Growth and Poverty Reduction*, ed. Basudeb Guha-Khasnobis and George Mavrotas. New York: Palgrave.
Kaye, B., and S. Jordan-Evans. (1999). *Love 'em or Lose 'em: Getting Good People to Stay*. San Francisco: Berrett-Koehler.
Kehoe, P. J. (2006). "How to Advance Theory with Structural VARS: Use the Sims-Cogley-Nason Approach." NBER working paper 12575, Cambridge, MA.
Kenen, Peter. (1983). "Use of SDR to Supplement or Substitute for Other Means of Finance." In *International Money and Credit: The Policy Roles*, ed. George M. von Furstenberg. International Monetary Fund, Washington, DC, Chapter 7.
Kenen, Peter. (2010a). "Reforming the Global Reserve Regime: The Role of a Substitution Account." *International Finance*, 13(1): 1–23.
Kenen, Peter. (2010b). "An SDR-based Reserve System." *Journal of Globalization and Development*, 1(2), Article 13.
Kent, Ch., A. Park, and D. Rees. (2006). *Demography and Financial Markets*, Reserve Bank of Australia.
Kerr, A., M. Wittenberg, and J. Arrow. (2013). "Who Creates Jobs, Who Destroys Jobs? Small Firms, Large Firms and Labor Market Rigidity." Unpublished manuscript accessed from www.econ3x3.org.
Keynes, John M. (1942–43). "The Keynes Plan." Reproduced in *The International Monetary Fund 1945–1965: Twenty Years of International Monetary Cooperation. Vol. III: Documents*, ed. J. Keith Horsefield. International Monetary Fund, Washington, DC, 1969, pp. 3–36.
Kim, S., and J. Lee. (2007). "Demographic Changes, Saving, and Current Account in East Asia." *Asian Economic Papers* 6(2): 22–53.
King, R. G., and R. Levine. (1993). "Finance, Entrepreneurship, and Growth: Theory and Evidence." *Journal of Monetary Economics*, 32(3): 513–42.
Kingdon, Greta and Knight, John. (2007). "Unemployment in South Africa, 1995 – 2003: Causes, Problems and Policies." *Journal of African Economies*, 16(5): 813–48.

Klasen, S. (2002). "Social, Economic, and Environmental Limits for the Newly Enfranchised in South Africa?" *Economic Development and Cultural Change* 50(3): 607–42.

Klasen, S., and I. Woolard. (2000). "Surviving Unemployment without State Support: Unemployment and Household Formation in South Africa." Discussion Paper No. 237, Institute for the Study of Labor, International reform monitor database.

Klein, N. (2012). "Real Wage, Labor Productivity, and Employment Trends in South Africa: A Closer Look." IMF working paper 12/92.

Kreps, David, and Evan Porteus. (1978). "Temporal Resolution of Uncertainty and Dynamic Choice Theory." *Econometrica* 46: 185–200.

Krueger, Dirk, and Alexander Ludwig. (2007). "On the Consequences of Demographic Change for Rates of Returns to Capital, and the Distribution of Wealth and Welfare." *Journal of Monetary Economics* 54: 49–87.

Krugman, P. (2013). "Secular Stagnation, Coalmines, Bubbles, and Larry Summers." *New York Times* blog, November 13.

Ladusingh, L., and M. R. Narayana. (2011). "Demographic Dividends for India: Evidence and Implications Based on National Transfer Accounts." ADB Economics working paper series no. 292, Manila, Philippines.

Lane, P. R., and G. M. Milesi-Ferretti. (2001). "Long-Term Capital Movements." NBER Working Paper No. 8366.

Lane, P. R., and G. M. Milesi-Ferretti. (2007). "The External Wealth of Nations Mark II: Revised and Extended Estimates of Foreign Assets and Liabilities, 1970–2004." *Journal of International Economics*, 73(2): 223–50. Available at http://www.imf.org/external/pubs/ft/wp/2006/wp0669.pdf

Lee, I., Xu Qingjun, and M. Syed. (2013). "China's Demography and its Implications". IMF working paper 14/82.

Lee, R. (2003) "The Demographic Transition: Three Centuries of Fundamental Change" *Journal of Economic Perspectives*, 17(4): 167–90.

Lee, R. (2011)."The Outlook for Population Growth." *Science*, 333 (July 29): 569–73.

Lee, R., and A. Mason. (2010). "Some Macroeconomic Aspects of Global Population Aging." *Demography*, 47 (supplement): S151–72.

Lee, R., and A. Mason. (2011). *Population Aging and the Generational Economy: A Global Perspective*. Cheltenham: Edward Elgar.

Lee, R. D., Lee, Sang-Hyop Lee, and Andrew Mason. (2008). "Charting the Economic Lifecycle." In *Population Aging, Human Capital Accumulation, and Productivity Growth, a Supplement to Population and Development Review*, ed. A. Prskawetz, D. E. Bloom, and W. Lutz. New York: Population Council, 208–37.

Leibbrandt, Murray. (2013). "The Demographic Transition and the Demographic Dividend: Why Do We Care?" Input into Health, Economic Growth and Poverty Reduction: South African Country Workshop, presented at Sheraton Hotel, Pretoria, March 14, 2013.

Leibbrandt, M., I. Woolard, H. McEwenand, and C. Koep. (2010). "Employment and Inequality Outcomes in South Africa." Working paper, Southern Africa Labor and Development Research Unit (SALDRU) and School of Economics, University of Cape Town.

Leibbrandt, M., J. Levinsohn, and J. McCrary. (2005). "Incomes in South Africa since the Fall of Apartheid." NBER working paper 11384.

Levine, R. (1997). "Financial Development and Economic Growth: Views and Agenda." *Journal of Economic Literature*, 35(2): 688–726.

Levine, R. (1999). "Law, Finance and Economic Growth." *Journal of Financial Intermediation*, 8: 36–67.

Levine, R. (2004). "Finance and Growth: Theory and Evidence." In *Handbook of Economic Growth*, ed. Philippe Aghion and Steven Durlauf. North Holland. 1st ed., vol. 1, Chapter 12, 865–934.

Levine, R., N. Loayza, and T. Beck. (2000). "Financial Intermediation and Growth: Causality and Causes." *Journal of Monetary Economics*, 46: 31–77.

Lewis, W. A. (1954). "Economic Development with Unlimited Supplies of Labor." *Manchester School of Economic and Social Studies*, 22(2): 139–91.

Lin, Justin Y., Fang Cai, and Zhou Li. (1996). *The China Miracle: Development Strategy and Economic Reform*. Hong Kong: The Chinese University Press.

Lindh, Thomas, and Bo Malmberg. (2009). "Effects of Age Structure on Investment, Saving, and Trade." In Clark et al., Chapter 7.

Lund, Susan, Toos Daruvala, Richard Dobbs, Philipp Härle, Ju-Hon Kwek, and Ricardo Falcón. (2013). *Global Capital Markets 2013*. McKinsey Global Institute, March.

Lutkepohl, H., and M. Kratzig. (2004). *Applied Time Series Econometrics*. Cambridge, UK: Cambridge University Press.

Lutz, W., and K. C. Samir. (2011). "Global Human Capital: Education and Population." *Science*, 333 (July 29): 587–92.

Maddison, A. (2001). *The World Economy: A Millennial Perspective*. Paris: OECD.

Madison, A. (2007). *Essays in Macro-Economic History*. Oxford: Oxford University Press.

Malthus, T. (1798). *An Essay on the Principle of Population*. Available in http://www.econlib.org/library/Malthus/malPop.html

Marjit, S. (2003). "Economic Reform and Informal Wage—A General Equilibrium Analysis." *Journal of Development Economics*, 72(1): 371–78.

Marjit, S., and P. K. Das. (2008). "Financial Sector Reforms for Stimulating Investment and Economic Growth—The Indian Experience in Asian Development Bank." In *Macroeconomic Management and Government Finances*. New Delhi: Oxford University Press.

Marjit, S., and S. Kar. (2011). *The Outsiders: Economic Reforms and Informal Labor in a Developing Country*. New Delhi: Oxford University Press.

Marjit, S., and S. Kar. (2013). "Firm Heterogeneity, Informal Wage and Good Governance." *Review of Development Economics*, 16(4): 527–39.

Mason, A. (2005). "Demographic Transition and Demographic Dividends in Developed and Developing Countries." United Nations Expert Group Meeting on Social and Economic Implications of Changing Population Age Structure, Mexico City, August 31–September 2.

Mason, A., and R. Lee. (2006a). "Back to Basics: What is the Demographic Dividend." *Finance & Development*. Washington, DC: International Monetary Fund, 16–17.

Mason, A., and R. Lee. (2006b). "Reform and Support Systems for the Elderly in Developing Countries: Capturing the Second Demographic Dividend." *GENUS*, 62(2): 11–35.

Mason, A., and R. Lee. (2007). "Transfers, Capital, and Consumption over the Demographic Transition." In *Population Aging, Intergenerational Transfers and the Macroeconomy*, ed. Robert Clark, Naohiro Ogawa, and Andrew Mason. Cheltenham, UK: Edward Elgar, 128–162.

Mason, A., R. Lee, G. Donehower, S. Lee, T. Miller, A. Tung, and A. Chawla. (2009). Mimeo, *National Transfer Accounts Manual Draft Version 1.0*.

Mason, Andrew, and Tomoko Kinugasa. (2005). "East Asian Economic Development: Two Demographic Dividends." Working paper, East-West Center, No. 83.

Matoo, Aaditya, and Arvind Subramanian. (2008). "Currency Undervaluation and Sovereign Wealth Funds: A New Role for the World Trade Organization." Peterson Institute for International Economics working paper no. 08–02.

Mboweni, Tito. (2013). "South Africa Faces Potent Crisis over Social Welfare, Warns Mboweni." *Business Day Live*. Available at http://www.bdlive.co.za/national/2013/06/28/south-africa-faces-potent/~ Accessed July 28, 2012.

McKinsey. (2004). "The Coming Demographic Déficit: How Aging Populations Will Reduce Global Savings."

Medhora, Rohinton. (2007). "Uneven Build Up of Global Reserves. Ways Forward." *World Economics*, 8(4) (October–December): 143–66.

Minami Ryoshin, and Xinxin Ma. (2010). "The Lewis Turning Point of Chinese Economy: Comparison with Japanese Experience." *China Economic Journal*, 3(2): 163–79.

Modigliani, Franco. (1976). "Life-Cycle, Individual Thrift, and the Wealth Of Nations." *American Economic Review*, 76(3): 297–313.

Modigliani, F., and R. H. Brumberg. (1954). "Utility Analysis and the Consumption Function: An Interpretation of Cross-Section Data." In *Post-Keynesian Economics*, ed. Kenneth K. Kurihara. New Brunswick, NJ: Rutgers University Press, 388–436.

Monnet, C., and E. Quintin. (2007). "Why do Financial Systems Differ? History Matters." *Journal of Monetary Economics*, 54(4): 1002–17.

National Bank for Agricultural and Rural Development. (2002–03). *Annual Report*, Mumbai.

National Commission for Enterprises in the Unorganised Sector. (2009). *The Challenge of Employment in India—An Informal Economy* Perspective, Government of India, New Delhi.

National Council of Applied Economic Research. (NCAER). (2003). *Rural Financial Access Survey*. New Delhi.

National Research Council. (2000). *Beyond Six Billion: Forecasting the World's Population*, Washington: National Academy Press.

Naudé, W., and P. Serumaga-Zake. (2010). "An Analysis of the Determinants of Labor Force Participation and Unemployment in South Africa's North-West Province." *Development Southern Africa*, 18(3): 261–78.

NBS-IPLE. (2013). *Urban Income and Expenditure Survey*. (UIES) database, IPLE, Chinese Academy of Social Sciences, Beijing.

NBS, various volumes, *China Statistical Yearbook*, Beijing: China Statistics Press.

NCEUS. (2009). *The Challenge of Employment in India—An Informal Economy Perspective*. National Commission for Enterprises in the Unorganized Sector, Government of India, New Delhi.

Nxumalo, Frank. (2013). "More People on Social Welfare than with Jobs: SAIRR." *SABC News.com*. Available at http://196.35.152.182/news/a/57ec468040257487bedfbece3e3f709b/More-people-on-social-welfare-than-with-jobs:-SAIRR-20132706. Accessed July 7, 2013.

Obstfeld, M., and K. Rogoff. (2009). "Global Imbalances and the Financial Crisis: Products of Common Causes." Paper prepared for the Federal Reserve Bank of San Francisco Asia Economic Policy Conference, Santa Barbara, CA, October 18–20, 2009.

Ocampo, José Antonio. (2002). "Recasting the International Financial Agenda." In *International Capital Markets: Systems in Transition*, ed. John Eatwell and Lance Taylor. New York: Oxford University Press.

Ocampo, José Antonio. (2010). "Reforming the Global Reserve System." In *Time for a Visible Hand: Lessons from the 2008 World Financial Crisis*, ed. Stephany Griffith-Jones, José Antonio Ocampo, and Joseph E. Stiglitz. New York: Oxford University Press, Chapter 16.

Ocampo, José Antonio. (2011). "Reforming the International Monetary System." 14th WIDER Annual Lecture, Helsinki: United Nations University World Institute for Development Economics Research (WIDER).

Ocampo, José Antonio. (2013). "Emerging Economies and the Reform of the Global Monetary System." this volume.

Ocampo, José Antonio, Jan Kregel, and Stephany Griffith-Jones. (2007). *International Finance and Development*. London: Zed Books.

Oizumi Keiichiro. (2011). "How Long will China's Demographic Dividend Continue?—A Question with Implications for Sustainable Economic Growth." *RIM Pacific Business and Industries*, 11(39): 2–20.

Organisation for Economic Co-operation and Development. (OECD). (2010). "Shifting Wealth." *Perspectives on Global Development*.

Organisation for Economic Co-operation and Development. (OECD). (2012). "Looking to 2060: Long-Term Global Growth Prospects." OECD Economic Policy paper series no. 03, November.

Ostry, Jonathan D., Atish R. Ghosh, Karl Habermeier, Marcos Chamon, Luc Laeven, Mahvash S. Qureshi, and Annamaria Kokenyne. (2011). "Managing Capital Inflows: What Tools to Use?" IMF staff discussion note SDN/11/06, Washington, DC: Fondo Monetario Internacional, April 5.

Ostry, Jonathan D., Atish R. Ghosh, Karl Habermeier, Marcos Chamon, Mahvash S. Qureshi and Dennis B.S. Reinhardt. (2010). "Capital Inflows: The Role of Controls." IMF staff position note SPN/10/04, Washington, DC: Fondo Monetario Internacional, February 10.

Padoa-Schioppa, Tomasso. (2011). "The Ghost of Bancor: The Economic Crisis and Global Monetary Disorder." In *Reform of the International Monetary System: The Palais Royal Initiative*, ed. Jack T. Boorman and André Icard. New Delhi: SAGE Publications, Chapter 6.

Paton, Carol. (2013). "Treasury Assures on South Africa's 'Welfare Bubble.'" *Business Day Live*. Available at http://bdlive.co.za/national/2013/07/02/treasury-assures-on-south/~

Peng, Xizhe. (2011). "China's Demographic History and Future Challenges." *Science*, 333 (July 29): 581–87.

Penn World Table. (2014). Penn World Table database version 8.0. Available at http://www.rug.nl/research/ggdc/data/penn-world-table

Polak, Jacques J. (1979). "Thoughts on an International Monetary Fund based fully on SDR." Pamphlet series no. 28., Washington, DC: International Monetary Fund.

Polak, Jacques J. (2005). *Economic Theory and Financial Policy: Selected Essays of Jacques J. Polak 1994–2004*, ed. James M. Boughton. Armonk, NY: M. E. Sharpe.

Posel, D., J. A. Fairburn, and F. Lund. (2006). "Labor Migration and Households: A Reconsideration of the Effects of the Social Pension on Labor Supply in South Africa." *Economic Modelling*, 23: 836–53.

Poterba, James. (Ed.). (1994). *International Comparisons in Household Savings*, Chicago: University of Chicago Press.

Poterba, James, Steven Venti, and David Wise. (2011).“The Composition and Drawdown of Wealth in Retirement.” *Journal of Economic Perspectives*, 25(4) (Fall): 95–118.

Pritchett, L. (1997). “Divergence. Big Time.” *Journal of Economic Perspectives* 11: 3–17.

Rajan, R. G. (2005). “Has Financial Development Made the World Riskier?” NBER working paper no. w11728.

Reserve Bank of India. (2006). *Annual Policy Statement for the Year 2006–07*, Mumbai.

Reserve Bank of India. (2012). Database of Indian Economy, Mumbai. Available at http://dbie.rbi.org.in/DBIE/dbie.rbi?site=home

Retherford, Robert, Minja K. Choe, Jiajian Chen, Xiru Li, and Hongyan Cui. (2005). “Fertility in China: How Much Has It Really Declined?” *Population and Development Review*, 31(1): 57–84.

Rospabea, S. (2005). “How did Labor Market Racial Discrimination Evolve after the End of Apartheid? An Analysis of Employment, Occupational and Wage Discrimination in South Africa Between 1993 and 1999.” *South African Journal of Economics* 70(1): 185–217.

Saad, Paul M. (2011). “Demographic Trends in Latin America and the Caribbean.” In Cotlear (2011).

Siggel, Eckhard. (2010). “The Indian Informal Sector: The Impact of Globaliztion and Reform.” *International Labour Review*, 149(1): 93–105.

Sims, C. A. (1980). “Macroeconomics and Reality.” *Econometrica*, 48: 1–48.

Speller, W., G. Thwaites, and M. Wright. (2011). “The Future of International Capital Flows.” Bank of England Financial Stability Paper No. 12. Available at http://www.bankofengland.co.uk/publications/Documents/fsr/fs_paper12.pdf

Stats SA. (2012a). “Income and Expenditure of Households 2010/2011.” Pretoria, South Africa. Available at www.statssa.gov.za/Publications2/P0100/P01002011.pdf. Accessed January 7, 2014.

Stats SA. (2012b). “Labor Market Dynamics in South Africa 2011”. Mimeo.

Stats SA. (2013a). “Quarterly Labor Force Survey: Quarter 4 (October to December) 2012.” Press statement issued on February 5, 2013.

Stats SA (2013b). “Mid-Year Population Estimates 2013.” Statistical release P0302.

Stiglitz, Joseph E. (2006). *Making Globalization Work*. New York: W.W. Norton.

Stock, J. H., and M. W. Watson. (2001). “Vector Autoregression.” *Journal of Economic Perspectives*, 15(4): 101–15.

Szelwicki, M., and J. Tyrowicz. (2009). “Labor Market Racial Discrimination in South Africa Revisited.” Munich personal RePEc archive. Poland: University of Warsaw.

TCB. (The Conference Board). (2013). *Total Economy Database*, New York.

Thakor, A. V., and F. Song. (2010). “Financial System Architecture and the Co-evolution of Banks and Capital Markets.” *The Economic Journal*, 120(547): 1021–55.

Thaler, Richard H. (1990). “Anomalies: Saving, Fungibility, and Mental Accounts.” *Journal of Economic Perspectives*, 4(1): 193–205.

Thaler, Richard H. (2000). “Mental Accounting Matters.” In *Choices, Values, and Frames*, ed. Daniel Kahneman and Amos Tversky. New York: Russell Sage Foundation, Cambridge University Press, 241–68.

Thapa, G. B., J. K. Routray, M. M. Ahmad, and P. K. Viswanathan. (2012). “Agrarian Transition and Emerging Challenges in Asian Agriculture: A Critical Assessment.” *Economic and Political Weekly*, 47(4): 41–50.

Triffin, Robert. (1961). *Gold and the Dollar Crisis*. Rev. ed. New Haven: Yale University Press.

Triffin, Robert. (1968). *Our International Monetary System: Yesterday, Today and Tomorrow*. New York:Random House.

Turra, Cassio M., Bernardo L. Queiroz, and Eduardo L. G. Rios-Neto. (2011). "Idiosyncrasies of Intergenerational Transfers in Brazil." in *Population Aging and the Generational Economy: A Global Perspective*, ed. Ronald Lee and Andrew Mason. Northampton, MA: Edward Elgar, 394–407.

Tybout, Roberts J. (1997). "Trade Liberalization and Its Aftermath." In *Industrial Evolution in Developing Countries: Micro Patterns of Turnover, Productivity and Market Structures*, ed. Mark J. Roberts, and James R. Tybout. New York: Oxford University Press.

United Nations. (1999). "Towards a New International Financial Architecture." Report of the Task Force of the Executive Committee on Economic and Social Affairs of the United Nations. Available at http://www.un.org/esa/coordination/ecesa/ecesa-1.pdf.

United Nations. (2004). "World Population to 2300." Available at http://www.un.org/esa/population/publications/longrange2/WorldPop2300final.pdf.

United Nations. (2009a). "World Population Aging 2009."

United Nations. (2009b). "Report of the Commission of Experts Convened of the President of the UN General Assembly on Reforms of the International Monetary and Financial System (Stiglitz Commission)." New York, September. Available at http://www.un.org/ga/econcrisissummit/docs/FinalReport_CoE.pdf

United Nations. (2013b). *National Transfer Accounts Manual. Measuring and Analysing the Generational Economy*. Mimeo.

United Nations. (2013a) "World Population Prospects. The 2012 Revision." Available at http://www.un.org/esa/population/

Visaria, Lila. (2009). "Demographic Transition in India." In *Sociology and Social Anthropology in India*, ed. Yogesh Atal. ICSSR survey of Advances in Research, New Delhi: Pearson.

Wang, Feng, and Andrew Mason. (2005). "Demographic Dividend and Prospects for Economic Development in China." Paper presented at UN Expert Group Meeting on Social and Economic Implications of Changing Population Age Structures, Mexico City.

Wei, Shang-Jin, and Xiaobo Zhang. (2009). "The Competitive Saving Motive: Evidence from Rising Sex Ratios and Savings Rates in China." NBER working paper 15093, June 2009.

Wei, Shang-Jin, and Xiaobo Zhang. (2011). "The Competitive Saving Motive: Evidence from Rising Sex Ratios and Savings Rates in China." *Journal of Political Economy*, 119(3) (June): 511–64.

Williamson, John. (1977). *The Failure of World Monetary Reform, 1971–1974*. New York: New York University Press.

Williamson, John. (2007). *Reference Rates and the International Monetary System*, Washington, DC: Peter G. Peterson Institute for International Economics, Policy Analysis, No. 82.

Williamson, John. (2010). "The Future of the Reserve System." *Journal of Globalization and Development*, 1(2), Article 15, 1–12.

Wilson, D., and S. Ahmed. (2010). "Current Accounts and Demographics: The Road Ahead." Goldman Sachs Global Economics Paper, No. 202. Available at http://

thehardtrade.com/blog/wp-content/uploads/2010/08/GS-demographics-study.pdf.

World Bank. (2012a). *Capital for the Future*. Global Development Horizons.

World Bank. (2012b). *World Development Indicators*, Washington DC: World Bank.

Wu, Harry X. (2008). "Measuring Capital Input in Chinese Industry and Implications for China's Industrial Productivity Performance, 1949–2005." Presented at the World Congress on National Accounts and Economic Performance Measures for Nations, Washington DC.

Wu, Harry X. (2013a). "Accounting for Productivity Growth in Chinese Industry—Towards the KLEMS Approach." Presented at the 2nd Asia KLEMS conference, Bank of Korea, Seoul, August 22–23, 2013.

Wu, Harry X. (2013b). "Sources of Growth in Chinese Industry and the Role of the State-Controlled Sectors." Presented at 9th CERDI-IDREC International Conference on the Chinese Economy University of Auvergne, Clermont-Ferrand, France, October 24–25, 2013.

Wu, Harry X. (2014). "China's Growth and Productivity Performance Debate Revisited." The conference board working papers, EPWP1401.

Wu, Harry X., and Esther Y. P. Shea. (2008). "China: Institutions, Domestic Financial Architecture and Macro Volatility." In *Macroeconomic Volatility, Institutions and Financial Architecture*, ed. José M. Fanelli. New York: Palgrave Macmillan, 125–15.

Yaari, M. E. (1965). "Uncertain Lifetime, Life Insurance, and the Theory of the Consumer." *The Review of Economic Studies*, 32(2): 137–50.

Yakita, A. (2001). "Uncertain Lifetime, Fertility and Social Security." *Journal of Population Economics*, 14: 635–40.

Yao, Yang, and Ke Zhang. (2010). "Has China Passed the Lewis turning point? A Structural Estimation Based on Provincial Data." *China Economic Journal*, 3(2): 155–62.

Yin, Wenyao, Yinmei Yao, and Fen Li. (2013). "Evaluation on Fertility Levels and Adjustments in Population Policy: Analysis on Provincial Fertility Levels." *Social Sciences in China*, 6: 1–15.

Yu, Yongding. (2012). "Revisiting the Internationalization of the Yuan." Asian Development Bank Institute working paper 336, July.

Zheng, B. (2011), "The 'Middle Income Trap' and China's Path to Development: International Experiences and Lessons." *China Economist*, 6(3) (May–June): 16–27.

Zhou Xiaochuan. (2009). "Reform the International Monetary System." People's Bank of China, Beijing. Available at http://www.pbc.gov.cn/english//detail.asp?col=6500&ID=178

Zilcha, I., and J. Friedman. (1985). "Saving Behavior in Retirement When Life Horizon is Uncertain." *Economic Letters*, 17(1–2): 63–66.

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