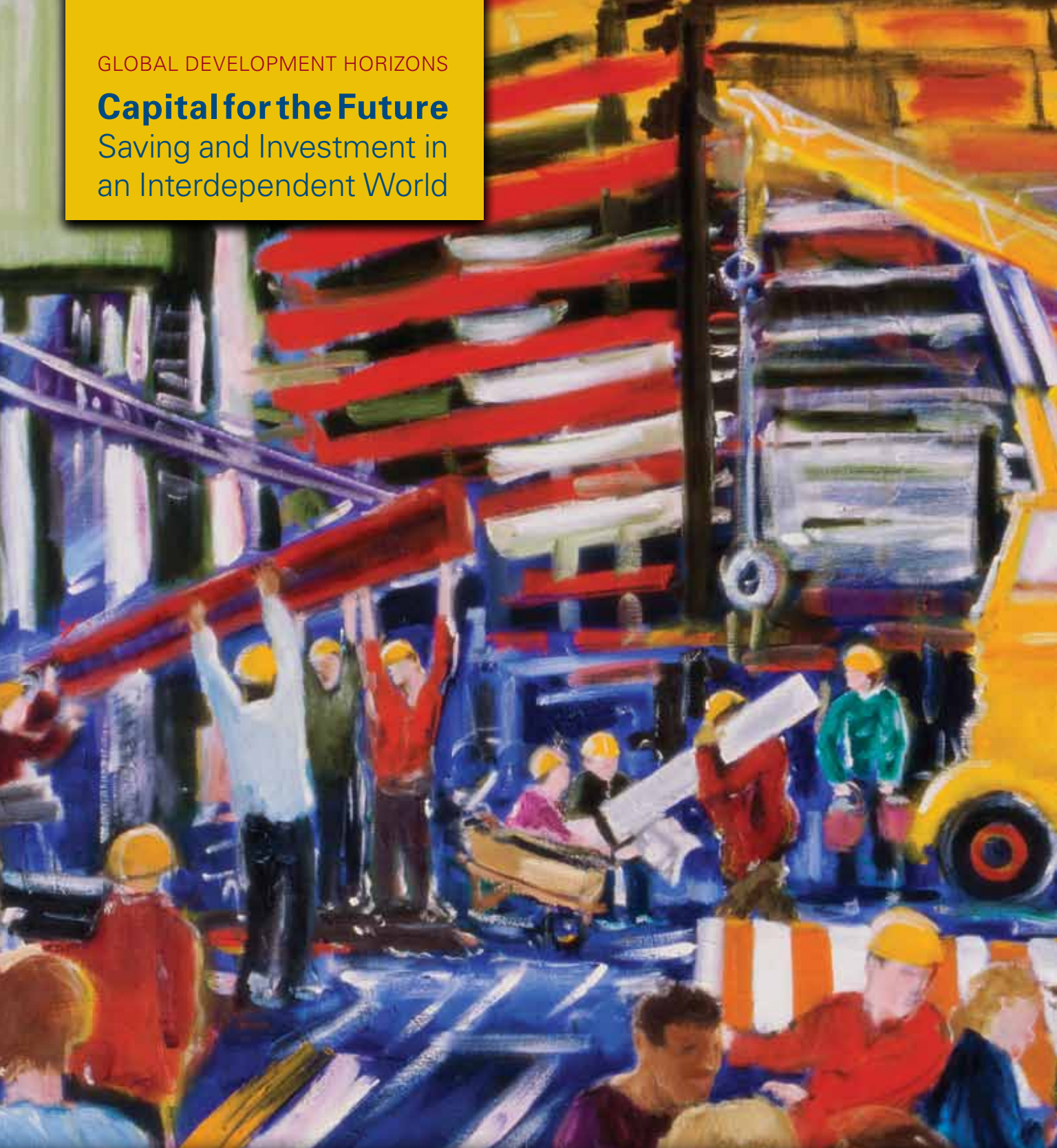


GLOBAL DEVELOPMENT HORIZONS

Capital for the Future

Saving and Investment in
an Interdependent World



THE WORLD BANK

Global Development Horizons

Capital for the Future: Saving and Investment in an Interdependent World

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THE WORLD BANK
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Foreword

VERY LONG-RUN FORECASTING IS a hazardous activity because the uncertainties and imponderables of life have plenty of time to intrude, and bend and buck the charted path. At the same time, to craft policy that is rooted in reason and reality, we need to peer into the future with the best information, statistics, and models that we have. That is what we have tried to do in *Global Development Horizons*. We have marshaled some of our best analysts and researchers to undertake this task. Let me thank them for taking on this hazardous and somewhat thankless job, but also remind them that one advantage they have is that, by the time the accuracy of their forecasts becomes known, most of them will have moved on to other pursuits.

The aim of this edition of *Global Development Horizons* is to build scenarios for the global economy over, roughly, the next two decades, with special focus given to saving and investment. Developing countries' share in global investment has grown from less than 20 percent to almost one-half in the past 15 years. A similar pattern is observed for saving. Only a minor part of these trends in saving and investment is due to the consequences of the 2008 global financial crisis. Most of the changes have emerged as a result of entrenched economic and demographic forces. Productivity catch-up, together with increasing integration into global markets, sound macroeconomic policies, and improved education and health, have contributed to an acceleration of growth and large increases in investment and saving rates in many developing countries. A further boost has been provided by the demographic dividend, which has reached peak levels in many countries. The rising investment and saving rates within developing countries, together with the expanding share of developing countries in

global GDP, have led to a spectacular dominance by developing countries in global investment dynamics. Two-thirds of the growth in global investment over the last ten years has originated in developing countries.

To varying degrees, these forces will remain in play in the medium to long run. Current projections indicate that the world population will grow from around 7 billion in 2010 to more than 8.5 billion in 2030. The addition of more than 1.4 billion people will occur almost exclusively in developing countries. More crucially, there will be a significant shift in the age structure of both developing and advanced countries. Aging in high-income countries, emerging East Asia, and the transition economies of Europe and Central Asia will affect both saving and investment behavior. In Sub-Saharan Africa and South Asia, on the other hand, the population will remain relatively young. Concurrent with these demographic trends, developing countries will continue to catch up with the higher productivity levels that exist in more advanced economies.

These trends raise some pressing questions about the financing of future global patterns of investment, and the answers to these are not at all obvious. For example, will aging societies starve the global economy of capital as the elderly draw down their stock of savings? Or will robust economic growth boost younger workers' incomes and saving? Will investment opportunities decline rapidly as the growth of the labor force slows across the world? To address these questions this edition of *Global Development Horizons* develops two scenarios of investment, saving, and capital flows through 2030, based on alternative paths of productivity and fundamental drivers of structural change.

The forward-looking scenarios explored in this report come at a critical juncture in the global economy. In the field of saving, developing-country governments are pondering strategies for expanding social services amid fiscal pressures emanating from their aging populations. In the investment arena, policy makers in developing countries are looking to spur domestic economic activity as they seek to reorient away from export-led growth while decoupling from the malaise still hindering the developed world. And in terms of capital markets, the global financial crisis has promoted a rethinking of the benefits and costs of unbridled capital flows, coupled with the widespread view that there is a pressing need for reform of the international financial system.

One key prognosis discussed at some length in the report is that, in spite of pressures from population aging, the world will not face a shortage of saving in the future, and yields on capital are expected to remain fairly stable through 2030. This stability of saving at the global level, however, belies a significant shift in composition. By 2030, developing countries will account for around two-thirds of every dollar saved and invested (compared with about half today), and around half of the stock of global capital will reside in the developing world, compared to less than one-third today. This implies a huge challenge for financial intermediation in developing countries. Currently, many countries with a dominant position in trade and production play a relatively minor role in international financial

markets. As a result, the global financial crisis illustrated that developing countries are vulnerable to what happens in dominant financial centers in high-income countries. This is unlikely to persist in scenarios in which developing countries' share of global saving and investment continues to rise.

The printed copy of this edition of *Global Development Horizons* will be just one part of a broader multimedia ensemble. The accompanying website, <http://www.worldbank.org/CapitalForTheFuture>, includes access to a host of related electronic resources, including data sets behind the two main scenarios presented in this report, background papers, technical appendices, interactive widgets that allow the interested reader to explore variations to some of the assumptions used in the projections, and related audio and video resources.

By setting out the implications of emerging trends as they will play out over the next two decades, this edition of *Global Development Horizons* should help policy makers become better armed with knowledge both in terms of positioning their respective countries in a new, multipolar, global economy, and in terms of adapting to potential challenges they will inevitably face, at home and beyond, in the near and more distant future.

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Abbreviations

AIC	Akaike information criterion
AIDS	acquired immune deficiency syndrome
BIS	Bank for International Settlements
BRICs	Brazil, the Russian Federation, India, and China
BRIIC	Brazil, the Russian Federation, India, Indonesia, and China
CGE	computable general equilibrium (model/analysis)
FDI	foreign direct investment
GARCH	generalized autoregressive conditional heteroscedasticity
GCC	Gulf Cooperation Council
GDH	<i>Global Development Horizons</i> (World Bank)
GDP	gross domestic product
GEM	Global Economic Monitor (World Bank database)
GNI	gross national income
ICT	information and communication technology
IMF	International Monetary Fund
IPP	independent power project
IPUMSI	Integrated Public Use Microdata Series, International
IWPP	independent water and power project
kWh	kilowatt-hour
LIBOR	London interbank offered rate
LNG	liquefied natural gas
MPK	marginal product of capital
NTA	National Transfer Accounts (project)
OECD	Organisation for Economic Co-operation and Development
PPP	public-private partnership
PPP	purchasing power parity
R&D	research and development
SAR	Special Administrative Region
TFP	total factor productivity
VAR	vector autoregressive
WDI	World Development Indicators (World Bank database)
3D	three dimensional

All dollar amounts are in U.S. dollars unless otherwise noted.

Overview

MAJOR STRUCTURAL TRANSFORMATIONS under way in the global economy will shape the economic fortunes of nations for decades to come. The gradual acceleration of trend growth in developing countries, which started during the 1990s, has increased their contribution not only to global investment but also to global saving. This is a significant change from a few decades ago, when many considered low national saving rates and difficulty in attracting foreign capital to be constraints to investment and growth in developing countries. Collectively, developing countries' domestic saving stood at 34 percent of their gross domestic product (GDP) in 2010, up from 21 percent in 1970, and their investment was around 33 percent of their GDP in 2012, up from 22 percent. As a result of the upward trends in these rates and an accelerated economic expansion, developing countries' share of global saving now stands at 46 percent, nearly double the level of the mid-1960s.

What is behind these trends, and will they continue in the future or are they a short-term phenomenon? What do they mean for development and poverty reduction? This report addresses these questions, identifying key economic and structural drivers that, together with demographic shifts, will affect saving and investment decisions over the next two decades—and thus the global distribution of capital in the future. The report builds two distinct scenarios that serve as “economic laboratories” to study the potential consequences of changes in these drivers. The main differences between the two scenarios are (a) the speed of convergence between the developed and developing worlds in per capita income levels (due to productivity catch-up), and (b) the pace of structural transformations in the

two groups (such as financial development and improvements in institutional quality). In the first scenario, this *convergence is gradual*, while in the second, *convergence is more rapid*.

Convergence between the developed and developing worlds was elusive for much of the 20th century. But upgrading of education and health, improvements in governance, continued economic and financial globalization, and the rapid diffusion of information and communications technologies increasingly point toward such convergence as reality (Spence 2011). The two convergence scenarios do not account for every trend or shock that may have an important economic impact over the time horizon considered, such as climate change, commodity shocks, or financial crises. Indeed, these scenarios are not intended to be forecasts and should not be judged by their likelihood of materializing. Their usefulness is in illustrating as clearly as possible how upcoming changes in the global patterns of growth, demographic change, and structural variables will affect—in a way fundamentally different from the past—saving, investment, and capital flows.

In the gradual convergence scenario, the average per capita income of the developing world will rise from about 8 percent of that in high-income countries in 2010 to about 16 percent by 2030. In the rapid convergence scenario, the gap between the two country groups is smaller: an average citizen of what is now a developing country will, by 2030, earn 19 percent of the income of an average citizen of a high-income country. The gradual and rapid scenarios predict average world economic growth of 2.6 percent and 3 percent per year, respectively, during the next two decades; the developing world's growth will average an annual rate of 4.8 percent in the gradual

convergence scenario and 5.5 percent in the rapid one. With gradual convergence, the contribution of developing countries to global growth will rise from 73 percent around 2015 to 87 percent by 2030; with rapid convergence, developing countries' contribution will reach 93 percent by the end of the period. In both scenarios, developing countries' employment in services will account for more than 60 percent of their total employment by 2030, their share of total expenditure on food items will be halved, and they will account for more than 50 percent of global trade.

The increasing global weight of investment activity in developing countries under these scenarios will not mechanically materialize but will require two conditions to be fulfilled: first, productivity growth and sectoral shifts will have to create enough investment opportunities. Second, both domestic and international investors will have to be willing to finance these investments and allocate two-thirds of global savings to developing countries. Fulfillment of these conditions depends on major structural changes and continued improvements in governance over the next two decades.

Thus, the scenario analysis considers how structural and institutional factors may change in the future. In the gradual convergence scenario, these structural factors are assumed to evolve in a fashion consistent with their historical patterns. In the rapid convergence scenario, however, structural transformations are assumed to break away from historical trends and proceed more quickly. This would occur if, for instance, the technological wave from the third industrial revolution becomes entrenched globally and fundamentally changes the economic and institutional structures of developing countries. In such a scenario, financial markets in economies like Brazil, India, and those of the Middle East will develop considerably, with these countries attaining, by 2030, a level of financial development comparable to the United States in the early 1980s. Similarly, the quality of institutions in developing countries will tend to improve significantly. Importantly, the rate of progress in these variables will differ among countries: for economies starting further away from the frontier, the rate of growth will be relatively faster.

Outlooks under the two scenarios

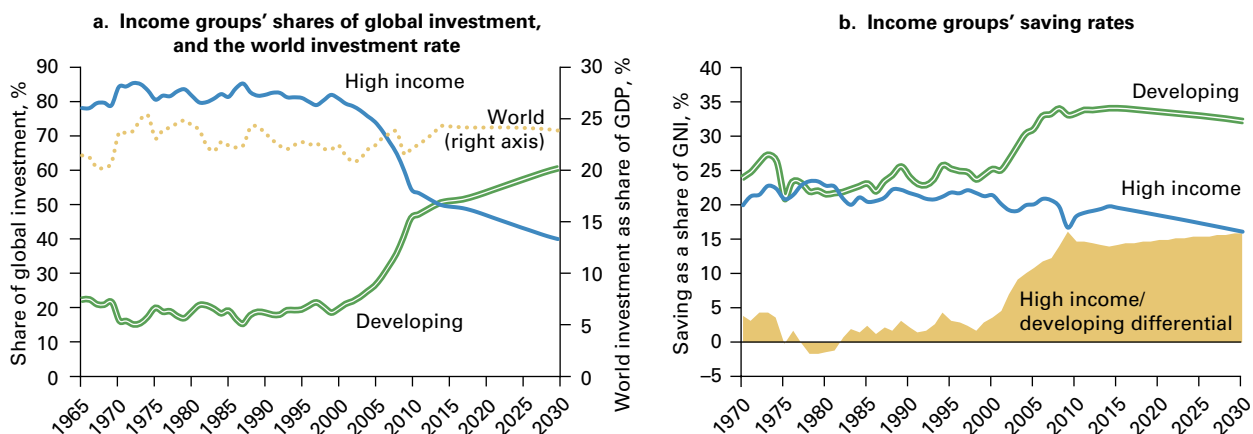
The two scenarios presented in this report offer a picture of the future of global capital that does not parallel recent trends, providing a template for thinking strategically about a number of global financial and economic challenges looming ahead and their implications for policy today. The main findings of the report are summarized below.

The world will not run out of saving in the future, and global investment rates, saving rates, and yields on capital will remain fairly stable through 2030

Aging will tend to be less pronounced in developing economies than in advanced economies over the forthcoming two decades. In addition, economic growth and the speed of financial market development will be greater in developing countries. Under the gradual convergence scenario, the saving rate of the developing world will inch down from a peak of 34 percent in 2014 to 32 percent in 2030, while the saving rate for high-income economies will fall from 20 percent to 16 percent over the same period (figure O.1, panel b). However, the world will not run out of saving because the global saving rate depends not only on country-level saving rates but also on economies' relative sizes. The shift of global economic weight toward high-saving developing economies means that, by 2030, developing countries will account for 62–64 percent of total world saving, depending on which scenario is considered, up from 45 percent in 2010. This shift in economic weight will compensate for the reduction in saving rates at the country level, so that the global saving rate will remain more or less unchanged.

With robust economic growth moderating the negative impacts of aging and financial market development on developing countries' saving rates, and with no significant increase in investment demand as growth slows moderately after 2020 in most countries, it is unlikely that there will be increased tension between global saving supply and capital demand. Accordingly, there will not be significant upward pressure on yields, even in the rapid convergence scenario, under which the average global yield is expected to rise

FIGURE O.1 Future global saving and investment rates will remain fairly stable in the gradual convergence scenario, but this stability belies substantial shifts in the relative shares of developing and high-income countries



Sources: World Bank projections, supplemented with calculations using data in the World Bank Global Economic Monitor and World Development Indicators databases.

by roughly half a percentage point between 2014 and 2030.

Global investment will expand at a rate in line with overall output, amounting to \$26.7 trillion (in 2010 dollars, or more than a quarter of the global output of \$105 trillion) by 2030 under the gradual convergence scenario (figure O.1, panel a).

The distribution of the global stock of capital will shift toward the developing world, but wealth may remain concentrated among high-income households in developing economies

The increased significance of developing countries as suppliers and demanders of global saving will lead to a redistribution of the world *stock* of capital and wealth. In the gradual convergence scenario, by 2030, half of the global stock of capital—\$158 trillion (in 2010 dollars)—will reside in the developing world (figure O.2). This will mean an acceleration of the shift in the global distribution of national wealth. The bimodal distribution of national wealth per capita, which currently displays a large “hump” of middle-income countries and a smaller peak of a number of high-income countries, may well become more balanced as more middle-income countries build their per capita national wealth.

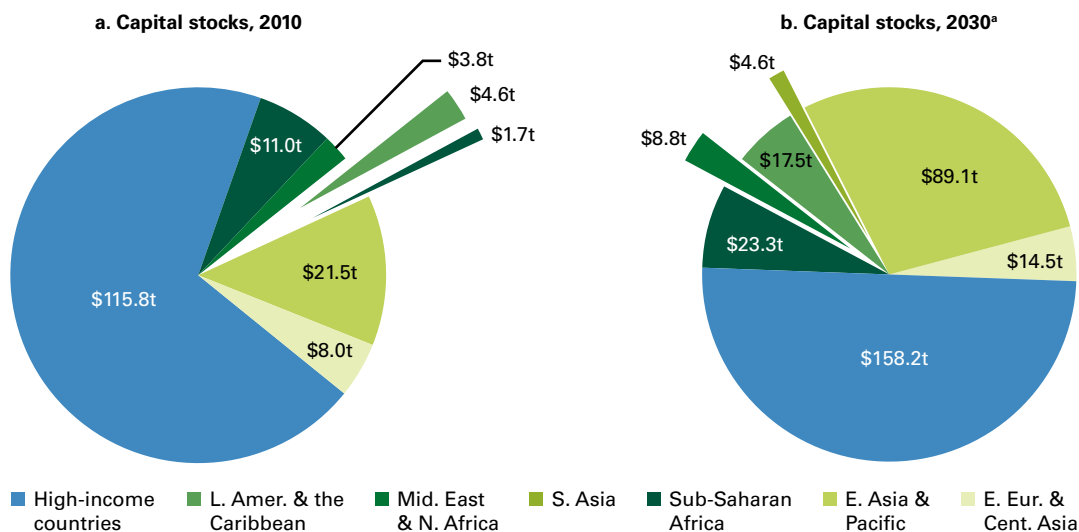
The more-equal distribution of capital and wealth *between* countries does not imply, however,

that such redistributive shifts will be replicated *within* countries. Indeed, saving (and wealth) in developing countries is highly concentrated among upper-income households. Data at the household level show that the least educated groups tend to have the lowest lifetime income and low or no savings, suggesting an inability to improve their earning capacity and, for the poorest, to escape poverty traps. If the distribution of education among workers of future generations were to remain as unequal as it is today, this would perpetuate inequality of earning capacity, saving, and wealth in the future. Leveling the playing field in terms of educational opportunities could thus be supported not just in terms of fairness but also—given the positive effect on private saving—in terms of efficiency. In Mexico, for instance, augmenting demographic projections with educational attainment yields a household saving rate in 2050 that is almost 5 percentage points above a scenario that does not take into account the impact of changes in education (figure O.3).

Sub-Saharan Africa will be the only region not experiencing a decline in its saving rate, while East Asia and Eastern Europe and Central Asia will record the largest reductions

Differences in the timing of demographic transitions imply that saving, factor prices, and income

FIGURE 0.2 Developing countries will represent more than half of global capital stocks by 2030 in the gradual convergence scenario, compared with about a third in 2010



Source: World Bank projections.
 Note: Capital stocks are calculated using a perpetual inventory method with a constant depreciation rate of 5 percent.
 a. Panel b projections assume a gradual convergence scenario of annual world economic growth of 2.6 percent over the next two decades, of which developing (high-income) growth will average 5.0 (1.0) percent annually.

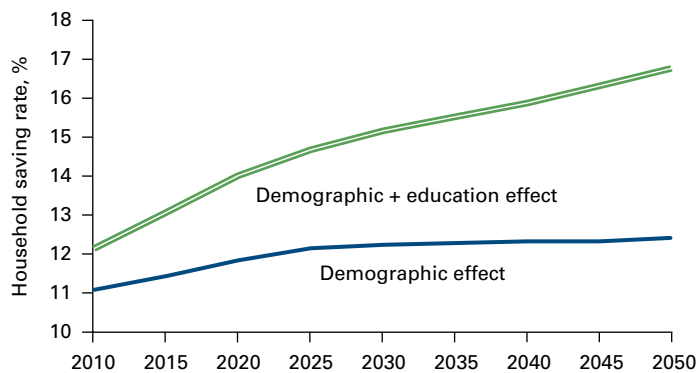
distribution will all be affected differently across countries. In aging economies, labor becomes scarcer with respect to capital, thus raising real wages relative to the return to capital. This divergence in the path of factor prices has intergenerational distribution effects: asset holders adversely affected by lower capital returns will tend to be

older than the average person, while those benefiting from higher wages will tend to be younger.

Set against these heterogeneous demographic pressures is the role of economic growth. Increases in productivity, resulting from technological advancement as well as institutional improvements, can raise the amount of output produced with a given amount of input. For some countries and regions, accelerated growth associated with productivity advancements will increase national saving, with younger cohorts of the population receiving larger lifetime per capita incomes such that they increase their saving more than older cohorts reduce theirs.

For these reasons, the stability of investment and saving rates at the global level masks substantial heterogeneity in country experiences. Indonesia, Japan, and the Russian Federation, for example, will experience sharp reductions in the working-age share of their populations and thus will see their saving rates fall significantly through 2030. In contrast, economies such as Brazil and Mexico will experience a more gradual decline. Sub-Saharan Africa, with its relatively young and rapidly growing population and robust

FIGURE 0.3 Increased earning power will be the greatest driver of saving by Mexican households



Source: World Bank projections using household survey data.

rate of growth due to productivity catch-up, will be the only region not experiencing a significant decline in its saving rate over the time horizon considered here. In absolute terms, however, saving will continue to be dominated by Asia and the Middle East: in the gradual convergence scenario, China will save far more, in absolute terms, than any other country in 2030—\$9 trillion in 2010 dollars—with India a distant second with \$1.7 trillion, having surpassed the levels of Japan and the United States in the 2020s.

The aging of the population will bring increases in age-related expenditures such as pensions and health services, putting pressure on public finances. In China, for example, total age-related public expenditures would increase by 5.4 percent of GDP between 2010 and 2030 if the generosity and coverage of the pension, health-care, and education systems were to remain constant; if China were to converge with U.S. generosity and coverage levels, age-related public expenditures would rise by 18.6 percent of GDP.

China and India will account for the majority of global investment, and investment will shift toward the services sector, especially in infrastructure

Strong economic growth will underpin China's leadership in global gross capital formation over the next two decades. In the gradual convergence scenario, China will account for 30 percent of global investment by 2030. Elsewhere in the developing world, robust growth will be associated with high investment rates as well. Brazil, India, and Russia, together, will account for more than 13 percent of global investment in 2030, more than the United States. Among high-income countries, relatively strong institutions and continued technological advantage will mean that investment rates remain fairly stable, at around 17 percent of output. In terms of volumes, investment in the developing world will reach \$15 trillion (in 2010 dollars) versus \$10 trillion in high-income economies. As is the case for saving, China and India will be the largest investors among developing countries—the two countries combined will represent 38 percent of the global gross investment in 2030, versus 40 percent in all high-income countries combined—and will

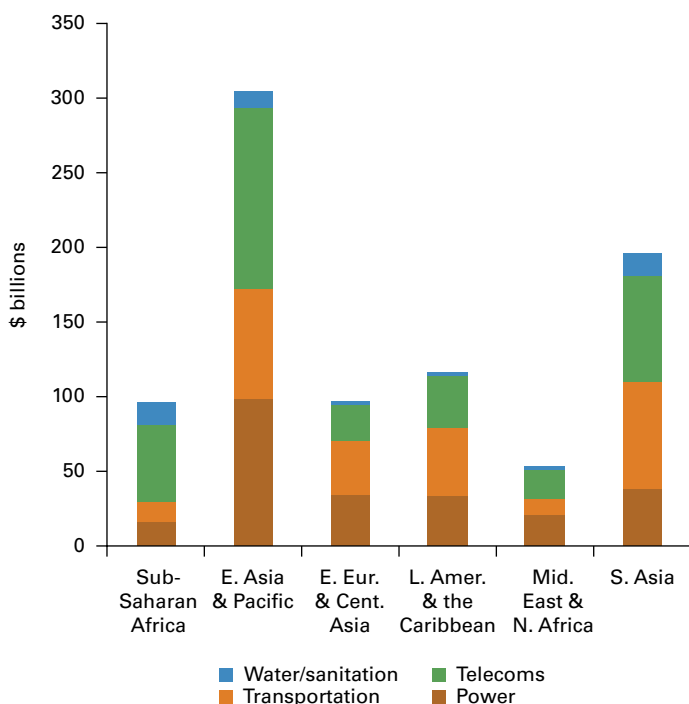
account for almost half of all global manufacturing investment.

The heterogeneity in investment patterns across countries will be more pronounced in the rapid convergence scenario. With financial development and institutional quality advancing at a faster pace under this scenario, developing economies in general will attract an even greater share of global saving. Some economies, such as China and India, will have investment rates of around 1 percent higher in the rapid convergence scenario than in the gradual convergence scenario by 2030. Economies such as Brazil and Indonesia, on the other hand, will see slightly lower rates of investment in the rapid convergence scenario (although their investment levels will be unambiguously higher) because their output will grow even faster than investment.

The future patterns of investment will entail not only geographic shifts but also sectoral ones. As countries become richer, demand shifts toward services. However, whether investment in the services sector rises concomitantly depends on the capital intensities of services relative to the other sectors. In the gradual convergence scenario, services as a share of total investment in developing countries will grow from 57 percent to 61 percent. This shift will likely be realized alongside demographic changes that will increase demand for educational, health, and infrastructural services, as well as a global move toward greater trade in services and a larger share of services being embedded in tradable goods.

A strong flow of investment into services will be evident in infrastructure. Measured in terms of value, infrastructural needs will be largest in developing East and South Asia (figure O.4) in light of population growth pressures and rapid increases in per capita income. Even exempting maintenance costs and replacement investments, fully meeting anticipated population coverage targets will result in a global infrastructure bill for developing countries that amounts to about \$866 billion annually in 2030 (in 2010 dollars), constituting about 10 percent of all services investment in developing countries. In Sub-Saharan Africa, where infrastructure needs are especially acute, it will amount to as much as 23 percent of total investment.

FIGURE 0.4 Annual infrastructure needs over the next 20 years are likely to be greatest in East and South Asia



Source: World Bank projections.

Note: Details of the methodology underlying the projections are given in the *Global Development Horizons* online annex 1.5.

Developing countries will account for a greater share of gross capital inflows and outflows in the future

The shifting geographic patterns of saving and investment activity will also manifest in patterns of global capital flows. In the gradual convergence scenario, much of the developing world will run moderate, gradually attenuating deficits. This pattern will predominate among countries that are relatively early in their demographic transitions and have significant scope for financial market development, which tends to moderate saving and at the same time boost investment. For example, India and, on aggregate, Sub-Saharan Africa fit this description well; they will run current account deficits averaging 2.4 percent and 3.2 percent of GDP, respectively, over 2010–30 in the gradual convergence scenario. Under the rapid convergence scenario, this pattern will be even starker

because faster financial development attracts capital and at the same time moderates private saving. These net capital inflows will not come primarily from the North but from newly industrialized East Asian countries, most notably China.

The relevance of capital flows, however, extends well beyond the balance of a country's borrowing or lending as captured by net inflows or outflows. From a policy perspective, it is equally important to also examine the future path of *gross flows*. As developing countries' volumes of gross inflows and outflows expand in the future, the potential benefits to these countries are significant: diversification of idiosyncratic national risks, the imposition of greater market discipline on policy making, and the opportunity to supplement domestic saving in ramping up fixed investment and growth. Gross inflows and outflows can be thought of as trade in financial assets. In this sense, the future path of a country's gross capital inflows and outflows depends on (a) the strength of demand for foreign assets; (b) the country's capacity to supply assets with return and risk characteristics appealing to international investors and creditors; and (c) the degree of frictions—for example, problems of asymmetric information—that potentially inhibit this exchange.

Institutional improvement and financial market development in the developing world, combined with an environment of rising perceived risk in high-income economies, appear set to remove advanced countries' monopoly on supplying high-quality assets. Encouraged by improvements in the business environment, solid economic growth, and demographic trends supportive of growing consumer demand, investors have shown greater interest in developing countries far beyond large emerging markets, as demonstrated perhaps most clearly in recent years by the growing level of capital inflows to Sub-Saharan African countries. In the future, improvements in institutional factors will co-evolve with ongoing regional and global integration of developing countries' financial markets, rendering developing countries much more significant sources, destinations, and potentially also intermediaries of global capital flows.

The scenario analysis estimates that developing countries will account for 47–60 percent of global capital inflows in 2030, up from 23 percent in 2010 (figure O.5). Relative to developing countries' GDP, however, the increase is less dramatic: inflows are foreseen to represent 6–11 percent of their GDP in 2030, versus 7 percent in 2010. There will also be clear changes in the regional distribution of capital flows. Disaggregating the projected increase in capital inflows to the developing world by country shows that China will be an important part of the story, but by no means will it be a China story—nor a BRICs (Brazil, Russia, India, and China) story—alone. By 2030, no single country will attract as great a share of global inflows as the United States or the Euro Area does today. Moreover, small and medium-size developing countries will collectively matter much more in the global economy than they do today, particularly in terms of their role in global financial markets and in driving capital flows.

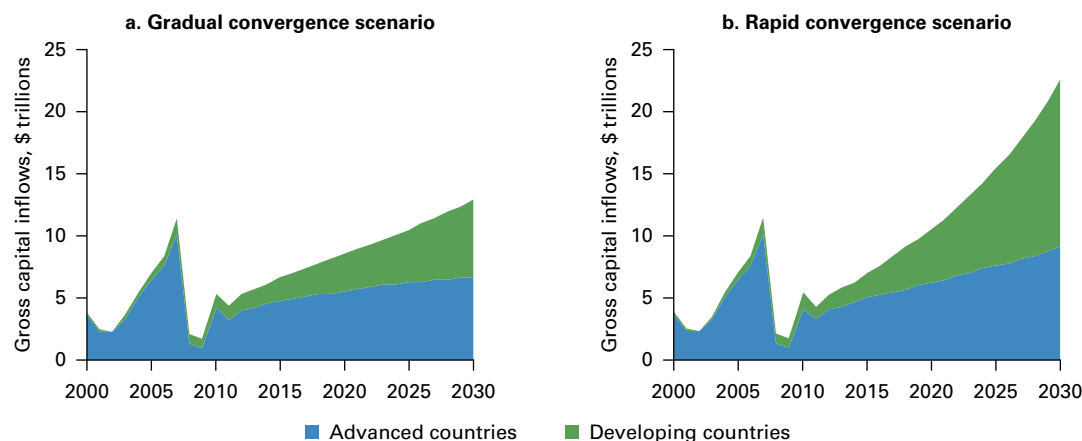
With developing countries accounting for nearly half or more of both global gross inflows and outflows under both scenarios, the South-South component of gross capital flows will

grow to become significant at the global level. Developing countries' financial markets will play a much greater role in intermediating capital flows than they do today, both in their role as intermediaries of South-South flows and in their intermediation of capital flows to and from the North. Reserve accumulation will likely decline as a share of developing countries' outflows, displaced by private flows as financial markets develop and as exchange rate regimes move toward greater flexibility.

Complex policy challenges will arise from changing patterns of saving, investment, and capital flows

The patterns of saving, investment, and capital flows through 2030 will affect economic conditions from the household level to the global macroeconomic level, with implications not only for national policy makers but also for international institutions and policy coordination. The rapid growth in cross-border capital flows in the decades ahead will make the world's economies more integrated than at any time in history. Eight main policy messages stem from the three chapters in this report:

FIGURE O.5 By 2030, nearly half or more of gross capital inflows will likely go to developing countries



Sources: World Bank projections, supplemented with calculations using data in the IMF International Financial Statistics database.

Note: Inflows are depicted in nominal dollars, assuming a constant 3.5 percent world inflation rate, where inflation is based on the 2003–07 five-year average from the World Bank Global Economic Monitor database. *Gradual* and *rapid* convergence refer to projected scenarios concerning the relative pace of convergence between developed and developing economies in terms of income and structural changes.

National policy makers seeking to support investment activity in their economies should concentrate their efforts on establishing a favorable investment climate. The importance of financial development and institutional quality in attracting investment from the global pool of saving, amply demonstrated by the difference in investment patterns in the rapid versus gradual convergence scenarios, underscores the importance of structural and institutional change for countries to effectively compete in the future world economy. Taking steps to improve the development of the financial sector and adjusting policies to raise the overall quality of governance can be effective for countries seeking to sustain high rates of private sector investment. This is not to say that public investment is irrelevant, since there may be a role for intervention where market failures are clear and where social returns are especially large. If policy makers do decide to pursue the interventionist route with regard to investment policy, attention should be paid to the institutional design. High levels of accountability should be maintained, and interventions should have clear sunset clauses to better align private sector incentives in an environment of active private sector competition.

Policy makers will have to recognize the forthcoming increasing demand for services and facilitate the needed accompanying investment. In many developing countries, governments currently engage in policies that, directly or indirectly, favor investment in agriculture and manufacturing while maintaining a protectionist stance in the services sector. Many economies, for example, explicitly prohibit foreign direct investment (FDI) in certain “sensitive” or “strategic” services. Such policies will become an increasing burden on efficiency in a global economy where services account for a larger share of output. Furthermore, if targeted interventions in investment are deemed desirable, the services sector is likely to offer the most social returns in areas such as education, health care, and infrastructure. Even in manufacturing and agriculture, there are subindustries where positive externalities may potentially be large; these include areas such as the production of “green” technology components or tropically adapted seeds.

For developing countries over the next 20 years, the issue of financing for infrastructural projects will

pose a major challenge. Infrastructure needs will have to be financed in a challenging environment in which demographic pressures will exacerbate public sector funding difficulties. Infrastructure financing is particularly challenging given the long-term nature (and associated risks) of these investments. Moreover, as developing countries constitute a larger and larger share of the world economy, they may outgrow traditional sources of infrastructure financing, such as lending by international financial institutions. To meet their future infrastructure financing needs, policy makers in developing countries will need to leverage private sector financing through public-private partnerships as well as tap structured financing from global capital markets.

Government will have to sustainably manage public finances with an eye toward the forthcoming demographic changes. A large increase in the share of population past working age, in combination with increased demand for health-care services in the later years of life that will come with rising incomes, will strain budgets. The shift in the composition of public expenditure toward health care and pensions will be offset only marginally by the expected impact of aging on education spending. Furthermore, in most developing countries, the scope for decreases in non-age-related expenditures is quite limited. Complex policy challenges will arise from efforts to keep the public burden of health care and pensions under control while limiting the decline in benefits and services. In the face of unprecedented aging, for many developing countries, the public pension and health-care models pursued in the past will no longer be viable options. Looking forward, part of the policy challenge will be to transition to systems with greater participation by private markets.

Demographic shifts due to changes in household structure will increase the importance of financial markets in providing for income support during old age. As incomes rise, household size tends to fall as workers are more geographically mobile and older individuals are more able to live independently on their accumulated savings. Alongside this reduction in household size tends to come a profound transformation of the old-age support structure away from an informal, multigenerational household system to more formal private

pension or public social protection systems. Greater reliance on privately financed pensions rather than household savings and transfers during old age has the potential to improve welfare, assuming that the elderly and their children all prefer to live separately. Another benefit is that using private financial markets to intermediate pension savings can increase financial depth and contribute to development. However, shifting from dependence on the income of family members to dependence on financial institutions also underlines the importance of strong regulation to limit fraud and excessive risk taking among financial intermediaries.

Policy makers in developing countries have a central role to play in boosting private saving through policies to raise educational attainment, especially for the poor. This is likely to reduce the saving concentration observed across household groups within countries. Indeed, such concentration also has negative implications for economic mobility and thus for the political and social cohesion essential for growth. Not only do high-income households tend to save a greater proportion of their incomes than low-income households, but they also account for the bulk of saving in countries at various stages of development and demographic transition, although to different degrees. In countries with high economic mobility, the relationship between low savings and low income could reflect efforts to smooth consumption by households experiencing temporary income losses. Unfortunately, a similar correlation is observed across households grouped by educational attainment, a proxy for permanent income and thus a more stable condition than the position in the income distribution at a point in time. Consistently, the least educated group in a country has low or no savings, suggesting that those individuals have an inability to improve their earning capacity and, among the poorest, to escape a poverty trap.

The course of global monetary and financial policy making will need to be adjusted as developing countries become responsible for an expected half or more of the world's capital outflows. Both the gradual and rapid convergence scenarios envisage that developing countries will account for a substantially increasing share of the world's gross capital inflows and outflows through 2030. As growing

amounts of capital are transferred among developing countries, South-South monetary policy coordination will become more critical in promoting stable financial and macroeconomic conditions in these countries. In particular, there is capacity for greater regional monetary policy spillover from large emerging economies such as Brazil and Russia. At the global level, greater use of the renminbi could considerably strengthen the impact of China's monetary policy on the rest of the world, partially eroding the dominance of U.S. and Euro Area monetary policy. For small and medium-size developing countries, a world with a multipolar currency hierarchy would mean that developing countries will become less affected by monetary policy spillovers from any one country. This could be stabilizing on a global level because liquidity shocks will be more diversified, but it could also become more difficult to assess the timing and extent of monetary policy spillovers, requiring greater monetary policy coordination. Regardless of the currency composition of capital flows in the future, the increasing share of global flows going to and from developing countries indicates that these countries should have a larger role in management of capital flows at the international level, within both bilateral and multilateral organizations.

Policy makers will need to prepare for a greater role of capital markets in international financial intermediation and promote the development of domestic capital markets. Looking forward, as gross capital inflows and outflows grow in scale, their composition in terms of portfolio, bank lending, and FDI will also grow in importance. This is because these different types of flows have different implications for macro stability. It is likely that, globally, capital markets will intermediate a growing share of flows in the future and that banks will account for less. Bank lending tends to be highly procyclical and generally less supportive of risk sharing than FDI or equity portfolio investment. However, total (debt and equity) portfolio investment has historically been even more volatile, in relative terms (that is, adjusting for the smaller magnitude of this component of developing countries' inflows), than bank lending. Moreover, as households and firms in developing countries increasingly demand not only greater access to credit but also greater

choice and variety in financial assets and services, domestic financial markets will have to compete globally in terms of both their structure and their depth. Although the many efforts under way to improve regulation of the international banking sector will remain highly relevant, policies should also be designed to accommodate—and in some cases actively promote—the development of domestic capital markets. At the same time, authorities should monitor the composition of capital flows; more broadly, they should develop regulatory institutions to be forward-looking and ready to adapt to potentially destabilizing changes in the composition of capital flows.

Modeling the global dynamics of investment, saving, and capital flows

The main objective of this report is to identify emerging trends of investment and saving. This is achieved not in terms of a set of forecasts but rather by asking a series of “what if” questions and by building scenarios. For example, the report addresses the question of *what* are the consequences for global saving *if* aging will hasten and will continue to exert negative pressure. Or *what* will happen to the demand for capital *if* productivity catch-up accelerates in developing countries.

A simple approach would just rely on correlations and, by extrapolating the trends of key determinants such as aging and productivity growth, infer their impact on saving and investment. Thus, in the first “what if” question above, this simple approach would suggest that global saving will decline. However, aging does not happen in isolation, and other factors counterbalance its negative impact. Likewise, faster rates of productivity growth will—for a given population growth rate—translate into faster economic growth and higher per capita incomes; higher incomes, in turn, will affect the pace of financial development and institutional improvement. These outcomes reinforce the positive impact that faster economic growth alone has on attracting investment financing.

To account for the direct and indirect effects of multiple factors on the emerging trends

of investment and saving—and the fact that income, saving, and investment affect each other—a structural model is needed. This is why, in this report, a global computable general equilibrium (CGE) dynamic model is adopted as the main analytical tool applied across all the chapters. In addition, other tools—such as panel data econometrics—are used (a) to estimate key parameters for the global CGE model, and (b) to complement the results obtained from it.

Given the focus of the methodological approach on capturing the impact of the main determinants, the potential effects of some other long-term trends and persistent economic shocks are omitted from the analysis. For example, as discussed in chapter 1, crises (whether commodity-based, financial, or environmental in nature) may engender increased uncertainty that results in longer-term effects on investment. Other elements—for example, changes in habits arising from shifts in cultural factors behind saving behavior, or changes in the global pattern of migration and remittances—also remain unmodeled.

It should also be noted that there are numerous potential outcomes of future changes in productivity, ensuing growth patterns, and accompanying policy changes. Although there is broad agreement on demographic projections, there is no consensus on the exogenous values governing productivity changes or on the correct parameterization of saving functions or equations of demand and supply of capital goods. Thus, even with sophisticated models, growth, investment, and saving rates for any specific country or region are subject to a large margin of error. With this in mind, the main advantage of a model-based scenario analysis is that it provides an opportunity to explore the interaction among broad trends rather than providing exact forecasts.

A global dynamic general equilibrium framework

The global CGE model—which is a modified version of the World Bank’s LINKAGE model, a dynamic model—comprises 17 country-regions, 7 sectors (encompassing agriculture, manufacturing, and services), and 3 factors of production (capital, and skilled and unskilled labor). The version of the model used here relies on the most

recent Global Trade Analysis Project (GTAP) dataset, whose base year is 2007. Scenarios are developed by solving for a new equilibrium in each subsequent year through 2030.

At its core, LINKAGE is a neoclassical model with aggregate growth, saving, and investment endogenously determined and predicated on assumptions regarding key exogenous determinants such as productivity changes, demographic shifts, financial market development, and institutional improvement. Unlike simpler growth models, however, LINKAGE has considerably more structure: First, it is multisectoral. This allows for more complex productivity dynamics, including differentiating productivity growth between agriculture, manufacturing, and services and picking up the changing structure of demand (and therefore output) as growth in incomes leads to a relative shift into manufactures and services. Second, it is linked multiregionally, allowing for the influence of openness—via trade and finance—on domestic variables such as output and wages. Third, LINKAGE includes a set of equations for capturing saving and investment behavior.

A full description of the LINKAGE model is available in Van der Mensbrugghe (2011), and this overview briefly describes the equations governing the dynamics of investment and saving as well as the main assumptions concerning the projected paths of exogenous determinants.

Starting with the latter, the key exogenous determinants are productivity and demographics. Productivity change is derived from a combination of estimates and is also subjectively fine-tuned. Agricultural productivity is assumed to be factor-neutral and exogenous and is set to estimates from empirical studies (for example, Martin and Mitra 1999). Productivity in manufacturing and services is labor-augmenting (Harrod-neutral technical change); it is skill-neutral but sector-biased, with productivity growth higher in manufacturing than in services. This gives rise to a long-term rate of total factor productivity (TFP) growth in the range of 0.1–0.2 percent for the high-income countries in the gradual convergence scenario, which lies toward the low end of the Bosworth and Collins (2003) estimates but is consistent with the trends in the early and mid-2000s. The range for developing

countries is somewhat wider: 0.7–3.5 percent until 2015 and constant thereafter. There is significant variation in TFP growth across developing countries, ranging from above 3.5 percent in China (in line with Bosworth and Collins [2008] estimates) to around 1.5 percent in Sub-Saharan Africa.

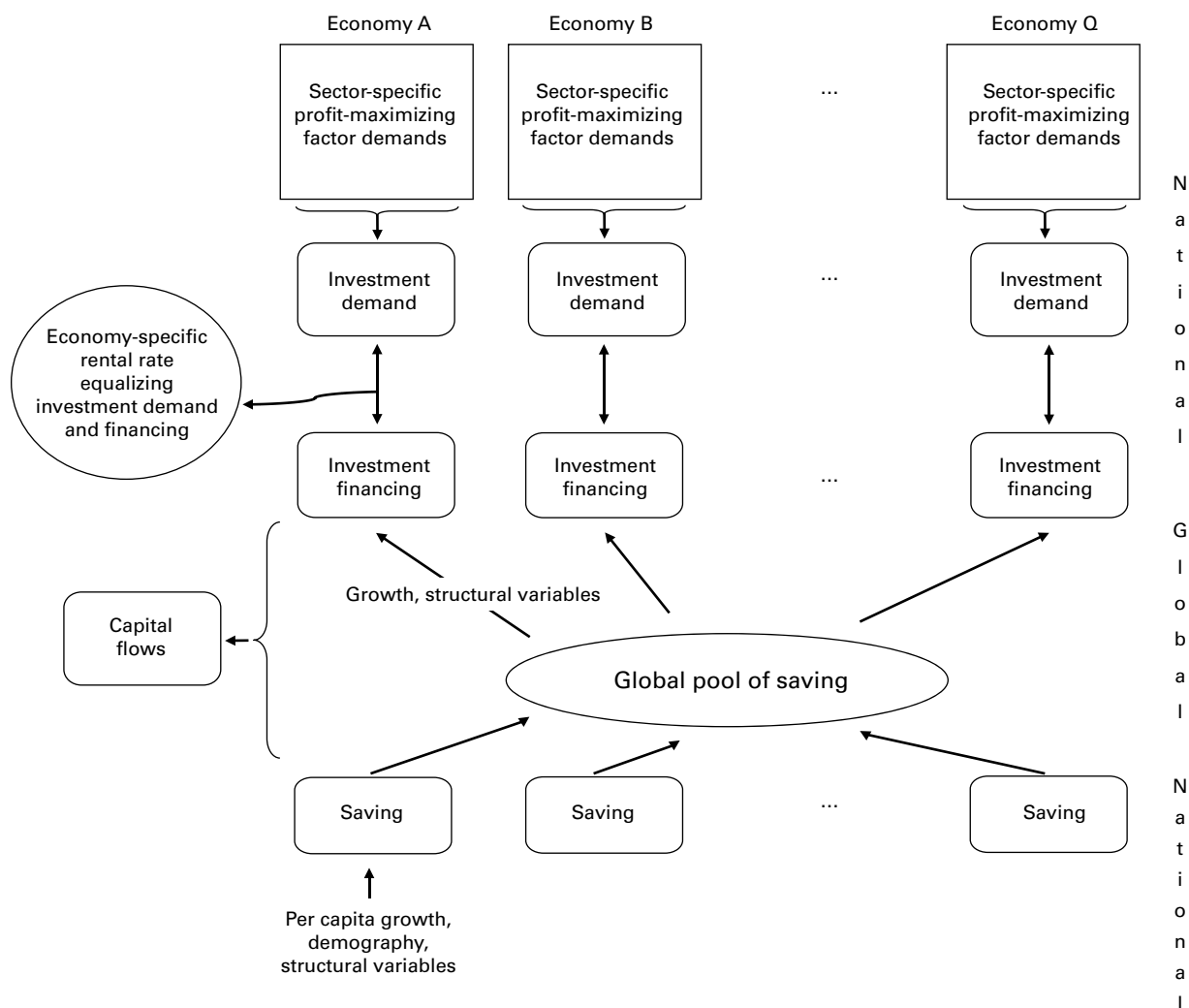
The growth in the labor force is derived from the United Nations age-specific population projections assuming no changes in participation rates. According to these population projections, the demographic transition is asynchronous across countries in several respects: the timing of its start, the speed with which the transition unfolds, and the relative sizes of bulge cohorts. In the current version of the model, there is no differentiation between the growth of skilled and unskilled workers.

The other crucial dynamics of the model deal with the accumulation of physical capital, which results from the interaction of global saving supply, domestic investment demand, and international capital allocation (figure O.6), as follows:

- In each country, *saving* behavior, in accordance with a standard life-cycle approach, depends on demography and per capita income growth; additional determinants include financial development and social protection systems.
- *Investment demand* is obtained from capital demand, which, in turn, is derived from sector-specific production functions in a setting of perfectly competitive profit-maximizing firms. Investment demand thus relates positively to output and negatively to rental rates.
- The global pool of saving is allocated across countries following a function representing the global *financing of investment*. This responds to relative rental rates but also to country-specific economic growth and structural factors such as financial development and the quality of institutions. The global financing of investment also captures home bias by including a lagged term.

For each country, net capital flows make up the difference between the level of financing and

FIGURE O.6 Schematic diagram describing interactions between saving, investment demand, and investment financing



Source: World Bank.

domestic saving. Thus the model allows for global capital mobility, but only imperfectly because the financing of investment responds to rental rate differentials with a finite elasticity and depends on other factors as well. In this setup, net capital flows between countries remain within limits that are reasonable given their historical range, and there is no guarantee that rental rates will equalize across countries. For example, a country benefiting from productivity catch-up will experience stronger capital demand, and rental rates

will be bid up. This will attract capital flows to the country, mitigating the upward pressure on rental rates but not eliminating it fully.

Summing up, in the LINKAGE model, saving, investment, output, and income as well as relative factor and good prices are simultaneously determined. However, for any specific country or region, income growth rates, investment and saving rates, and net capital flows generated by the model are subject to a margin of error because the resulting trends in these variables depend on:

- (a) Assumptions on the path of exogenous variables, specifically on productivity, demography, financial sector development, and quality of institutions
- (b) Parameterization of the equations and, more explicitly, the elasticity of the saving and investment rates with respect to aged dependency (only for saving), income growth, financial sector development, and quality of institutions

Some of the key assumptions concerning point (a) have already been described above. By considering two scenarios, the report takes into account uncertainty in the future trends. In the rapid convergence scenario, productivity is exogenously raised by a factor of 50 percent for all developing countries, and the rate of growth of structural variables is boosted so that they reduce by 25 percent the distance between their current levels and that of the United States in 2030 (assumed to be the frontier). With regard to point (b), a key assumption made is that the coefficients for the economic and structural variables in the saving and investment financing equations are indeed stable.

Complementary analytical approaches: estimating parameters

The parameterization of the investment demand function draws on the large, and by now standard, empirical literature that estimates the parameters of the production function. The literature is, however, somewhat more circumspect with regard to parameter estimates of the saving and investment financing functions. Accordingly, this report performs estimates for the elasticities corresponding to the described determinants using econometric techniques designed to limit the impact of endogeneity in the regressors as well as measurement error (details are given in online annex 1.5).¹

The signs of these estimated coefficients are consistent with underlying theory. For example, the coefficient on demography in the saving equation—measured by the aged dependency ratio—is negative and statistically significant, which implies that economies with older populations tend to save less. As another example, even after

accounting for the possible endogeneity of economic growth, faster growth is positively related with both saving and investment financing.

The coefficients on the structural variables also accord with a body of empirical and theoretical work. For instance, financial development is positively associated with the investment rate (more sophisticated financial markets are able to lend more readily to firms for investment purposes) (Benhabib and Spiegel 2000) but negatively related to the saving rate (households with easier access to consumer credit need to save less for consumption smoothing) (Loayza, Schmidt-Hebbel, and Servén 2000).

Complementary analytical approaches: enriching the CGE results

The CGE analysis requires a number of simplifying assumptions and cannot generate some of the results that are of interest to policy makers and development practitioners. For example, the population age structure of a country (or groups of countries) is approximated by a simple old-age dependency ratio; and, given the fact that the model works with a representative household, it cannot provide any insights on different saving behavior for different categories of households. Therefore, complementary analytical tools are used to address these issues.

In the case of saving, a complementary approach studies the future of saving by considering how demography and income growth will affect saving at the household level. Examining the issue from a microeconomic perspective provides a more realistic and nuanced view of the likely evolution of saving, although at the price of considering a limited set of countries because of data availability. While the household-level analysis confirms the broad conclusions of the CGE analysis, the micro-level data also expose the complexities of the interaction among aging, saving, and growth. The microanalytical approach is described in more technical detail in online annex 2.1.

In the case of capital flows, the CGE model-generated saving and investment scenarios have direct implications for *net* capital flows (essentially countries' saving-investment differentials), but a separate model is required to complement

these findings with scenarios for countries' gross volumes of capital inflows and outflows. An econometric model is specified to estimate gross inflows (outflows can be backed out from these and net flows), drawing on the literature to identify key determinants, and also controlling for any country-level effects that do not vary over time and for global shocks across time. Two scenarios for gross flows are generated by fitting projected paths of the independent variables to the estimated equation, which correspond to the two CGE model-generated scenarios (details are given in online annexes 3.3 and 3.4).

Note

1. The online annexes are available at <http://www.worldbank.org/CapitalForTheFuture>.

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The Emerging Pattern of Global Investment

A SNAPSHOT IN 2030 WILL REVEAL a world in which more than two-thirds of all global investment and half of the global accumulated capital stock will be in developing economies. This is in sharp contrast with recent history. Currently, almost 70 percent of the world's capital stock resides in the developed world, and in 2000 developing countries' share in global investments was only about 20 percent. Projections presented in this chapter indicate that, by 2030, global aggregate investment activity will far and away reside in China—with 30 percent—while India and Brazil (7 percent and 3 percent, respectively) will account for shares comparable to the United States and Japan (11 percent and 5 percent, respectively). Developing Asia will collectively hold capital stocks exceeding 55 percent of the entire developed world's.

This shift in investment activity toward the Global South coincides with rapid catch-up growth that began during the 1990s as developing countries integrated into global markets, underwent structural transformations, and improved their institutions. Assuming a continuation of needed reforms, this catch-up process is expected to carry on over the course of the next two decades. In fact, the shift in allocation of the global capital stock corresponds closely to a similar rise in developing countries' share of global gross domestic product (GDP). Currently, roughly 70 percent of global GDP is produced in high-income countries, and that share will decline to around 50 percent by 2030. Indeed, the capital-to-GDP ratios of developing countries as a group and high-income countries as a group differ very little, even as the ratio can vary substantially across individual countries: in both groups, the size of the capital stock is about 2.5 times the size of annual GDP, and this ratio is

expected to increase gradually over time. As labor productivity in developing countries catches up with the higher levels that exist in high-income countries, the global distribution of capital per capita will become more equal.

With much higher productivity growth in developing countries, their investment rate has to be substantially higher than in high-income countries for the capital stock to keep pace with potential output. Today, developing countries collectively invest slightly above 30 percent of GDP, a rate almost twice that of high-income countries, which currently stands at about 17 percent. The high investment rates—together with the rising share of developing countries in global GDP—will increase developing countries' share in global investment to two-thirds before 2030. However, this outcome will not mechanically materialize, but will require two conditions to be fulfilled: First, productivity growth and sectoral shifts must create enough investment opportunities. Second, both domestic and international investors must be willing to finance these investments, allocating two-thirds of every dollar of global savings to developing countries. These two conditions are analyzed in this chapter. The analysis of the first one relies heavily on standard factor demand equations in a global general equilibrium model. The analysis of the second condition brings in econometric analysis regarding the historical behavior of investors, who react not only to growth opportunities and yields, but also to institutions and other factors, often encapsulated by the term “investment climate.”

That the discussion has shifted to how much developing countries will contribute to, and reshape, global investment trends is a testimony to the great strides that the developing world has made over the past half century. Estimates by a

group of experts convened by the United Nations placed the total capital requirements of developing countries in 1950–60 at \$19 billion, of which they believed only a fraction would be met by domestic savings, leaving an “investment gap” of \$14 billion (UN 1951). Pioneers in development economics argued over whether structural rigidities in developing countries could ever be overcome such that investment could be productively translated into output, engendering an industrial takeoff (Meier and Seers 1984).

The main messages of this chapter are the following:

- *Since 2000, there have been three notable changes in the pattern of global investment activity: a shift in global investment toward the developing world, a shift toward greater manufacturing investment globally, and a slow, but definitive, redistribution of capital stocks toward the developing world.* Although a nontrivial share of these phenomena can be attributed to large economies such as China and India, significant increases in investment rates have occurred elsewhere in the developing world as well.
- *The future structure of production will imply also a global shift toward investment in services.* This shift is the natural consequence of (a) increased shares of services in economies with higher per capita incomes, (b) demographic changes that will increase demand for educational and health services, and (c) a larger share of services embedded in tradable goods. Between 2010 and 2030, services investment will rise from 57 percent to 61 percent of the total investment profile in developing countries, and from 75 percent to 78 percent in high-income economies. This rise is expected to occur despite ongoing rapid growth in manufacturing investment, especially in several lower-middle-income countries and regions (such as India and the lower-income economies of Southeast Asia).
- *The overall relationship between economic growth and investment is strong and significant, and developing countries' growing share of global investment since 2000 has been due in large part to robust growth in those countries.* This observation is consistent with optimal factor demand calculations in a computable general equilibrium (CGE) model. It is also confirmed by econometric analysis of how investors allocate resources over countries. However, the historical correlation between growth and investment ratios found in the latter analysis indicates that growth alone will be insufficient to fully satisfy optimal factor demand. That means improvements in other driving forces are needed to attract sufficient capital. One of those forces is financial development, or the maturity of the financial sector. A 10 percent increase in a standard measure of financial intermediation—the ratio of private credit to GDP—is associated with a 1–5 percent increase in investment. If such improvements are insufficient, yields relative to those abroad will have to rise in fast-growing economies to attract sufficient capital.
- *One major area of concern in developing countries regards infrastructure needs.* Even exempting maintenance costs and replacement investments, fully meeting anticipated population coverage targets will result in a global infrastructure investment bill for developing countries that amounts to about \$866 billion annually in 2030 (measured in 2010 dollars). Although this amounts to only around 3 percent of all developing-world investment in 2030, its financing is particularly challenging given the long-term nature (and associated risks) of these investments.
- *Despite many common changes in investment patterns, the patterns themselves can significantly differ across countries.* There are predictable patterns; for example, low-income countries invest primarily in agriculture, and middle-income countries invest heavily in manufacturing and increasingly in services. But there are notable exceptions. For example, Vietnam (which until recently was a low-income country) invested a disproportionately large share of all fixed

investment in manufacturing. Countries have also varied in their overall capital-to-GDP ratio, with the natural resource-rich economies of Brazil and the Russian Federation requiring less capital per unit of output than China and India. Finally, although the private sector has tended to account for a larger proportion of investment than the public sector in most upper-middle-income economies, the economies of China and the Middle East have been notable exceptions.

- *Despite the rising share of developing countries, the global investment rate is expected to remain relatively stable.* If investment rates in individual countries would remain constant, the global investment rate would rise because of the growing share of the developing world. However, investment rates in virtually all individual countries are expected to fall. That drop is largely associated with slowing growth in production potential, reflecting demographics and the shift toward services (where productivity growth is lower). The slowdown will not be uniform across the world. China's investment will fall more sharply than elsewhere in the developing world, while Sub-Saharan Africa will actually experience a rise relative to its recent historical average. This fall of the investment rate in individual countries compensates for the composition effect of a larger share of developing countries in the world, leading to a stable global investment rate.
- *In a scenario where convergence between developing and high-income economies occurs more rapidly, total investment at the global level will be 7 percent higher than in a scenario where convergence follows recent historical trends and is far more gradual.* In this rapid convergence scenario, aggregate investment in developing countries will also rise by \$2.7 trillion (in 2010 dollars) compared with the gradual convergence scenario, while investment in high-income countries will fall by about \$1 trillion relative to the gradual convergence outcome. Whether investment rates rise or fall in

any given country will depend, however, on the increase in its investment relative to its output; in China and India, for example, investment rates will rise on the order of about 1 percent, while economies such as Brazil, Mexico, and Indonesia will see small declines in their investment rates, of 0.4–1.1 percent.

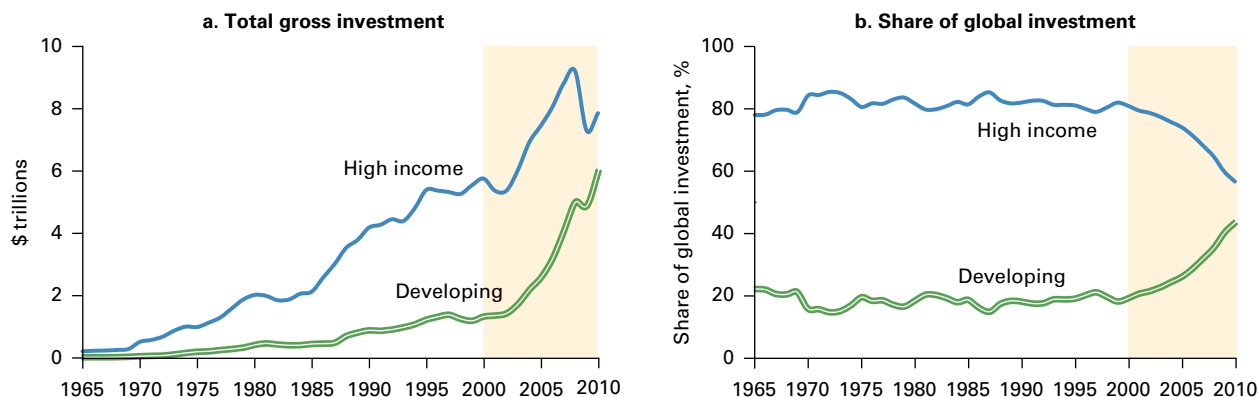
- *Policy makers seeking to support investment activity in their economies should concentrate their efforts on establishing a favorable investment climate that supports private sector investment activity,* including policies aimed at improving financial sector development and policies to raise the overall quality of governance, especially concerning the rule of law. To the extent that direct intervention is warranted, it should be in areas where market or government failures are clear and where social returns are especially large. If policy makers do decide to pursue the interventionist route with regard to investment policy, their efforts may be best placed supporting the upcoming expansion in service sector investment, especially in areas such as education, health care, and infrastructure, where spillovers from positive externalities can be especially high. Insofar as infrastructure is concerned, the trend toward public-private partnerships can offer both additional sources of capital and a disciplinary mechanism to limit potential public sector inefficiencies.

Changing patterns of investment worldwide

There has been a global shift toward greater investment in the developing world

Since the turn of the 20th century, the pattern of global investment—measured as gross capital formation¹—has changed significantly. Between 1965 and 1999, investment in developing countries held a relatively constant global share—averaging 18.5 percent—but this share increased dramatically in the first decade of the

FIGURE 1.1 Gross investment in developing countries has increased in absolute terms (panel a) and as a share of global investment (panel b)



Source: World Bank calculations, using data in the World Bank World Development Indicators database.

Note: Shaded area corresponds to the period from 2000 onward, where a break in the series occurred (a simple linear regression on time in the 1965–99 period for developing countries is $I = -0.011t + 21.360$, where I is total gross investment and t is the year, while that for the 2000–10 period is $I = 0.024t - 49.312$; the Chow test $F = 52.06$ is significant at the 1 percent level).

21st century, reaching about 40 percent by 2009 (figure 1.1, panel b); the change is even starker when one adjusts for differences in purchasing power (as further discussed in box 1.1). Moreover, this convergence in global investment shares has been hastened by the global financial crisis. Since 2007, investment has fallen more sharply in high-income countries than in the developing world (figure 1.1, panel a). The growing influence of developing countries in the global investment picture has clearly paralleled the emergence of developing countries on the world economic stage.

This convergence in investment shares between developing and high-income countries owes as much to increases in the developing world's investment rates (figure 1.2, panel a) as it does to their larger size in the global economy (figure 1.2, panel b). Although these trends are unlikely to persist indefinitely—the process of deleveraging in Europe and the United States following the 2007–09 crisis will eventually end, and saving and investment rates will ultimately reach upper limits in the developing world—investment in developing countries appears likely to play a greater global role in the future. Indeed, the gap between developing and high-income countries' investment shares of output has never been greater for any period since the mid-1960s.

Further, although the investment share of output in developing countries has remained strong after the crisis, it contracted sharply in the developed world. Consequently, there is reason to believe that future saving and investment flows—and the associated costs of capital—may in fact stabilize at levels demonstrably different from those observed today.

By virtue of sheer size, much of the sharp rise in developing countries' share of global investment can be attributed to China and, to a lesser extent, India. Moreover, with so much of the change in developing-country investment occurring in China and India, neglecting to examine their experiences risks obscuring the important dynamics that are taking place there. But even in the absence of these two developing-country giants, the share of global investment accounted for by developing countries has risen steadily since 2000, and currently stands at the highest level since the mid-1960s (figure 1.3). Across developing countries, investment rates have risen significantly from lows in the 1990s—including countries as diverse as Ghana (20 percent in the 1990s to 24 percent in the 2000s), Guatemala (16 percent to 19 percent), and Mongolia (31 percent to 35 percent). Looking at the world as a whole, an unmistakable message emerges: the convergence of investment performance between the

BOX 1.1 Different terms, different rates: Purchasing-power adjusted investment vs. investment expressed in national currency

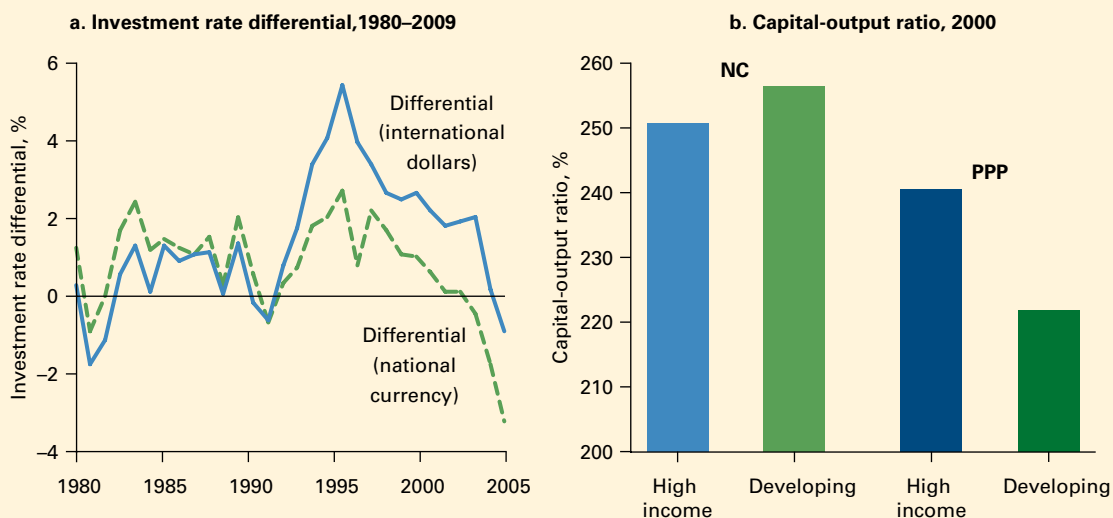
In this report, investment ratios are expressed in market prices, as are the underlying optimal capital-output ratios. Investment rates do not depend on the choice of a specific unit of measurement of the output or investment volumes because market prices will reflect the chosen volume units. Nevertheless, it might also be interesting to express investment rates in specific volume units—units expressed in purchasing power parity (PPP) terms that are the same across countries.

That PPP-adjusted investment rates tend to be lower in developing countries than rates measured in national market prices has been known for some time (Summers and Heston 1991) (figure B1.1.1, panel a). Recent research confirms that the difference is primarily attributable to differences in output prices across countries (Hsieh and Klenow 2007), a reflection of the Balassa-Samuelson observation that at low levels of development, lower productivity levels in the tradable sectors relative to nontradables translates into lower price levels overall. In contrast, because investment goods are, by and large, internationally traded, their price differences also tend to be small across countries. Consequently,

within developing countries, investment goods are *relatively* expensive, and investment rates (along with capital-output ratios) turn out to be significantly smaller when expressed in international PPP units, even if these ratios calculated in market prices are similar.

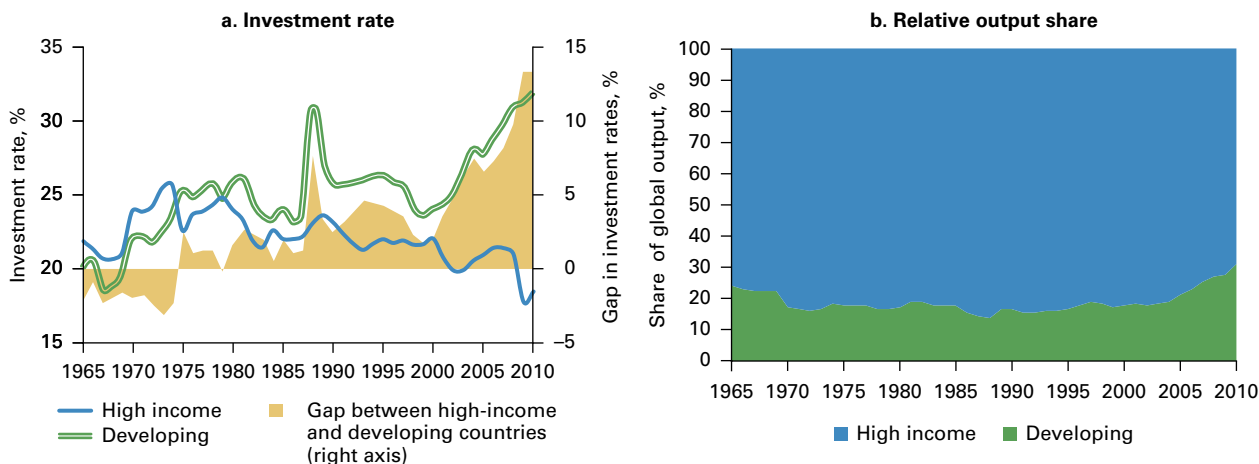
As developing countries catch up, the difference between market prices and PPP units will disappear, and capital-output ratios in PPP measures will converge toward those in high-income countries. In other words, over time the volume of the capital in developing countries will rise not only as overall productivity increases but also because the relative price of output will rise. This important trend can be explained only if the analysis is conducted in market prices, and using PPP measures of investment may introduce potentially significant distortions to the data (Knowles 2001). For example, the small capital-output differential between high-income and developing countries becomes more pronounced after PPP corrections (figure B1.1.1, panel b), even though this differential has no bearing on the investment decisions faced by economic agents within any given country.

FIGURE B1.1 Differentials in investment rates (panel a) and capital-output ratios (panel b) are greater when measured in PPP terms



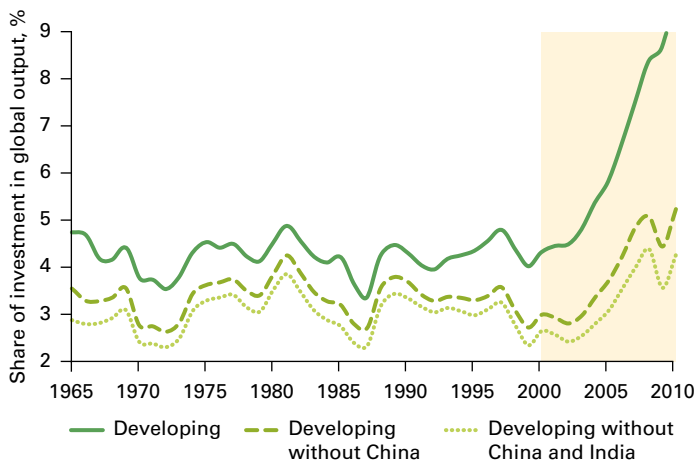
Source: World Bank calculations, using data in the World Bank World Development Indicators database and Penn World Tables (<https://pwt.sas.upenn.edu/>). Note: PPP = purchasing power parity. The investment rate differential is calculated as the difference between (unweighted) average investment rates for high-income and developing countries, measured in either national currency (NC) or PPP-adjusted international dollars. Capital stocks were calculated using a perpetual inventory method with an assumed constant depreciation rate of 5 percent. Calculations with weighted averages yield similar results.

FIGURE 1.2 Developing countries’ rising investment rates (panel a) and growing share of global output (panel b) have contributed to their increased share of investment in global output



Source: World Bank calculations, using data in the World Bank World Development Indicators database.
 Note: The gap between developing and high-income investment is computed as the difference between the two groups’ investment shares of gross domestic product.

FIGURE 1.3 The rising share of developing countries’ investment in global output is due to more than just changes in China and India



Source: World Bank calculations, using data in the World Bank World Development Indicators database.
 Note: Shaded area corresponds to the period from 2000 onward, where a break in the series occurred (a simple linear regression on time in the 1965–99 period for the full developing country subsample is $I = -0.011t + 21.360$, where I is total gross investment and t is the year, while that for the 2000–10 period is $I = 0.024 - 49.312t$; the Chow test $F = 52.06$ is significant at the 1 percent level.

developed and developing worlds has definitively begun and is likely to consolidate in the future.
 The clear upswing in investment in developing countries as a whole is not to deny that many

developing countries continue to struggle with sustaining high levels of investment over time. The upper-middle-income economies of Sub-Saharan Africa, for example, saw an investment takeoff between 1965 and 1980—peaking at 30 percent of GDP in 1978—before falling to annual averages of 15–20 percent (figure 1.4). Similarly, investment growth in major emerging economies such as Brazil, Mexico, and Turkey has been more modest and gradual.

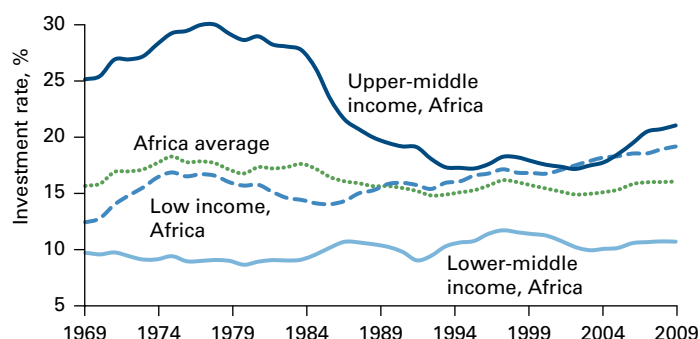
Globally, investment booms—characterized by a fairly sharp increase in an economy’s investment rate over just several years—have been somewhat rare phenomena, although some historical episodes did persist over an extended period. An examination of countries that have experienced such booms suggests that such spurts of investment have not, in general, been associated with sustained subsequent economic growth (box 1.2).

Some have questioned China’s heavy reliance on investment as an engine of growth, especially when examined in terms of the relatively low-value-added nature of Chinese manufacturing (Bardhan 2010). Consequently, if China—along with other high-investment economies—is to sustain a “soft landing” for its current high investment rate, observers have argued that its

investment-centric economic growth model must be ultimately accompanied by structural changes to the economy (World Bank 2012a). Such structural changes include not only sectoral shifts in investment and production but also more fundamental changes in terms of financial market development, its economic and sociopolitical institutions, and its financial integration into the global economy.

In sum, it is clear that, since 2000, there has been an unmistakable shift in the pattern of gross capital formation at the worldwide level, with developing countries becoming increasingly important in the global investment picture. This shift appears to have been led by robust economic growth in the developing world relative to the developed world and by greater convergence in investment rates between the two.

FIGURE 1.4 Investment rates among Sub-Saharan African countries of different income levels have followed distinct paths



Source: World Bank calculations, using data in the World Bank World Development Indicators database.

Note: Investment rates are the unweighted shares for each income group. GDP-weighted results are qualitatively similar.

BOX 1.2 Investment booms are not always associated with sustained growth

Investment booms have historically occurred in a broad range of developing and high-income countries (table B1.2.1). However, such booms have not necessarily been accompanied by sustained economic growth in the aftermath of the boom. Indeed, many economies that have experienced investment booms—defined as any period of steady growth in investment rates lasting for at least three consecutive years—have experienced subsequent weak growth even after the initial postboom period (figure B1.2.1).

Investment-boom economies also include many economies that have remained low- or lower-middle-income. Interestingly, China—which has maintained very high levels of investment since reforms in the 1980s—has not sustained the sorts of investment surges that would justify the label “boom”: rather, the Chinese experience has been one of steady and consistent ratcheting up of investment, with occasional pauses. Altogether, there have been at least 38 investment booms over the past half century.

TABLE B1.2.1 Investment booms have occurred in a broad range of developing and high-income countries

Number of booms	Economies
1	Albania; Algeria; Azerbaijan; Bahamas, The; Belarus; Botswana; Chad; Côte d’Ivoire; Cameroon; Eritrea; Iceland; Iran, Islamic Rep.; Kazakhstan; Lebanon; Macao SAR, China; Madagascar; Malawi; Malta; Morocco; Pakistan; Papua New Guinea; Philippines; Saudi Arabia; Serbia; Sri Lanka; Thailand; Trinidad and Tobago; Zambia
2	Jordan; Malaysia; Venezuela, RB
4	Lesotho

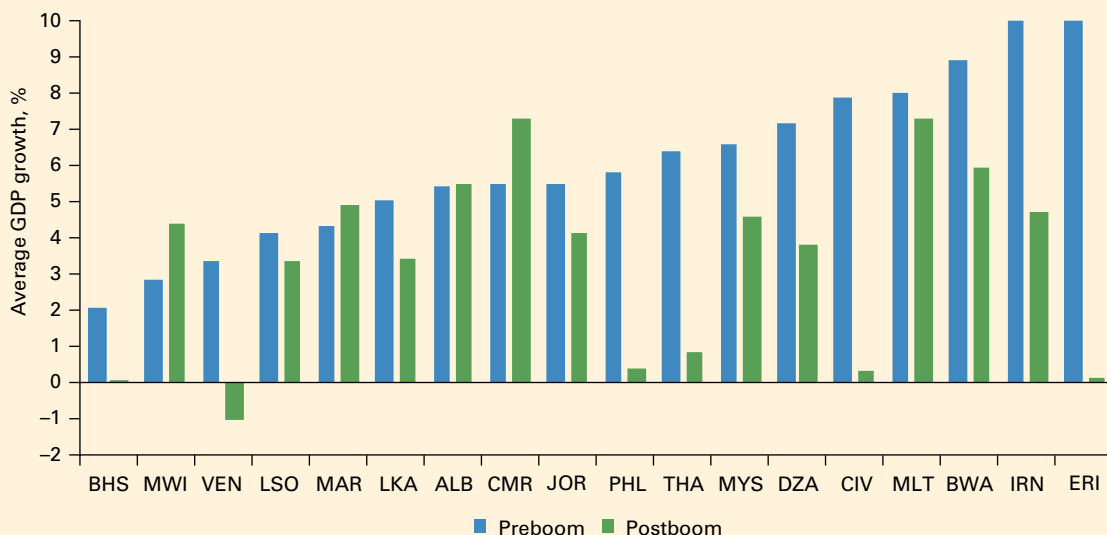
Source: World Bank calculations, using data in the World Bank World Development Indicators database.

Note: Investment booms are defined as any three-year episode where the investment share of gross domestic product increased by at least a total of two percentage points, conditional on an initial investment share of at least 10 percent.

(continued)

BOX 1.2 (continued)

FIGURE B1.2.1 Many countries experience weak growth following an investment boom



Source: World Bank calculations, using data in the World Bank World Development Indicators database.
 Note: Data are for 1960–2010 preboom (postboom) periods, defined as the GDP growth rate in the four-year period just prior to the boom (the four-year period after the end of the boom). For countries experiencing more than one boom, the reported numbers average the rates across all booms. Investment booms are defined as any three-year episode of at least two percentage points’ growth in investment share of GDP, conditional on an initial investment share of at least 10 percent

Some of these investment booms have lasted for fairly long periods. The longest episode was the recent Belarussian boom of 2003–10. As is to be expected, several fast-growing economies have also experienced investment booms: these include República Bolivariana de Venezuela in the 1970s and Malaysia and Thailand in the 1990s. Nevertheless, the conditions underlying investment booms differ across economies: Kazakhstan and Saudi Arabia, for example, experienced booms in

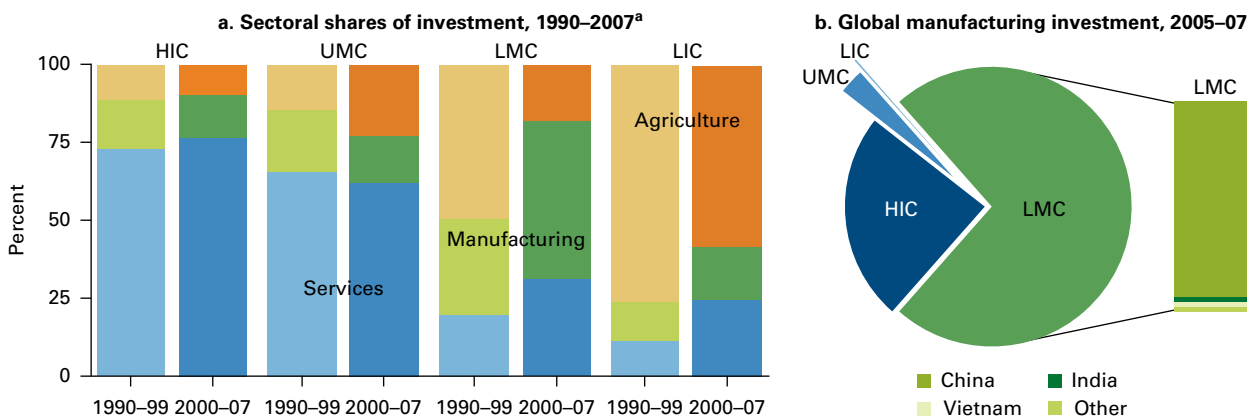
large part due to natural resources, while some booms coincided with significant appreciation in real estate (Belarus and Lebanon) or financial asset markets (Macao SAR, China). Other economies have had booms led by the public sector, such as that of Côte d’Ivoire in the mid-1970s. Finally, some booms were driven by foreign capital inflows, which may give rise to the boom-bust cycles commonly observed in middle-income countries (Tornell and Westermann 2002).

A shift in sectoral distribution toward manufacturing and services is under way

As an economy’s income level rises, its production structure tends to move away from the predominance of agriculture, toward a larger manufacturing base, and eventually to a service-oriented economy. As average income levels rise, an analogous

shift can be expected to occur in investment patterns. Indeed, since 2000, capital formation has gradually moved away from agriculture, and manufacturing investment—as a share of global fixed investment—has doubled, rising from 11 percent in 2000 to 22 percent in 2007, even as global investment in agriculture has remained relatively stagnant (of about 9 percent of global fixed investment, roughly half its share in the 1980s).

FIGURE 1.5 Global manufacturing investment tends to be concentrated in lower-middle-income countries (panel a), with China currently accounting for the vast majority of investment in those countries (panel b)



Sources: World Bank calculations, using data in the UNIDO Industrial Statistics database; FAO FAOSTAT database; GTAP database; and World Bank World Development Indicators database.

Note: HIC = high-income countries, UMC = upper-middle-income countries, LMC = lower-middle-income countries, LIC = low-income countries.

a. Shares are the unweighted averages of annual data indicated for each income group. Investment-weighted results are qualitatively similar but overstate the 2000–07 shares for the LMC category because of the large weight of China. Global manufacturing data for 2000–07 averages for LMC include Indian data for only 2005 (the only year data were available). Global agricultural data for 1990–99 averages for LIC include Tajikistan data for only 1995 because of anomalous shares for the later years.

This increase in the overall importance of manufacturing investment notwithstanding, the global distribution of manufacturing investment has remained concentrated in lower-middle-income countries, a feature that has been relatively stable over the past two decades (figure 1.5, panel a). Thus, although China has accounted for the vast majority of lower-middle-income investment in the sector, its share is likely to decline in the future as lower-middle-income countries—such as India and Vietnam (figure 1.5, panel b)—gradually ramp up their manufacturing bases with added investment. To the extent that future growth in Sub-Saharan Africa remains robust, low-income countries in the continent may also see increases in their manufacturing investment shares.

As income levels rise in the developing world, global investment activity is on the cusp of yet another major shift in sectoral investment patterns. This transition will likely see services investment rise in both the developed and developing worlds, completing the global move away from the primary and secondary sectors and toward a postindustrial investment landscape with the services sector dominating global investment activity.

These changes in the sectoral distribution of investment activity will likely be accompanied by gradual improvements in the efficiency of investment. Aggregate and sectoral investment figures often obscure the extent to which investment is actually translated into productive capital, and as economies develop, such allocative efficiency will probably rise. Estimates of the efficiency of capital use indicate wide variations, both between and within countries (table 1.1).² In China, the economywide ratio of changes in output for each additional unit of capital deployed (the marginal product of capital, or MPK) averaged 22 percent annually. This is comparable to the MPKs in India, Indonesia, and Mexico but is significantly lower than Turkey's MPK (and higher than Russia's)—suggesting that, at the economywide level, investment is more efficiently deployed in Turkey (and less efficiently in Russia).

Taking these estimates at face value, the fairly low MPK of around 10 percent observed for China's and Indonesia's manufacturing sectors (both relative to other economies and within these respective economies) indicates that investment is less efficiently deployed in manufacturing than in the agriculture and services sectors in these countries. For China, one possible

TABLE 1.1 There is significant heterogeneity in marginal products of capital, at both economywide and sectoral levels, across developing countries

	Brazil	China	India	Indonesia	Mexico	Russian Federation	Turkey
Economywide	0.17	0.22	0.24	0.26	0.27	0.03	0.48
Agriculture	0.28	0.29	0.19	0.14	0.10	0.03	0.34
Manufacturing	—	0.08	0.35	0.11	0.27	—	1.17
Services	—	8.78 ^a	0.19	—	0.24	—	0.19

Sources: World Bank calculations, using data in the UNIDO Industrial Statistics database; FAO FAOSTAT database; GTAP database; and World Bank World Development Indicators database.

Note: MPK = marginal product of capital, — = not available. Unless otherwise indicated, data are for 1991–2007. MPKs are computed as the capital output elasticity-weighted ratio of output to capital stock, computed for a sector j (or economywide) in year t from the formula $MPK_{jt} = \alpha_j Y_{jt} / K_{jt}$, where Y and K are gross domestic product (GDP) and the capital stock formation, respectively, and α is computed from the share of compensation to physical capital in that sector (or economywide), excluding natural capital. Sectoral GDPs are computed from sectoral value-added shares of total GDP. Capital stocks are calculated from sectoral investment using a perpetual inventory method with an assumed constant depreciation rate of 5 percent. In most cases, annual data for manufacturing and services are not available for the full period, and reported MPKs are computed from available data. The computation excludes the years 1998–99 (financial crisis) for Brazil; years prior to 1996 (transition) and 1999–2000 (financial crisis) for Russia; 1997–98 (financial crisis) for Indonesia; 1994 (financial crisis) for Mexico; and 1999–2000 (financial crisis) for Turkey.

a. Because no data are directly available for investment in services, the figures for service sector investment were recovered as the residual of total investment and investment in the other two sectors. Consequently, very large service MPKs (as for China) may be the result of underestimating service sector investment rather than actual high levels of efficiency in the sector.

explanation for this finding is that the high levels of capital formation required for the construction of its world-class assembly plants are ultimately rewarded with relatively less by way of value-added output (Koopman, Wang, and Wei 2012). In Indonesia, governance problems have undermined the efficiency of investment, especially in projects tied to the public sector (Fisman 2001; Olken 2007). India—in spite of its reputation in globally tradable services (Kapur and Ramamurti 2001)—possesses an overall service-sector MPK that is not higher than that of its other sectors. In contrast, Brazil’s high MPK in agriculture appears consistent with the overall evidence in favor of the sector’s global competitiveness (Rada and Buccola 2012).

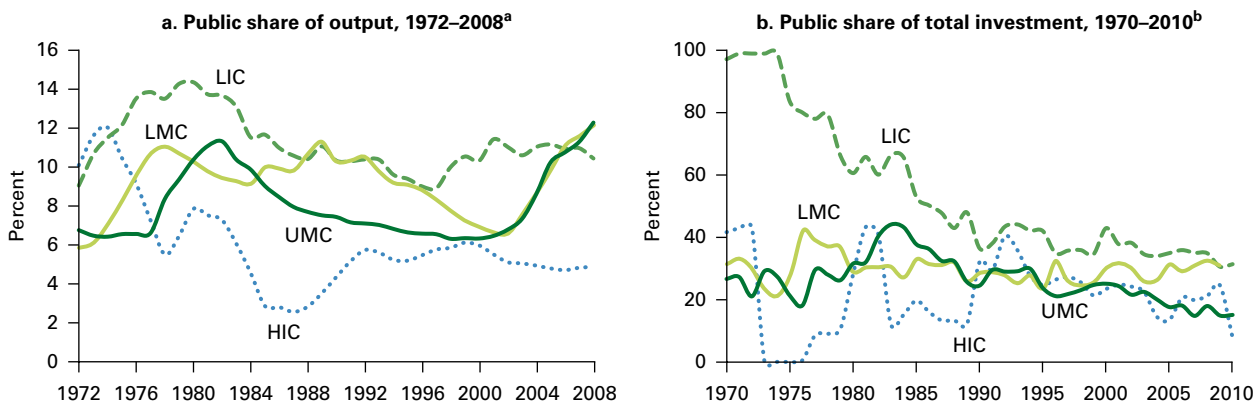
To the extent that cross-country variations in MPKs are indicative of the efficiency of capital deployment—with the resulting resource misallocation reflected in aggregate total factor productivity (TFP) differentials—the message of low overall efficiency of investment in developing countries is a theme that has found resonance in recent academic research (Caselli and Feyrer 2007). Additional estimates for Africa (Kalemi-Ozcan and Sørensen 2012), Eastern Europe (Bartelsman, Haltiwanger, and Scarpetta 2009), and China and India (Hsieh and Klenow 2009) all point to the presence of significant inefficiencies in capital allocation

among developing-country firms. The upshot of this finding is that many potential efficiency gains remain for developing countries to exploit as they grow.

One potential reason for the historical inefficiency of investment in many developing countries may be the preponderance of public sources as the origin of investment activity. Public sector investment rates—averaging about 9 percent of total output—are often significantly higher in developing economies relative to high-income countries (figure 1.6, panel a). In low-income countries, in part because of greater infrastructure needs, this share may be even larger; public investment rates in low-income countries average about 2 percentage points higher than in middle-income ones. Moreover, for low-income economies that are commodity exporters, the government often invests directly in the extractive resource industry.

Yet public investment often fails to produce economically valuable capital, and even in cases where public capital can be economically beneficial, public investment *spending* often suffers from severe misallocation problems (Pritchett 2000). However, the role of the state in investment has diminished in most developing countries since the 1970s (especially among low-income African countries exiting a “Big Push” model)³ (figure 1.6, panel b). Moreover, future trends may support

FIGURE 1.6 The public sector share of output is lower in high-income countries than in other country groups (panel a), but the public sector share of investment has converged among country groups (panel b)



Source: World Bank calculations, using data in the World Bank World Development Indicators database.

Note: HIC = high-income countries, UMC = upper-middle-income countries, LMC = lower-middle-income countries, LIC = low-income countries.

a. (Unweighted) shares of total output are computed as a five-year moving average, given the volatility of annual investment relative output.

b. (Unweighted) shares of public investment are computed from public fixed capital formation as a share of gross fixed capital formation, with statistically implausible outliers (shares greater than unity) dropped.

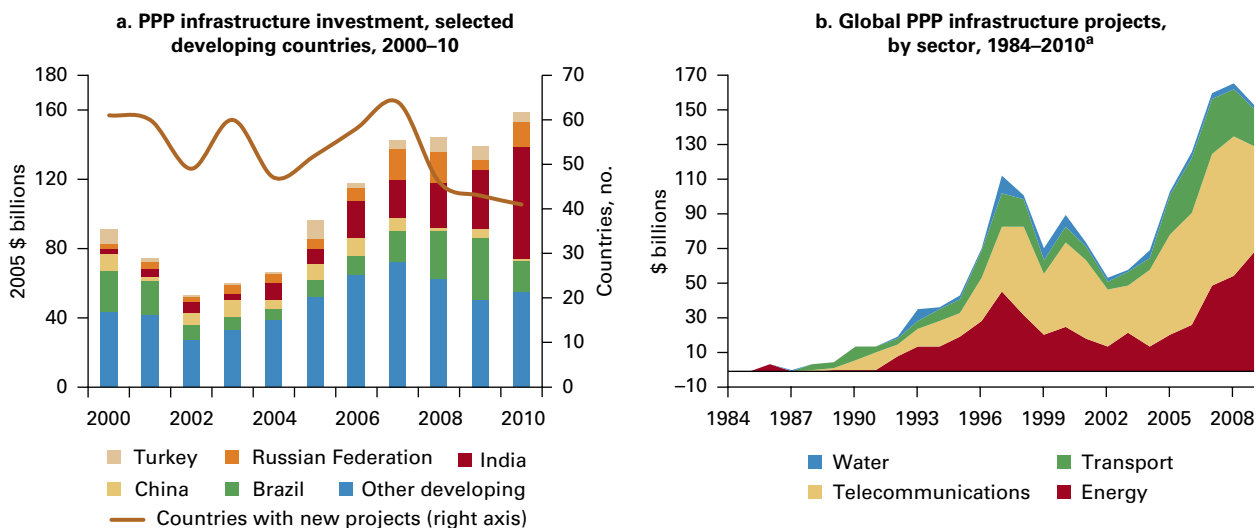
even greater rollback: the increased openness of economies to foreign direct investment (FDI) in funding large infrastructure projects, and the movement of more countries from low-income to lower-middle-income status. On this final point, the development of economies worldwide would exert further downward pressure on overall public sector investment. Working against these factors is the growing perception that, in a multipolar world economy with influential sovereign wealth funds, the state can play a more major role in economic activity overall (Mostrous, Gue, and Dittman 2010), which could signal more active involvement of governments in future investment activities.

Another factor that may support lower levels of public investment in the future is the increased involvement of the private sector in the provision of infrastructure—namely, through public-private partnerships (PPPs).⁴ These partnerships can be a crucial step toward improving discipline in the allocation of public funds for infrastructure and enhancing the efficiency of infrastructure services. (Such discipline has typically been lacking in the public sector, eroding the contribution of public investment to capital accumulation and growth.) Enhancing public investment efficiency is especially important given the contribution

of public capital to output in low-income countries (Gupta et al. 2011). More generally, the gains to output growth from increases in infrastructure investment could potentially be large: improving infrastructure quality from that of a median economy to the top quartile translates into as much as a 7.7 percent increase in output per worker (Caldéron, Moral-Benito, and Servén 2011). Since the 1990s, PPP infrastructure projects have become increasingly common among developing countries (figure 1.7, panel a).

In addition to the long-term increase in private sector involvement in infrastructure, aid flows have become more important as the public sector retrenched in the wake of the global financial crisis. In 2008, for example, more than one-third of infrastructure spending in low-income countries was aid-financed (compared with only 4 percent in middle-income countries). With government budgets increasingly strained in the developed world, however, and fiscal outlooks relatively grim for the next decade or two, support for infrastructure from traditional donor sources is likely to slow significantly. This leaves nontraditional bilateral donors—such as Brazil, China, the Gulf Cooperation Council (GCC) countries,⁵ and India—to pick up the slack as major financiers of infrastructure projects in Africa.

FIGURE 1.7 Private sector commitments to infrastructure have risen over time, both in major developing countries (panel a) and across most infrastructure subsectors (panel b)



Source: World Bank calculations, using data in the World Bank Private Participation in Infrastructure database.

Note: PPP = public-private partnership.

a. Data for total global distribution for 2000–10 (panel b) have been adjusted for U.S. Consumer Price Index inflation and are given in real 2005 dollars.

For all their benefits, PPP projects remain, at this time, limited in their ability to meet comprehensive infrastructure needs, with most projects limited to the telecommunications and energy sectors. One reason for this is that private investment commitments have been heavily concentrated; the energy and telecommunications sectors have clearly benefited the most from the increase in private investment (figure 1.7, panel b). In low-income countries, three-quarters of PPP commitments have been in telecommunications, as opposed to a shade less than half for middle-income countries. This concentration can also be seen geographically, with the major developing countries often accounting for more than half of all PPP projects in a typical year. India has been the top recipient of private sector flows in infrastructure since 2006, followed by Brazil, China, Russia, and Turkey.⁶

Moreover, on net, private investment in infrastructure often has not offset declines in public sector investment, leading to cases, such as in Pakistan and South Africa, where infrastructure investment in terms of GDP plummeted as public sector investment declined (Commission on Growth and Development 2008). In major Latin

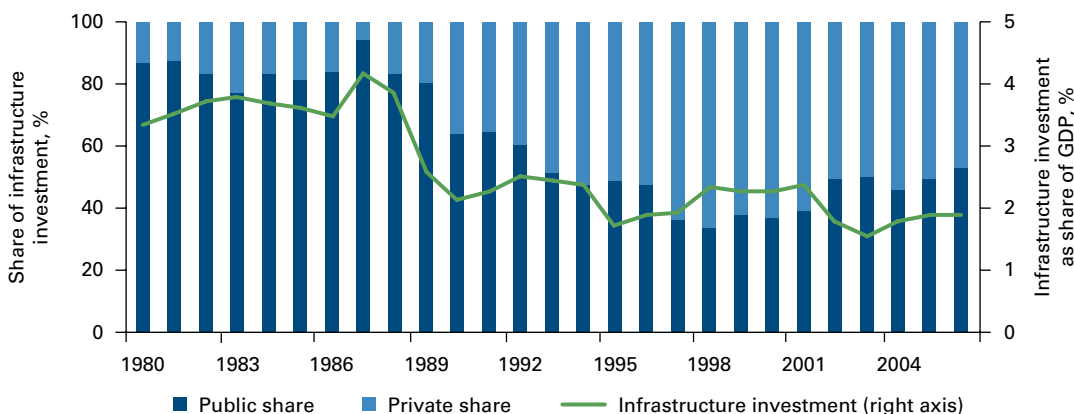
American economies, infrastructure investment as a share of GDP collapsed in the late 1980s and early 1990s and has remained subdued in the years since, the exception being Chile (figure 1.8).

This could suggest that private and public investments in infrastructure are complements rather than substitutes (Calderón and Servén 2010). The limited global success of private provision of important public goods is a cautionary tale against a rush into PPPs in other areas where the state has historically played a central investing role, such as human capital (box 1.3).

Perhaps the biggest challenge facing PPP-based infrastructure financing is how, historically, such financing has been an enormously complex process. Financing large-scale infrastructure projects typically involves multiple financing sources, numerous public and private contracting parties, intricate legal documentation governed by both national and international laws, and difficult contracting and institutional design problems.

The complexity of the multiparty, multimodal approach to infrastructure financing is evident, for example, in the largest energy projects recently undertaken in the Middle East (box 1.4). The contours of infrastructure financing have

FIGURE 1.8 Infrastructure investment shares of GDP declined rapidly in major Latin American economies in the late 1980s and have remained subdued in subsequent years



Source: World Bank calculations, using data from Calderón and Servén 2010.

Note: The six Latin American economies covered in the figure are Argentina, Brazil, Chile, Colombia, Mexico, and Peru.

also changed gradually over the past decade, with bond issuance replacing traditional bank loans, and banks based in emerging economies now becoming major intermediaries in the infrastructure sector. The challenges facing infrastructure financing in the future will be revisited later in this chapter.

In sum, sectoral investment patterns also imply changing patterns since 2000, with a shift in global investment away from agriculture toward manufacturing, and a gradual reduction of the role of public sector investment in developing countries. The world appears to be on the cusp of yet another shift in investment patterns, this time toward an increased emphasis on the services sector. The expanded role of the services sector will likely be manifested in a host of investment activities, ranging from services related to greater human capital production to an expansion of infrastructure in the developing world.

A gradual redistribution of global capital stocks has occurred in recent decades

The ongoing shift in the distribution of global investment shares has meant that the existing stock of productive physical capital has also been changing over time.⁷ In 1980, global

capital (measured using the perpetual inventory method),⁸ was largely concentrated in the developed world, especially in the United States and Western Europe (map 1.1). By 1995, this situation had begun to change, with several large developing economies, such as Brazil and China, accumulating stocks comparable to those of high-income countries. The latest data suggest that this shift has further consolidated. Today, Brazil, China, India, and Russia together account for about 18 percent of the global share of capital, more than twice the share of Germany and near that of the United States.

The process is far from complete: a normalized Herfindahl index of capital stocks has fallen only modestly—from a high of 0.08 in the late 1980s to a low of 0.07 of 2010—compared with a larger fall in the analogous normalized Herfindahl of production (a decline from 0.13 to 0.10). This slow evolution of the Herfindahl points to the high concentration of capital and wealth that continues to reside in the industrialized high-income countries, a reflection of the legacy of capital accumulation that occurred over the 19th and 20th centuries. Nevertheless, the process of a gradually less unequal global distribution of capital should continue in the future as developing economies grow in size and absolute investment flows into their domestic capital stocks rise.

BOX 1.3 Investment in human capital can be a source of economic growth

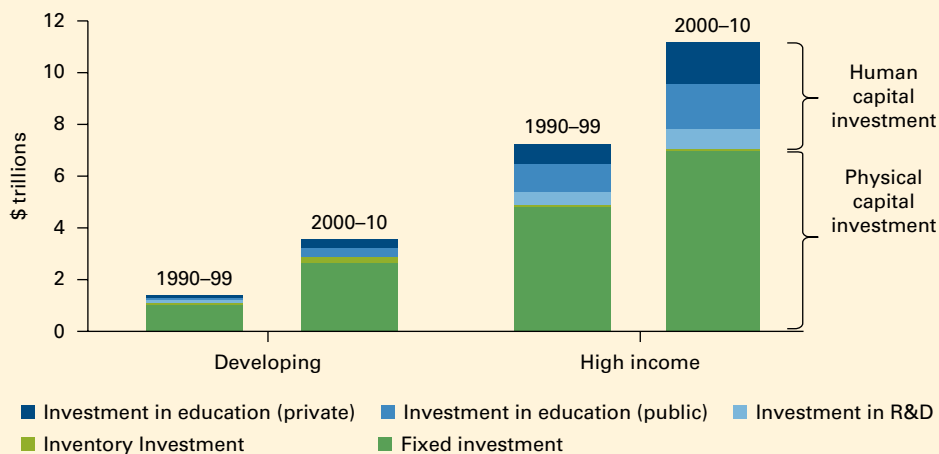
Although the focus of this report is on investment in physical capital, it is important to recognize that accumulation of human capital may stimulate economic growth and development. Though it is possible that human capital may be subject to diminishing returns in the same way as physical capital (Mankiw, Romer, and Weil 1992), some scholars have argued that endogenous growth via increasing returns could be realized through spillovers from knowledge embedded in human capital (Romer 1990).

Over the past two decades, high-income countries have outspent developing countries in developing human capital, not only on an absolute basis but also in relative terms. Between 1990 and 2009, high-income countries invested, on average, about 35 percent of

their total investment bill^a on human capital, whereas developing countries spent about half as much over the same period (figure B1.3.1). In fact, the most recent decade saw only a slight increase in human capital investment by developing nations, to 19.6 percent (from 17.3 percent in the decade before). Given the growing importance of human capital in the deployment of technology, even in capital-intensive sectors such as manufacturing, developing countries will likely need to adjust their capital allocation decisions in the future. To the extent that they do, this increased investment in human capital will be yet another element giving rise to higher levels of investment in the services sector, since education and research and development (R&D) are typically classified as services.

a. Current national income accounting practice classifies expenditure in these sectors as consumption, not investment. For the purposes of box 1.3, the total investment bill is calculated to include these expenditures as forms of "investment."

FIGURE B1.3.1 Investment in human capital relative to physical capital in high-income and developing countries, 1990–99 to 2000–10



Sources: World Bank calculations, using data in the World Bank World Development Indicators database and World Bank EdStats database.

Note: Investment in private and public education and research and development (R&D) are measured as expenditures in each of these sectors.

Although the distribution of stocks of capital provides an important sense of the cumulative investment that would be required before the global inequality in the distribution of capital is

diminished, the greater abundance of capital in high-income countries need not signify that capital has been inefficiently distributed. Capital must, ultimately, be paired with labor (and other inputs)

BOX 1.4 Energy project financing in the Middle East: A multiparty, multimodal approach

Infrastructure financing related to the highest-value energy projects undertaken in the Middle East illustrates the complexity of large-scale infrastructure financing operations. Projects typically involve multiple local and regional investors and financing based on a capital structure that combines direct equity stakes, debt issuance, and syndicated lending, together with some elements of export credit (both direct and covered) and Islamic financing (table B1.4.1). Pricing structures are also often complex; most projects, for example, peg pricing to the London interbank offered rate (LIBOR), with varying markups for tranches according to the stage of the project.

The general resilience of project financing in the Middle East in 2009 demonstrates that sound, credit-worthy projects continue to be able to raise long-term financing in a global environment of credit-constrained markets, especially when projects employ innovative approaches to syndicate formation. The Shuweihat 2 independent water and power project, for example, secured a key loan component of its financing from the Japan Bank for International Cooperation after the participation of Japan's Marubeni among the deal's equity sponsors. The RasGas project is the second time the project has sought financing, the first being a 70-30 debt-equity offering in 1996 (Dailami and Hauswald 2007).

TABLE B1.4.1 Top five project finance deals in the Middle East, 2009

	Sector	Country	Value (\$ billions)	Financing breakdown (\$ billions)	Sponsors (country, stake)
Dolphin Gas Pipeline	Oil and gas	United Arab Emirates	4.1	Bond (1.3); syndicated loan (1.4); covered loan (0.2); shareholder loan (1.2)	Mubadala (United Arab Emirates, 51%); Total (France, 25%); Occidental Petrol (United States, 25%)
Shuweihat 2 IWPP	Power	United Arab Emirates	2.6	Syndicated loan (2.1, 2 tranches); sponsor equity (0.5)	Abu Dhabi Water and Elec (United Arab Emirates, 60%); Suez (France, 20%); Marubeni (Japan, 20%)
Rabigh IPP	Oil and gas, power	Saudi Arabia	2.5	Syndicated loan (1.9); sponsor equity (0.5)	ACWA Power (Saudi Arabia, 40%); Kepco (United States, 40%); Saudi Electricity (Saudi Arabia, 20%)
Ras Laffan LNG Project	Oil and gas	Qatar	2.2	Bond (0.5 3-yr, 1.1 5-yr, 0.6 10-yr)	n.a.
Al Dur IWPP	Power and desalination	Bahrain	2.2	Syndicated loan (1.3); senior public bond (0.1), sponsor equity (0.6)	Suez (France, 40%); GIC (Singapore 20%); SIO (Bahrain, 10%); Cap Mgmt Hse (Bahrain, 25%); Instrata (Bahrain, 5%)

Source: World Bank calculations, using data in the PFI database.

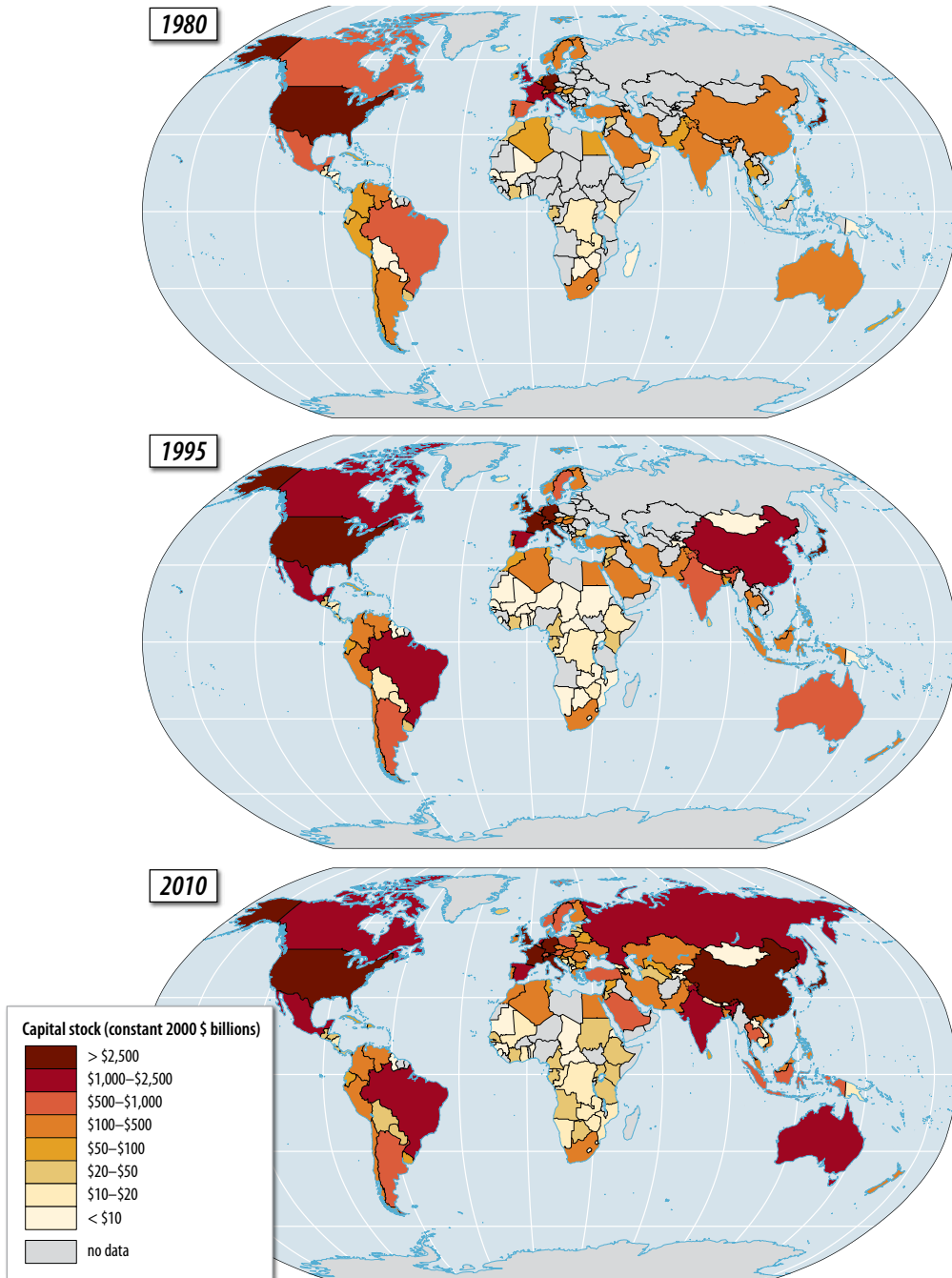
Note: IPP = independent power project, IWPP = independent water and power project, LNG = liquefied natural gas, n.a. = not applicable.

for the purposes of production; a given country would only be “capital-starved” if there existed a significant imbalance between available capital and labor (adjusted for human capital differentials).

Thus, the distribution of such efficiency-adjusted capital stocks may offer a different

message than a focus on stocks alone. The East Asia and Pacific region, for instance, has the largest stock of capital, mainly due to the size of China. Once the capital stock is adjusted for efficient units of labor, however, the region falls into the lower half of the distribution in terms of

MAP 1.1 The geographical distribution of capital stocks has gradually shifted to developing countries over the past three decades



Sources: World Bank calculations, using data in the World Bank World Development Indicators database and World Bank Global Economic Monitor database.

Note: Capital stocks are calculated using a perpetual inventory method with assumed constant depreciation rate of 5 percent. Countries with insufficient data in the constant investment series are backcasted using a regression of the investment deflator on the GDP deflator and available investment data. Data for the 2010 chart are either for 2010 or the latest year since 2006.

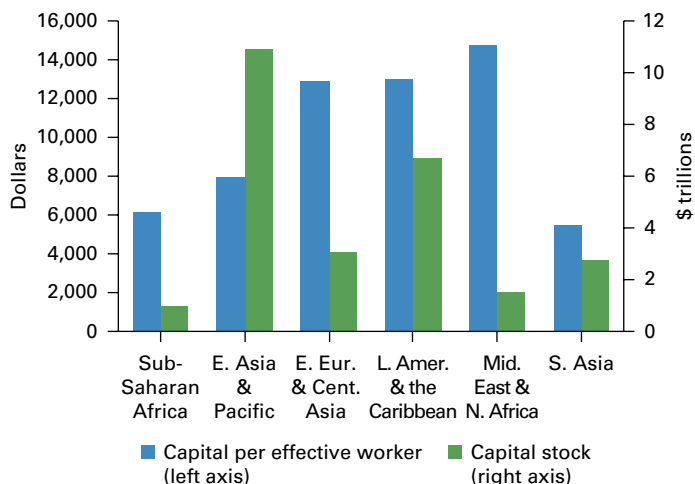
capital per effective worker (figure 1.9). The opposite phenomenon can be seen, most dramatically, in the Middle East and North Africa. Finally, the stock of capital in Sub-Saharan Africa, while significantly less than that of other regions, is higher than that of South Asia in per-worker units.

These differences in capital stock per efficiency-adjusted labor unit point to the importance of considering the evolution of complementary factors when assessing the future demand for capital. For example, Latin America may experience weaker demand for investment in the future, especially because impending population dynamics (explored in greater detail in chapter 2) may mean a slower expansion of the complementary labor force. Conversely, capital demand may be greater in regions such as Africa and South Asia, given the anticipated expansion of the labor force in these countries. There also appears to be room for more capital accumulation in a high-capital-stock region like East Asia.

Historical increases in capital per worker also carry significant implications for overall worker welfare. The average worker in 1950 in the United States—then, as now, the technologically leading nation—was paired with the equivalent of \$72,400 worth of capital (measured in 2005 PPP-adjusted international dollars) in the form of machinery, plant, and equipment, a level that countries such as Chile and Mexico attained by 2008. The catch-up in worker welfare is even more stark when compared to other high-income countries. Today, the average worker in Malaysia is paired with only 20 percent less capital than a French worker had in 1975, and that does not take into account the vast improvements in the overall quality of capital goods. Even in a low-income economy such as Bangladesh, the average worker works with one-tenth the capital an average British worker did in the 1980s.

Although absolute capital stocks will continue to (slowly) converge over the next two decades, differentials in the per-worker stock of capital between developing and high-income countries—which is already substantially more equally distributed today than it has ever been (map 1.2)—may not necessarily fall further. This is because population growth in developing countries will likely offset their fairly mild

FIGURE 1.9 Adjusting capital stocks by efficiency-adjusted units of labor results in different distributions compared to comparing capital stocks alone



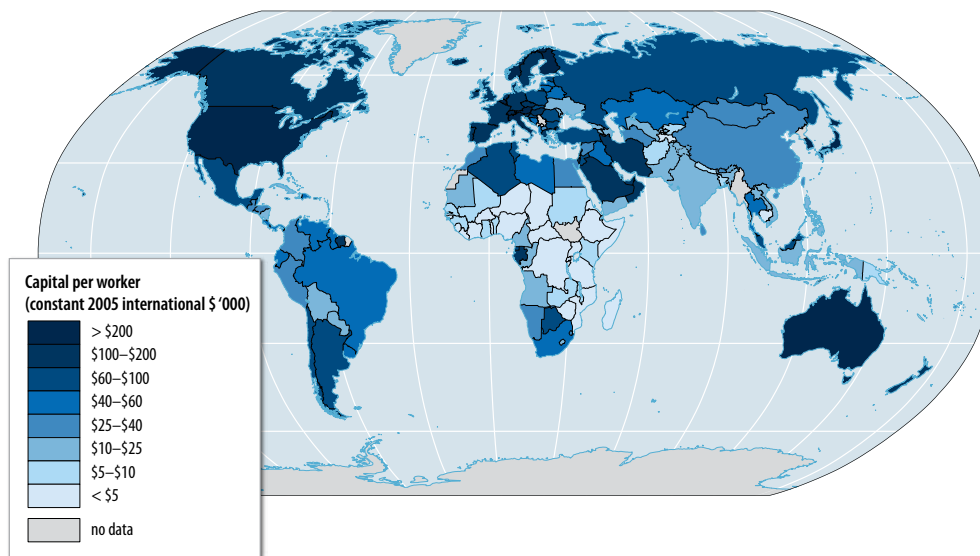
Sources: World Bank calculations, using data in the World Bank World Development Indicators database and World Bank Global Economic Monitor database.

Note: Capital stocks are calculated for 2010 (or latest), using a perpetual inventory method, with assumed constant depreciation rate of 5 percent, for the region collectively. Efficiency units of labor are calculated as the share of the working-age population participating in the labor market, adjusted by returns to the existing stock of human capital (measured as the average years of schooling of the population above 15 years of age). Capital stocks per efficiency-adjusted units of labor are calculated as simple averages for each region.

increases in capital stocks, thereby placing a natural brake on the convergence of per-worker stocks of capital.

Long-run drivers of investment around the world

With its central role as a signal of anticipated future prosperity, the study of investment has pre-occupied macroeconomists since the discipline's emergence. Keynes (1936, 161) termed the spontaneous and volatile forces behind investment “animal spirits.” But the driving forces behind economic actors’ long-run decisions to invest are not entirely a black box. Traditional models of investment activity appeal to macroeconomic determinants, such as the growth rate and the real cost of capital (Jorgenson 1963), the shadow cost of capital (Tobin 1969), uncertainty (Lucas and Prescott 1971), and nominal variables such as asset prices (Dixit and Pindyck 1994) and the money supply (Holmström and Tirole 1997).

MAP 1.2 Capital stocks per worker are now more equally distributed than ever before

Source: World Bank calculations, using data in the Penn World Tables (<https://pwt.sas.upenn.edu/>).

Note: Data are for 2009. Capital stocks are calculated using a perpetual inventory method with assumed constant depreciation rate of 5 percent, and presented in thousands of 2005 (Geary-Khamis) international dollars.

At the global level, investment is ultimately constrained by saving. This accounting fact implies that independent changes in global saving patterns will directly affect the extent of global investment activity. Were there to be reductions in global saving in the years ahead, for instance, this would imply reductions in world investment as well. Nevertheless, a single-minded focus on the global saving supply would leave open the crucial question of how, given this supply of saving, global investment is subsequently allocated across countries. This allocation into global portfolios of investments is subject to two countervailing forces that may suppress investment activity in any given economy: disincentives for additional domestic investment, arising from diminishing returns (Kraay et al. 2006); and frictions impeding mobility of capital across national borders, both of which give rise to differences in expected returns across countries. Understanding what drives such cross-country differences in expected returns is key to predicting the ability of economies to attract investment financing.

Differences in macroeconomic growth, in particular, are a central part of the story. Economies that grow faster tend to invest more and attract

more investment from abroad. Although increases in investment need not automatically translate into economic growth (Easterly and Levine 2001),⁹ greater investment is naturally associated with heightened economic activity because firms respond to anticipated future profit opportunities by raising investment today. Productivity gains drive heightened growth and investment activity, inciting lasting structural transformations in the broader economy. The relationship between growth and investment can be substantial: econometric estimates suggest that, all else equal, each additional percentage point of growth is associated with a 0.2 percentage point increase in the investment rate.

Structural factors are important drivers of changes in the allocation of investment financing

However, given the heterogeneity of developing countries' experience with investment, even for economies growing at similar rates, it is clear that economic growth alone does not fully explain all aggregate investment activity. The opportunity cost of undertaking any given investment

activity lies, ultimately, in the attractiveness of other available investment opportunities worldwide, and this attractiveness is embodied in these alternative investments' expected returns to capital. Such expected return differentials are attributable not just to differences in countries' economic growth. Of central importance is also the yield on capital an economy offers relative to others.¹⁰ Finally, cross-country differences in structural factors—in particular their levels of financial development and the overall quality of their institutional environments—can also affect the expected returns from investing in a given country because such structural factors can also distinguish the developmental fortunes of nations.¹¹

Two structural factors are especially important in negatively influencing investment financing: low levels of financial development and inadequacies in institutional quality. Together, these factors give rise to (real or perceived) shortages of safe, investible assets (Caballero 2008). This is a chronic problem in emerging economies and can engender instabilities that go beyond the country's borders: the pursuit of safe investment opportunities can suppress long-term real interest rates, decrease the efficiency of global saving allocation, ignite speculative bubbles in safe asset-generating countries, and contribute to unsustainable global imbalances (Caballero, Farhi, and Gourinchas 2008). Overall, the empirical evidence supports the notion that structural factors are central to determining the amount of investment financing a country can attract, and it offers a potential explanation of why cross-country patterns of investment differ as much as they do (box 1.5).

The importance of these two factors on actual investment activity is evident from the cross-country data. As countries grow, they also tend to yield more mature and sophisticated financial systems; this increased level of financial development, in turn, appears to move together with changes in investment rates. This relationship is especially striking for developing countries, although changes in credit provision have historically followed investment rates closely for high-income countries as well, with the exception of the period after 2000, when credit provision grew sharply in the developed world (figure 1.10). Econometric analyses suggest that, for a 10

percent increase in financial development, investment can rise as much as 3.3 percent.

Investment is also positively associated with the overall quality of the institutional environment (figure 1.11). On this account, developing countries have made significant strides over the past decade: between 1996 and 2010, developing countries' control of corruption and rule of law advanced by about 4 percent, while that in the developed world slid by about 1 percent, according to the World Bank's Worldwide Governance Indicators.¹² Although governance challenges remain an issue for developing countries, these improvements could well make a difference to their likely investment paths in the future. Econometric analyses indicate that real investment activity, even after controlling for a host of other intervening factors, remains statistically significant (figure 1.11) and can rise by as much as 1.6 percent for each 10 percent increase in institutional quality.

Finally, the openness of a country's borders to foreign capital inflows can also increase domestic investment. As individual economies become more integrated into the global economy, future investment—especially in the smaller and poorer economies—may be increasingly led by such FDI. Cross-border capital movements (still) remain a small fraction of what would be implied in a world with more frictionless global capital markets (Lucas 1990), but if financial globalization were to proceed at the pace of the past two decades, patterns of capital flows could be dramatically affected, as discussed in chapter 3.

Investor sentiment is a key driver shaping future investment dynamics

One way of interpreting Keynes's "animal spirits" behind investment is that such spirits may also embody expectations surrounding future investment dynamics. Such investor sentiment is ultimately based on expectations formed with regard to both future growth prospects and uncertainty surrounding those prospects. These expectations are not easily captured in econometric analyses of observable variables, but the

BOX 1.5 Structural factors can affect the cross-country allocation of investment financing

Traditional models of investment typically rely on standard macroeconomic determinants—such as output, economic growth, and the real cost of capital—to explain investment activity. However, macroeconomic variables are subject to cyclical shocks of a short-term nature, and such models may end up capturing factors whose effects may dissipate over the longer run. Just as important, these older models do not capture the potential effects of informational asymmetries and incomplete markets, a shortcoming that has been remedied by more recent models of investment.

The important role of uncertainty and market imperfections highlighted by these more recent studies hint at the need to consider how structural variables can affect aggregate investment at the cross-country level. After all, such frictions often find root in structural changes such as differences in the ability of the financial sector to intermediate saving (Dailami 1992), the legal frameworks that govern contract enforcement (Cooley, Marimon, and Quadrini 2004), and property rights more generally (Besley 1995), along with the broader business climate and political-institutional environment (Acemoglu, Johnson, and Robinson 2005). Economic openness, so crucial to the medium-term current account, may also affect long-run investment activity (Chinn and Prasad 2003).

Differences in such structural factors can potentially alter the flow of investment financing received by any given country. Three major considerations must be taken into account in any successful model that seeks to explain such cross-country investment patterns. First, the approach should incorporate, at its core, cross-country differentials in interest rates. Second, to account

for additional factors affecting expected returns (but not fully reflected in interest rates), the model should be supplemented by economic and structural variables that may differ systematically between countries. Third, the approach should account for the significant heterogeneity that may occur in unobservable variables, along with the potential endogeneity in the explanatory variables. Although no single model can simultaneously address these distinct considerations, this report relies on several econometric approaches to specify a range of plausible coefficients for the main variables of interest.

The formal analyses (reported in the online *Global Development Horizons* [GDH] annex 1.3) suggest that although not all structural variables exert a systematic impact on the cross-country allocation of investment financing, some clearly do. One important factor is the role of financial development: as the level of financial development increases, investment tends to rise as well. This is consistent with the literature (Benhabib and Spiegel 2000; Levine 2005; World Bank 2012b), which finds that financial development has a causal influence on, among other things, capital formation. The overall institutional environment appears to be important for driving investment as well. For example, Mauro (1995) has demonstrated that widespread corruption causes lower levels of investment at the cross-country level, while Besley (1995), using the case of Ghana, has shown that the same applies to the strength of the property rights regime. More generally, strong, positive relationships tend to exist between institutions and investment growth (Acemoglu, Johnson, and Robinson 2005), especially those that are supportive of economic freedom (Dawson 1998).

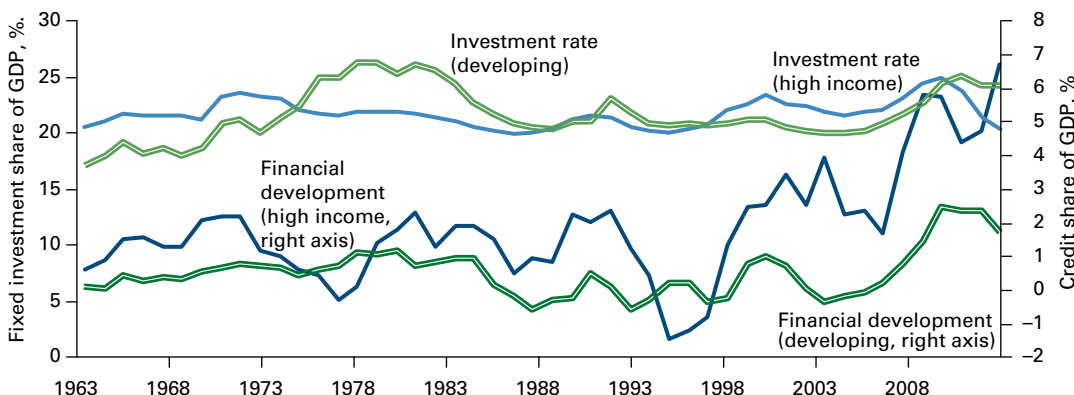
role of investor sentiment can be teased out in other ways. Consequently, although the LINKAGE model used in this report for scenario analyses does not explicitly model the effect of investor sentiment, several other approaches offer hints about the role that sentiment can play in shaping future investment in developing countries.

One such approach is to examine the implicit (or shadow) cost of capital, as measured by Tobin's Q .¹³ Estimates of Tobin's Q point to financial market participants' conditional forecasts of

investment.¹⁴ Values of Q significantly above unity are suggestive of optimism regarding future investment opportunities, and vice versa for values significantly below one. Computations of Tobin's Q for developing countries suggest that investors anticipate continued positive growth prospects for many developing economies (box 1.6).

Another alternative way of attempting to capture the importance of investor sentiment is to examine the effect that even temporary shocks to uncertainty can have on future investment.

FIGURE 1.10 Investment rates and financial sector development in developed and developing countries have evolved similarly

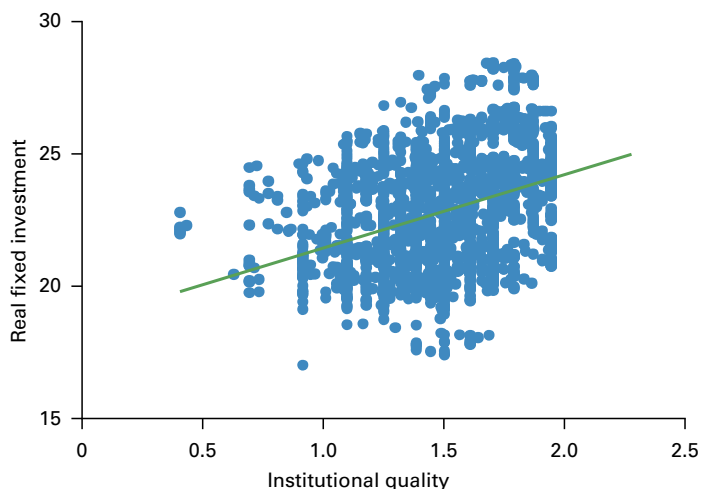


Sources: World Bank calculations, using data in the World Bank World Development Indicators database and Financial Development and Structure database.

Note: Investment rate is defined as the fixed investment share of GDP, while change in financial development is defined as the three-year moving average of the annual change in the ratio of domestic credit provision to the private sector as a share of GDP; both ratios are unweighted averages for the two country groups.

This is especially pertinent given how the global financial crisis of 2007–09 is often associated with decreased investor confidence. The logic behind this mechanism is well understood: capital investment is essentially a decision on when to exercise an option on an irreversible project, contingent on uncertainty about its future profitability (Dixit and Pindyck 1994; McDonald and Siegel 1986).¹⁵ Therefore, increased uncertainty about future economic prospects may dampen aggregate investment as firms retain their option value by postponing capital formation decisions.¹⁶ Large variations in uncertainty alone may be sufficient to freeze investment activity and generate sharp recessions, independent of productivity shocks (Bloom 2009), and may have an effect even when realized real interest rates themselves remain constant (Fernández-Villaverde et al. 2011). By and large, empirical studies have found that uncertainty does have a corrosive effect on investment (Carruth, Dickerson, and Henley 2000). For developing countries, the effect of uncertainty is likely to be especially pronounced for macroeconomic volatility (Aizenman and Marion 1999), uncertainty regarding the real exchange rate (Servén 2003), and commodity price fluctuations (Claessens and Duncan 1993).

FIGURE 1.11 A positive relationship exists between investment and institutional quality



Sources: World Bank calculations, using data in the World Bank World Development Indicators database and Financial Development and Structure database.

Note: Data are pooled for all countries over the period 1980–2010. The figure is a bivariate plot of real fixed investment and institutional quality, with linear regression line. Investment rate is defined as fixed investment in 2000 dollars, and institutional quality is the simple average of (subjective) measures of corruption and rule of law. Both variables are in logarithm form, are unweighted, and are significant in both bivariate and multivariate regressions at standard levels.

The deleterious effects of uncertainty are not limited to the short run. Simulations of the response of investment to a transient shock arising from economic uncertainty show that

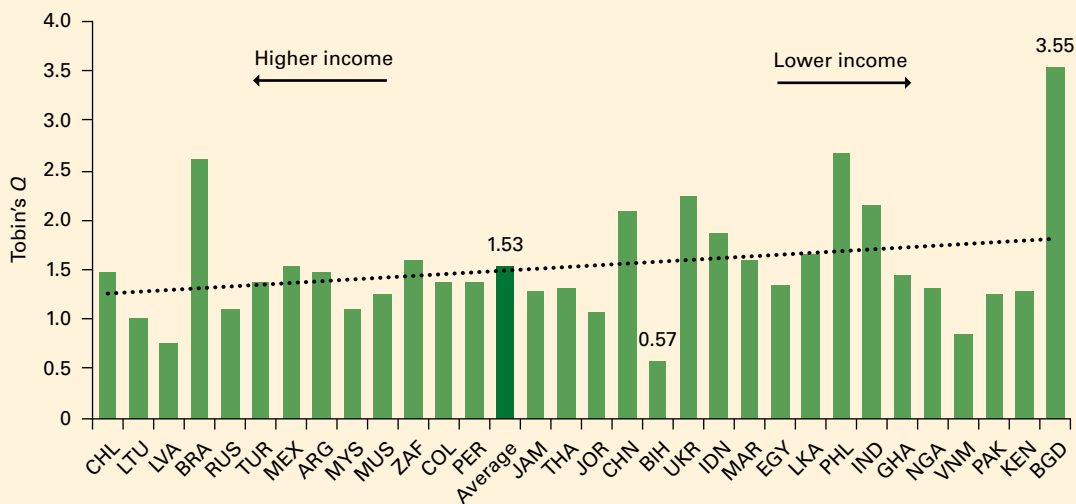
BOX 1.6 Tobin’s Q calculations for developing countries suggest positive growth prospects

To the extent that Tobin’s Q serves as a reasonable conditional (medium-term) forecast, cross-country measures of Tobin’s Q for developing economies reveal a mixed picture with regard to prospects for investment in the developing world. On one hand, it is evident that, on average, lower-income countries possess higher levels of average Qs (figure B1.6.1), a result consistent with the notion that expectations of future investment are greater in lower-income countries. (Although not reported, Tobin’s Q calculations for developed countries typically yield values that fluctuate around the equilibrium-consistent value of unity.) Moreover, measured Qs in several fast-growing developing countries—such as Bangladesh (3.55), Brazil (2.60), China (2.08), India (2.14), and Indonesia (1.87)—are higher than the developing-country average (of 1.53), which accords with the notion that anticipated investment prospects in these countries are generally favorable. On the other hand, Tobin’s Q values for several Eastern European countries indicate that market expectations for investment in the region remain more guarded,

which could reflect long-lasting negative spillover effects of the European financial and debt crisis.

Some caution is warranted in placing too much weight on a single, raw measure of countries’ likely future investment. Developing countries—almost by definition—will tend to possess financial markets that are less complete and more inefficient, which would reduce the predictive value of the market-based valuations on which Tobin’s Q computations rely. Higher valuations for developing-country firms may also reflect intangibles—such as political connections or monopoly rents—rather than bright growth prospects. Indeed, while the relationship between investment rates and Tobin’s Q is reasonably strong for high-income economies, it is far weaker for developing ones, which does limit the confidence one can place on the predictive ability of the measure. Nevertheless, with 90 percent of Qs measured at levels above unity, the overall message of these calculations is that investors anticipate a continued positive growth path for many developing economies.

FIGURE B1.6.1 Tobin’s average Q is higher on average in lower-income developing countries, reflecting market expectations of greater growth potential



Source: World Bank calculations, using data in the Bloomberg database.
 Note: Data are for 2010. Country-level Tobin’s average Qs are computed as the average of the ratio of aggregate market value to book value of assets held by public firms domiciled in the country, with outliers greater than two standard deviations removed. Countries are sorted in order of descending per capita income, measured in 2010 dollars. Country coverage is limited by data availability. The developing-country average is computed as a simple average of available data. The positive slope of the linear fit line indicates that Tobin’s Q is higher for economies with lower levels of per capita income.

although such uncertainty seems to have a more pronounced effect on investment in high-income countries, the negative effects of such shocks may also be acutely felt in developing countries (box 1.7).¹⁷

In sum, the existing literature on investment suggests that the cross-country variations in investment financing observed in recent times—especially in terms of the shift in investment activity toward developing countries and the move toward greater investment in secondary sectors—can be explained by examining

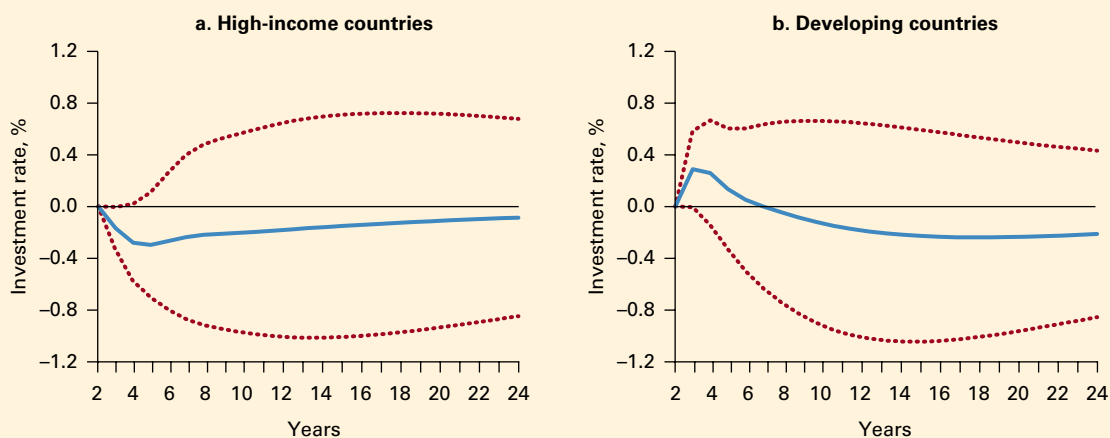
cross-country differences in growth rates and relative returns to capital (when such relative returns are understood to embody not just observable differences in countries' relative yields but also structural factors), along with unobservable differences arising from investor sentiment. On balance, therefore, the overall pattern of global and country-level investment through 2030 will depend on the global supply of saving, its allocation to investment across countries, and country-specific demands for capital. It is to this issue that the next section turns.

BOX 1.7 How transient shocks to uncertainty can have a long-lasting impact on investment

The deleterious effects of uncertainty are not limited to the short run. Simulations of the response of investment to a transient shock arising from economic uncertainty show that although such uncertainty seems to have a more pronounced effect on investment in high-income countries (figure B1.7.1, panel a), developing countries are certainly not exempt; the negative effects of an uncertainty shock may appear

after a lag of about eight years in developing countries (figure B1.7.1, panel b). For both sets of countries, an uncertainty shock can be quite persistent, and the effect may not disappear completely long after the shock has ended. Moreover, the sharp results suggest that shifts in uncertainty of a more fundamental nature may have even more negative and detrimental effects on investment

FIGURE B1.7.1 Investment rate response to increased uncertainty in high-income and developing countries



Source: World Bank.

Note: Investment rate is defined as the fixed investment share of output. The increase in uncertainty is a one standard-deviation shock to uncertainty, measured as the contribution-weighted principal components of generalized autoregressive conditional heteroscedasticity (GARCH) (1,1) conditional variances of inflation; real exchange rate; and agricultural, metals, and energy commodity price indexes. The figures show impulse response functions for a one standard-deviation innovation (solid blue) with +/- 2 standard error bands (dotted red), for 25 periods (years) into the future, generated from a level vector autoregressive (VAR) specification with two Akaike information criterion (AIC)-selected lags. Details of the estimation are provided in the *Global Development Horizons* online annex 1.4.

The changing face of future investment opportunities

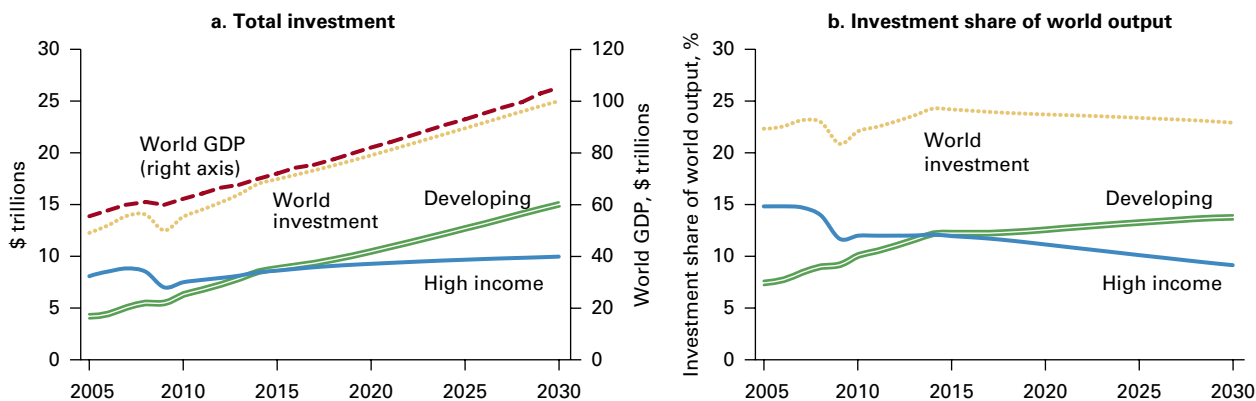
The gradual convergence scenario: A fairly stable path for the global investment rate, with heterogeneity at the country level

After the dip due to the global crisis of 2007–09, the scenario analyses performed for this chapter indicate that global investment will recover and trend steadily upward, growing at a rate in line with overall output (figure 1.12, panel a). By 2030, global investment will amount to \$25 trillion, measured in 2010 dollars, with developing countries accounting for about two-thirds (\$15 trillion) of the total. In absolute terms, investment in developing countries will overtake that in high-income countries by the middle of the 2010s. The global investment rate will remain more or less stable, consistent with the global saving rate of about 22 percent (figure 1.12, panel b, and chapter 2). The share of global investment as a percentage of world output accounted for by high-income countries is expected to fall significantly—from 12.0 percent to 9.1 percent of world output—with the rise in the investment share by developing countries more than making up the difference.

The shift in distribution of investment as a share of global output between developing and high-income countries can be understood by considering the two components underlying this change: changes in each respective group’s investment rates and changes in their sizes relative to each other. The bulk of the increase in the share held by developing countries will actually be due to increases in their relative size. Collectively, investment in high-income countries as a proportion of their own output will decline slightly, by 0.7 percentage point (from 17.5 percent to 16.8 percent), with an even larger corresponding decline in the developing world (a fall from 32.2 percent to 30.1 percent). Thus, developing countries’ increasing share of investment as a percentage of global output will be due to their catch-up economic growth, which results in their relative size rising from about one-third of the global economy in 2010 to almost half by 2030.

Just as China’s contribution led the surge in developing-world investment, the future decline in investment rates within developing countries will also be led by China, which will see its very high investment rate of 48 percent (as of 2010) edge down to about 45 percent in 2016 (as its shorter-term postcrisis stimulus fades) before

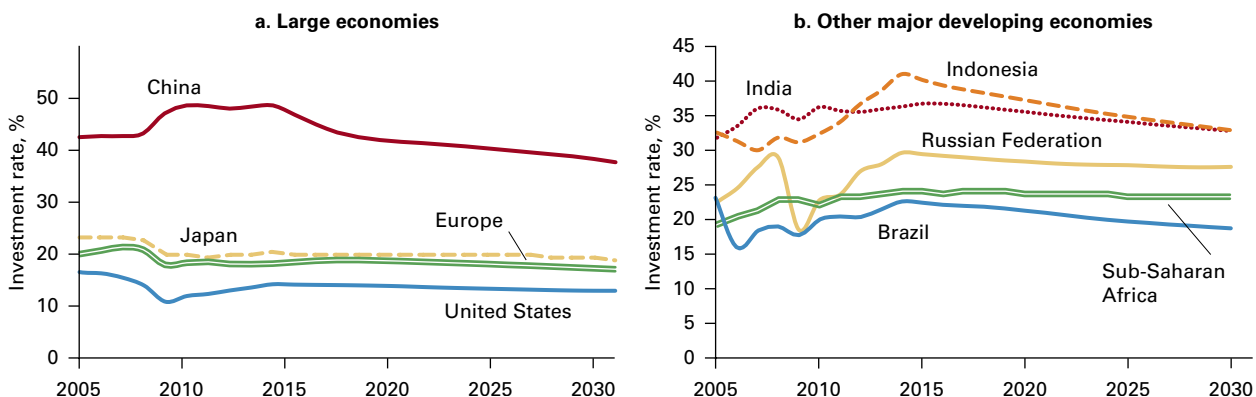
FIGURE 1.12 Total investment (panel a) and investment share of global output (panel b) will increase in developing relative to high-income economies in the gradual convergence scenario



Sources: World Bank projections, supplemented with calculations using data in the World Bank Global Economic Monitor database and World Bank World Development Indicators database.

Note: Figure projections assume a gradual convergence scenario of annual world economic growth of 2.6 percent over the next two decades, of which developing (high-income) growth will average 5.0 (1.0) percent annually.

FIGURE 1.13 Investment rates in many developing countries will trend downward in the gradual convergence scenario, but remain fairly stable in high-income countries



Source: World Bank projections, supplemented with calculations using data in the World Bank Global Economic Monitor database.

Note: Investment rates for the short run (2011–13) follow estimates and projections from the World Bank's Global Economic Prospects, while medium- and long-run projections (2014–30) are from the Bank's global LINKAGE model. Actual realizations for post-2014 are likely to be noisier. Figure projections assume a gradual convergence scenario of annual world economic growth of 2.6 percent over the next two decades, of which developing (high-income) growth will average 5.0 (1.0) percent annually.

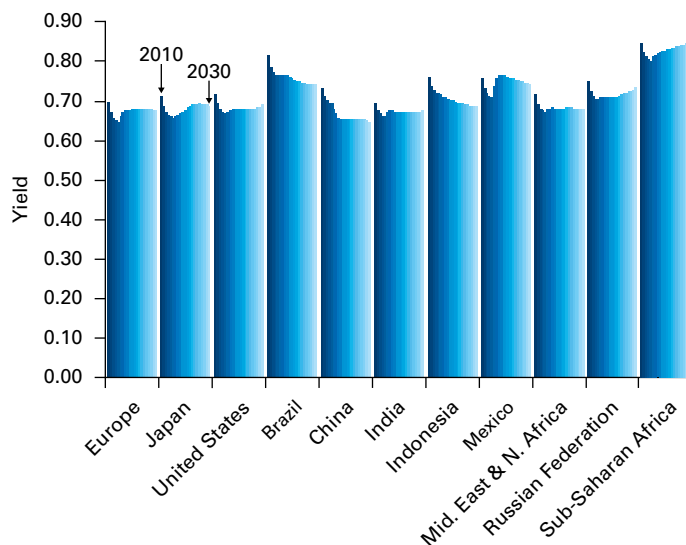
declining gradually to 37 percent by 2030 (figure 1.13, panel a). Already, there are signals in China—for example, underuse of office buildings in major cities and suspension or partial suspension of many high-speed rail projects—that investment opportunities are being gradually exhausted. This declining investment trend in China will occur alongside a slowdown in the country's rate of economic growth resulting from a rising old-age dependency ratio, which will reduce both capital supply (as saving falls) and labor supply (from a shrinking working-age population). Of course, the decline of China's investment rate to a still-very-high 37 percent is not entirely surprising, given the general consensus by academic, market, and policy economists that investment rates consistently exceeding 40 percent are unlikely, even taking into account China's relatively high rate of expected growth (Bardhan 2010; Dobbs et al. 2010; World Bank 2012a).

Although the sharp drop in the investment rate in China will not be matched by any other developing country, several countries will experience significant declines relative to anticipated peaks in the medium term. These include Brazil (from 23 percent in 2014 to 19 percent in 2030) and Indonesia (from 41 percent to 33 percent)

(figure 1.13, panel b). At the same time, not all developing countries will see continuous declines in investment rates: Sub-Saharan Africa, for instance, will see its investment rate rise to average 24 percent between 2010 and 2030—a rate higher than its 2005–09 average of 21 percent—and Russia's investment rate will remain above 27 percent over most of the projection period, significantly higher than its historical 2005–09 average. By way of contrast, the investment rate in the largest high-income countries will remain more or less stable, a testament to the fact that mild (but nevertheless positive) rates of productivity growth will mean that demand for investment in these capital-intensive economies will not dip precipitously. In the United States, for example, investment rates will close 2030 at around 13 percent, which is its average rate over the course of the two decades.

In the gradual convergence scenario, future declines in investment rates will be largely driven by a slowing of either productivity growth or the labor supply because these factors determine the demand for investment. However, investment rates can also fall because of insufficient financial resources available for any given country (the supply of investment financing). Changes in yields, relative to average yields in the world, would

FIGURE 1.14 The yield on loanable funds will rise more rapidly in high-income countries than in many developing countries



Source: World Bank projections.

Note: The leftmost (rightmost) bar for each country corresponds to 2010 (2030). Sub-Saharan Africa in these graphs excludes South Africa. Figure projections assume a gradual convergence scenario of annual world economic growth of 2.6 percent over the next two decades, of which developing (high-income) growth will average 5.0 (1.0) percent annually. Yields are normalized to unity for 2007, and so reported levels are not directly comparable across countries.

indicate whether forces of demand or supply are responsible for the decrease in investment rates. If (weak) demand is the driving force, relative yields will decline, and investors that are eager to supply their funds will mitigate the drop in the investment rate by encouraging more capital-intensive production. If, instead, (weak) supply is the driving force, the relative yield will increase, enticing still some additional financial capital while reducing demand by lowering the capital-intensity of production.

The relatively high yields in Sub-Saharan Africa, for instance, signal a difficulty in attracting ample financing from global sources to meet their large investment demand and many new investment opportunities (figure 1.14). For a similar reason, yields are also expected to be relatively high in Russia, Mexico, or high-income countries. The relative decline of yields in China, India, and Indonesia, in contrast, indicate a drop in investment demand from current levels. The

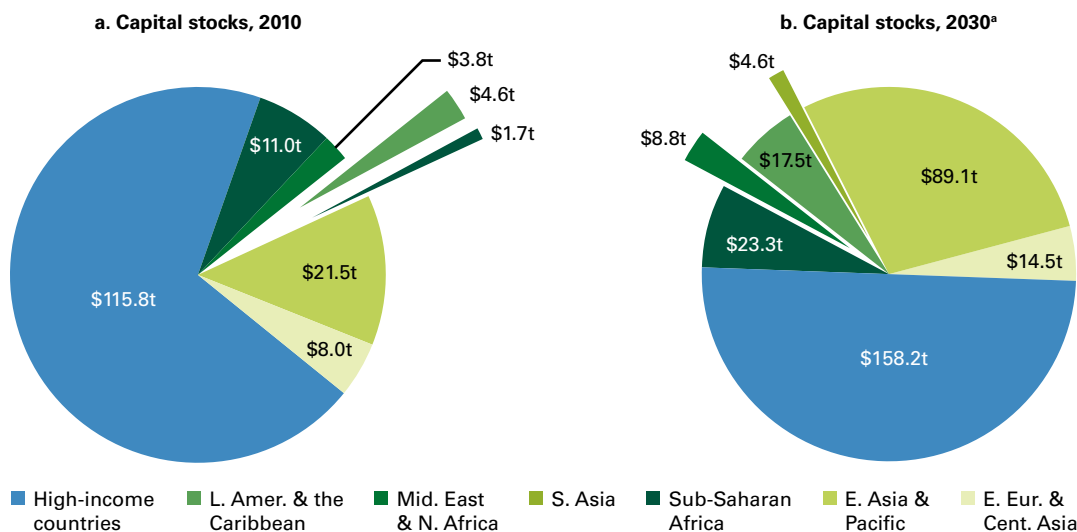
underlying mechanism inducing this change is the converse of Sub-Saharan Africa: shrinking labor forces and a deceleration from current fast productivity growth will mean that investment demand softens over the course of the next two decades. Then—conditional on trends in domestic saving—the drop in investment rates and the lower yields will also be accompanied by a slowing of net capital inflows (discussed in detail in chapter 3) as investors seek relatively higher-return opportunities elsewhere.

High levels of investment by developing countries in their domestic economies over the next two decades will go some way toward correcting the inequality in the global distribution of capital stocks between the developing world and high-income countries. By 2030, half of all capital stocks will reside in developing countries, with countries in East Asia and Latin America accounting for the largest shares of these stocks (56 percent and 15 percent of the developing world total, respectively) (figure 1.15). Sub-Saharan Africa will see the third-fastest growth in its capital stock among developing regions (after East and South Asia), albeit from a low base; by 2030, its capital stock will more than double to \$4.6 trillion (in 2010 dollars). As a group, developing countries' capital stocks will grow by 212 percent by 2030, compared with a 37 percent increase in high-income countries.

The rapid convergence scenario: A similarly stable path for the global investment rate, although with slightly higher investment rates among developing countries

As an alternative to the gradual convergence scenario, it is interesting to consider a rapid convergence scenario where convergence between developing economies and high-income ones proceeds more rapidly. Such a scenario could arise, for instance, if the tepid post-financial-crisis recovery in high-income countries plays out over an extended period and if more rapid catch-up growth in the developing world is accompanied by significant structural and institutional transformation. For example, financial development in Brazil, India, and the Middle East would

FIGURE 1.15 Developing countries will account for more than half of global capital stocks by 2030 in the gradual convergence scenario (panel b), compared with about a third today (panel a)



Source: World Bank projections.

Note: Capital stocks are calculated using a perpetual inventory method with a constant depreciation rate of 5 percent.

a. Panel b projections assume a gradual convergence scenario of annual world economic growth of 2.6 percent over the next two decades, of which developing (high-income) growth will average 5.0 (1.0) percent annually.

advance to attain, by 2030, a level of financial development comparable to the United States in the early 1980s. Similarly, the quality of institutions in China, Indonesia, and Russia would reach, by 2030, a level of the rule of law that is approximately two-thirds that of Scandinavian economies such as Norway or Sweden today. Importantly, the rate of progress in these variables is assumed to differ between countries: for economies starting further away from the frontier, the rate of growth will be relatively faster (the specific assumptions for this scenario are documented in detail in the *GDH* online annex 1.6).

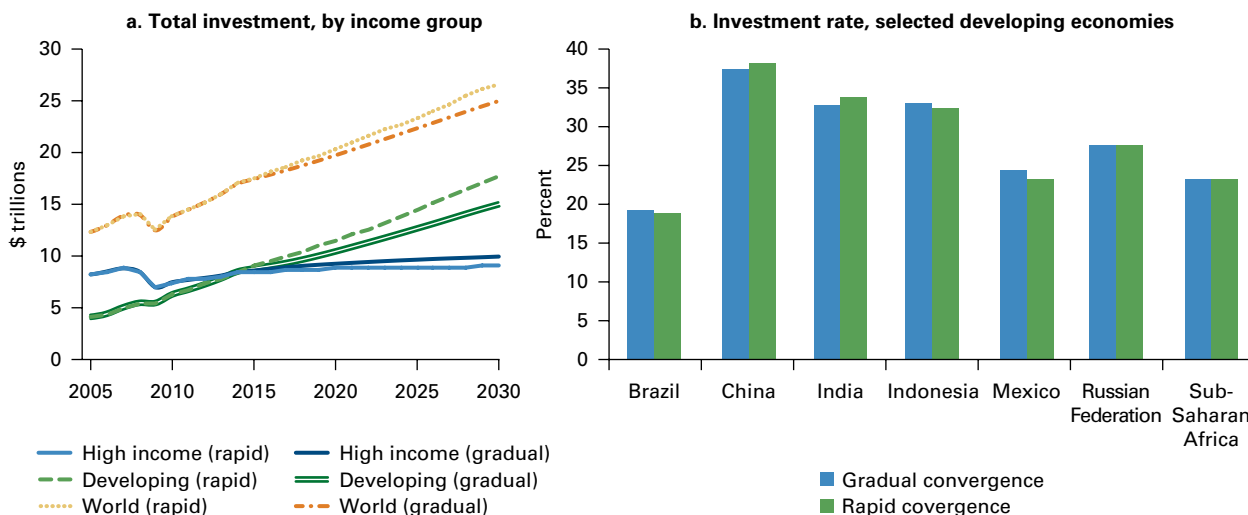
The results of this rapid convergence scenario indicate that global investment will be higher by 2030—led by substantially higher levels of investment in the developing world than under the gradual convergence scenario—to a total of \$26.7 trillion (figure 1.16, panel a). The increases in investment in developing countries are underpinned by higher productivity, with some reinforcing effect from changes in the structural variables, especially from financial development.¹⁸

Thus, as a group, the developing world will see its investment rate exceed that projected under the gradual convergence scenario by an average of about one percentage point throughout the 20-year projection horizon.

For high-income countries, however, the investment rate under this rapid convergence scenario will be marginally lower—by about one percentage point—with a widening disparity between the two scenarios as 2030 approaches. Overall, the global investment rate rises slightly (because of the relatively larger size of developing economies), although it remains around 23 percent. This uptick, nevertheless, will be smaller than the decline in global saving rates under this rapid convergence scenario (to be discussed in chapter 2), which results in some upward pressure on yields worldwide (discussed in chapter 3).

Even though the investment rate for developing countries collectively will rise slightly, there will be significant heterogeneity in their investment rates in the rapid convergence scenario relative to the gradual convergence scenario (figure

FIGURE 1.16 Total global investment will be higher for developing countries in the rapid convergence scenario (panel a), but this belies substantial heterogeneity in individual developing-country experiences (panel b)



Sources: World Bank projections, supplemented with calculations using data in the World Bank Global Economic Monitor database and World Bank World Development Indicators database.

Note: Figure projections assume two scenarios: a gradual convergence scenario of annual world economic growth of 2.6 percent over the next two decades, of which the developing (high-income) growth will average 5.0 (1.0) percent annually; and a rapid convergence scenario of annual world economic growth of 3.0 percent over the next two decades, of which the developing (high-income) growth will average 5.9 (1.0) percent annually.

1.16, panel b). For example, China and India will experience slightly higher rates of investment, on the order of around one percentage point. At the other end of the spectrum, economies such as Brazil, Indonesia, and Mexico will experience small declines in their investment rates, of 0.4–1.1 percent. This variation between countries is attributable to two mutually offsetting factors: (a) a positive contribution from high growth rates, rapidly growing financial maturity, and fast institutional advancement, all of which attract greater investment financing and hence raises investment; set against the fact that (b) output may grow even faster, so that *as a share of this much higher GDP level*, the investment rate falls (in terms of investment levels, of course, there are absolute increases in investment flows). For China and India, therefore, the growth in all three of these drivers of investment financing—in conjunction with very little change in global saving—do not lead to output growth outstripping investment growth, and so investment rates are higher than in the gradual convergence scenario.

The opposite is true of Brazil, Indonesia, and Mexico.

Transformations in sectoral investment in developing countries

A shift toward investment in services can be expected

The transformations in the global picture of investment will not occur independently of dramatic shifts in the sectoral distribution of investment within developing countries. One major trend in sectoral shifts concerns the anticipated increase in the proportion of investment in the services sectors.¹⁹ In the gradual convergence scenario,²⁰ by 2030, investment demand by the services sector as a proportion of total investment demand will rise by about four percentage points in high-income countries, reaching a high of 84 percent in Japan and the United States. In

developing countries, the increase will be even larger: the services sector proportion of investment demand will increase by close to five percentage points (to 60 percent) overall, with the largest increases in India (from 60 percent to 70 percent) and Russia (66 percent to 73 percent).²¹ There will also be significant upticks in certain countries that currently hold relatively small services shares, such as Indonesia, where the share can be expected to rise by around six percentage points (table 1.2). The developing economies of East Asia (excluding China and Indonesia) and Sub-Saharan Africa (excluding South Africa) will also experience significant increases in their service sector shares of roughly 6 percentage points.

The increase in the representation of services in total investment will be supported by four distinct trends:

- Increasing per capita incomes in the largest developing countries
- Demographic change
- A rising share of services components along the supply chain
- Infrastructure investment needs (infrastructure being defined in this report, as it is conventionally, as a service)

The first effect is well known: economies tend to experience higher services value-added shares as their per capita incomes rise. India, for instance, had a services share of 38 percent of output in 1960, but as of 2010 this had risen to 55 percent. Similar trends have occurred in developing economies as diverse as South Africa (from 51 percent to 67 percent over the same period) and Argentina (from 39 percent to 59 percent between 1965 and 2010).

The second effect will stem from rising health-care needs faced by aging populations in many regions (this is discussed more thoroughly in chapter 2), alongside smaller youth populations in search of higher-quality educational services. These demographic pressures will result in a greater demand for investment in services.

Third, with perhaps the notable exception of infrastructure—which is classified as a service in any case—agricultural and manufactured goods will embed a far greater services component in

the future, and services in general will be more tradable. This increasing tradability is already evident in the information and communication technology (ICT) portion of the services export sector in some developing countries, such as virtual medical diagnostics in India and Pakistan, human resource processing in the Gulf countries, and call centers in African countries such as Kenya and South Africa (Anand, Gable, and Mishra 2011).

The final trend pertains to increased infrastructure needs as economies develop (in emerging economies), coupled with the need to upgrade aging infrastructure (in advanced economies), both of which will channel more investment into the services sector.

Developing countries will continue to be the world's manufacturing workshop. Collectively, developing countries will invest almost twice the amount that their high-income counterparts will in manufacturing by 2030 (compared with four-fifths of that of high-income countries in 2010). In the currently lower-middle-income economies, manufacturing investment will grow steadily over the next two decades: Indonesia and India, for instance, will have average annual manufacturing investment growth of around 7 percent and 5 percent, respectively, and in Sub-Saharan Africa as a whole investment will grow at an annual rate of somewhat less than 5 percent (table 1.2). Other smaller economies in East Asia, such as the Philippines and Vietnam, could also contribute to the global manufacturing picture, especially given their physical proximity to the East Asian production network. Manufacturing in the rest of developing Asia will grow by an average of about 4 percent per year.

In some high-income countries, there will be a significant falloff in manufacturing investment: Japan, for example, will see its manufacturing investment steadily shrink each year, to reach 15 percent of its total investment in 2030. Perhaps somewhat surprisingly, Europe and the United States will experience small, but nevertheless positive, annual growth rates in manufacturing investment, although the *share* of manufacturing in their investment bills will decline (by two percentage points each; it will decline by twice that in Japan).

TABLE 1.2 Both developing and high-income countries will see a rise in the share of investment devoted to the services sector in the future

	Agriculture		Manufacturing		Services	
	Share (%)	Growth (%)	Share (%)	Growth (%)	Share (%)	Growth (%)
Developing countries						
East Asia and Pacific	11	6.4	34	7.1	56	8.0
China	10	7.4	35	7.7	56	8.6
Indonesia	22	4.5	24	5.1	54	6.2
Eastern Europe and Central Asia	12	1.8	18	2.8	70	3.8
Russian Federation	17	1.7	11	3.1	73	3.9
Latin America and the Caribbean	10	3.0	19	3.0	71	4.1
Brazil	11	3.4	16	2.9	74	4.3
Mexico	4	2.8	20	2.1	76	3.4
Middle East and North Africa	39	3.1	16	3.9	46	5.0
South Asia	14	5.1	17	6.5	69	8.1
India	13	5.4	17	7.0	70	8.6
Sub-Saharan Africa	26	5.4	17	4.6	57	5.8
South Africa	4	1.6	21	2.1	75	3.3
High-income countries						
Europe	3	-0.9	16	0.9	82	1.8
Japan	1	-1.2	15	-0.1	84	1.1
United States	3	-0.8	13	1.1	84	2.3

Source: World Bank projections.

Note: Investment share is computed as the sectoral share of total investment for each respective sector in 2030. Investment growth is computed as the compound annual percentage growth in sectoral investment for each respective sector between 2010 and 2030, measured in constant prices. Agriculture is defined to include natural resources, manufacturing is defined to include capital goods, and services are defined to include infrastructure and construction. Table projections assume a gradual convergence scenario of annual world economic growth of 2.6 percent over the next two decades, of which developing (high-income) growth will average 5.0 (1.0) percent annually.

In addition to the growing share of global manufacturing investment represented by developing countries in the coming decades, the nature of manufactured goods will change. Manufactured goods are likely to embed greater services components in the future and will be more technologically sophisticated in ways beyond quality improvements, while also becoming increasingly transportable and transferable. Technological sophistication could be realized as enhanced interdevice interconnectivity (such as home appliances that seamlessly interact with either a central computer or a mobile phone application) and as cost-competitive, environmentally friendly products (such as high-efficiency vehicles and air conditioners operating on solid-oxide fuel cells, bio-fuels, or electrofuels). Other advances in additive manufacturing, such as three-dimensional (3D) printing, will allow more on-demand, physically complex, and highly customizable production. Such manufacturing processes have the potential

to lower the price of certain product lines, such as single-use medical devices, that would otherwise be unaffordable or inaccessible, especially in low-income countries when they are produced by the traditional manufacturing industry. 3D-printing techniques could also defeat component obsolescence (supporting poorer farmers and craftsmen who cannot afford equipment and regular product upgrade cycles) and potentially encourage the development of products for which the end users are predominantly located in low-income countries.

For most countries, a larger share of investment activity within the services sector will be mirrored by a shrinking share held by the agriculture sector. In developing countries as a whole, the share of investment in agriculture will shrink from 16 percent to 13 percent, although the variance across countries will be fairly large. Brazil and Sub-Saharan Africa will emerge as the (relative) leaders in this regard: their shares of agricultural

investment, as a share of their total gross investment, will be mostly maintained through 2030, growing at annual rates of 3 percent and 5 percent, respectively. This growth would reflect Brazil's comparative advantage in agricultural innovation, along with the adaptation of agricultural technologies for the next frontier of mass agricultural cultivation in Africa, and is likely to be realized in the form of locally adapted technologies for tropical-weather farming and yield enhancement. Almost everywhere else in the world, however, agricultural investment will contract more sharply: in high-income countries—excluding investment in natural resources by the high-income countries of the GCC—agricultural investment will shrink, on average, to just 2 percent of the investment bill, and even in the developing world, agriculture will amount to only 13 percent of investment expenditures. In general, declines in pure agriculture (excluding natural resources) around the world will be somewhat offset by increases in natural resource investment; such developments are likely to reflect the resurgence of shale gas extraction through horizontal drilling and hydraulic fracturing.

The bottom line is that there will always be new technologies that absorb investment, and reallocations of investment between sectors ultimately are led by changes in the relative returns to investment in each sector (which in turn is a function of relative output and factor prices between sectors). In short, the world is not about to “run out” of investible opportunities.

Developing-country infrastructure investment needs will be substantially higher in 2030

One investment priority consistent with the forthcoming shift toward services investment is the pressure in most developing countries for expanded infrastructural services. As discussed in the previous subsection, services investment in developing countries will rise substantially from current levels, amounting to almost \$10 trillion by 2030. Of this amount, \$626 billion (slightly more than 6 percent) will be spent on infrastructure. Yet in spite of major advances over the past decade, infrastructural needs remain one

of the most pressing challenges for developing countries, especially when considered alongside rapid advances in per capita income and population growth pressures in the poorest parts of the world.

To better understand what such infrastructure investment *needs* are, it is necessary to go beyond likely investment *paths* and toward anticipating the investment expenditures that would result *if desired targets* for infrastructure were fully satisfied. Indeed, even excluding maintenance costs, such needs will substantially exceed likely levels of actual infrastructure investment.²² Furthermore, given the central role that the public sector typically plays in infrastructural services, meeting such anticipated infrastructure needs is a first-order concern for developing-country policy makers.²³

Moreover, increased investment in sound infrastructure can serve a broader catalytic role in enabling sectoral shifts in investment as economies develop. Low-income countries seeking to break into global manufacturing markets will need reliable electricity generation, improved road and rail networks, and expanded port facilities. Lower-middle-income economies will need higher-quality roads, more sophisticated water and drainage systems, and improved Internet and cellular phone coverage as their middle classes develop and as demand rises for these infrastructural services. And upper-middle-income nations will need modern, high-speed ICT networks and high-capacity power generation to effectively compete in high-tech manufacturing and globally tradable services while upgrading the overall quality of their service sectors.

A central question that developing-country policy makers will need to confront as they seek to scale up their infrastructure investments is how technological progress has changed, and will continue to change, the mechanisms and possibilities surrounding infrastructure service delivery and operation. The meaning of the term “infrastructure” is no longer self-evident: four decades ago, fixed-line telecommunications cables appeared to be a natural monopoly benefiting from public sector provision; starting in the 1990s, a wave of privatizations around the world took hold, expanding penetration and coverage and

enhancing efficiency (Li and Xu 2004). Today, fixed telephone lines are almost anachronistic, with many developing countries leapfrogging fixed lines and installing cellular transmitter towers instead. Finally, improved efficiencies due to technological improvements in grid storage and digital power conversion could mean that future infrastructure spending in power will shift from investment in production toward storage.

Although the specific composition and nature of infrastructural capital will adapt according to changes in the world economy, the nature of economic services that characterize infrastructure nevertheless remain the same: high capital intensity, elements of natural monopoly, and location-specific investment.²⁴ Accordingly, the discussion in this report will retain the traditional categories of power, transportation, telecommunications, and water and sanitation, while acknowledging that the specific technologies implied by these categories require some flexibility in interpretation.

Though estimates are not consistent, analysis of demand for infrastructure services generally reveals that although demand increases with per capita income, the pace of growth in demand is faster at lower per capita income levels. Currently, per capita electricity consumption in developing countries ranges from an average of 452 kilowatt-hours (kWh) for low-income countries to 3,073 kWh in upper-middle-income countries; by comparison, the average in developed countries is 10,408 kWh. The sheer number of people who lack access to other forms of infrastructure provides another hint of how much investment will be required: 1.1 billion people in the world currently lack access to safe drinking water, and 2.4 billion face inadequate sanitation services.

In 2030, infrastructure investment *needs* in developing countries will amount to an estimated \$864 billion, as measured in 2010 dollars (figure 1.17, panel a).²⁵ These needs will be concentrated in the power (\$243 billion) and transportation (\$254 billion) subsectors, which will together account for more than half of all infrastructure needs. Fixed-line telecommunications infrastructure—presumably in the form of digital and optical cables—will also be a major area of investment, amounting to \$172 billion (or 20 percent of total infrastructure investment needs).

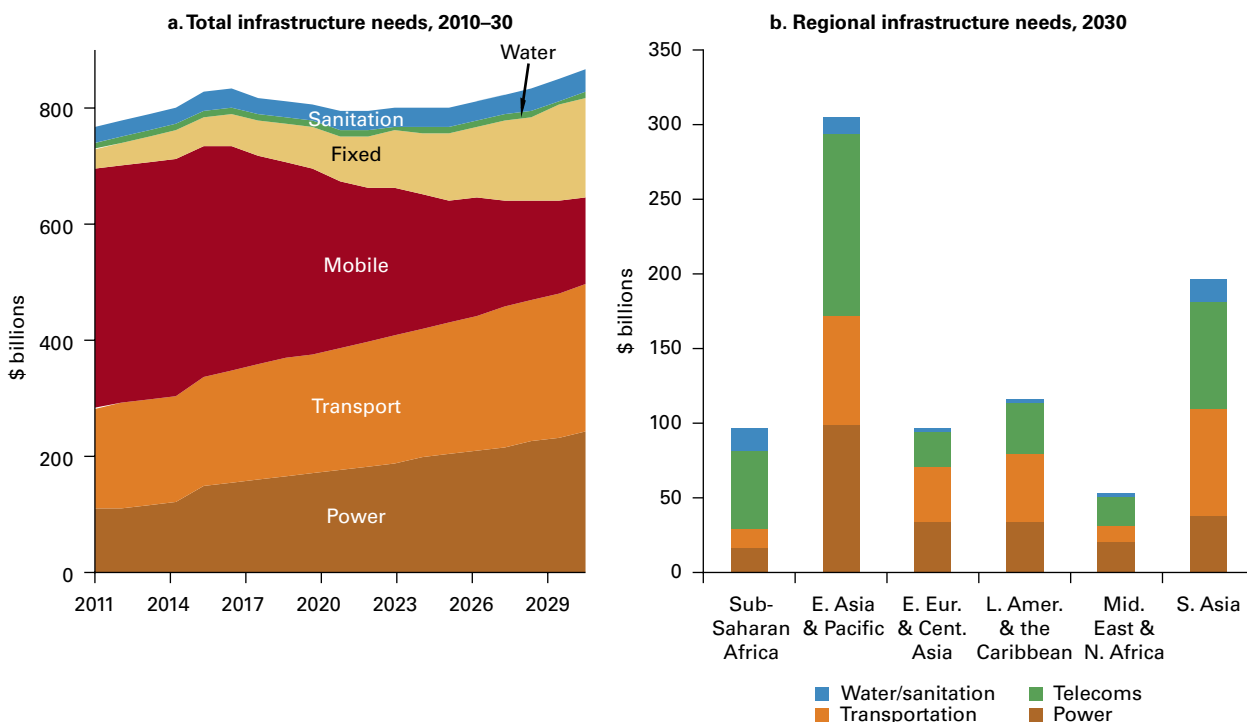
Infrastructure investment needs are likely to be most concentrated in East Asian and South Asian countries: the amount in just those two regions will total \$501 billion in 2030, reflecting continued strong demand for infrastructure by the very large Chinese and Indian populations (figure 1.17, panel b). In China, power needs will dominate, but this will be coupled with fixed-line telecommunications demand as more and more Chinese consumers and businesses seek high-speed connectivity. In India, investment will need to be directed toward improving the country's very poor road system, although mobile connectivity will draw infrastructure investment as well.

Yet even the substantial sum of \$501 billion may underestimate the tremendous infrastructure needs of Asian countries when considering *international* infrastructure links (those involving improving access between two or more countries). Using this more expansive definition bumps up infrastructure needs for Asia to an estimated \$750 billion per year for the decade between 2010 and 2020 (ADB 2010)—about 26 percent more than estimated expenditures when only intracountry needs are considered.

As for Sub-Saharan Africa, the region's infrastructure investment needs do not appear significantly greater than that of other developing regions in absolute terms. Were they to be met in full, however, the amount would constitute a significant share of total investment in the region: \$97 billion, or 15 percent of the total \$662 billion. Moreover, this estimate excludes investment needs arising from the need to rehabilitate the estimated 30 percent of existing infrastructure that has been poorly managed (AfDB 2010) or the additional investment required to enhance regional interconnectivity (PIDA 2011).

Importantly, infrastructure investment needs at the regional level will not evolve monotonically. Given the easy availability of cellular mobile phones and their widespread adoption, demand for cellular telecommunications infrastructure, in particular, is likely to be greatest over the next five years. This front-loaded demand is likely to reach saturation in a significant number of developing countries by 2017 or 2018.²⁶ As these needs taper off, fixed-line infrastructure will increase in importance. Power and transportation needs are likely to

FIGURE 1.17 Annual infrastructure investment needs in developing countries will be substantial for the next two decades (panel a), with the greatest needs arising in East and South Asia (panel b)



Source: World Bank projections.

Note: Details of the methodology underlying the projections are given in the *Global Development Horizons* online annex 1.5.

grow more gradually, a reflection of more gradual changes in population demands for these services.

Enormous resource mobilization will be required to meet infrastructure financing needs in developing countries

Successfully meeting developing countries' cumulative infrastructure financing needs of \$14.6 trillion between 2012 and 2030 will require an enormous mobilization of financing—one akin to frontier expansion by European countries in the New World in the 19th century, which generated massive investment needs in the form of railways, real estate, and large-scale agricultural projects. Although infrastructure investment has traditionally been the purview of the public sector, as discussed earlier, this trend is changing, toward greater public-private partnership. Indeed, the

sheer size of infrastructure investment needs (which does not distinguish between public or private investment) suggests that adequately meeting these needs will call for a rethinking of existing institutional arrangements of service delivery, increased internationalization of funding sources, and innovative financing strategies that are better designed to meet the high levels of capital intensity. Concurrent with meeting these purely financial goals is the necessity of being keenly aware of the broader public policy issues of efficiency, access by the poor, and quality of services.

More than other sectors, infrastructure financing has witnessed a distinct shift in terms of government policy, public attitude, and intellectual treatment. Since the mid-20th century, these trends first encouraged a model of public ownership and control, vertically integrated industrial organization, and public financing of

investment. Since the 1990s, the common model has shifted toward market liberalization, unbundling of power and telecom utilities, privatization of public assets, and financing through private markets. More recently, the model has evolved toward public-private partnerships in financing, especially in middle-income countries.

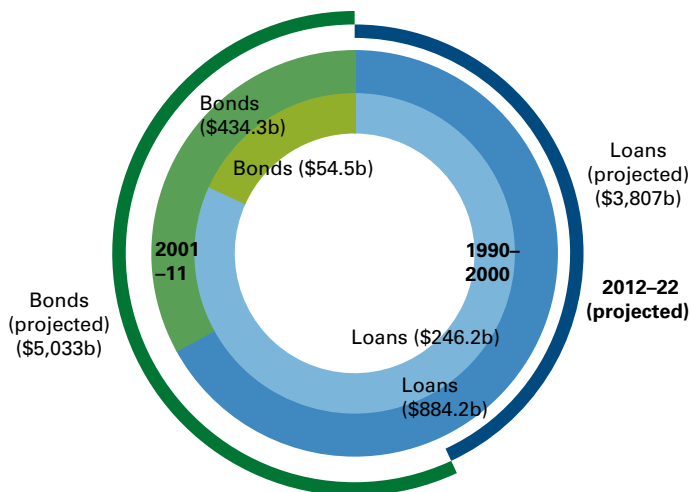
The evolution toward greater private sector involvement in infrastructure financing could not have come at a more opportune time. The financing of future infrastructure investment needs will occur in a global environment where the public sector will almost certainly face funding difficulties. As will be further discussed in chapter 2, fiscal balances worldwide were compromised as a result of the financial crisis. This was especially the case in advanced economies but also in the developing world. Furthermore, questions about the sustainability of sovereign debt, as detailed in chapter 3, are likely to negatively affect the global outlook for public sector access to global capital markets. Even the ability of traditional private sector financial intermediaries (such as

international banks) to provide the necessary capital for large-scale infrastructure projects is questionable, given weaknesses in their postcrisis balance sheets (an issue also discussed in chapter 3). Considered together, these factors will limit the options available to policy makers seeking to finance infrastructure.

One respite offered by the long-term duration of infrastructure assets is that, in spite of global rollbacks in overall syndicated lending, the nature of the investment allows for more innovative financing options through, for instance, increased securitization of future cash flows. In fact, there is evidence that this shift toward bond financing has already occurred (figure 1.18) and will continue to expand in the future, perhaps accounting for as much as half of all infrastructure investment financing.

The current trend toward globalization of corporate finance is also likely to intensify in the future, and this will further support infrastructure financing sourced from global capital markets. Such bond market maturation will ultimately lead to lower credit spreads and hence the cost of capital. There is evidence that this is already under way: emerging market corporate bonds carried spreads over comparable U.S. Treasury securities of about 450 basis points in the early 1990s, but the average spread narrowed to 392 basis points in 2011. Of course, such financing structures are feasible only when the underlying financial, regulatory, legal, and institutional frameworks are sound, which in turn is premised on the developing world’s progress in developing their financial institutions. In situations where such frameworks are not properly in place or are in a state of transition, investors are likely to increase their hurdle rates. This is typically passed on as higher tariffs for infrastructure services, which, as experience indicates, leads to such services being prohibitively expensive, especially for the poor. But innovative financing need not be limited to securitization. Innovations can also occur in the manner by which funding is raised, especially when aided by modern ICT (box 1.8).

FIGURE 1.18 Infrastructure investment financing modes have changed over time and will likely favor greater bond financing in the future



Source: World Bank projections, supplemented with calculations using data from Dealogic Bondware and Loanware.

Note: Infrastructure financing is calculated as a share of cumulative investment financing needs during the respective time periods. Total values, in billions of current dollars, are given in parentheses. Projections for 2012–22 are based on the assumption of similar growth rates between the second two periods as between the first two periods and zero inflation. The cumulative infrastructure investment bill for 2012–22 is \$8.8 trillion.

Conclusion and policy directions

The future face of global investment activity will see developing countries in far greater

BOX 1.8 **Alternative financing mechanisms have begun to be adopted in financing infrastructure**

The idea behind crowdsourced capital has a relatively long, and reasonably venerable, history in developing-world finance. Distilled to its essence, crowd financing seeks to minimize the role of intermediaries in matching savers with investors. On the saving front, rotating savings and credit associations as well as the more recent innovation, community finance associations, can be regarded as forms of crowd financing (Besley, Coate, and Lounsbury 1993). As for investing, some microfinancing organizations, such as Kiva, have been known to employ crowd funding as their primary financing mechanism (Cull, Demirgüç-Kunt, and Morduch 2009).

Information technology, as well, has expanded the potential to draw on diverse sources to finance infrastructure in developing countries. One such initiative, Sokoni, has established a digital marketplace that connects donors and investors directly to project developers and governments. Innovative financing mechanisms

of this kind are possible pathways into a future where infrastructure financing breaks free from traditional modalities and embraces the power and connectivity made available by modern information and communications technologies.

Another alternative mechanism that has begun to take hold in infrastructure financing is Islamic finance, particularly for large-scale projects in the Middle East. Although the broader applicability of Islamic finance may continue to face economic, legal, and systemic challenges (Hesse, Jobst, and Solé 2008), there is reason to believe that Islamic finance could be credibly scaled up as an alternative medium for cross-border infrastructure financing. The tenets of Islamic finance—which focus on direct participation in asset performance—are well suited for the long-term nature of infrastructure finance, where the rate of return could be difficult to predetermine and may be realized years after an initial investment.

prominence, investing more than high-income countries in absolute value and as a share of global investment. Since 2000, developing countries' investment as a proportion of their own output has been substantially higher than that of high-income countries. These trends are not expected to continue indefinitely into the future, but their effects are already palpable, and their full ramifications will be realized over the next two decades.

Although this chapter focuses on real investment activity—in particular, gross capital formation—across countries, the current account identity implies that investment should be understood alongside saving and capital flows.²⁷ For many small developing economies, shocks to saving in major economies, such as the United States, will inevitably affect their domestic patterns of investment (Feyrer and Shambaugh 2012). This result is a double-edged sword. On one hand, it suggests that developing countries can leverage increases in national saving in large, high-income countries to relax domestic saving constraints and boost investment at home. On the other hand, it also means

that when large economies engage in profligate public policies or unrestrained private borrowing, there could be material contractions in the global supply of saving (to the extent that such actions are not fully offset by Ricardian equivalence). This can choke off investment in small, vulnerable developing countries, which typically have less fiscal space to offset negative shocks from abroad.

The anticipated fundamental forces that will shape the global economy in the years to come—asynchronous demographic transformation, asymmetric productivity growth, structural change, and financial globalization—will therefore alter not just investment needs and opportunities but also saving decisions and choices along with the cross-border flow of financial capital and international investment positions. Accordingly, the following chapters will address the issue of global patterns in saving (chapter 2), along with the saving-investment imbalance that constitutes international capital flows (chapter 3), tying the notion of investment needs with opportunities together at the global level.

Policy makers have an important role to play in supporting a favorable investment climate

Because investment is primarily a private sector-led activity, government policy action in most countries exerts only an indirect effect on changing the level of investment in a country. Rather, government's role is often to establish an environment—the investment climate—that is supportive of robust and sustainable investment activity. This is not to say that public investment is irrelevant, since there may be a role for intervention where market failures are clear and where social returns are especially large. For instance, governments in developing countries often have a well-defined role in the provision of infrastructure, which serves as an important foundation for private investment activity. But the policy framework for investment is ultimately an indirect one.

With this overriding framework in mind, the importance of changes to structural factors in attracting investment from the global pool of saving—amply demonstrated by the difference in investment patterns in the rapid versus gradual convergence scenarios discussed earlier—suggests that countries seeking to compete in the future world economy will need to pay attention to fostering a favorable investment climate. In general, a favorable investment climate is characterized not only by traditional policy areas that can foster private sector investment, such as a stable macroeconomic and regulatory regime, but also by (a) the broader institutional environment in which firms operate (which includes secure property rights and stable rule of law); (b) the governance framework, such as adequate control of corruption and a limited burden from—and simplified administration of—direct and indirect taxation (which includes the risk of outright appropriation); and (c) the level of maturity of the financial sector. In this sense, getting the investment climate right shifts the policy dialogue away from a laundry list of specific actions and policies for reform, and toward a discussion of what constitutes the appropriate set of rules, governance, and incentives that would stimulate the private sector to invest in economically efficient and socially

desirable projects and activities. Moreover, attracting investment from abroad often requires the presence of a professional, knowledgeable, and investor-focused investment facilitation agency, equipped with the capacity to ease cross-border informational asymmetries (World Bank 2012c).

For policy makers interested in boosting investment, a central element of the investment climate is the level of development of the financial sector. As discussed in this chapter, an increasingly mature financial system is associated with rising levels of investment. More important, well-functioning financial systems ensure a superior mobilization and corresponding allocation of saving toward the most productive investment opportunities (Levine 2005) while providing investors diversification and risk management benefits. A lengthy discussion of policies that can stimulate financial sector development is beyond the scope of this report, but recent work by the World Bank offers a menu of ideas for jump-starting such development, especially as it pertains to the role of the state, and for guarding against circumstances of state capture and government failure (World Bank 2012b). For the purposes of relaxing credit-related constraints, especially for small and medium-size enterprises, the establishment of a credit information agency can be especially helpful. It is important to point out, however, that any policies designed to encourage financial sector development—a long-run goal—should not be interpreted simply as the pure expansion of credit; such a narrow view may give rise to the pursuit of unsustainable short-term policies that are ultimately detrimental to economic and financial stability.

Major developing economies have not stood idly by in seeking to foster enhanced financing facilities for South-South investment. The BRICS countries (Brazil, Russia, India, China, and South Africa) touted a South-South development bank in early 2012, for example, as a mechanism to help recycle surplus saving for their developing countries' investment needs, while regional multilateral development banks have also expanded their operations dramatically in recent years (a topic that will be revisited in chapter 3).

Improvements in the overall quality of governance in developing countries, especially with regard to the rule of law, can also have a major impact on the investment climate and serve to attract financing for investment from global sources. This is not surprising given that respect for the rule of law is essential to ensuring that investors can realize returns from their investment activities. However, successfully addressing governance challenges as they pertain to the investment climate calls for going beyond de jure corrections to the letter of the law or salutary actions such as the establishment of independent investment and regulatory commissions. Actions will need to ensure that the elements of rule of law are maintained de facto by bureaucrats and politicians and that formal institutional bodies can enforce violations of rule of law in an uncompromised fashion.

Such fundamental reform, of course, is likely to encounter resistance by entrenched interests, and so reform efforts must be undertaken with a mind toward building coalitions for change through expanding the scope of stakeholders and encouraging partnership models of stakeholder interactions (World Bank 2008). Even seemingly innocuous reform efforts, such as routine, unbiased implementation of investment-related competition law, can face staunch political opposition if they would weaken existing monopolistic or oligopolistic positions of incumbent businesses.

Successful investment policy, of course, seeks to not only correct areas of government failure as described above but also to suggest direct intervention in cases where market failures are sufficiently evident (and remain uncorrected) or where social returns are sufficiently high. Recent research (Aghion et al. 2012; Bloom and van Reenen 2007; Rodrik 2009) has revived the idea that targeted interventions can better align private sector incentives and foster private sector competition (rather than rent seeking)—especially when such policies are not so much targeted at a specific sector (where the risk of subsequent capture can be high) but at particular constraints (such as inadequate knowledge of good management practices or difficulties in obtaining credit); when high levels of accountability are

maintained; and when interventions have a clear sunset clause.

If policy makers do ultimately decide to pursue the targeted intervention route, their efforts may be best placed in supporting the upcoming expansion in service sector investment (as discussed earlier), especially in areas (such as education and health care) where spillovers from positive externalities could be especially high. Even in manufacturing and agriculture, there are certainly subindustries (like “green” technology components or tropically adapted seeds) where social returns appear to be sufficiently large to justify the risks of direct intervention.

Although the institutional design that best supports such successful interventions is likely to be idiosyncratic, a wholesale rejection of a public role in investment is probably unwarranted. Just as important, governments that currently engage in policies that, either directly or indirectly, favor investment in agriculture and manufacturing (for example, many governments explicitly prohibit FDI in certain “sensitive” or “strategic” services) will place a burden on their economies’ efficiency in a world where services account for a larger share of output.

Indeed, the area where government policy is likely to offer some of the greatest social returns is in the provision of infrastructure. As discussed earlier, this is also a sector of the economy that will likely face increased demand for future investment. Yet even in this area, which has been the traditional bulwark of public sector investment, government roles are evolving. PPPs have helped move along projects that cash-constrained public sectors sometimes have had trouble completing on their own. For example, by offering guarantees on minimum concession charges for toll-road operations, private investors in Chile, India, and Mexico have funded transportation infrastructure in many remote areas that were previously underserved. In Jordan and Russia, new airports have been built and operated by foreign investors, which in turn contribute to positive network externalities for future business opportunities. Even in areas where citizen-state conflicts have arisen in the past—such as

water utilities—a willingness to employ professional management in state-owned facilities has helped improve efficiency and service quality in Colombia, Gabon, and the Philippines.

International financial institutions such as the World Bank, International Financial Corporation, and the Multilateral Investment Guarantee Agency can have an especially important role to play in this regard. The World Bank has traditionally been active in infrastructure financing, and it can play an important intermediary function in offering low-cost infrastructure financing through its participation in PPP lending syndicates or by designing structured financing options (such as infrastructure bonds). But the institution's role goes beyond financing. The World Bank is now a repository for knowledge on PPPs in infrastructure, and as such can provide technical assistance and other advisory services that draw on the diversity of cross-country experiences in infrastructure investment projects (World Bank 2012d).

Notes

1. The definition of “investment” used in this chapter is, in most cases, gross capital formation, including purchases of physical structures, plants, machinery, and equipment, together with inventory accumulation, but gross of depreciation. Further information on this and other definitions of investment may be found in online annex 1.1 (available, with the rest of the annexes for this and the other chapters, at <http://www.worldbank.org/CapitalForTheFuture>).
2. It is important to be aware that measurement difficulties mean that the reported sectoral marginal products of capital (MPKs) should be regarded as indicative, rather than definitive. It is also important to keep in mind that calculated MPKs capture the *mean* of a distribution of firm efficiencies, and so the most productive firms in a country or sector may still be highly efficient. Analogous computations using a more familiar metric, the incremental capital-output ratio, are reported in online annex 1.2, with similar qualitative results.
3. Although there is still considerable debate over the veracity of such models in stimulating growth, it is well recognized today that any such approach cannot occur in the absence of absorptive capacity, in terms of both economic payoffs and political institutions, that would ensure that large investment expenditures are not misallocated.
4. PPPs are typically formed through the establishment of a single long-term contract between a government and a private investor that bundles infrastructure investment and service provision.
5. The Gulf Cooperation Council (GCC) was established in 1981 through an agreement between Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates.
6. Indeed, in recent years there has been a major shift as investors from advanced economies have retreated and developing-country investors have emerged as a major source of investment finance for infrastructure projects with private participation (Ettinger et al. 2005).
7. As discussed in online annex 1.1 (on the *Global Development Horizons* [GDH] website), the definition of “productive physical capital” intentionally excludes broader measures of capital, including that of human and natural capital. Such corrections may be appropriate for the study of certain phenomena—such as the optimal rate of natural resource extraction (World Bank 2006, 2011)—but a considered treatment is beyond the scope of this report. Moreover, as discussed elsewhere in this report, there are potential problems in regarding all forms of investment (private, public, or investment in nonreproducible capital) as equivalent to productive capital formation. With these caveats in mind, the goal of this subsection is to provide a better sense of the distribution of global fixed capital stocks, and caution is warranted in relying on the capital stock computations provided here in secondary analyses.
8. Although the capital stock calculations are based on constant 2000 dollars and the perpetual inventory method assuming a constant depreciation rate, alternative calculations, using either PPP-adjusted investment or hyperbolic discounting of the capital stock, deliver a similar qualitative message.
9. The relationship between economic growth and investment is clearly endogenous. Nevertheless, there is a strong correlation between the two because sustained economic growth is the result of improvements in total factor productivity (TFP) and not factor accumulation alone. TFP, in turn, derives from a far richer set of factors over and above high levels of investment.
10. This relative yield \tilde{r} is defined in the context of the investment financing equation in online annex 1.6 (on the GDH website).

11. Undoubtedly, interest rates should reflect some of the differences that arise from these structural factors. However, interest rates may not fully capture the impact of structural differences due to financial market imperfections. For example, financial repression—common in many developing countries—may result in a distortion so that a disconnect arises between reported interest rates and expected returns.
12. The changes are measured by the simple average of the control of corruption and rule of law measures in the Worldwide Governance Indicators for the two years (1996 and 2010). For more information about the Worldwide Governance Indicators project, see <http://info.worldbank.org/governance/wgi/index.asp>.
13. Theory posits that the investment rate is equal to the ratio of firms' shadow value of capital per unit price of investment goods, a relationship known as marginal Q . However, because such shadow prices are not observable, economists have operationalized the concept by taking the ratio of the firms' (observable) market valuations to their replacement costs of capital, or average Q . Under certain additional assumptions—which include perfect competition and perfect capital markets—these two ratios are in fact equivalent (Hayashi 1982). Recent research has even suggested that future investment opportunities are better captured by average, rather than marginal, Q . Empirical Tobin's Q studies seeking to explain investment by Q alone, however, have had a disappointing track record, which may be attributable to the divergence between these two measures as a result of financial frictions (Lorenzoni and Walentin 2007).
14. A common alternative interpretation of Tobin's Q is that it is a proxy for adjustment costs for changing capital stocks. Absent such costs, the coefficient on Q would be unity. A small coefficient estimate for Q is thus interpreted as an indication of large (convex) adjustment costs (although recent research by Abel and Eberly [2011] dispute this traditional interpretation). In the reported sample, the coefficient for Q in the full sample is 0.01, which is remarkably close to estimates typically obtained in the literature, using far more sophisticated estimation techniques and alternative specifications.
15. Treating investment decisions as real options simultaneously accounts for three features of investment that are not well captured by the traditional approach of equating user cost to marginal product: the *irreversible* nature of many investment projects, the importance of *timing*, and, crucially, the inherent *uncertainty* involved in assessing investment opportunities.
16. The theoretical prediction of the negative effect of uncertainty on investment is more ambiguous. Caballero (1991), for instance, has noted that the response of investment to uncertainty depends on assumptions regarding decreasing marginal returns to capital, while Lee and Shin (2001) show that the share of labor in the production function can affect the balance between the positive and negative effects of uncertainty.
17. As can be seen from box 1.7, figure B1.7.1, there is significant uncertainty about the true impact of the shock; the error bands for both impulse responses include zero. Nevertheless, as Jordà (2009) has argued, the inclusion of zero within the confidence bands for the impulse response need not disqualify the variable from having an effect, especially if the function appears to trend smoothly in one direction or another during the propagation of the shock, rather than vacillate unstably around zero. It should also be noted that other studies (for example, Carrière-Swallow and Céspedes, forthcoming) have found that the effect of uncertainty shocks on investment is actually greater for emerging economies.
18. Because labor supply remains unchanged in this scenario, higher levels of financial development attract greater amounts of investment financing, which increases efficiency-adjusted capital stocks and serves as an additional boost to growth over and above the productivity increase. When decomposed into the contribution of growth versus structural change (by separately running the scenario with only changes in either), the effect of growth is generally twice as large as that of structural changes. Although not reported, these results are available on request.
19. Although one may reasonably expect that service sector investment would rise as countries become richer (given the trend that output in the service sector does rise with per capita incomes), this is not immediately obvious because the capital intensity of the service sector differs from that of the manufacturing sector. In the model used in this report, the capital intensity of the service sector is indeed, on average, significantly lower than that of the manufacturing sector across developing countries.
20. For space reasons, this section will rely on estimates consistent with the gradual convergence scenario. Although the numbers differ, the main

- messages that emerge using numbers from the rapid convergence scenario are similar.
21. Globally, the services investment share will actually remain stable, at 69 percent. This apparent anomaly can be understood by the fact that any change in global investment can be decomposed into two effects: change in respective investment rates and change in relative sizes. Between 2010 and 2030, the investment rate in services will increase in both developing and high-income regions. However, as developing countries increase their weight in the global economy, the fact that services investment was, on average, much lower in 2010 in these economies means that the total global increase was much more modest.
 22. Accordingly, in contrast to the general equilibrium model adopted for the earlier sections of this chapter, this subsection supplements the earlier analysis with a partial equilibrium approach. This methodology provides better estimates of investment *needs* because it abstracts from likely substitution effects that may arise because of changes in relative prices, technological advances that may improve energy efficiency units, and changing preferences for infrastructure services. Consequently, the estimates provided may be higher than actual infrastructure investment. However, because estimates of investment needs provided here do not account for *maintenance*, including such maintenance needs into infrastructure investment may result in estimates higher than even the figures presented here.
 23. Although not the focus of this report, anticipated infrastructure needs are also a priority for many high-income economies, which are experiencing the gradual erosion of their domestic infrastructure and the need to upgrade legacy systems. Indeed, the anticipated high relative rental rates in high-income countries could be a major factor supporting future foreign investment in infrastructure in high-income economies.
 24. Such a definition will, for instance, exclude fixed capital for education, health, and sports and recreation because these facilities typically do not reflect the continuously diminishing marginal costs that are characteristic of natural monopolies. Likewise, cellular transmitter towers, which are generally well provided by private sector, would not constitute infrastructure, while fiber-optic and digital cable deployment would be considered infrastructure.
 25. For reasons documented in endnote 24, this estimate is around 18 percent higher than the estimate of \$626 billion in the gradual convergence scenario. These estimates also suggest that infrastructure investment grows at an annual rate of only 0.6 percent for 2011–30, a rate one order of magnitude slower than the annual growth rate of services in developing countries (of 6.2 percent). As can be seen in figure 1.17, however, this slow rate is due mainly to a significant drop-off in mobile infrastructure spending. Annual growth in infrastructure investment *excluding* this category grows by 2.5 percent, which remains slower than the overall rate of services growth, but not substantially so.
 26. This saturation point is assumed to be at two cellphones per user. As of 2010, only Hong Kong SAR, China, has coverage (slightly) in excess of this level.
 27. The current account identity states that the difference between national saving and investment is equivalent to a country's net capital flows. The surprisingly high correlation between saving and investment was first observed by Feldstein and Horioka (1980), who regarded the finding as evidence of home bias in saving and investment. Subsequent work has punctured this notion that high saving-investment correlations necessarily imply poor capital mobility (Kraay and Ventura 2000), although the more general point that the three variables are closely linked should not be understated.

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Global Saving in 2030

WHETHER SAVING IS A SERIOUS impediment to growth in developing countries has long been an issue of concern. In the late 1960s, developing countries saved only 18 percent of their income, and low-income economies only 13 percent, compared with 21 percent in high-income economies. Given developing countries' limited ability to attract foreign saving, it was felt that inadequate domestic saving constrained investment, and thus growth, necessitating large transfers from high-saving rich countries. Whether saving was the primary constraint on development can still be debated, but the situation has changed dramatically. Developing countries' domestic saving averaged 32 percent of their income in 2009, while the rate in developed countries had fallen to 17 percent.¹ This sharp increase in saving rates among developing countries has not laid to rest the concern that inadequate saving may limit their growth prospects, however, because aging populations may put downward pressure on their saving rates in the coming decades.

A conclusion of this chapter is that despite the tendency of population aging to lower saving rates, saving is unlikely to be a binding constraint on global growth. Although this conclusion applies at the *global* level, there will be clear disparities in saving rates across countries and regions and some of them may face difficulties in the future.

The main messages of the chapter are as follows:

- *Changes in saving rates in developing countries over time will be driven by three main factors: aging populations, economic growth rates, and the deepening of financial markets.* The aging of populations in much of the

developing world will put downward pressure on household saving rates. However, aging will also make (young) labor scarcer with respect to capital, raising real wages relative to the return to capital. This shift in relative factor prices will entail a redistribution of income from asset holders, who tend to be older and thus have lower saving rates, to workers who tend to be younger and thus have higher saving rates, contributing to mitigate downward pressure.

The higher economic growth rates in developing countries will also encourage saving. Indeed, a scenario of gradual convergence between the developed and developing worlds in terms of income and structural change assumes that, for a large group of developing countries, growth rates will continue to increase up to around 2020, when they will stabilize and then slowly decelerate. For some countries, notably in Sub-Saharan Africa, growth rates are projected to follow an increasing trend through 2030. These accelerations of growth are even stronger in a scenario where the productivity gap between high-income countries and the developing world closes more rapidly. These positive changes in the pace of growth boost saving and partially offset the drag from the increasing share of old people.

Other growth-related mechanisms will also play a role. Longer life expectancy may have the effect of increasing saving to finance additional years of education and retirement. In turn, the increased number of better-educated workers with steeper age-earnings profiles will also tend to increase saving rates. Moreover, higher incomes are associated with fewer children

and greater female labor force participation, increasing the potential for saving during workers' most productive years.

Financial deepening in developing countries is found to put downward pressure on saving rates. Specifically, financial development can relax liquidity constraints and thus reduce the need for saving by individuals and firms with high-return investments. Financial deepening reflected in the greater availability and use of insurance and pension arrangements can also reduce the need for precautionary saving. But financial deepening is also associated with a more efficient allocation of capital, and thus with higher growth in incomes, which would tend to support saving. This complex interaction among aging, growth, and financial deepening can be expected to result in a slight decline in developing countries' average saving rate, from a peak of 34 percent in 2014 to 32 percent in 2030.

- *The evolution of saving will differ significantly by region.* In two regions—East Asia as well as Eastern Europe and Central Asia—downward pressure on saving rates due to rapid aging will be at least partially offset by rapid growth, so that saving rates will not fall by as much as in high-income countries. In Indonesia, for example, the old-age dependency ratio will increase at as rapid a pace as in high-income countries between 2010 and 2030, but its saving rate will fall only from 32 percent to 31 percent (under the gradual scenario), in contrast to the expected decline in high-income countries' saving rate from 18 percent to 16 percent. Some of this difference reflects changes in structural variables such as financial sector depth and the size of social security systems, but mostly it is due to Indonesia's higher growth rate. At the other end of the demographic spectrum, Sub-Saharan Africa's relatively young and rapidly growing population, coupled with its increasing growth due to productivity catch-up, will make it the only region where the saving rate does not fall during the time horizon considered here.
- *The rise of developing countries will support global saving rates.* Developing countries will experience rapid growth in output, rapid population growth in regions with relatively young populations, and relatively high saving rates between 2010 and 2030, while high-income economies will experience slower growth and declining saving rates. By 2030, developing countries will contribute 62 of every 100 dollars of total world saving, up from 45 in 2010. The shift in economic weight to relatively high-saving developing economies will counterbalance the contraction of saving in high-income countries. Developing countries' rapidly growing share of global saving implies also that their share of global wealth will also rise, albeit more slowly.
- *Saving in developing countries appears to be concentrated among high-income households.* Although the concentration of saving (and of wealth) within a small segment of a country's population has the possibility to support growth by encouraging financial deepening, concentration also has somber implications for economic mobility and thus for the political and social consensus essential for growth. Not only do high-income households tend to save a greater proportion of their incomes than low-income households, but they also account for the bulk of saving in countries at various stages of development and demographic transition. In countries with high economic mobility, the relationship between low saving and low income could reflect efforts to smooth consumption by households experiencing temporary income losses. Unfortunately, a similar correlation is observed across households grouped by educational attainment—a proxy for permanent income and thus a more stable condition than the position in the income distribution at a point in time. Consistently, the least educated groups in a country have low or no saving, suggesting an inability to improve their earning capacity and, for the poorest, to escape a poverty trap. Policy makers in developing countries have a central role to play in boosting private

saving through policies that raise human capital, especially for the poor.

- Changes in household structure will increase the importance of financial markets in providing for income support during old age.* As incomes rise, household size tends to fall because workers are more geographically mobile and older individuals are more able to live independently on their accumulated savings. Alongside this reduction in household size tends to come a profound transformation of the old-age support structure—from an informal, multigenerational household system to more formal private pension or public social protection systems. Reliance on privately financed pensions rather than household saving and wealth during old age has the potential to improve welfare if the elderly and their children all prefer to live separately. Another benefit is that using private financial markets to intermediate pension savings can increase financial depth and contribute to development. However, shifting from dependence on the income of family members to dependence on financial institutions also underlines the importance of strong regulation to limit fraud and excessive risk taking by financial intermediaries.
- Demographic change will challenge the sustainability of public finances.* In developing countries experiencing a large increase in the share of their populations past working age, budgets will be strained by mounting pension and health-care costs. The shift in the composition of public expenditure toward old-age-related items, though, will be offset only marginally by the reduction in education spending expected in the face of aging populations. Furthermore, the scope for decreases in non-age-related expenditures is limited. Complex policy challenges will arise from efforts to reduce the burden of health care and pensions while limiting the decline in benefits and services. Working through these challenges will be necessary to ensure the sustainability of public finances without imposing severe hardships on the old.

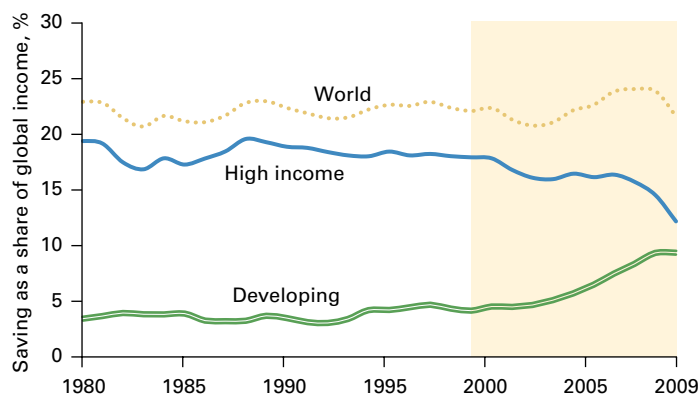
Saving at the aggregate level: Past, present, and future

Saving has increased in developing countries

A large portion of global saving now originates in the developing world. This is quite a recent observation, however. For the two decades from 1980 to 2000, developing countries' saving amounted to a fairly stable ratio of around 4 percent of world income (figure 2.1). That ratio increased sharply since 2000, however, to more than 9 percent by 2009, while total saving by high-income countries fell from 18 percent to 12.5 percent of global income over the same years. The rapid rise in developing countries' saving has sustained global saving rates in the face of declines in high-income countries. A notable follow-on effect of the increase in saving in developing countries is that they account for a growing share of global wealth (discussed in box 2.1).

The growth in developing countries' contribution to the global pool of saving can be decomposed into two parts: (a) the size of their economies relative to the global economy and (b) their saving rates. Looking at changes in developing

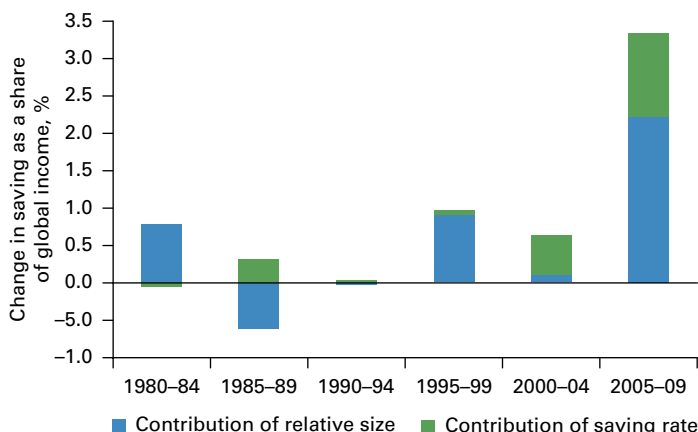
FIGURE 2.1 Developing countries have accounted for a growing share of global saving since around 2000



Source: World Bank calculations using data in the World Bank World Development Indicators database.

Note: Shaded area corresponds to the period from 2000 onward, where a regime shift in developing countries' total saving appears to have occurred (a simple linear regression of developing countries' saving rates on time in the 1965–99 period is $S = 0.000t - 1.464$, while that for the 2000–09 period is $S = 0.002t - 47.369$, where S and t correspond to developing countries' total saving and the year, respectively).

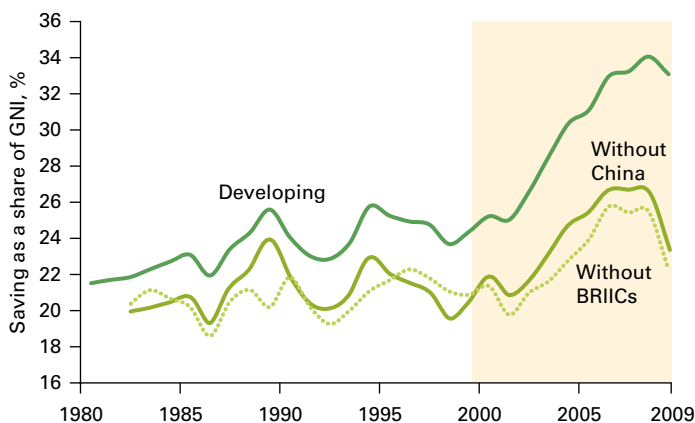
FIGURE 2.2 Both relative size and saving rates have contributed significantly to the increased global importance of developing countries' saving



Source: World Bank calculations using data in the World Bank World Development Indicators database.

Note: The decomposition of the investment share takes total derivatives from the formula $(s/Y) = (s/y) \times (y/Y)$, where s , y , and Y correspond to developing countries' saving, developing countries' income, and global income, respectively.

FIGURE 2.3 Developing countries' saving rates have increased



Source: World Bank calculations using data in the World Bank World Development Indicators database.

Notes: Shaded area corresponds to the period from 2000 onward, where a regime shift in developing countries' total saving appears to have occurred (a simple linear regression on time in the 1965-99 period is $S = 0.000t - 1.464$, while that for the 2000-09 period is $S = 0.002t - 47.369$, where S and t correspond to developing countries' total saving and the year, respectively). BRICs = Brazil, the Russian Federation, India, Indonesia, and China.

countries' saving for five-year periods since 1980 shows that both relative size and saving rates have, on average, contributed (figure 2.2). For the years 2000 to 2009, changes in saving rates

have increased total saving in developing countries by 1.5 percent of global income, while another increase of 1.9 percent was directly due to changes in economic size.

Saving in developing countries has risen sharply from the levels of some 50 years ago. Developing countries as a group saved 18 percent of their income in the 1960s, and low-income countries only 13 percent, compared with 21 percent in high-income countries.² These low saving rates were viewed as a major constraint on investment and thus on future growth. Other factors such as uncertain policy environments, poor infrastructure, and undeveloped financial systems also hindered investment and at the same time reduced incentives to save.

But much has changed since the 1960s. The past three decades in particular have seen impressive policy improvements and large increases in growth, saving, and investment. Saving had risen to almost a third of developing countries' income by 2009, despite some decline during the global financial crisis (figure 2.3). Conversely, aging populations have put significant downward pressure on advanced economies' saving rates. The ratio of developing-country saving rates to those in high-income countries rose steadily from 0.9 in 1980 to 2.0 in 2009.

As in the case of investment, much of the increase in saving by developing countries is attributable to China, though other large emerging economies, such as India and Indonesia, have made significant contributions as well (figure 2.4). The path of saving rates has differed substantially across major developing economies: India's saving rate has increased steadily; Brazil showed a slowly increasing trend in saving until the peak in 1989 and a distinct downward trend thereafter; and the Russian Federation's saving rate has been erratic since the dissolution of the Soviet Union.

Saving trends in China, in particular, have received considerable attention in both policy circles and academic literature. China is notable not only because of the large size of its saving pool and its high saving rate but also because the composition of saving is broad: China's household, corporate, and government saving have all

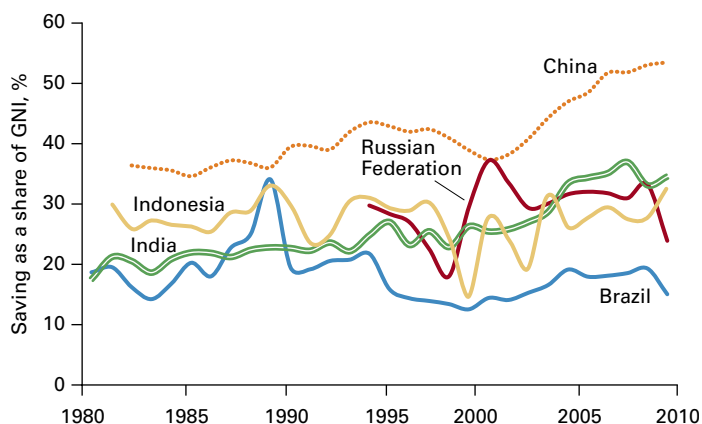
seen large increases. The literature points to several factors in the increasing saving rate, including the following:

- Chamon and Prasad (2010) identify the rising private burden of housing, education, and health care expenditures as well as increased precautionary saving as important drivers of a seven percentage point increase in the urban household saving rate between 1995 and 2005.
- Ma and Yi (2010) focus on the rapid increase in the working-age share of the population, the structural shift from agriculture and corresponding urbanization, tough corporate restructuring, a shrinking social safety net, and transition to a partially funded pension system.
- Wei and Zhang (2011) emphasize competitive saving by parents with sons to make them more attractive for marriage given a skewed gender ratio in the population.
- Curtis, Lugauer, and Mark (2011) show that China's changing age distribution appears to be an important factor when a bequest motive for saving is taken into account.

Another key factor is the relatively unbalanced pattern of financial market development in China; households and small and medium-size enterprises often face tight credit constraints, so they must save to self-finance, while state-owned enterprises typically have easy access to credit. But perhaps the most important factor behind China's high level of saving in recent decades has been its high rate of economic growth, which tends to push up saving rates.

Although the forces at work in driving up saving rates in China apply to many developing countries, nowhere is the impact of the forces as acute as it is in China; in fact, in much of the developing world, one or more of the characteristics clearly observable in China is absent. For example, Sub-Saharan Africa is at an earlier point in the demographic transition than other developing regions, and the transition is proceeding more slowly than it did in other regions. Also, financial systems have deepened worldwide; this

FIGURE 2.4 The paths of saving rates have differed substantially across major developing economies

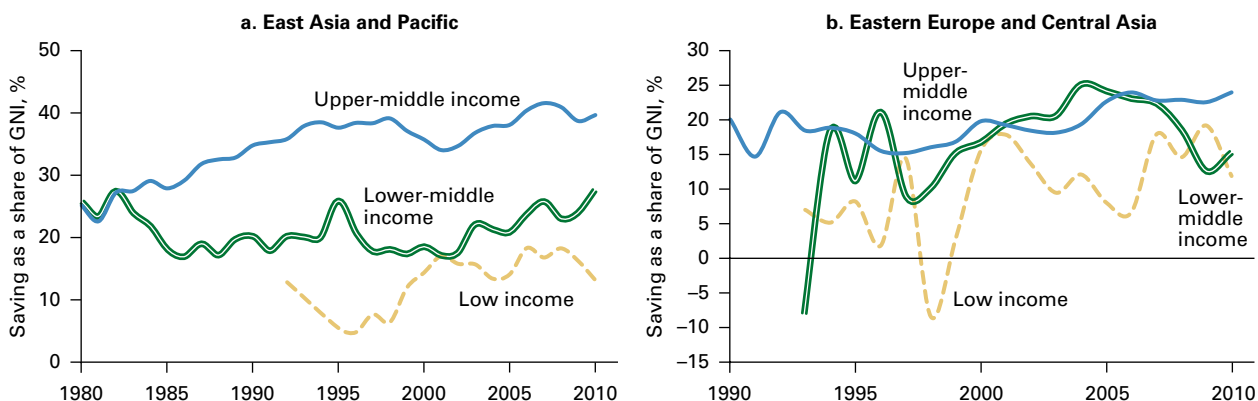


Source: World Bank calculations using data in the World Bank World Development Indicators database.

has been concentrated in high-income countries, but middle-income countries have seen significant deepening since the early 1990s as well (Beck, Demirgüç-Kunt, and Levine 2010).³

Regional saving trends among developing countries indicate that the recent rise in saving has been mainly due to increases among countries in East Asia and the Pacific, the Middle East and North Africa, and South Asia. This rise in saving has been concomitant with significant external surpluses (owing to robust exports of manufactured goods and energy), although, notably, in South Asia the rise has occurred even in the presence of small deficits.

Within regions, too, there is significant diversity in the level and trend in domestic saving. Typically, saving rates tend to be lower in low-income countries (figure 2.5). In East Asia, for example, the region's relatively high overall saving rate—averaging 24 percent between 1980 and 2010—masks much lower rates of saving among low-income nations, although saving rates among countries in income groups in East Asia have risen over time (figure 2.5, panel a). In times of crisis, such as during the Asian financial crisis of 1997–98 and the global crisis of 2007–09, saving rates actually dropped because incomes fell and debt was incurred to smooth consumption.

FIGURE 2.5 Saving rates tend to be lower in lower-income countries

Source: World Bank calculations using data in the World Bank World Development Indicators database.

Notes: Saving rates were the unweighted shares for each income group. GDP-weighted results are qualitatively similar, with the exception of shares for the lower-middle-income category for East Asia, due to the large weight of China.

The private and public components of saving have varied significantly across countries and across time

When national saving is broken down into its private and public components, it is clear that both are important.

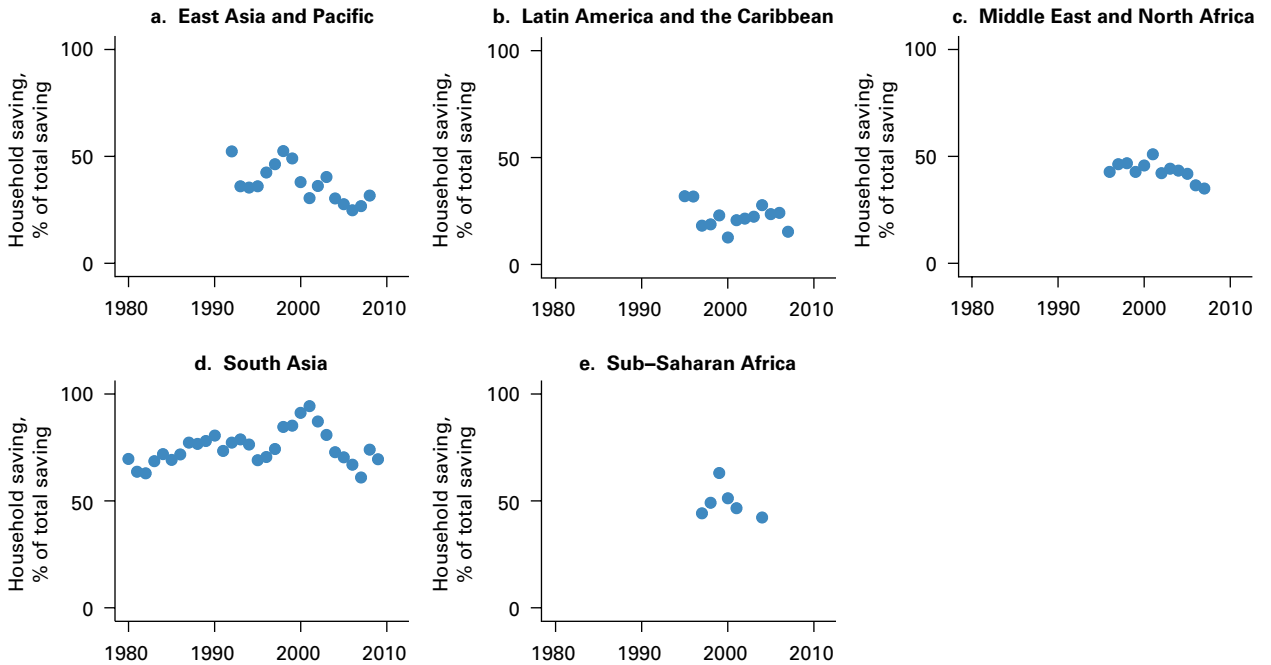
Private saving is typically the greater of the two, and historically private saving has tended to fluctuate more than public saving. For many countries, household saving alone accounts for most of national saving, although once country data are aggregated to a regional level the extent of household saving varies substantially (figure 2.6). Households' share of total saving has ranged from around 25 percent in Latin America to an average of 68 percent in India since the 1950s. One reason for relatively low saving by Latin American households is probably that corporate saving is high there, and because firms are ultimately owned mainly by households, corporate saving substitutes for household saving. Because household saving is sensitive to both economic growth and demographic change, differences in the timing of the demographic transition and in growth over the coming decades have the potential to affect global patterns of saving through their impact on household saving decisions.

Private saving in several major developing countries (notably China and India) is atypically high and has actually grown relatively faster than household saving in recent years (figure 2.7). Theory suggests that corporate saving is negatively related to cash flow (Riddick and Whited 2009), which in turn suggests that external financing constraints—which could result from financial development not keeping pace with growth—may be responsible for the recent rise in corporate saving in these economies. As the financial sectors in China and India mature, however, this tendency for high corporate (and hence private) saving will likely diminish.

Public saving does not show such an obvious long-term trend. Although it has fluctuated to some extent, the public portion of national saving has remained roughly in the range of 10–20 percent of national saving in developing countries over the 30-year period 1981–2011 (figure 2.8). The notable exception was during the years leading up to the global recession in the late 2000s, when public saving exceeded 25 percent of national saving from 2006 through 2008 before quickly returning to historical levels in 2009.

The trend in public saving for the entire world has followed a path roughly the same as that of developing countries over the past three decades,

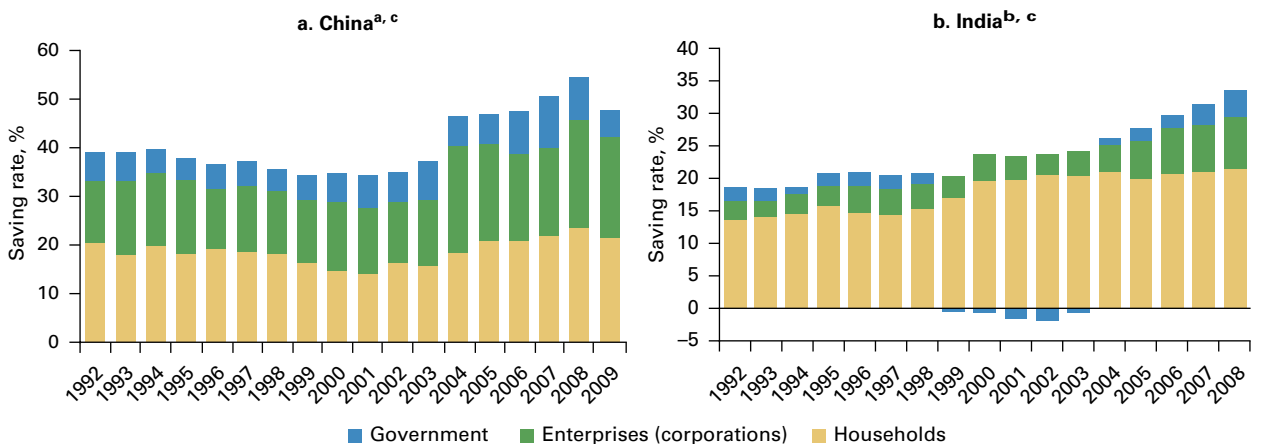
FIGURE 2.6 Household saving varies significantly by region



Source: World Bank calculations using data in the UN National Accounts Main Aggregate database.

Note: Shares are the unweighted average of household saving as a share of national saving across countries in the region, reported only for years in which data are available for enough countries to account for at least 40 percent of the region's gross domestic product.

FIGURE 2.7 Corporate saving in China and India has grown faster than household saving in recent years



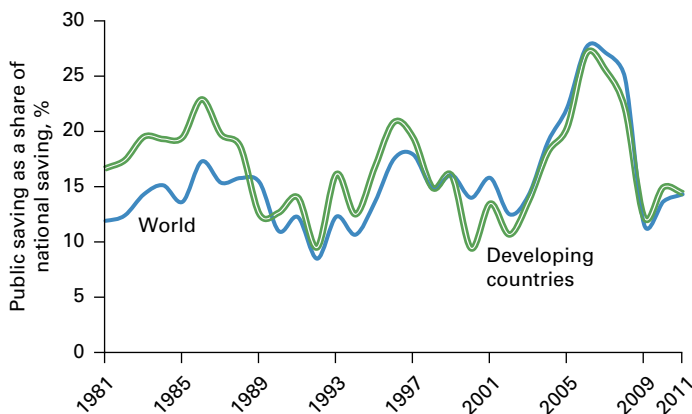
Sources: World Bank calculations using data in the ACMR All China Data Center database (China) and CSO National Accounts database (India).

a. For China, 2009 household and enterprise saving are imputed from their respective 2008 shares of 2009 total private saving.

b. For India, 2007 data are provisional and 2008 are estimates, and household saving is defined as the sum of household financial saving and household physical saving.

c. The use of the terms "enterprises" and "corporations" are retained from the original data sources ("enterprises" for China, and "corporations" for India).

FIGURE 2.8 The public portion of national saving has fluctuated within a fixed range



Source: World Bank calculations using data in the IMF World Economic Outlook database.

Note: Gross national saving is defined according to the national income accounting standard: the difference between gross national income and public and private consumption, plus net current transfers. Gross public saving is current revenues minus current expenditures, for all levels of government. Current expenditures consist of government consumption expenditures, current transfer payments, interest payments, and subsidies; public investment is not included in current expenditures, so it essentially counts toward public saving. For years 1992–2011, the graph represents the unweighted average of the ratio of gross public saving to gross national saving for all countries for which data exist for all years (omitting Kuwait, which experienced large swings in its saving around the time of the First Gulf War). This sample includes 40 advanced countries and 102 developing countries. For years prior to 1992, the sample includes all countries for which data were available in a given year (again omitting Kuwait).

although public saving in developing countries typically accounted for a greater share of total saving than in high-income countries until the late 1990s, and public saving fell more sharply for developing countries than for high-income countries during the early-2000s global recession.

It remains an open question whether the global financial crisis interrupted what would have been a sustained upward shift in governments' role in saving and capital formation (perhaps due to greater infrastructure investment in developing countries) or whether the ramp-up was a short-run phenomenon. Regardless of which description of the precrisis years is more accurate, it is clear that any upward trend in public saving in the coming decades is likely to be offset by significant pressure from aging populations on public health care and pension expenditures.

Although stocks of wealth evolve much more slowly than output, saving, investment, and capital flows, developing countries' rapidly growing shares of these flows will gradually accumulate into a growing share of global capital and

international investment positions (for more details on the recent evolution of the global distribution of wealth, see box 2.1).

Growth, demography, and financial development will drive changes in the global pattern of savings

A key objective of this report is to provide a preview of world saving for the next two decades. A definitive theory of saving unambiguously identifying its determinants is not yet available (for a recent survey, see Attanasio and Weber 2010). However, there is broad consensus that economic growth, demographic transition, and certain structural variables such as financial sector development affect saving. Theoretical models as well as reduced-form empirical equations show the relevance of these variables.

For example, the importance of income growth and changes in the age structure due to population growth are central in explaining saving behavior in the life cycle (Modigliani and Brumberg 1954) and permanent income (Friedman 1957) models. These models remain common benchmarks against which saving behavior is evaluated. More recent models consider how the stock of wealth can serve as a precautionary buffer against unexpected shocks (Carroll 1997) and how uncertainty about future income may influence saving at the household (Weil 1993) and firm (Riddick and Whited 2009) levels, especially absent complete markets for risk insurance (Aiyagari 1994).⁴ Increased longevity can potentially raise saving rates at all ages (Bloom, Canning, and Graham 2003; Kinugasa and Mason 2007). Thus, if increased growth and improvements in longevity happen together, this effect would reinforce the positive impact of growth on saving.

Structural changes in developing countries can alleviate uncertainty and informational asymmetries and contribute to moving toward more complete markets. For example, financial development can relax liquidity constraints and hence affect saving activity (Deaton 1991; Jappelli and Pagano 1994). At the same time, presence (or absence) of social insurance mechanisms can also condition

how much households in a country choose to save (Hubbard, Skinner, and Zeldes 1995).

The scenarios for the future of world saving are constructed using a global dynamic computable general equilibrium (CGE) model that includes a

saving equation whose determinants are per capita income growth, demography (aged dependency), financial development, social protection, and past saving rates. Following standard practice, this equation is *calibrated* using observed data and

BOX 2.1 A gradual shift in the global distribution of wealth is under way

The rise in savings rates in developing countries relative to high-income countries has resulted in an increase in developing countries' share of global wealth (the accumulation of national saving over time). The growing importance of developing countries is most evident in terms of external wealth holdings: the emerging world saw rapid reductions in negative external positions in the 1990s and early 2000s (Lane and Milesi-Ferretti 2007), which have since become positive and continue to grow.^a Despite the fact that distributions change at a glacial pace, there was a noticeable shift in the global distribution of national wealth in the 15 years between 1992 and 2007, in both absolute and per capita terms.

Figure B2.1.1 shows, in panel a, the global intercountry distribution^b of wealth per capita in 1992 and 2007, along with, in panel b, the difference between the two when the 1992 mean is preserved to show the change in the shape of the distribution independent of the shift in the global average. That the distribution shifted to the right means that the world became wealthier in real terms. The bimodal pattern of the distribution in panel a is indicative of the presence of two clubs of countries: the change in the peak on the left, which became slightly higher in 2007, reflects the fact that a number of previously poor countries (such as China, the Dominican Republic, and Namibia) amassed assets and became middle-income countries. the change in

the peak on the right, consisting of moderately wealthy high-income countries, fell as rapid growth in per capita wealth (in economies such as Hong Kong SAR, China; Luxembourg; Norway; and Singapore) meant that they moved from the right peak to the right tail of the distribution. There was thus an increasing gap between the wealthiest high-income countries and those around the right peak—for example, Gulf States and southern European countries, respectively.

Most of the world's stock of wealth remains entrenched in high-income countries. Recent analysis of household wealth by Davies et al. (2011), for example, shows that North America, Europe, and high-income Asia-Pacific countries account for 90 percent of global wealth. Among developing countries, wealth tends to be held in nonfinancial assets, such as housing and land (Shorrocks, Davies, and Lluberas 2010). The continued concentration of wealth in high-income countries, however, has been accompanied by marginal progress toward more equal distribution of national wealth per capita among countries of different income levels over the past 15 years. When countries are weighted by their populations,^c the Gini coefficient fell from 0.77 in 1992 to 0.74 in 2007. This moderate convergence in national per capita wealth can be expected to continue, albeit gradually, in the future as developing countries account for a growing share of global output, saving, and investment.

a. Net international investment positions are available from the International Monetary Fund's International Financial Statistics (<http://www.imf.org/external/data.htm>). It should be noted that China's position constitutes a large part of the developing-country aggregate.

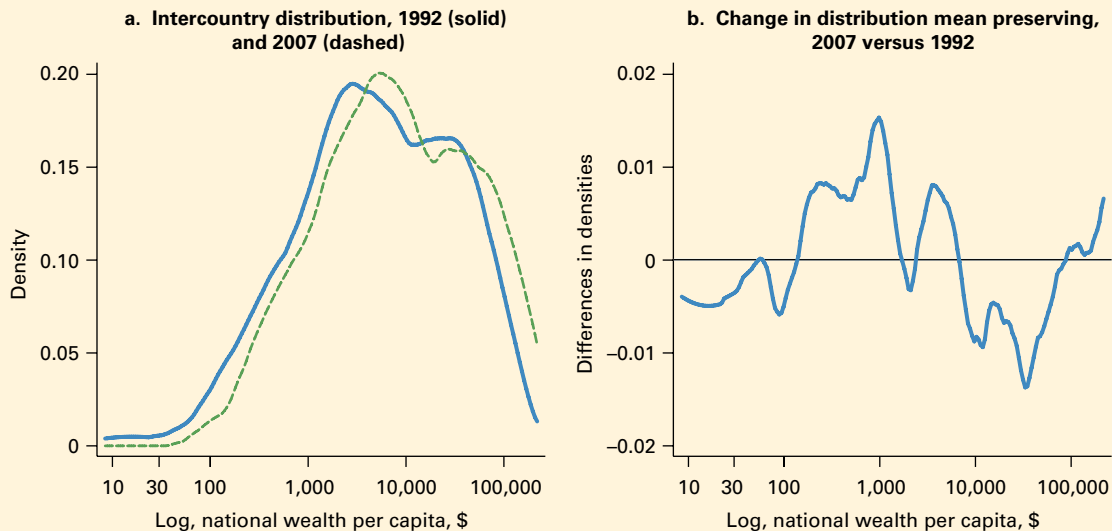
b. Milanovic (2005) discusses three broad concepts for measuring income inequality across countries. In principle, these can also be applied to wealth inequality. Intercountry inequality is based on giving each country's per capita wealth equal weight in the world distribution. International inequality takes into account the relative sizes of countries, weighting each by its population. Global inequality takes within-country inequality into account, measuring the distribution across individuals regardless of their nationality (see, for example, Bourguignon and Morrisson 2002). The global inequality approach is plagued by data limitations. The international inequality approach gives a good picture of what is happening at the global level, but the results can be dominated by one or two large countries (in the case of developing countries, China and India appear as two spikes that dominate the distribution).

c. The population-weighted Gini measure of international inequality was calculated by assigning each country's average per capita wealth to each of its residents and taking the Gini coefficient of the resulting global distribution. Over the same period, the unweighted (intercountry) Gini rose from 0.66 to 0.68, indicating that the result on international inequality depends in large part on changes in populous developing countries such as China and India.

(continued)

BOX 2.1 (continued)

FIGURE B2.1.1 The global distribution of national wealth per capita has changed over time



Sources: World Bank calculations using data in the World Bank World Development Indicators and Global Economic Monitor databases and Lane and Milesi-Ferretti 2007.

Note: Panel a shows the probability distribution of the logarithm of total national wealth, computed for the 100 countries for which data are available for both years, as Gaussian kernel density estimates. National wealth is defined as the sum of the capital stock and net foreign assets, deflated to 2000 dollars. Capital stocks are calculated using a perpetual inventory method with an assumed constant depreciation rate of 5 percent, and are deflated with the country's respective investment deflator. Net foreign assets, by Lane and Milesi-Ferretti (2007), are calculated to account for changes in stock, valuation, and exchange rate, and are deflated with the respective country's GDP deflator. The mean-preserving difference in the per capita wealth distributions for the two years (1992 and 2007), shown in panel b, is computed by subtracting the increase in the mean of 2007 relative to 1992 from the observed countries' values of 2007 prior to calculating differences.

elasticities obtained from econometric estimations. Measuring global saving, accounting for the general equilibrium effects of growth patterns and policy changes, and predicting the future are all difficult things to do in economics, and they can all be easily criticized. However, the main advantage of a model-based analysis is not in providing precise forecasts but in having a framework that is consistent with economic theory and that can be used to test and explain the other-things-equal effects of changes in key determinants.

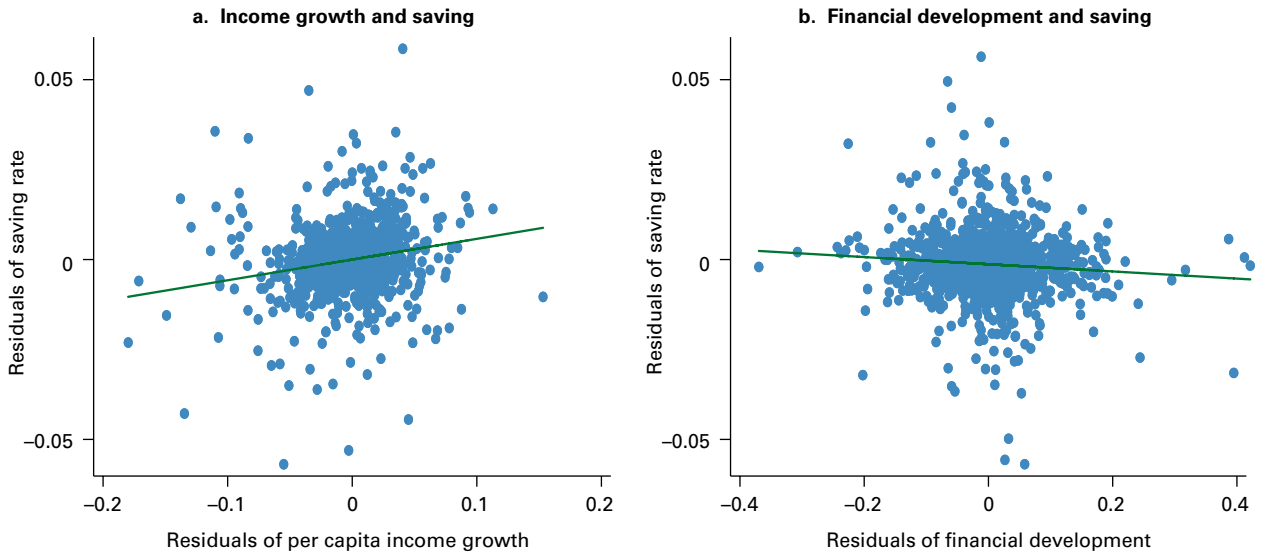
The elasticities used in the CGE model are obtained from a formal multivariate econometric analysis, and graphical representations of its main results are offered in figures 2.9 and 2.10.⁵

As depicted in figure 2.9 (panel a), the conditional⁶ relationship of saving rate and per capita

income growth is found to be positive. For each 10 percent increase in the rate of growth of per capita income, the national saving rate rises 0.5–1.0 percent. This fairly strong relationship goes some way toward explaining why—over the past decade during which developing countries have enjoyed robust per capita income growth—saving rates in many developing countries have also moved upward.

This positive link between saving and growth is moderated by two factors: changes in the aged dependency ratio and changes to the level of financial development, both of which have a negative relationship with the saving rate. As the financial sector develops, there is generally a downward pressure on saving: with credit more readily available in more sophisticated financial

FIGURE 2.9 Saving rates tend to increase with growth (panel a) and decrease with financial development (panel b)



Sources: World Bank calculations using data in the World Bank World Development Indicators database and Financial Structure and Development database.

Note: The figures depict added variable plots of the residuals of the saving rate against per capita income growth (panel a) and saving rate against financial development (panel b), where saving rate is defined as domestic saving share of gross domestic product (GDP), measured in local currency; financial development is defined as domestic credit provision to the private sector as a share of GDP; and per capita income growth is calculated from real per capita income, measured in 2000 dollars. The relationship between the x-axis and y-axis variables is conditional in the sense that the relationship takes into account the effects of other determinants whose contributions are held constant. The graphs above are constructed from the results of specification S4 in table 1A.4 of online annex 1.6. All variables are in logarithm form, are unweighted, and are significant in multivariate regressions at standard levels. Plots for the developing country subsample show very similar patterns.

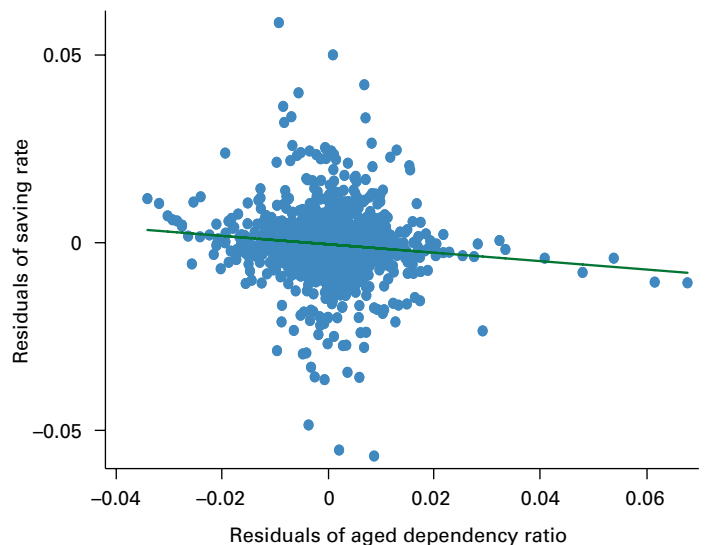
markets, households are more likely to draw on consumer credit to address their financing needs. Similarly, firms face a weaker incentive to retain earnings when it is easier to access capital markets to meet their working capital needs.

The negative relationship between aged dependency and saving is illustrated in figure 2.10, and it confirms a standard result of the life-cycle theory.

Forthcoming demographic shifts will have a strong impact on global labor supply and saving

Momentous demographic change, already under way, will be a key factor in shaping the future of global saving. Three major demographic forces must be taken into consideration: (a) an increase in the size of the population of developing countries relative to the world population, (b) change in the age structure of the world population, and (c) the asynchronicity of changes in age structure

FIGURE 2.10 Saving rates tend to decrease with population aging



Sources: World Bank calculations using data in the World Bank World Development Indicators database and Financial Structure and Development database.

across regions. Together with high economic growth rates, these forces will mean that global saving will be increasingly determined by occurrences in developing countries.

The world population will grow considerably in future decades, from around 7 billion in 2010 to 9 billion in 2050 (United Nations Population Division 2011).⁷ Although the rate of population growth over this period will be far less than during the previous four decades, the addition of more than 2 billion people to the world through 2050 (an addition roughly equivalent to the current population of China, Indonesia, and the United States combined) is not inconsequential. Importantly, this increase in population will be almost exclusively due to growth within developing countries. Already, developing countries represent the main source of growth of the world population, and their contribution has steadily increased. In 1950, 80 out of 100 new people were natives of a developing country; the share increased to almost 95 percent by 2010; and from 2050 onward, developing countries will likely be the only ones contributing to the growth of the world population. As developing countries represent a growing proportion of the world economy, their saving patterns will play a larger role in shaping the overall picture of global saving.

The evolving age structure of both developing- and advanced-country populations will also have profound implications for saving rates. Typically, households go through three broad phases during the life cycle: (a) a first phase, when a household is raising young children and when its income is growing, but so are its expenditures and its investment in the education of the offspring; (b) a second phase, during which the household head and possibly the spouse reach their maximum earning potential and purchasing power; and (c) a final phase, when the main breadwinners cease participating in economically productive activities and rely on accumulated assets and pensions or other transfers to fund consumption. During these three phases, income and consumption—key determinants of the welfare of the household members—are strongly influenced by life-cycle factors such as the age and composition of the

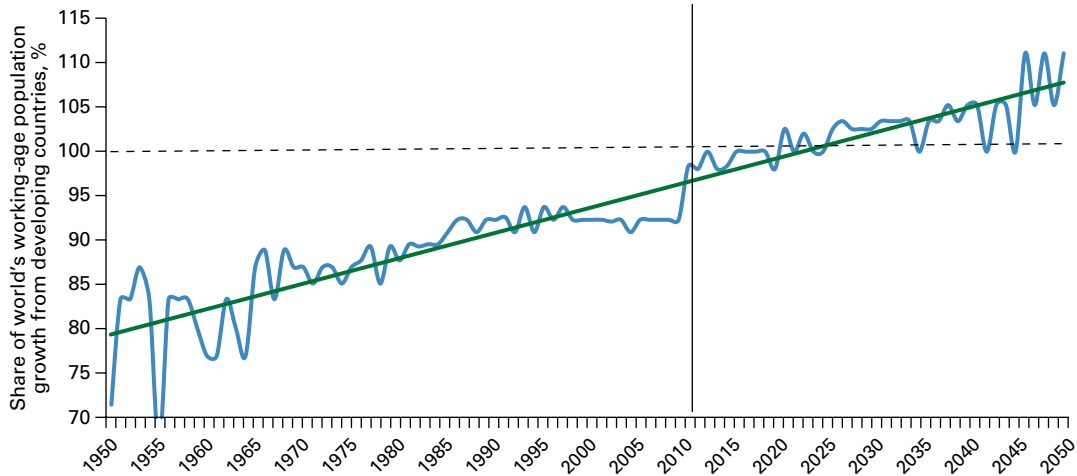
household, which may be quite different, on average, in developing versus advanced economies. In a typical household, however, the life cycle leads to a hump-shaped saving profile over time: saving rises from low or negative levels in the first phase, reach a maximum level in the second phase, and begin to decline in the third phase. This third phase thus implies that as the share of elderly people in a country's population rises, national saving may fall.

Indeed, considerable change is under way in the structure of the world's population. By 2021, less than a decade into the future, growth in the world's working-age population will be exclusively determined by developing-country natives (that is, the blue line in figure 2.11 will meet the horizontal line at 100 percent). By 2050, this scenario will be quite different: each 100 working-age individuals added to the global population will be the result of 110 additional working-age people among developing country natives and 10 fewer working-age people in high-income countries. Assuming that working-age people have higher saving rates than elderly people, this growing representation of natives of developing countries in the world's working-age population implies that developing countries will account for a growing share of global saving.

Large disparities in birth, death, and migration rates between developing and high-income countries help explain both the developing world's growing population and the change in the world's age structure. For any given country, the gap between death and birth rates (assuming no net migration) is the rate of population growth, while the sequencing in the reduction of these two rates—the demographic transition—determines a period of rapid population growth.

A recent phase⁸ of the demographic transition is depicted in figure 2.12 for the six developing regions. Several aspects of population dynamics in recent decades are emphasized by this figure: First, for all the regions, birth rates are still higher than death rates. Second, death rates are still falling, but they seem to be leveling off at around 10 deaths per 1,000. Finally, the difference between death and birth rates and the speed of its closing are different across developing

FIGURE 2.11 By 2020, growth in world’s working-age population will be exclusively determined by developing countries



Sources: World Bank projections, supplemented with calculations using data in the World Bank World Development Indicators database and United Nations Population Division 2011.

Note: The green line shows the linear time trend in the data presented by the blue line. Where the share exceeds 100 percent, it reflects loss of working-age people in high-income countries. For example, by 2050, each 100 additional working-age individuals in the global population will be the result of 110 additional working-age people in developing country natives and 10 fewer working-age people in high-income countries.

regions’ trends (the determinants of which are explored in box 2.2).

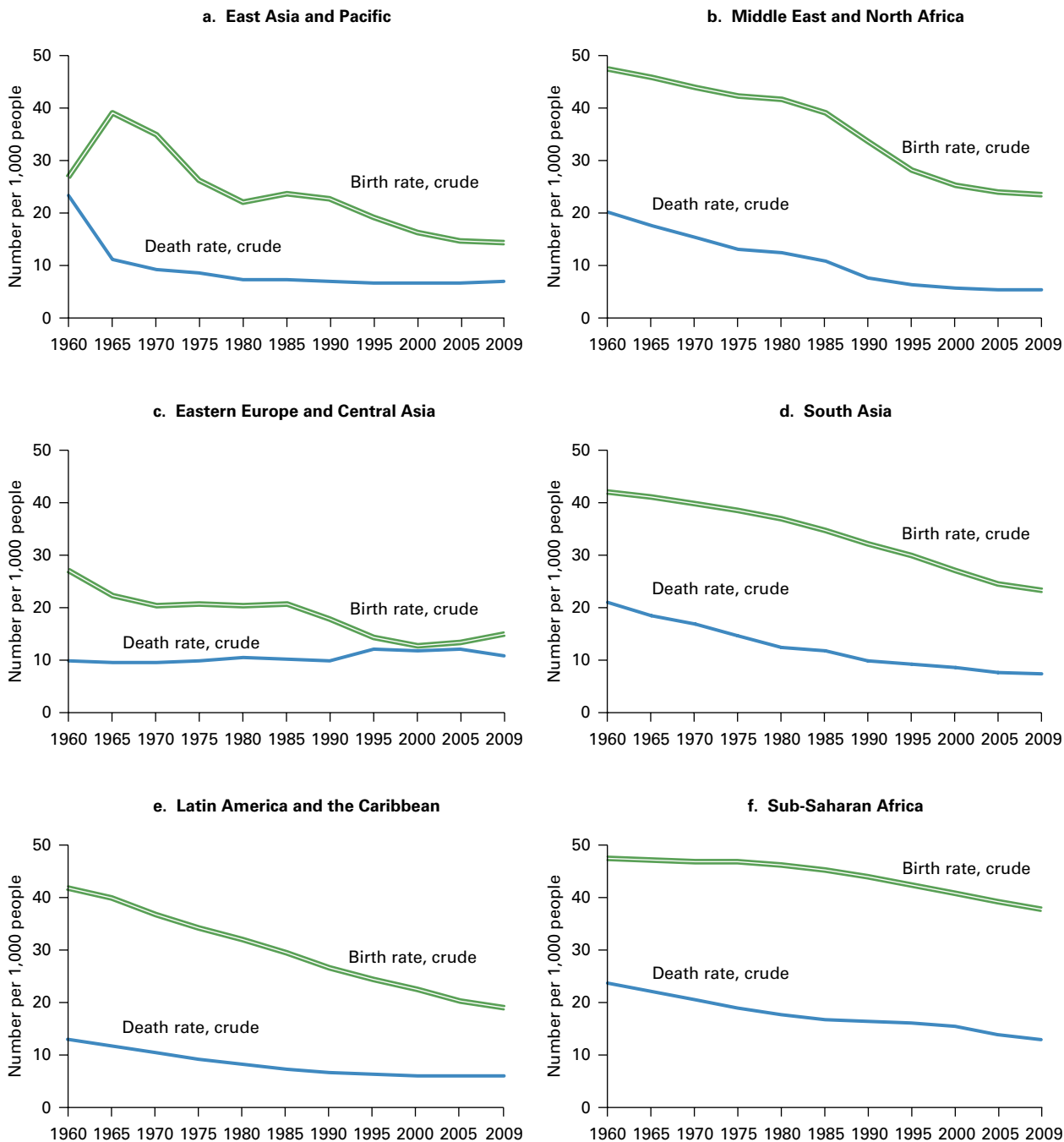
A somewhat complex set of mechanisms lies behind the timing of changes in the gap between a country’s birth rate and death rate. When a country experiences an initial fall in child mortality, this generates a cohort of young people that is much larger than that of earlier generations. At a certain point, fertility rates begin to slow down and the increase in the very young population ends. But, as shown in box 2.2, figure B2.2.1, the closing of the gap proceeds at a different pace in different regions. The larger the initial gap and the shorter the time period to close this gap, the bigger will be the “bulge” in the age structure. As time goes by, the “bulge” cohort enters the labor market, increasing the ratio of working-age to nonworking-age population. The opposite effect occurs when the bulge cohort reaches retirement age, with an increase in the ratio of nonworking-age people to working-age people.

A graphical representation of this “bulge” concept can be seen for various regions in figure 2.13. One of the most interesting features highlighted by this figure is that aging is geographically

asynchronous—with high-income countries and some parts of the developing world much more advanced in their demographic transition. The asynchronicity is shown by the considerable diversity of the height of the peak of the ratio of working-age to nonworking-age population, the timing of this peak, and the slope of the curve around the peak.

In high-income countries, the ratio of working-age to nonworking-age persons increased slowly from 1950 to 2000, and now is declining.⁹ As a consequence of the fairly slow demographic transition, this group has experienced mild age structure effects. By contrast, in the East Asia and Pacific region, the reduction in fertility has been rapid (see box 2.2) and the increase in the ratio of working-age population steep. South Asia, the Middle East and North Africa, and Latin America and the Caribbean follow a somewhat similar path: their fertility rates have been decreasing, but their demographic dividend has not yet reached its maximum. Sub-Saharan Africa is once again an exception, showing a glacial pace in its demographic transition. Fertility rates have remained high (as shown in figure

FIGURE 2.12 Birth and death rates have shown distinct trends across regions



Source: World Bank calculations using data in the World Bank World Development Indicators database.

Note: The crude death rate is the number of deaths among the population of a given geographical area during a given year, per 1,000 midyear total population of the given geographical area during the same year. Crude birth rate indicates the number of live births occurring during the year, per 1,000 population estimated at midyear. Subtracting the crude death rate from the crude birth rate provides the rate of natural increase, which is equal to the rate of population change in the absence of migration.

BOX 2.2 The geographically asynchronous demographic transition is driven by cross-country differences in some key factors

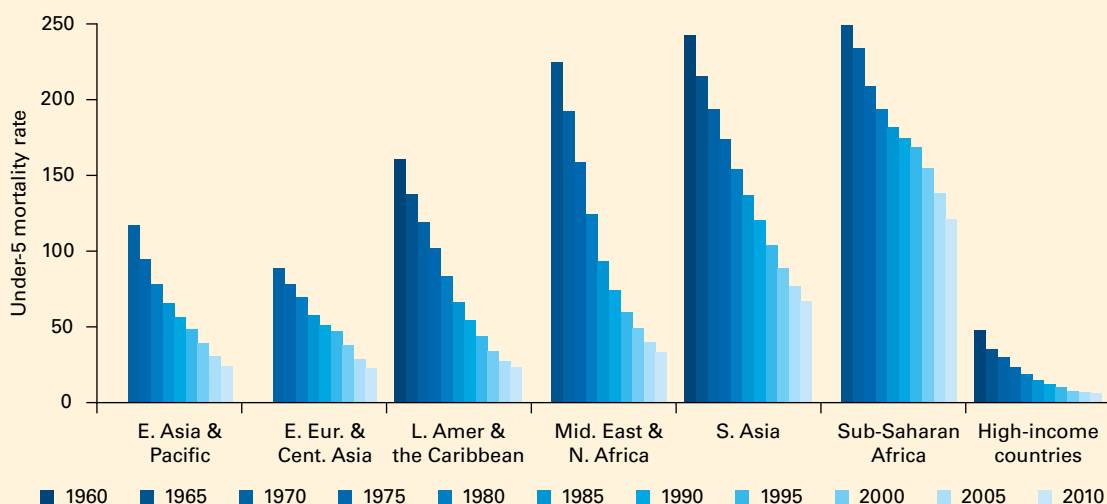
For any given country, declines in two major demographic measures, mortality rates and fertility rates, contribute to the aging of a population. Consider first the mortality rate. Reductions in infant and child mortality due to the expansion of access to clean water and sanitation as well as to preventive health care (such as vaccination against infectious diseases) are the initial drivers of population growth and explain the increase in life expectancy experienced in the recent past. High-income countries have long had an advantage in terms of having the financial resources to address these concerns, as reflected in their dramatically lower under-5 mortality rates in 1960 than in any developing region (figure B2.2.1). In the five decades since, however, developing countries have made significant progress in reducing child mortality, although from different starting points and at different rates.^a

As of 2010, under-5 mortality rates in the East Asia and Pacific, Eastern Europe and Central Asia, and Latin America and the Caribbean regions were similar to those in high-income countries in the 1970s.

Meanwhile, the rate in the Middle East and North Africa as of 2010 was roughly equivalent to the rate in high-income countries in the 1960s. Under-5 mortality remains comparatively high in South Asia and Sub-Saharan Africa, however, with rates 10 and 19 times those of high-income countries, respectively, as of 2010. For high-income countries, by comparison, recent reductions in the overall mortality rate are attributable to the reductions in old-age mortality, which result from more expensive health treatments and, more generally, higher incomes.

The aging of populations in recent decades also reflects sharp reductions in fertility rates. In the 1960s, developing regions (excluding Eastern Europe and Central Asia) had fertility rates of around 6.2 births per woman, or more than twice the rate of high-income countries. That gap has now become much smaller (figure B2.2.2). As of 2010, East Asia and the Pacific and Eastern Europe and Central Asia had fertility rates equal to that of high-income countries and approximately equal to the so-called replacement rate of 2

FIGURE B2.2.1 Developing countries have made significant progress in reducing child mortality, although from different starting points and at different rates



Source: World Bank calculations using data in the World Bank World Development Indicators database.

Note: The under-5 mortality rate is the probability per 1,000 that a newborn baby will die before reaching age five if subject to current age-specific mortality rates.

(continued)

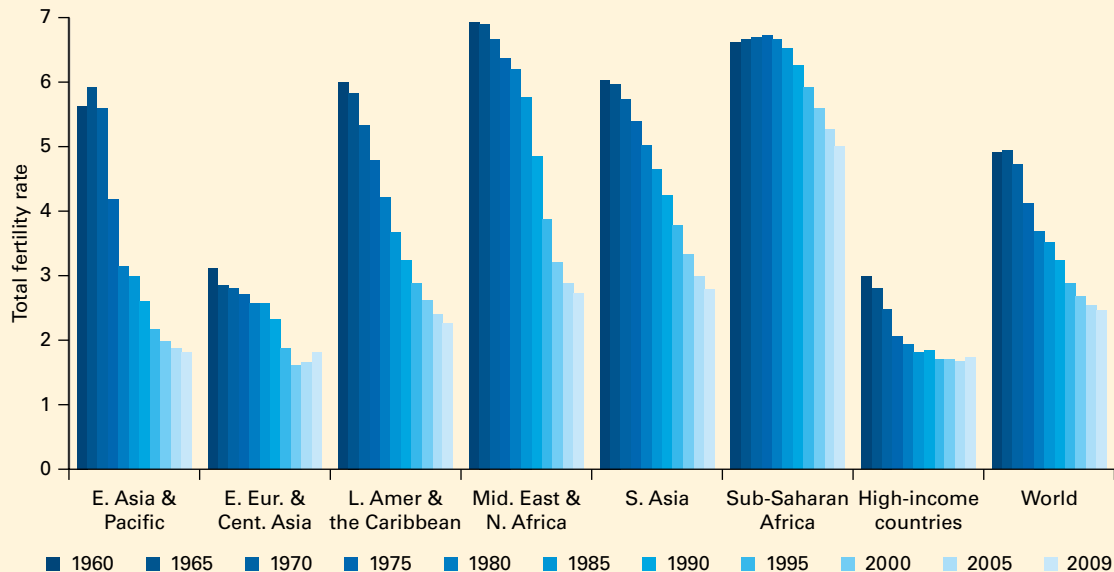
BOX 2.2 (continued)

births per woman. The fertility rate in Latin America and the Caribbean is now only slightly higher than the replacement rate, and, at 2.7 and 2.8 births per woman, respectively, the Middle East and North Africa and South Asia are not terribly far above that level. Sub-Saharan Africa remains the exception, with a

fertility rate of 5 in 2010. Two main reasons have been advanced to explain this rapid reduction in fertility: falling infant mortality rates and increased female education, the latter of which improves the labor market opportunities of women and increases the opportunity cost of childraising.

a. Infant mortality rates, although lower than the under-5 mortality rates shown in figure B2.2.1, show similar regional dispersion and reduction patterns.

FIGURE B2.2.2 The gap in fertility rates across regions has narrowed



Source: World Bank calculations using data in the World Bank World Development Indicators database.

Note: The total fertility rate represents the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with current age-specific fertility rates.

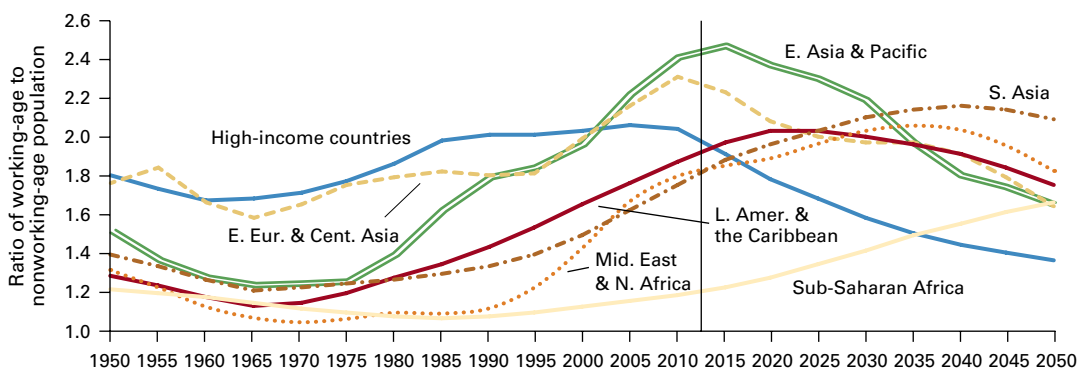
B2.2.2), and as long as they continue to do so, the average age of the population and its share of working-age individuals will remain low compared with other regions. The high incidence of acquired immune deficiency syndrome (AIDS) among young adults has added to the reduction in the ratio of workers to young and old.

Given this heterogeneity in demographic conditions, regions will differ in terms of their saving dynamics; relative factor returns (capital

versus wages); and pension, health care, and other old-age support needs. These, in turn, will affect international capital flows (see box 2.3).

World saving patterns are set to shift in the decades ahead

This report's view of the future evolution of global saving is based on scenarios built with a multi-country dynamic general equilibrium model. The

FIGURE 2.13 The size and timing of the demographic “bulge” differs across regions

Sources: World Bank projections, supplemented with calculations using data in the World Bank World Development Indicators database and United Nations Population Division 2011.

model is used to assess the effects on saving of several major forces: the forthcoming changes in demographics, the fact that developing countries will continue to grow faster than high-income countries, and shifts of other structural determinants such as the level and coverage of financial development and social protection. The approach is broadly similar to that taken in the second group of studies described in box 2.3.

Two scenarios are run with the model. The main difference between the two scenarios is the pace of convergence between developing and high-income countries in terms of economic growth and financial development. The *gradual convergence* scenario assumes a certain degree of economic growth convergence, accompanied by endogenous increases in financial deepening. The *rapid convergence* scenario imposes faster growth convergence, together with the assumption that developing countries will be able to reduce the gap between their financial development and that of the United States in 2030 by about 25 percent. All of the other exogenous variables (notably, demographic shifts in the age composition and labor supplies) as well as other policy variables (such as tax rates, tariffs, and government expenditures) are held at the same levels in both scenarios. (The assumptions and parameters of the model are detailed in online annex 1.6).

The scenarios' results reported are for national saving—that is, they represent the combined

change in both private and public saving. Given its long-term view, the model makes the simplifying assumption that governments run balanced budgets: any increase in public expenditures is passed on to households via an increase in direct taxation. The impact of demographics on both private and public age-related spending is reflected in a change in private sector consumption and saving and, thus, national saving. The mechanisms by which demographic change affects the public component of national saving are not explicitly modeled in the CGE framework but are nevertheless captured. A later section of the chapter presents a more detailed, but partial equilibrium, analysis of the forthcoming expansion of age-related public expenditures.

Under a gradual convergence scenario, global saving will almost double from its 2010 level

Developing countries will represent a very large share—almost two-thirds—of all global saving by 2030 (figure 2.14, panel b), up from slightly less than half in 2010. China and other Asian economies (both developing and high-income) will continue to be major savers, with China accounting for a larger share of global savings than any other individual country. Together, high-income European countries also will continue to contribute a significant share of global savings.

BOX 2.3 Literature on modeling the effect of aging on saving at the global level^a

A recent wave of studies uses multicountry or multi-region general equilibrium models to account for the impact of cross-country demographic changes on saving—some considering the historical experience, and others the outlook for future decades. It is possible to identify at least two different strands of this literature.

Auerbach and Kotlikoff (1987) provide an early example of an approach that uses large-scale overlapping generations models to analyze the implications of policy reform. A large number of papers follow this approach to study social security reform (for example, Conesa and Krueger 1999) and basic tax reform (for example, Altig et al. 2001; Conesa and Krueger 2006), among other issues. Within this first group of studies, a subset of papers focuses on the economic consequences of population aging in closed economies. A specific question addresses the adjustments required in the social security system because of demographic shifts. Important examples include Huang, İmrohoroğlu, and Sargent (1997); De Nardi, İmrohoroğlu, and Sargent (1999); and, with respect to asset prices, Abel (2003).

In a closed-economy setting, geographically asynchronous aging does not matter, and the saving effects of the demographic transition—particularly in the latter phases, when the society is aging—are determined by the speed of change in the age structure and size of the bulge cohort. More specifically, in an economy closed to international capital flows, changes in labor supply and aggregate saving affect the relative returns of labor and capital and the growth of the economy. In an aging economy, young labor becomes scarcer with respect to capital, thus the return to labor rises relative to the return to capital.

This change in factors' relative prices also has intergenerational distribution effects. The people who lose from lower capital returns will tend to be asset holders who are older than the average person, while those who gain from higher wages will tend to be younger than the average.^b

These effects are intensified by a rapid demographic transition and a quickly closing gap between an initial mortality reduction and subsequent fertility reduction. These two aspects of the demographic transition strengthen the changes in aggregate saving and labor supply, thus exacerbating the changes in relative factor supplies and the divergence in relative factor prices.

For an open economy, geographically asynchronous aging across other countries will affect saving, and thus the relative factor prices, through international capital flows.^c A country's current account deficit and its capital inflows are determined by the excess of its investment over its saving (and vice versa for a surplus and capital outflows). Because the supply of saving is related, via the life cycle, to the age structure of its population, the current account balance is affected, all things equal, by demographic change. In a world with free capital movement, capital should flow from fast-aging regions, where capital is relatively abundant, to regions with fast-growing populations, where labor is abundant.

A second strand of studies extends the previous approaches by explicitly considering these open-economy issues. By taking into account international links (trade and capital flows) and using multicountry or multi-region general equilibrium models, this third strand of literature reassesses the impact of cross-country demographic changes on various economic issues. Several studies use demographic projections to quantify, for example, the effects of pension reforms on the viability of social security systems (Aglietta et al. 2007; Attanasio, Kitao, and Violante 2006, 2007; Börsch-Supan, Ludwig, and Winter 2006; Fehr, Jokisch, and Kotlikoff 2003). Krueger and Ludwig (2007) study the impact of demographic forecasts on the distribution of wealth and welfare in Organisation for Economic Co-operation and Development countries. Other studies adopt an *ex post* approach. For example, using calibrated life-cycle models, Domeij and Flodén (2006), Feroli (2003), and Henriksen (2002) find that changes in demographics explain a large part of historical current accounts.

a. This box draws heavily on Marchiori (2011) and Krueger and Ludwig (2007).

b. The intergenerational distribution effects are further complicated when the funding of pension schemes comes from payroll taxes.

c. International migration will also be affected, and the mechanisms will be similar to those described for international capital flows.

Compared with the start of the 21st century, saving rates will have fallen by 2030, a reflection of increased demographic pressures from aging populations in much of the world and slowing growth rates. In both the developing and developed worlds, saving rates will decline from their respective peaks (figure 2.14, panel a). For developing countries collectively, saving is anticipated to reach a peak of 34 percent of their income in 2014 and steadily creep downward to 32 percent in 2030; for high-income countries, the corresponding reduction will be from 20 percent to 16 percent. The significantly slower decline in the developing world’s saving rate, coupled with the increasing size of developing countries in the global economy, will contribute to a widening difference between the global saving contributions of the two groups.

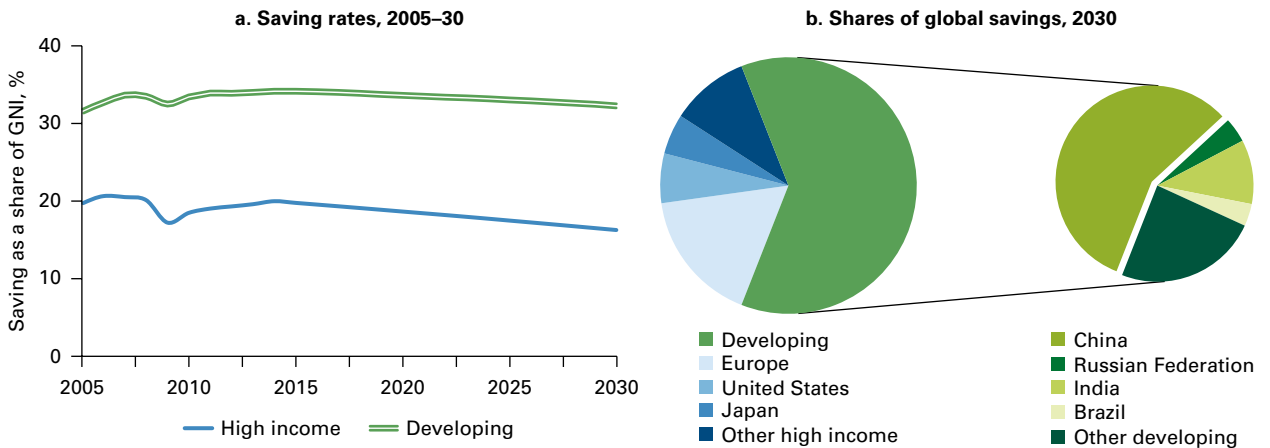
Another implication of the increased relative size of developing countries is that the global saving rate will not fall in spite of decreases in the saving rates of both groups. The larger economic size of the developing world, alongside the slower rate of decline in its relatively higher saving rate, will offset the decline of saving in high-income countries. In summary, although the global flow of saving will rise dramatically in absolute terms between 2010 and 2030,

the global saving *rate* will remain constant at around 24 percent.

China will continue to be dominant in the global savings picture. The continuous increase in the country’s saving over the scenario horizon will mean that by 2030, its absolute saving will be far and away the largest among all economies worldwide, at around \$9 trillion (measured in 2010 dollars) (figure 2.15). This large amount of saving is a function of China’s large population and high propensity to save, as often noted, but those strong upward pressures on saving will be to some degree offset by a rising old-age dependency ratio (China’s ratio will surpass 2010 U.S. levels in the latter half of the 2020s) and decreasing economic growth. Thus, although China’s saving will undoubtedly remain large, it will nevertheless be smaller than it would be in the absence of changes in population structure and the slowdown of economic expansion.

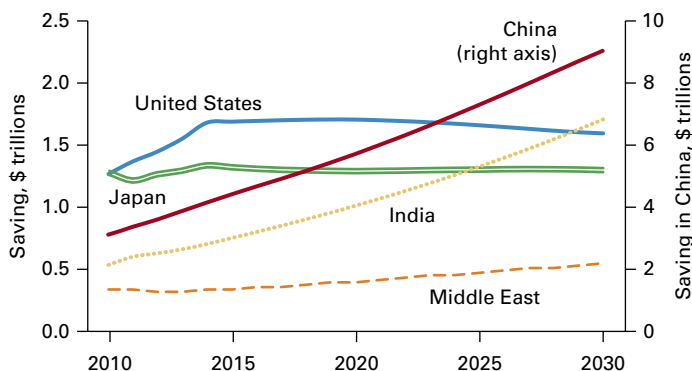
The effects of a large population on national saving will also be seen in India, which will overtake both Japan and the United States in terms of its absolute level of national saving sometime in the 2020s. A major factor supporting the relatively rapid rate of growth in saving in India is its favorable demographics: India’s old-age dependency ratio will rise far more slowly than in East

FIGURE 2.14 Saving rates will decline more slowly in developing countries, and by 2030 those countries will account for two-thirds of global saving



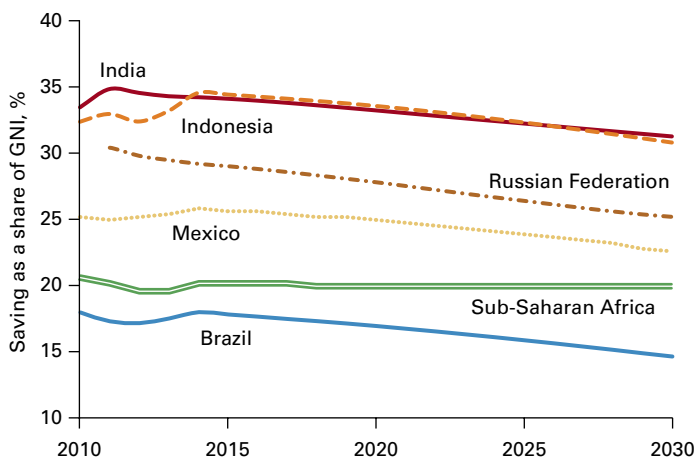
Source: World Bank projections.

FIGURE 2.15 China will continue to be dominant in the global saving picture



Source: World Bank projections.
 Note: Saving levels are measured in 2010 U.S. dollars.

FIGURE 2.16 Differences in the demographic transition will translate into different saving rate trends



Source: World Bank projections.

Asia or high-income nations. Still, as discussed earlier in the chapter, India’s demographic dividend will gradually peter out as it approaches 2030, and this will moderate its increase in saving. Regardless, the saving rate in India will remain higher than that of many other developing countries, in no small part because of growth in per capita incomes.

The expected effects of asynchronous demographic changes on saving activity are most

evident when comparing the saving rate paths among developing countries (figure 2.16). In economies that will experience a simultaneous sharp reduction in the working-age share of their population and an increase in the old-age share of their population, such as Indonesia and Russia, the saving rate will fall significantly. The more moderate decline in saving rates in Mexico will be due in part to its relatively more positive demographic evolution.

A remarkable exception to these general trends will be Sub-Saharan Africa, where the saving rate will not fall thanks to a stable old-age dependency ratio and healthy rates of economic growth (the region will average about 5 percent annual growth in the gradual convergence scenario). Indeed, Sub-Saharan Africa stands as a remarkable outlier to the global pattern of declining saving rates worldwide, largely because of the favorable combination of productivity growth and little demographic pressure.

Under the rapid convergence scenario, the absolute level of global saving will be slightly larger

Global saving will be \$27 trillion under the rapid scenario, whereas under the gradual convergence scenario, it will be \$25 trillion. This larger amount of global saving is mainly due to the assumption of a higher growth rate in the global economy. The overall global saving *rate* under this new scenario will, however, still fall slightly: this is mainly because, even though developing countries save more in *absolute* terms, the negative impact of higher levels of financial development on saving rates will dominate—households and firms need to set aside less saving in the presence of better financial intermediation—and the net effect will be a reduction in developing countries’ saving rates, to 30 percent, versus 32 percent in the gradual convergence scenario (figure 2.17, panel a).¹⁰

In the rapid scenario, faster financial development in developing countries tends to bring down their saving rates. The impact on the global saving rate, however, is offset by the fact that the global weight of developing countries (which still

tend to have higher saving rates than advanced countries) is greater relative to the gradual scenario. Thus, the path of the global saving rate is roughly the same across the two scenarios.

Relative to the first scenario, developing countries will capture a slightly larger share of global saving under the rapid convergence scenario (figure 2.17, panel b). This small change obscures a significant degree of heterogeneity in the paths of different countries, however. This heterogeneity, in turn, results from the difference in impact of financial development on saving in this second scenario: for countries starting at low initial levels of financial development, reducing by one-fourth their distance from the United States means a larger increase of financial development. China, for example, will experience a decline in its saving rate of 7 percentage points (from 52 percent to 45 percent), whereas Indonesia will see a sharp drop in its saving rate of more than 7 percentage points (from 32 percent to 25 percent). Both countries will follow healthy growth paths, but Indonesia, which in 2010 had a level of financial development only a fifth of the high-income-country average (compared with China, with a level close to two-thirds in the same year) will experience a larger change in its financial

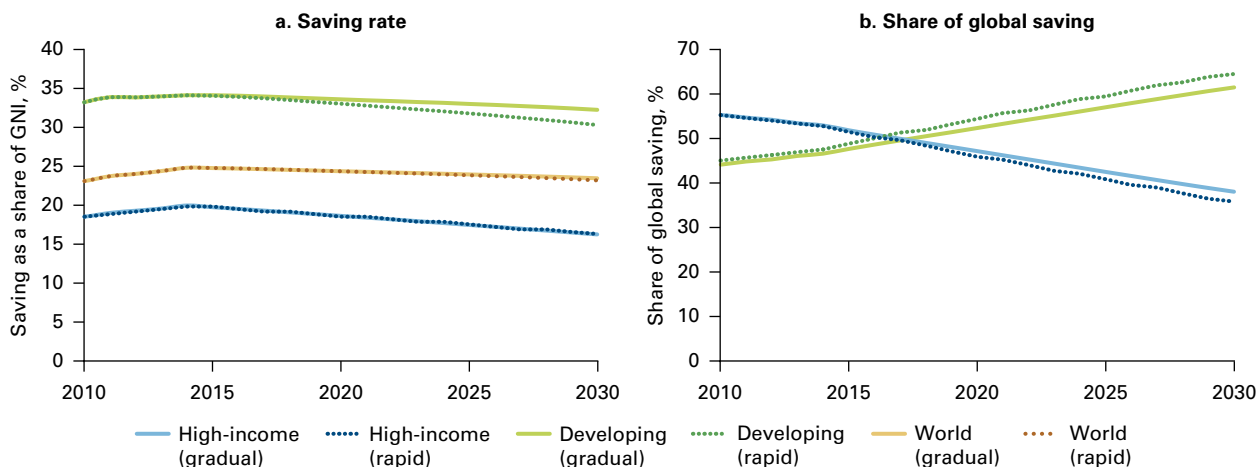
development and thus a greater negative impact on its saving rates.

The small reduction in global saving implies an increase in the rental rate of capital worldwide, however, because lower global saving reduces the supply of capital, while higher overall growth increases the demand for capital (as discussed more thoroughly in chapter 1). Interest rates turn out to be significantly higher in the rapid convergence scenario than in the gradual scenario. However, stronger price signals, and better financial intermediation in terms of coverage and efficiency, mean that savings will be channeled more effectively to its most productive uses.

A more nuanced view of the future of saving: Distribution, public finance, old-age support, and other impacts

The scenarios presented in the previous section explored the implications for global saving of forecasts for productivity growth, demography, and financial development. The principal conclusions were that higher growth tends to increase saving, a rise in the elderly dependency

FIGURE 2.17 National saving rates (panel a) and share of global saving (panel b), by income groups, gradual versus rapid convergence scenario, 2010–30



Source: World Bank projections.

Note: The gradual and rapid convergence scenarios refer to numerical simulations based on two sets of assumptions on productivity growth and structural changes (see details in the main text).

ratio tends to reduce saving, and higher financial development may lower saving rates but improves the efficiency of investment allocation and thus increases growth. Overall, average global saving rates would remain roughly constant through 2030, in part because of the rising global gross domestic product (GDP) share of the relatively higher-saving developing countries. This macroeconomic analysis requires a number of simplifying assumptions. For example, the population age structure of a country (or groups of countries) is approximated by a simple old-age dependency ratio, growth is assumed to benefit all households in the same way, and saving is not disaggregated into households, government, and firms.

Other approaches to studying the future of global saving are to consider how demography and growth will affect saving at the household level, and how aging will affect public finances. Examining saving from a microeconomic perspective can provide a more realistic and nuanced view of the likely evolution of saving, although at the price of considering a limited set of countries given the data availability. Although the household-level analysis confirms the broad conclusions of the macroeconomic analysis, the micro-level data also expose the complexities of the interaction among aging, saving, and growth. The analysis finds that (a) aging tends to reduce saving; (b) the size and composition of households simultaneously affect saving, labor supply, and other key economic decisions; and (c) all three of these factors have feedback effects on demography. It also finds that saving tends to be highly concentrated, which may initially help boost development of financial systems but also has potentially negative implications for economic mobility and inclusion.¹¹

These findings have significant public policy implications, not least of which is that the decline in the extended family support system in many developing countries will require greater reliance on formal financial institutions, which in turn will affect both financial markets and government finances. Many countries will find it challenging to provide health care and retirement benefits for their aging populations while ensuring financial sustainability and encouraging healthy rates of economic growth.

This second part of the chapter complements the general equilibrium-generated scenarios of global saving discussed above. The more disaggregated analyses of the household and government saving in this part are based on different tools and datasets, and therefore some of the mechanisms operating in these settings—for example, the impact of education on the life-cycle saving behavior and the effects of demographic changes on government expenditure—were not integrated in the CGE modeling.

Saving at the household level: Who actually saves?

The evolution of household saving and economic development are strongly interrelated. A glance back at figure 2.6, for instance, shows that household saving represents a large share of national saving of an economy and, therefore, its capacity to finance investment using domestic resources. Indeed, fundamental economic decisions concerning saving are made at the household level: how time is allocated between leisure and work; how income is earned and shared; how much of income is consumed (and for which goods and services) versus saved; and what proportion of resources is devoted to investment in the education of the young.¹² Analysis at the micro level can thus provide substantial insights, also because it considers distributional aspects ignored by representative-agent approaches.

The microeconomic analysis undertaken here considers the household-level data of a group of developing economies in which saving behavior is driven by distinct characteristics: a middle-income economy with modest economic growth rates (Mexico), a middle-income country with robust growth (Thailand), a transition economy with an aging population (Russia), and a country with a large demographic dividend (Ghana). The analytical approach adopted here is a cohort (or pseudo-panel) approach that uses a series of repeated cross-sectional data on both income and consumption. This approach allows not only the measurement of saving rates of individuals at different ages, but also determines whether these individuals belong to different cohorts (that is, if they were born in different years). In other words,

the differences in incomes and saving of a younger individual relative to an older one can be decomposed into a portion attributable to their different ages (the age effect) and a portion attributable to the fact that the younger individual belongs to a cohort that, on average, has different income and saving (the cohort effect). In addition, saving rates change from one year to another (the time effect) as agents respond to shocks. Box 2.4 and

online annex 2.1 provide additional methodological details.

Following cohorts over time is appealing because it helps shed light on how the two key drivers of saving—demography and growth—operate at a more disaggregated level. Cohort analysis can help determine whether saving has been rising because the share of the population at high-saving ages has increased or because younger

BOX 2.4 Micro analysis is a useful tool for determining likely trends in future savings

Separating the age, cohort, and time effects in the estimation of the age-saving profile is not straightforward and requires several identification restrictions. The micro analysis presented in this report follows an approach that was pioneered by Heckman and Robb (1987) and subsequently used by Deaton and Paxson (1994); MaCurdy and Mroz (1995); Gokhale, Kotlikoff, and Sabelhaus (1996); Paxson (1996); Attanasio (1998); and more recently, Chamon and Prasad (2010). The saving data, consisting of data points for each cohort and each year, are the dependent variables; these are regressed on dummies for age, cohort, and time (where time is the year of the survey). The restrictions are equivalent to assuming that “all deterministic trends in the savings rate data originate from a combination of cohort and age effects” (Attanasio and Szekely 2003, 15).^a

For the four countries examined here, household saving is estimated from high-quality household surveys. These surveys are all nationally representative and were conducted using a broadly comparable methodology over a fairly long period covering the mid-1980s to the late 2000s. The saving variable estimated from the surveys is obtained as simply the difference between total household disposable income (which includes imputed amounts—for example, imputed rents from owning a house, income in kind, and consumption of automobiles) and total expenditures.^{b, c}

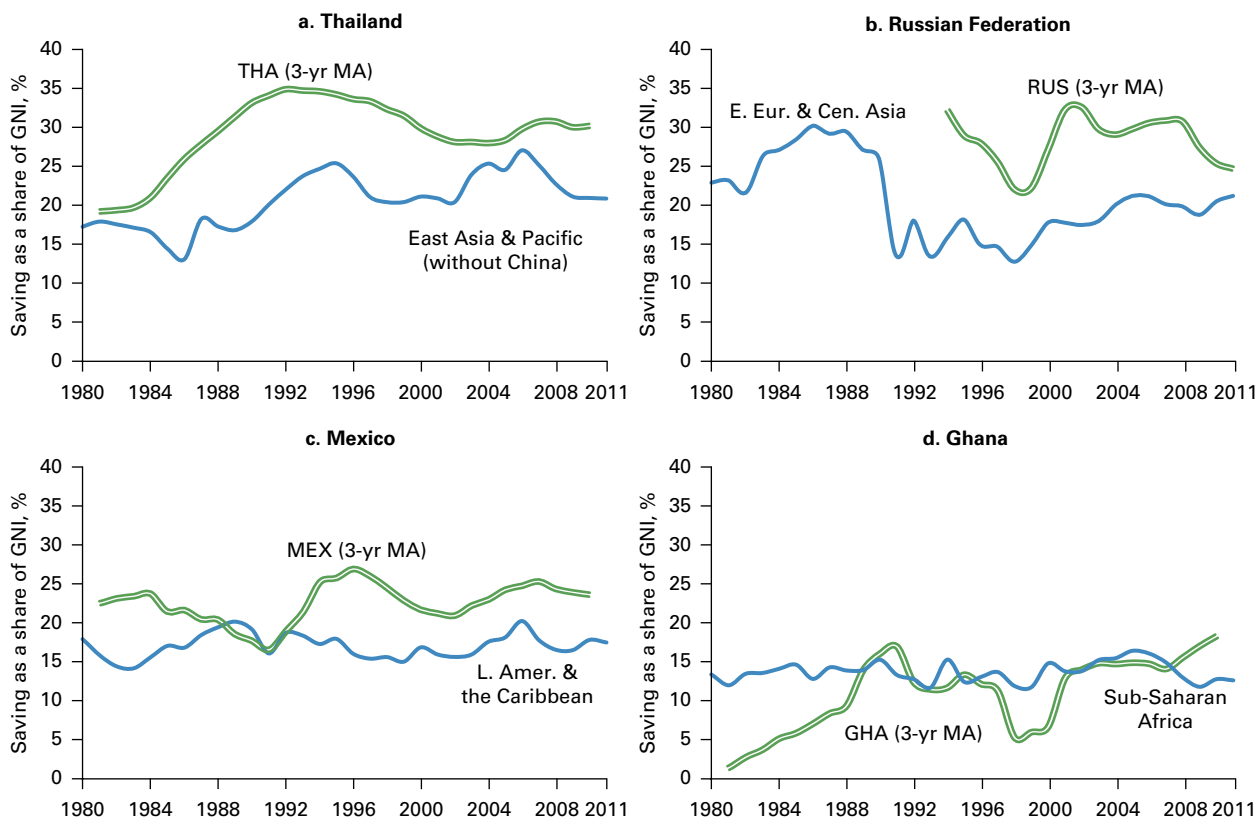
Most of the findings that follow from this analysis are illustrated by graphing variables of interest along the life cycle. Thus, it is useful to describe how these graphs are constructed. In each country and for each household survey, approximately 14 five-year birth cohorts are constructed. Cohort 1 is the youngest cohort; for example, in Mexico, cohort 1 is represented by all household heads born 1985–89, so that, in the most recent surveys of 2009–10, they are 20 to 25 years old. Cohort 2 represents household heads who were born 1980–84 and were repeatedly observed in the surveys of 2004 at the “average” age of 22, in the survey of 2005 at the age of 23, and so on, until the most recent survey of 2010 at the age of 28. The oldest cohort, cohort 14, represents household heads who were born 1920–24; in the first Mexican survey of 1984, these heads were 60–64 years old. The graphs plot the cohort’s average for the variable of interest against the age of the head, and so the age profile of the cohort is obtained by connecting the different points in time when the cohort is observed. Given that the surveys cover a period of about 20 years, cohorts can be followed over a large portion of their life cycles. Furthermore, this construction allows different cohorts to be observed at the same age. Figures 2.23, 2.27, 2.28, and 2.29 are presented in this manner.

a. For more details on the estimation procedure and its relationship with the life-cycle theory, see online annex 2.1.

b. Other definitions of saving have been used, but the main results do not vary significantly. Additional definitions include (a) excluding investment components—such as purchases of durable goods and spending on education and health—from the total expenditures; and (b) netting transfers, such as pensions, from the income aggregate. Note that for the case of Russia, the estimation of consumption is not reliable, but the questionnaire included a specific question on saving. Therefore, for the case of Russia, we used this self-reported saving variable.

c. These micro-based estimations of household saving are not strictly comparable with domestic saving in the national accounts (NA): for these countries, NA’s domestic saving includes corporate saving, and the definitions of income and consumption are not consistent across the NA and the household surveys.

FIGURE 2.18 National saving rates of Thailand, the Russian Federation, Mexico, and Ghana are similar to those of their regions



Source: World Bank calculations using data in the UN National Accounts Main Aggregate database.

Note: Series represent three-year moving averages (MA).

cohorts have been saving more, possibly because of stronger economic growth. Discerning the difference between these two cases is important because it may suggest whether the expansion of aggregate saving is temporary (because a large cohort is currently in the working-age stage of its life cycle) or more permanent. The estimated age and cohort profiles of saving can also be used to make exploratory inferences about how saving will evolve in the future.

Before considering the results of the analysis in detail, it is useful to examine some descriptive statistics on saving. Figure 2.18 shows that the levels and movements of national saving rates of Thailand, Russia, Mexico, and Ghana are similar to those of their regions, thus supporting the notion that the findings of specific country

analyses can be used to make qualified generalizations regarding broader groups of countries.

As is the case for national saving rates, trends in household saving rates in the four countries of interest have varied greatly in recent decades (table 2.1). In Ghana and Thailand, there has been an upward trend in household saving rates since the late 1980s. Thailand's household saving rate was also much higher than in the other three countries over the same period. Mexico's household saving rate shows some sign of increasing toward the mid-late 2000s, but it is reduced again if 2010 is included, presumably an effect of the global financial crisis. The household data for Russia show not only a much lower saving rate relative to the other three countries but also little variation over time. The low rate of household

saving in Russia is perhaps not surprising because household saving in the Eastern Europe and Central Asia region is lower than in other developing regions.

These micro data confirm one of the main findings from the macro trends described earlier in the chapter: apart from Russia, developing countries have increased their saving rates, and micro data show that some of this increase is attributable to increases in households' saving rates.

How do demographic differences drive differences in savings? Ghana versus Russia

Together with the assumptions of the life-cycle hypothesis, the age-saving profiles identified with the pseudo panel approach can be used to make some simple inferences on the outlook for household saving. Theory suggests that the bulk of an individual's lifetime saving occurs during the middle of his or her life cycle—that is, during the individual's working years. Thus, an increase in the share of a population of working age should increase aggregate savings. This inference rests on strong assumptions, however: it assumes no behavioral change and no price, wage, rental rate, or other general equilibrium effects. In fact, it is mainly an *accounting* projection, and as such it should be taken with a good bit of caution. However, studying the relationship between the age structure and saving is still relevant and interesting in that it can give an indication of how differences in countries' progression along the demographic transition will affect their saving profiles in the coming decades. The case of Ghana versus Russia is considered first.

The projected saving rate (as shown in figure 2.19) is estimated using the following equation:

$$\hat{S}_{tot,t} = \sum_c \hat{S}_{c,t} \frac{\hat{Y}_{c,t} N_{c,t}}{\sum_c \hat{Y}_{c,t} N_{c,t}} \quad (2.1)$$

where $\hat{S}_{tot,t}$ is the projected aggregate saving rate for year t , $\hat{S}_{c,t}$ is the saving rate of cohort “ c ” predicted for year t (using the age and cohort profiles identified by the regressions described in online annex 1.5), and the

TABLE 2.1 Trends in saving rates differ widely across countries percent

Year	Mexico	Russian Federation	Thailand	Ghana
1984	7.2	—	—	—
1987	—	—	—	4.9
1988	—	—	8.6	6.4
1989	11.1	—	—	—
1990	—	—	17.1	—
1991	—	—	—	14.2
1992	12.0	—	20.9	—
1994	14.2	—	21.2	—
1996	9.5	—	27.8	—
1997	—	4.7	—	—
1998	13.0	3.8	31.6	13.2
1999	—	3.4	33.5	—
2000	11.0	5.2	31.2	—
2001	—	5.5	—	—
2002	11.0	5.4	29.9	—
2003	—	4.6	—	—
2004	10.3	3.3	27.6	—
2005	14.2	4.4	—	—
2006	10.8	5.9	20.6	11.3
2007	—	5.3	22.8	—
2008	20.3	4.0	—	—
2009	—	—	24.1	—
2010	11.1	—	—	—

Source: World Bank calculations using household surveys.

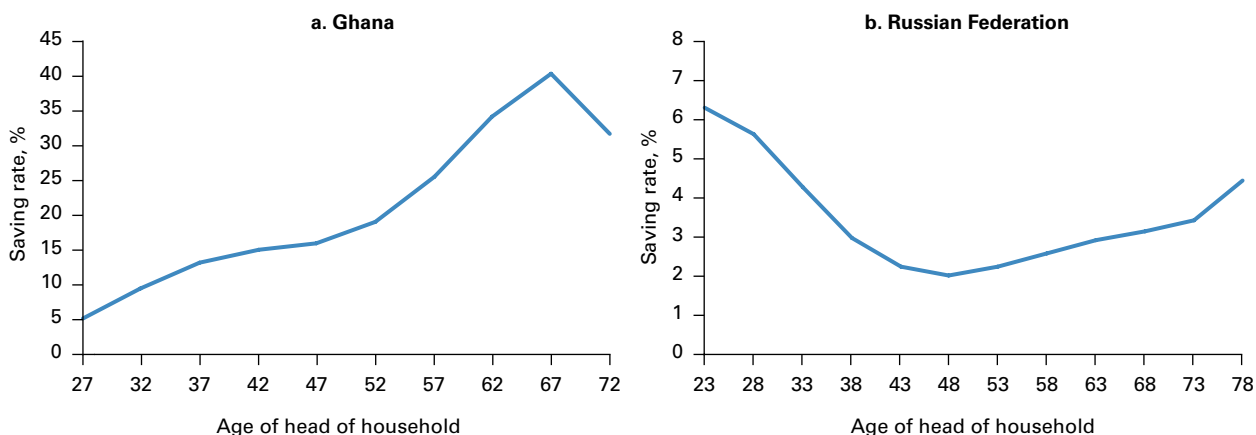
Note: For all countries except Russia, household saving rates are estimated as the ratio of the difference between the household income and household consumption over household income. For Russia, the household saving rate is self-reported by survey participants. — = not available.

fraction is the income weight of cohort c for the year t . These weights are also predicted for time t using the age and cohort effects for the income levels ($\hat{Y}_{c,t}$) and the future population levels ($N_{c,t}$).

The results of this exercise are shown in figure 2.20, which depicts an upward trend in projected aggregate household saving rates in Ghana and a downward trend in Russia.

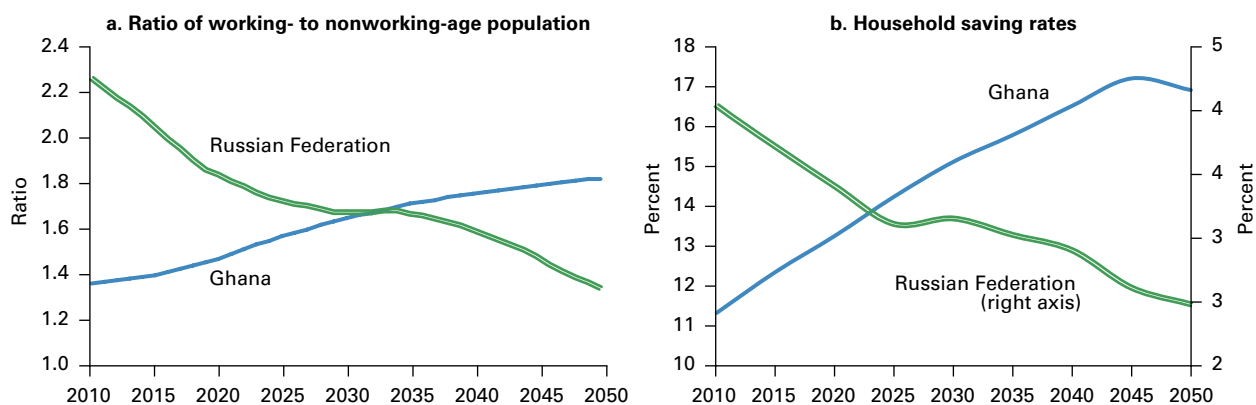
These opposite trends in household saving are due to the different shapes of the age effects for saving (as reported in figure 2.19) and to the different patterns of demographic transition in Ghana and Russia. Figure 2.20 (panel a) shows that the ratio of working-age population to nonworking-age population will rise from about 1.4 to 1.8 in Ghana (and, in fact, for the entire

FIGURE 2.19 Projection of age effects on household saving rates in Ghana and the Russian Federation



Source: World Bank calculations using household survey data.

FIGURE 2.20 Demographic change will drive large changes in saving rates in the decades ahead



Source: World Bank calculations using household survey data.

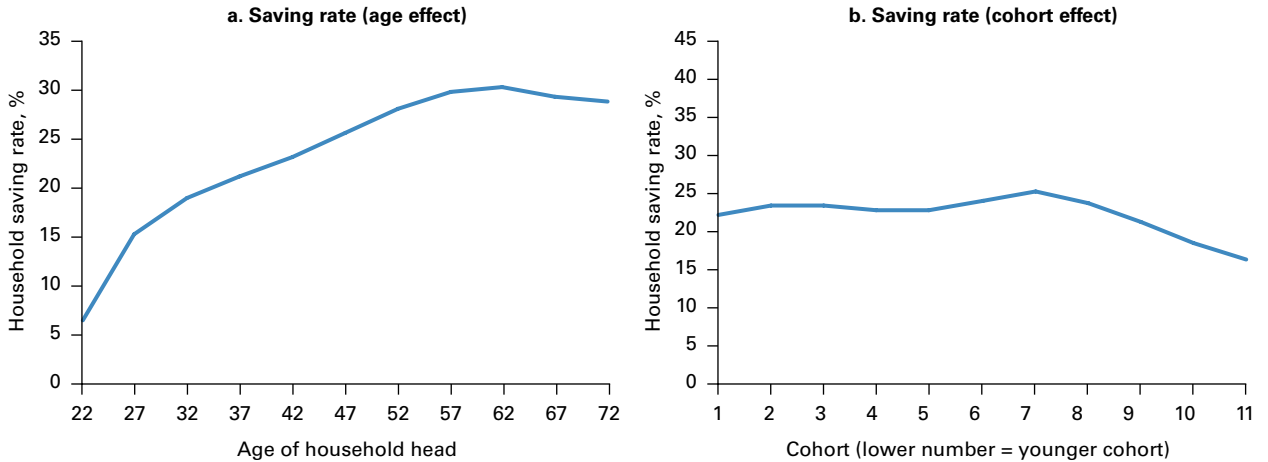
Sub-Saharan region, as shown previously in figure 2.13) between 2010 and 2050. In Russia, however, the ratio will fall considerably over the same decades, from about 2.3 to less than 1.4.

How do demography and growth interact to affect saving? Thailand versus Russia

In Thailand, the saving rate is forecast to rise between 2010 and 2050 despite the expected decline in the share of the working-age population over the projection period. This result

can be explained by considering more closely how the forecast is generated. First, note that the saving rate among people of retirement age in Thailand will fall only slightly (figure 2.21, panel a). Second, the cohort effect will play an important role in Thailand (figure 2.21, panel b). In the forecast, the future (still-unborn) cohorts are assigned the cohort effect of the most recent cohort (that is, those near the vertical axis)—which, in the case of Thailand, reflects a fairly high saving rate (as younger cohorts’ rapid growth in incomes results in higher saving rates than for older cohorts). Thus the aggregate saving

FIGURE 2.21 Due to strong growth, the cohort effect will play an important role in the path of Thailand’s saving rate



Source: World Bank calculations using household survey data.

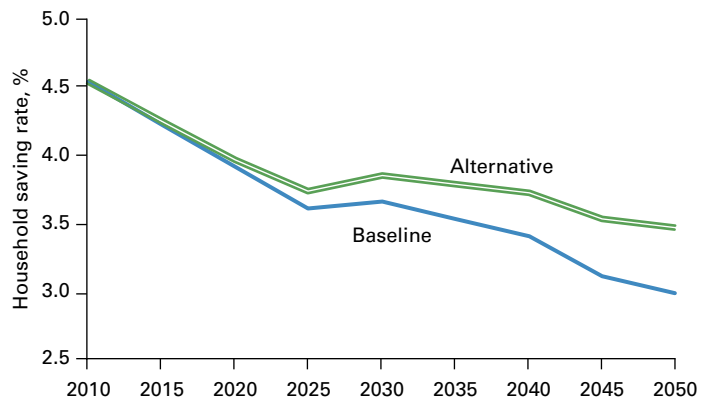
Note: Cohorts are defined in terms of five-year age ranges of birth year. For Thailand, cohort 1, the youngest cohort, is represented by all household heads born 1985–89, so that, in the most recent surveys of 2009–10, they are roughly 20 to 25 years old. Cohort 2 represents household heads who were born 1980–84, and so on.

rate rises over time as younger (higher-saving) cohorts replace older (lower-saving) cohorts. This effect is reinforced because these younger cohorts are larger in size and move along an income-age profile that is above that of older cohorts, so their weight in aggregate saving rises over time.

Another illustration of how higher income growth increases saving can be seen by comparing the baseline forecast for Russia with an alternative case. In the alternative case, higher growth is simulated by increasing the cohort effect on incomes of the new (still-unborn) cohorts.¹³ As will be the case for Thailand, these new cohorts will have higher saving rates and higher incomes than older cohorts. By 2030 in the alternative, increased-growth scenario, the share of total income earned by the younger cohorts (considered those born between 1990 and 2009) would reach 37 percent, versus 27 percent in the baseline scenario. The gap between the two scenarios is even larger, with incomes of the younger cohorts (now considered those born between 2010 and 2029) accounting for 51 percent of the total, versus 26 percent in the baseline scenario.

As the share of total income accounted for by cohorts with higher saving rates rises, so will the aggregate saving rate. Thus, in the case of Russia,

FIGURE 2.22 Growth is an important determinant of saving rates: Two scenarios for the Russian Federation



Source: World Bank calculations using household survey data.

Note: The figure shows the difference in projected saving rates under two income growth scenarios for Russia that approximate the gradual (baseline) and rapid (alternative) convergence scenarios discussed in the first part of the chapter.

the saving rate will be about half a percentage point higher by 2050 in the alternative scenario than in the baseline scenario (figure 2.22). This conclusion—that rising incomes are associated with higher saving rates—reinforces the finding from the previous macro modeling section that

growth generates the means to sustain itself (it is also consistent with a basic prediction of the standard life-cycle model).¹⁴

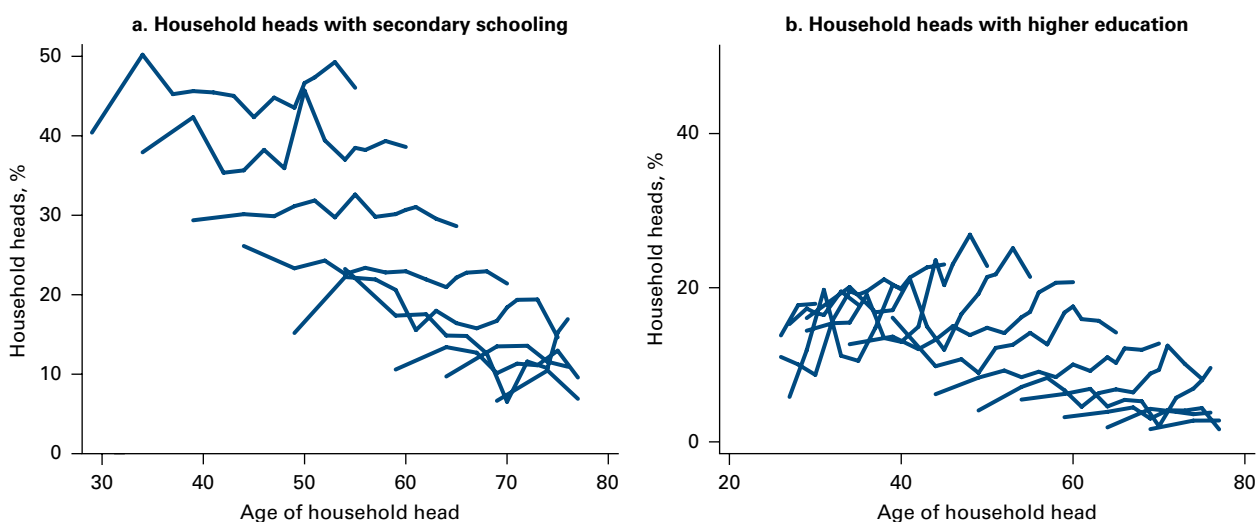
Increases in educational attainment will support growth and saving: The case of Mexico

In Mexico, as in other developing countries, the entry of larger numbers of skilled workers into the labor market in the coming decades will support growth in both incomes and saving rates, even after accounting for some erosion in the wage premium due to the increased supply. This effect can be seen by grouping households according to educational attainment of the household head. As shown in figure 2.23, panel a, household heads of young cohorts are much more likely than those of older cohorts to have a secondary or higher education: only about 10 percent of household heads born in the 1920s have a secondary education, but that figure has steadily risen over time to about 50 percent for household heads born in the mid-1980s. Similar progress can be observed for the share of heads with higher education (figure 2.23, panel b).

The saving profiles of Mexican households differ significantly by education level. The age-saving profiles tend to be quite flat for the least-educated group and higher and steeper for the more-educated groups (see figure 2.24, panel a). There are some mild declines in saving rates for household heads who are above age 65, especially in the case of the group with tertiary education. Higher saving by more-educated heads of households reflect their anticipated rising income levels, while heads with lower education face a much flatter age-earning profile. Because education is typically a good proxy for permanent income,¹⁵ this analysis helps explain why low-income (and typically not well educated) households tend to save less than high-income (and typically better-educated) households.

Another observation that can be gleaned from figure 2.24 (panel b) is that young cohorts (those closest to the vertical axis) have higher saving rates than old cohorts: saving rates for the youngest cohorts are 10 percentage points higher than for the oldest cohorts, a significant change. This indicates that the long-term trend (at least for the most recent decades observed in these surveys) has been upward-sloped for saving.¹⁶ The

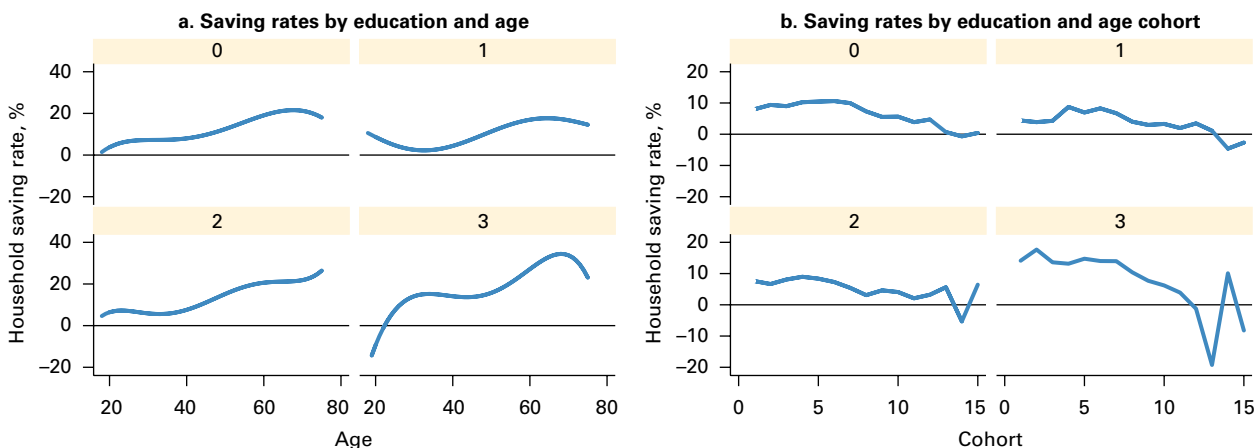
FIGURE 2.23 Educational attainment in Mexico has been rising over time



Source: World Bank calculations using household survey data.

Note: Box 2.4 provides details of how the cohorts shown in these figures were constructed

FIGURE 2.24 The saving life cycle differs significantly by educational attainment (panel a), but across all educational levels, young cohorts tend to save more than older cohorts (panel b)



Source: World Bank calculations using household survey data.

Note: 0 indicates whole population, 1 population with no education or just primary education, 2 secondary education, and 3 tertiary education. Cohorts are defined in terms of five-year age ranges of birth year.

steepness of the upward trend, however, differs across education groups. The data for Mexico show that the positive cohort effect is strongest for the most-educated group.

To estimate the path of aggregate saving in Mexico over coming decades, we begin with a baseline forecast in which the impact of education on saving rates is not taken into account. The results show that the aggregate saving rate will rise until about 2025 because the share of working-age people in the total population will increase over the same period, thus allowing aggregate saving rates to rise because more of the population will be earning income. The forecast aggregate saving rate levels off in 2025, however, as the share of the nonworking-age population starts to decrease after reaching a peak.

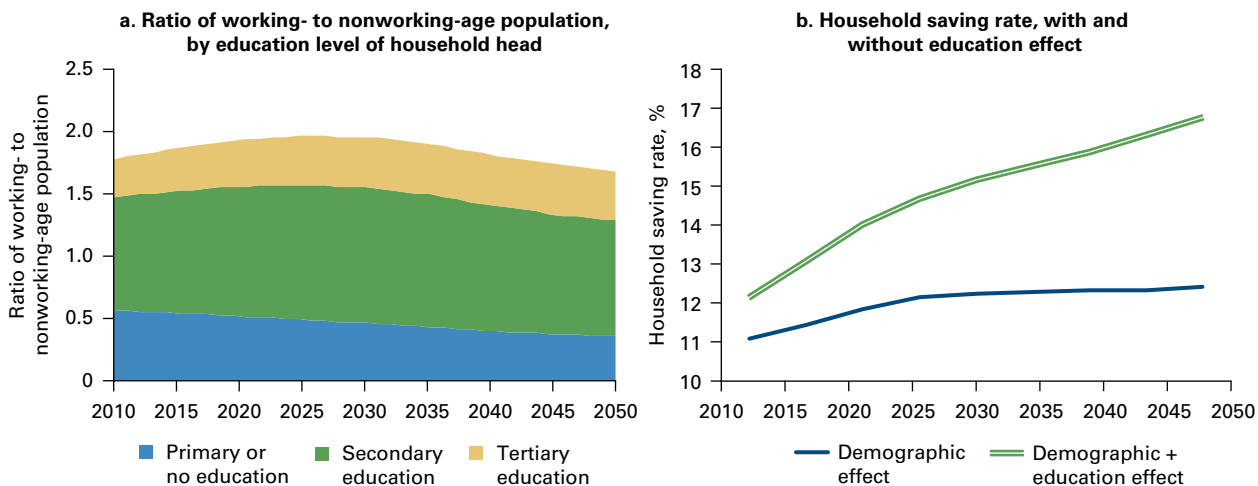
An alternative scenario, which reflects the impact of rising education levels on savings, predicts considerably higher saving rates over the forecast period. To generate projections that take into account the different saving and income profiles, equation (2.1) can be applied separately to three groups of households: those with low or no education, those with secondary education, and those with tertiary education. An average saving rate is then calculated by weighting each of the

three groups by its share of total income. These education-augmented demographic projections (figure 2.25, panel a) show that by 2050, the least-educated group will account for the smallest share of nonworking-age people in Mexico. Because the least-educated group's earnings and saving rates—in terms of both age and cohort effects—can be expected to continue to be lower than those of other groups, the economywide saving rate will be almost 5 percentage points above the baseline scenario by 2050.

Poor households save little, limiting their ability to escape poverty: Mexico and Thailand

In most countries, saving tends to be concentrated in households that are relatively high-income compared with the country average. In Mexico and Thailand, saving rates are actually negative up to the 25th percentile of the income distribution. Even if this is partly due to measurement error or temporary fluctuations,¹⁷ the poorest quarter of households seems to accumulate much less saving, while saving rates of households beyond the 75th percentile of the income distribution are high: saving rates among the richest 1

FIGURE 2.25 Increased earning power will be the greatest driver of saving by Mexican households



Source: World Bank calculations using household survey data.

percent of households are consistently above 60 percent in Mexico and 70 percent in Thailand (table 2.2). Furthermore, this gap between rich and poor households’ saving rates does not appear to have diminished in recent decades.

Admittedly, there are drawbacks to comparing the saving behavior of households across income percentiles to ascertain whether there are permanent vulnerabilities for certain groups. Low or negative saving rates may result from consumption smoothing by households facing a temporary shock. Similarly, the highest-income households are disproportionately in the high-earning years of their life cycles, and their earnings likely include greater than average non-age-related transitory components as well. Total transitory components of income can be large and, because of economic mobility, saving by those households that make up an income percentile at a given point in time may be determined either by long-term saving behavior or by composition effects. That is, low saving among the lowest percentiles may reflect income smoothing by households that are temporarily poor, while high saving among the highest percentiles may reflect smoothing by households that are temporarily flush. Alternatively, low saving may reflect a permanent incapacity of some households to accumulate assets for their retirement or to cope with unexpected drops in

income. Grouping the saving data by the level of education of the household head provides a good proxy for permanent income because heads seldom change their educational attainment after forming a household. Therefore, tracking households grouped by education over time minimizes the potential bias introduced by composition effects.

In both Mexico and Thailand, households where the head has low educational attainment tend to also have low saving. According to the most recent household survey data—2010 for Mexico and 2009 for Thailand—the least-educated group accounted for 17 percent and 34 percent of saving, respectively. By contrast, in Mexico about 60 percent of total saving was provided by the most-educated group of heads of household versus 47 percent in Thailand. Moreover, saving tends to be even more concentrated than income: shares of total income accounted for by the most-educated groups were 50 percent and 37 percent for Mexico and Thailand, respectively, according to the most recent survey data. The fact that these income shares are much lower than the saving shares means that more-educated people not only save more in absolute terms but also save, on average, a higher proportion of their incomes.

This concentration of saving among household heads with greater education, and thus greater

TABLE 2.2 Household saving rates differ significantly along the income distribution

Year	Percentile							
	1st	5th	10th	25th	75th	90th	95th	99th
Mexico								
1984	-177.4	-69.7	-38.2	-12.9	22.7	39.2	48.0	64.1
1989	-215.9	-79.1	-49.1	-14.9	25.6	41.9	52.5	70.5
1992	-140.0	-60.6	-40.3	-13.0	21.7	36.4	46.1	65.4
1994	-120.4	-47.5	-29.5	-8.6	22.8	38.4	47.4	64.6
1996	-135.9	-55.2	-34.2	-12.7	17.2	32.0	41.8	60.4
1998	-178.9	-66.8	-39.7	-13.4	21.9	38.8	47.1	64.9
2000	-142.8	-54.9	-33.5	-10.3	22.2	36.8	45.4	62.2
2002	-131.5	-53.3	-32.3	-8.7	23.6	39.0	47.6	61.7
2004	-158.2	-72.9	-45.2	-14.7	24.6	40.2	49.0	62.7
2005	-178.8	-66.8	-39.2	-11.2	27.9	43.2	51.5	67.5
2006	-154.5	-66.7	-41.7	-12.4	24.2	39.1	47.7	63.8
2008	-151.6	-76.9	-49.7	-16.8	31.5	49.0	58.5	73.8
2010	-237.2	-91.8	-55.0	-17.5	26.8	42.9	52.1	68.0
Thailand								
1990	-387.2	-141.6	-81.8	-28.4	26.7	45.2	55.3	71.6
1992	-302.2	-127.2	-76.3	-23.1	28.0	46.3	55.8	73.8
1994	-332.7	-130.5	-80.0	-26.3	31.8	49.6	58.9	74.6
1996	-193.7	-108.3	-64.1	-14.5	36.9	54.6	63.1	76.5
1998	-254.5	-97.9	-55.8	-11.7	37.2	54.3	63.0	78.3
1999	-264.3	-95.4	-51.5	-9.3	36.2	52.9	62.3	75.6
2000	-226.2	-88.5	-47.7	-8.1	37.5	54.6	63.5	77.7
2002	-239.9	-85.0	-46.5	-8.0	37.9	53.8	62.0	76.1
2004	-231.3	-83.3	-46.4	-8.7	37.3	53.7	62.5	76.7
2006	-278.6	-98.2	-54.9	-16.1	24.9	43.3	53.9	72.7
2007	-214.4	-79.6	-44.5	-10.6	26.3	44.8	55.0	72.9
2009	-166.9	-60.3	-32.2	-6.9	26.2	43.5	54.3	73.4

Source: World Bank calculations using household survey data.

permanent earning capacity, has increased over the most recent two decades for Thailand but not for Mexico. In Thailand, the share of total saving by households with secondary education has basically been stable, while there has been an increase among the group with higher education, counterbalanced by a reduction for the group with no or very little education. This trend toward increased concentration of savings partially reflects the increased weight of educated individuals in the total population. The share of households with a highly educated head has increased quite significantly as well, not just for the two countries considered here but also in the developing world more generally.¹⁸ However, for

Mexico, reductions in the skill premium may have moderated the increase in the share of the highly educated in total saving.¹⁹

Low saving among the poorly educated likely reflects a long-term incapacity to save because they face much flatter age-earning profiles. Negative saving may reflect these households' long-term incapacity to accumulate resources because they face unemployment or other barriers to income generation, while consumption exceeds income because of either public or private transfers. Lack of saving makes it difficult for these households to achieve sustainable increases in income by investing in the education of their members or to cope with adverse shocks. The

concentration of saving thus exacerbates the difficulties involved in reducing poverty, raising the prospect of a permanent underclass with little potential for upward mobility.

The concentration of saving among high earners also has important implications for financial inclusion in developing countries. On one hand, concentration of financial services, in terms of either geography or income levels, can make it less costly for financial institutions to enter and operate in developing-country markets. On the other hand, the resulting concentration of financial institutions among the high-income segment of a population, and in the areas where they live and work, has the potential to perpetuate lack of access to financial services for the poor. Analysis of recent survey data on saving vehicles in developing countries (Demirgüç-Kunt and Klapper 2012) shows that the bottom 40 percent of income earners in developing regions are not only less likely to save than the top 60 percent but are also less likely to save using formal financial institutions (figure 2.26). This suggests that the concentration of saving associated with income inequality may be exacerbated by a spillover effect in which

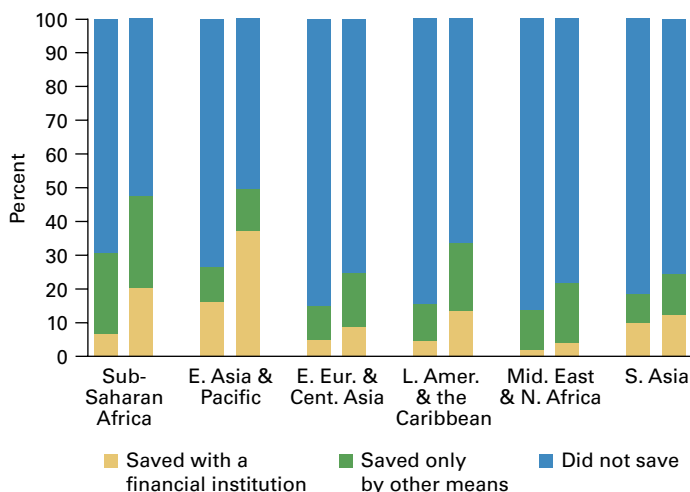
poor households' limited participation in formal financial markets further limits the financial inclusion of other poor households, potentially contributing to poverty traps.

Saving behavior depends on household formation and composition over the life cycle

There are several reasons why household data for developing countries may not reveal the expected inverted-U shape for the relationship between aging and saving (saving rises during a person's working years, then levels off and declines during retirement):

- Because consumption is measured at the household level, it is often difficult to precisely attribute consumption amounts to individual members of the household. As pointed out by Deaton and Paxson (2000), many individuals may live in multigenerational households, such as a 45-year-old household head living with his 20-year-old son and 70-year-old father. At the household level, the positive saving of the 45-year-old may be cancelled out by the negative saving of the young and old members of his household. Thus, the age profile of household saving may be biased and quite different from the age profile of individual saving.
- Elderly individuals who are relatively poor may be more likely to live with their children than richer ones, thus creating a selection bias.
- Different mortality rates may affect the composition of the cohorts because longevity and wealth may be positively correlated, as Attanasio and Hoynes (2000) point out. As a cohort ages, richer individuals survive longer and become the larger subgroup within the cohort. If they continue saving to leave bequests, the inverted U age-saving profile may disappear mainly because of changes in the composition of the cohorts.

FIGURE 2.26 The bottom 40 percent of income earners in developing regions are not only less likely to save than the top 60 percent but are also less likely to save using formal financial institutions



Source: World Bank calculations using data in the World Bank Global Financial Inclusion database and Demirgüç-Kunt and Klapper 2012.

Note: The left bar for each region represents the bottom 40 percent of the population by income; the right represents the top 60 percent.

The potential biases introduced by these observations help explain why the hump-shaped relationship between aging and saving predicted by theory is not always observed in the cases examined here.

Figure 2.27 shows, for Mexico, Thailand, and Russia, the average age of the household head against the age of the individuals who live with that head. Four panels are displayed for each country: one for the whole population, and three for the different education levels. The 45-degree line indicates the cohort profile that would be observed if all individuals were heads or were living with heads of their same age. However, as shown in the figure, there are clear deviations from this case, especially at the beginning and end of the life cycle.

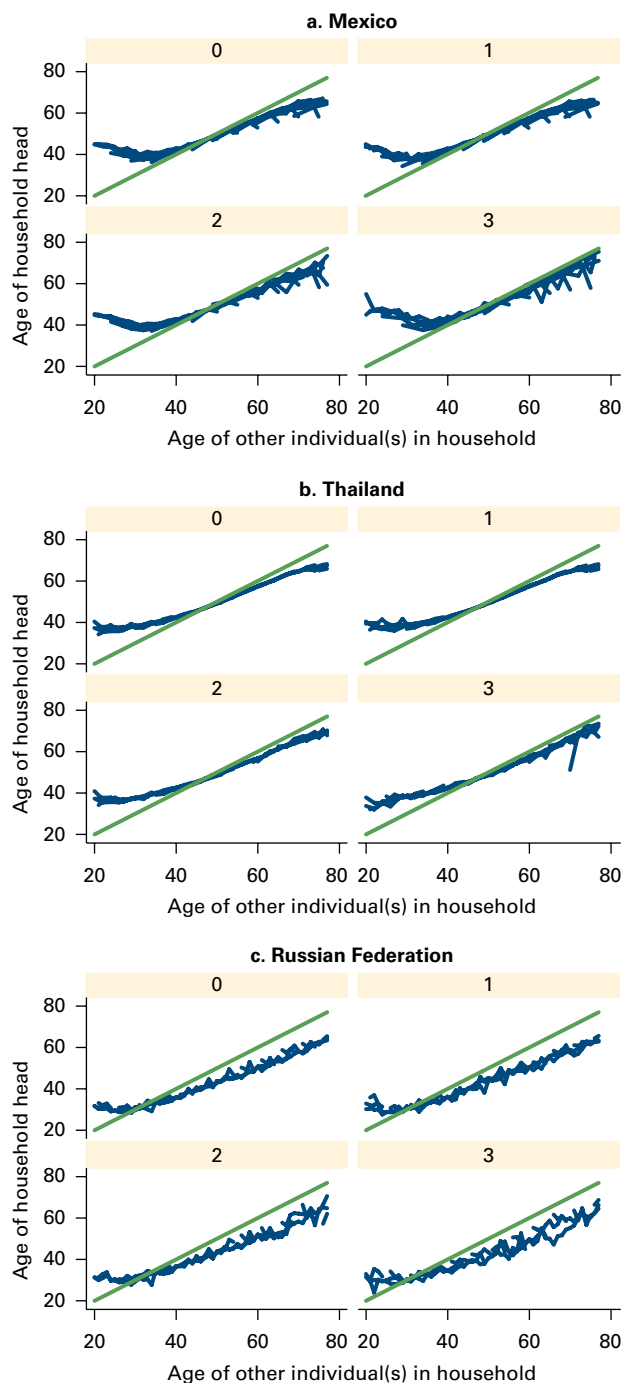
At the beginning of the life cycle, household heads tend to be older (above the 45-degree line) than other members of their households. This is because there are fewer heads at fairly young ages, and some young individuals still live with their parents. The opposite effect occurs toward the end of the life cycle, when the elderly cease being household heads when they return to live with their children, thus making household heads younger (below the 45-degree line) than other members of their households.

The deviations from the 45-degree line display a common pattern across all countries: the higher the education level, the less likely it is that old people live in a household headed by a person younger than themselves. This suggests that more-educated individuals may have better means by which to support themselves (accumulated saving) during old age. Conversely, families play an important role of smoothing consumption for old people with lower education and with lower earning and saving capacity.

Apart from this commonality, the three countries differ significantly in the relevance of this intergenerational (or extended) household setup. Specifically, this phenomenon seems less prevalent in Mexico than in Russia or Thailand. This finding can also be observed at the regional level, where a larger proportion of old people maintain head-of-household status in Latin America than in East Asia or in Eastern Europe and Central Asia, as shown in table 2.3. The table also illustrates that the proportion of elderly people who are not household heads, and for whom the support of extended families is important, decreases as income levels increase: the share declines from about 30 percent in low-income countries to 10 percent in high-income countries. The reduction is even more striking for females.

Notice that figure 2.27 also provides a visual corroboration of the potential bias due to the

FIGURE 2.27 The age composition of households varies by age of the household head; more highly educated individuals are less likely to live in a household headed by someone younger



Source: World Bank calculations using household survey data.

Note: In each set of four panels, 0 indicates whole population, 1 population with no education or just primary, 2 secondary education, and 3 tertiary education. Box 2.4 provides details of how the cohorts shown in the panels were constructed. The 45-degree line indicates the cohort profile that would be observed if all individuals were heads or were living with heads of their same age.

TABLE 2.3 The prevalence of intergenerational households varies by country income level and by region
percentage who maintain head-of-household status

	Population above 70		Population above 65	
	Female	Male	Female	Male
Low-income economies	23	66	24	71
Lower-middle-income economies	30	76	28	80
Upper-middle-income economies	47	81	45	82
High-income OECD members	56	89	53	90
East Asia and Pacific	32	79	32	82
Eastern Europe and Central Asia	50	76	48	77
Latin America and the Caribbean	45	85	44	87
Middle East and North Africa	5	24	5	29
South Asia	14	72	14	77
Sub-Saharan Africa	42	88	43	89

Source: World Bank calculations using household surveys of the Global Income Distribution Dynamics, data for 2005.

Note: OECD = Organisation for Economic Co-operation and Development.

change in household composition discussed above. Even if the group of household heads born in the same year is followed through time, the age composition of their households is changing, and this may affect saving decisions beyond the pure (individual head's) age effect.

Changes in household size during the life cycle also affect household behavior. Figure 2.28 plots household size against the age of the household head for the four countries across different cohorts and education levels. As postulated by Becker (1993) in his economic theory of family formation, there is a trade-off between quantity and quality of offspring. Households with low levels of income tend to opt for more children because they are unable to invest in their human capital. This is clearly visible across all the four countries, where household size is larger for lower education groups.

Additional observations that can be gathered from figure 2.28 are that younger cohorts tend to have smaller family sizes than older ones, and that family sizes differ quite a lot across different countries.²⁰ Once again, these findings can be validated by a broader regional analysis, as shown in figure 2.29 (additional background information on how this figure was generated is discussed in box 2.5).

In the regional breakdown, it is also possible to see that household size declines quite slowly

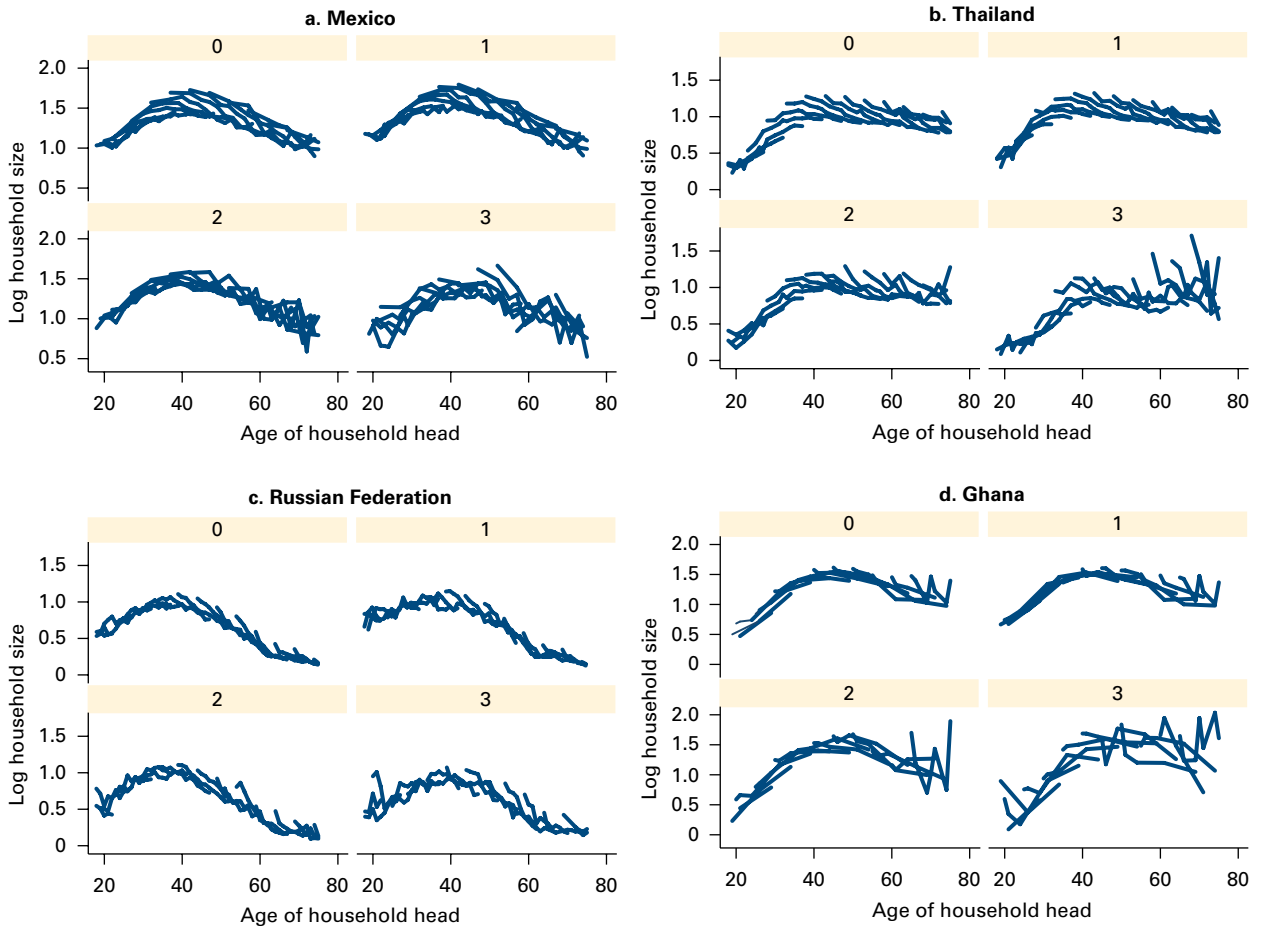
in Eastern Europe and Central Asia, South Asia, and Sub-Saharan Africa after reaching a peak, indicating once again that multigenerational households are common in these regions of the world.

Evolving systems of old-age income support

In most developing countries, extended families have traditionally cared for the elderly who can no longer work. However, this is changing for the educated population in the four countries analyzed here: the higher the level of education, and thus the higher the level of accumulated saving, the less likely it is that elderly persons join younger households. Thus, rising incomes in developing countries can be thought of as shifting the support system for the elderly from informal provision by relatives to formal provision through pension systems. The shift from informal to formal provision of support for the elderly, which is likely to accelerate as incomes rise in the developing world, changes the nature of the risks the elderly face in sustaining their levels of consumption after retirement. It will also require changes in the regulation of developing countries' financial systems.

The existence of large pools of saving, and the need to maintain the real value of this

FIGURE 2.28 Household size varies by age of the household head, and this relationship varies somewhat by educational level



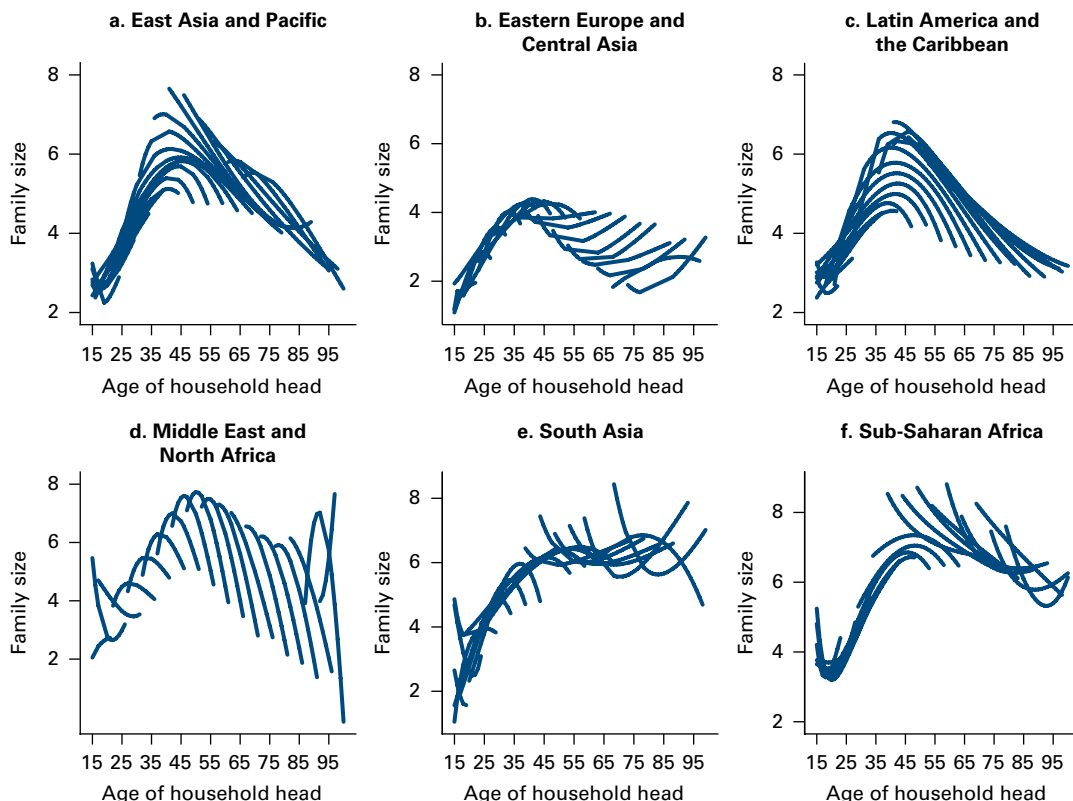
Source: World Bank calculations using household survey data.

Note: In each set of four panels, 0 indicates whole population, 1 population with no education or just primary, 2 secondary education, and 3 tertiary education. Box 2.4 provides details of how the cohorts shown in the panels were constructed.

saving over several decades, will encourage the growth of financial intermediaries such as pension funds, investment firms, and life insurance companies. The growth of such intermediaries has the potential to improve the efficiency of investment by increasing the involvement by professionals who specialize in evaluating the profitability and soundness of different investment vehicles. On the other hand, the growth of formal pension systems can also present the elderly with new risks, including a reduction in their expected standard of living if their private

pension plans incur substantial investment losses or are inadequately regulated. Poorly designed public pension systems present similar investment risks for the elderly in addition to the potential loss of benefits that may accompany a redefinition of benefits or age-related eligibility levels. Changes in the taxation of pensions, or the presence of high inflation that reduces the real value of fixed-income annuities, can negatively affect both private and public pensions. Of course, informal support systems also present significant risks for the elderly, principally in the

FIGURE 2.29 Younger cohorts tend to have smaller family sizes, but this relationship varies significantly across regions



Source: World Bank calculations using census data from the Integrated Public Use Microdata Series, International (IPUMSI).

Note: Values in each panel are simple averages. See box 2.5.

form of unanticipated declines in their family members’ incomes. The important point is that the risks will evolve in the decades ahead.

Aging will challenge the sustainability of fiscal policy in both developing and advanced countries

Two of the largest components of government expenditures in many countries are health care and pensions. Both of these components require more resources as the average age of the population rises. At the same time, as incomes increase, the share of these expenditures in income tends to rise. Thus, as populations age and incomes continue to increase in developing countries, health

care and pension expenditures are likely to grow even more rapidly than incomes. Moreover, tax revenue is heavily dependent on the size of the working-age population, which will shrink in some developing regions in the years ahead. The rising burden of expenditures on the elderly will not be offset by the declines in expenditures on education that one might expect to result from a decreasing share of young people because rising incomes will also lead to increased demand for education per child. Thus, aging and growth can be expected to increase the fiscal burden of age-related expenditures.

This strain on public finances has important implications for national saving. The public component of national saving could contract because of fiscal deficits or reduced public investment. In

addition, various policy changes to counteract demographic pressures—such as tax increases, reduction in coverage or generosity of age-related benefits, or cuts to non-age-related spending—may affect household saving behavior. These important saving dynamics are not *explicitly*²¹ accounted for in the general equilibrium model-generated scenarios; therefore, this section complements the previous analysis, although in a partial equilibrium setting.

Already, pensions are a significant component of the government budget in many developing

countries. Pension systems are also potentially highly sensitive to demographic change, so projections of public pension costs are critical for thinking about the magnitude and timing of demographic pressures on overall public finances. Most projections suggest that the increased public spending on health care will be as important as pensions, accounting for roughly half of the increase in age-related liabilities over the next few decades.²²

The data available on age-related public expenditures by age of recipient (from the National

BOX 2.5 A global dataset of household censuses provides a nuanced view of saving at the micro level

The data behind figure 2.29 come from censuses that have been carried out in 43 developing countries since the 1960s. These censuses are collected and standardized by the Integrated Public Use Microdata Series, International (IPUMSI, <http://international.ipums.org>). Table B2.5.1 shows the number of countries by region with available census data.

Using these data, we calculated the year of birth for each household head in the censuses and thus identified all household heads between 15 and 90 years old. Their birth years range from 1870 to 1994. Five-year cohorts were then constructed according to the

birth year of the heads. For example, household heads born between 1870 and 1874 belong to cohort 1, while those who were born between 1875 and 1879, to cohort 2, and so on. These cohorts are then followed through time for all the dates for which the censuses were repeated. For most countries, there are at least four or five repeated censuses. The data for the various countries were then averaged to obtain information at the regional level. The averages were calculated as simple averages or as weighted averages where the weights are the population sizes of the countries.

TABLE B2.5.1 Number of countries with available census data, by region, 1960–2009

WB Region	1960–64	1968–72	1973–77	1978–82	1983–87	1988–92	1992–97	1998–02	2003–07	2008–09
East Asia and Pacific		2		3		6	1	6		2
Eastern Europe and Central Asia			1			1		4		
Latin America and the Caribbean	7	5	4	7	2	9	3	10	3	
Middle East and North Africa							2		3	
South Asia			1	1	2		1	3	1	
Sub-Saharan Africa					3	5	2	9	2	2
Total	7	7	6	11	7	21	9	32	9	4

Source: World Bank compilation.

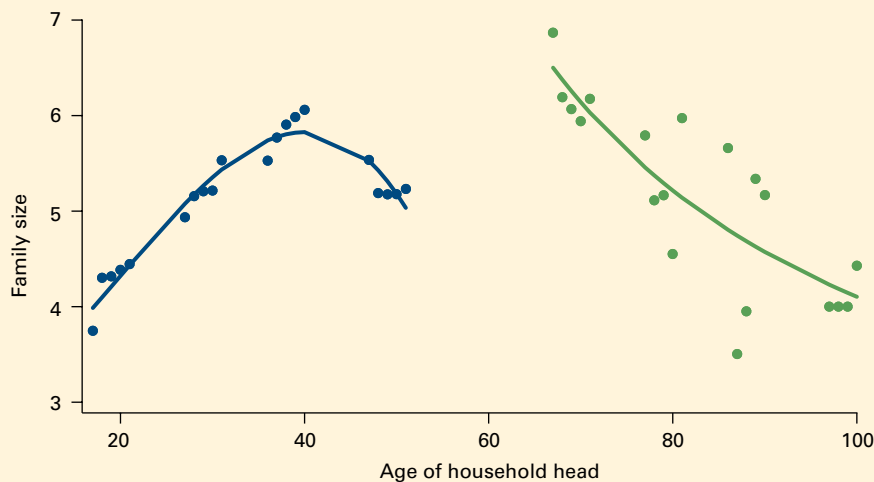
(continued)

BOX 2.5 (continued)

Family size represented in figure 2.29 is a variable directly coded in the IPUMSI censuses. Smoothed lines connecting the cohort data were plotted by adopting a polynomial approximation. Figure B2.5.1 shows how

this polynomial method fits two set of points relating family size and household heads' age for two separate cohorts (the youngest and the oldest) in an example for República Bolivariana de Venezuela.

FIGURE B2.5.1 Family size for the first and latest cohort, points and fitted values, República Bolivariana de Venezuela



Source: World Bank calculations using República Bolivariana de Venezuela census data.

Transfer Accounts [NTA] project, discussed in box 2.6) show wide variation across countries in the extent to which public transfers rise with age (figure 2.30). Health care transfers to the elderly tend to be much greater in advanced countries, not only relative to GDP per capita but also relative to health care spending at other ages (in per capita terms). This is consistent with findings that, at the micro level, health care at very advanced ages is a luxury good (see, for example, De Nardi, French, and Jones 2010). In the case of public pensions, transfers tend to begin at substantially younger ages in developing countries than in advanced countries; thus, there may be significant room for reforming developing countries' public pension systems by raising retirement

ages. Finally, education expenditures tend to be a larger share of GDP in high-income countries than in developing countries. This implies that even as aging reduces the share of developing countries' school-age populations, higher enrollment rates and more rapid growth in per-student expenditures than in incomes will limit any decline in total education expenditures relative to GDP.

Although the burden of age-related expenditures will be significant in many countries in the years ahead, age-related expenditures will be highly sensitive to the generosity and coverage of pension and health care systems (the model generating these scenarios is described in box 2.7). Absent changes in benefits and coverage, four of

the six developing countries considered in table 2.4—Brazil, Chile, China, and Costa Rica—will experience a substantial increase in the fiscal burden of their old-age expenditures as their populations age in future decades. But this calculation may understate the potential burden on public expenditures because rising incomes could result in demands for higher benefits and more widespread coverage in countries where the public sector currently provides only limited pension and health-care services.

Some further insight can be gained by comparing (a) projections of public age-related expenditures in individual countries assuming an unchanged policy scenario, with (b) projections assuming convergence with the 2003 benefits and coverage levels offered by a European country with a deep benefit system (Sweden) and (c) convergence with the somewhat lower benefits provided in the United States, which has a more modest public pension program even than most developing countries but high public health care expenditures on the elderly. A path of convergence with Swedish levels of benefits and coverage would be untenable for most developing

countries; the resulting increase in the ratio of public transfers to GDP from 2010 to 2050 in the six developing countries ranges from 14 percentage points in India to 47 percentage points in China. Even adopting U.S. coverage and benefits levels would increase the public transfers-to-GDP ratio significantly from current levels, ranging from 9 percentage points in Brazil to 19 percentage points in China.

These scenarios include projections of public health care expenditures. It should be born in mind that speculating on the future of public health care expenditures is subject to more error than predicting pension expenditures because the costs of public health care depend to a large extent on factors beyond the control of policy makers. Prices of medical services and medicines, for instance, are determined at least in part by market conditions—international as well as domestic—and technological innovations not only affect prices but also make altogether new treatments available. Thus, any projections on health care spending have a high degree of uncertainty, even assuming an unchanged policy environment.²³ The changing nature of demand for

BOX 2.6 The National Transfer Accounts project is a valuable source of data on age-related public transfers

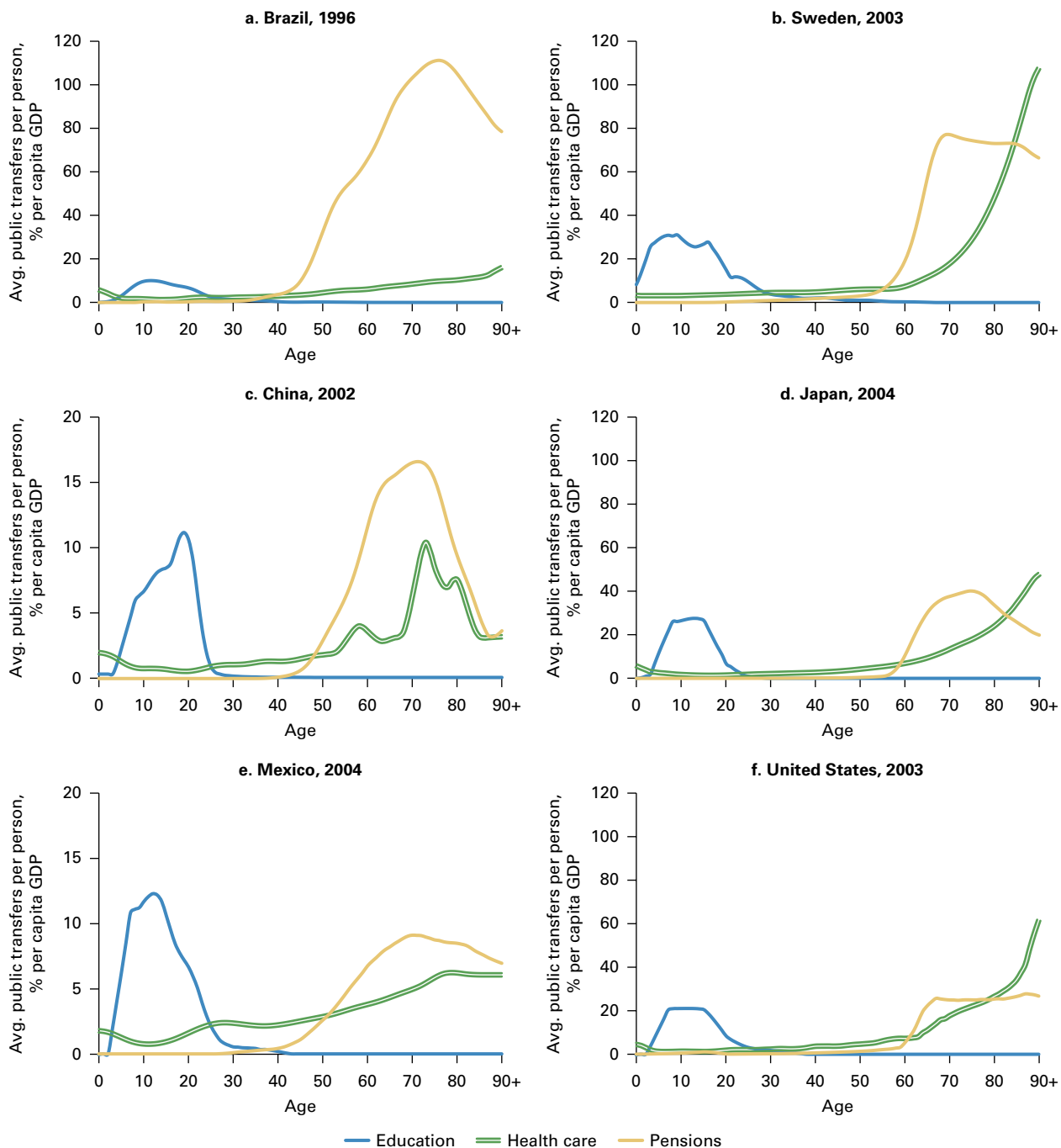
Data on age-related public expenditures are typically not disaggregated by age group. However, the National Transfer Accounts (NTA) Project^a aims to measure public transfer inflows and outflows by one-year age cohort, and data for at least some series have been prepared for 21 countries so far. Most of these countries have series on public education, health care, and pension transfer inflows by age, and among these are six developing countries with data on all three: Brazil, Chile, China, Costa Rica, India, and Mexico. The project is still under way; more countries will be added, and some existing data may yet be revised.

Data are currently available for only one year for each country, and the year varies by country.

Some countries have undergone significant reforms since the year for which its accounts are available—for example, Brazil, in the case of public pension reform—which have undoubtedly altered age-related expenditures since then, both in terms of magnitude and age distribution. Bearing these caveats in mind, the NTA data are nonetheless useful estimates of age-related public transfers disaggregated by age. The NTA methodology is harmonized so that age distributions of transfers are directly comparable across countries.

a. The NTA Project is a collaborative effort to measure, analyze, and interpret macroeconomic aspects of age and population aging around the world (<http://www.ntaccounts.org/web/nta/show/>). Funded by an array of public and private sources, the lead institutions for the project are the Center for the Economics and Demography of Aging at the University of California, Berkeley, and the Population and Health Studies Program of the East-West Center in Honolulu. For details on the project, see Lee and Mason (2011) and <http://www.ntaccounts.org>.

FIGURE 2.30 There is wide variation across countries in the extent to which public transfers tend to rise with age



Source: World Bank calculations using data in the National Transfer Accounts (NTA) project (<http://www.ntaccounts.org/web/nta/show/>).

Note: NTA data are at the one-year age cohort level, in terms of average transfers to a person at that age. They are shown here as percentages of the country's GDP per capita, in five-cohort rolling averages, for the year for which each country has NTA data available. The vertical axes of the China and Mexico graphs are on a different scale than the graphs of the other four countries.

BOX 2.7 The impact of aging on government budgets is clarified by breaking it down into its components

Fiscal balances are affected by changes in the age distribution of a population mainly because public health care and pension expenditures are greater for older people, education expenditures are greater for younger people, and tax revenue comes mainly from people in their working years. A simple decomposition of expenditures (equation B2.7.1) common in the literature (see, for example, Miller, Mason, and Holz 2011), shows aggregate public expenditures E , on a particular program or category of programs (for example, public pensions), as a fraction of GDP Y , expressed as the sum across ages of expenditures relative to GDP on people of each age. For each age cohort, this is broken down into average expenditures per person E_{age}/C_{age} (where C_{age} is the population of the cohort), relative to output per working-age person Y/W (where W is the working-age population, for example, aged 20–64 years), and the ratio of the population of each age cohort to the working-age population C_{age}/W . For a given E_{age}/C_{age} for each age, total expenditures E/Y increase relative to Y/W as C_{age}/W rises for ages with higher than average costs per person E_{age}/C_{age} , that is, as more expensive cohorts grow in size relative to the working-age population.

The above identity can be further disaggregated (equation B2.7.2), separating the average expenditures

per person of each age into average expenditures per participant in the program E_{age}/P_{age} , and the share of the population of the cohort covered by the program P_{age}/C_{age} . This highlights that average expenditures per person in the age group can change because of either an increase or a decrease in the generosity of the system, or because of diminished or expanded coverage.

In principle, all of the above components can be expected to change over time. For example, countries that experience a fall in the ratio of the school-age population to the working-age population are often experiencing rising incomes at the same time (which is typically associated with having fewer children but also with rising school enrollment rates) as well as increased education spending per student (Becker and Lewis 1973). Thus, the first two ratios on the right-hand side of the identity rise while the third falls, and the sign of the net change in education expenditures as a fraction of GDP depends on the relative magnitudes of the effects. However, holding expenditures per person constant relative to average income (or relative to income per working-age adult) can be a useful thought experiment, and in any case there is not always an a priori reason to expect program generosity or coverage to change in one direction or another.

$$\frac{E}{Y} = \left[\frac{\left(\frac{E_0}{C_0} \right)}{\left(\frac{Y}{W} \right)} \right] \times \left[\frac{C_0}{W} \right] + \left[\frac{\left(\frac{E_1}{C_1} \right)}{\left(\frac{Y}{W} \right)} \right] \times \left[\frac{C_1}{W} \right] + \dots + \left[\frac{\left(\frac{E_{90+}}{C_{90+}} \right)}{\left(\frac{Y}{W} \right)} \right] \times \left[\frac{C_{90+}}{W} \right], \tag{B2.7.1}$$

Avg. expenditures on each zero-year-old, relative to avg. output per working-age person
Zero-year-old population, relative to working-age population

$$\frac{E}{Y} = \sum_{age=0}^{90+} \left[\frac{\left(\frac{E_{age}}{P_{age}} \right)}{\left(\frac{Y}{W} \right)} \right] \times \left[\frac{P_{age}}{C_{age}} \right] \times \left[\frac{C_{age}}{W} \right] \tag{B2.7.2}$$

Generosity: Avg. expenditures on each program participant in age cohort, relative to avg. output per working-age person
Coverage: Share of the cohort participating in the program
Cohort population, relative to working-age population

health services must also be taken into account in assembling any estimate of future costs. At present, health care spending for persons near the end of their lives is much higher in advanced countries than in developing countries. If elderly populations in developing countries begin to demand costlier medical services in their final years, the impact of aging on public finances in those countries will be much greater than it would be assuming a static level of services.

Table 2.4 illustrates that if the generosity of public health care programs were to gradually converge with current U.S. levels, for a number of countries the fiscal burden of health care costs would be roughly double what it would be from aging alone. Sweden, with one of the most lavish public health care systems in the world for its elderly, is an outlier. However, the projections in which generosity converges with Swedish levels

are useful—first, for illustrating that U.S. levels are not extraordinarily high for an advanced country (and therefore that convergence with those levels is not unthinkable for developing countries over a time horizon of 40 years); and, second, for illustrating just how greatly outcomes may vary if per capita expenditures are driven up by rising health care costs because the fiscal effect of a large increase in costs would be similar to that of a large increase in generosity. Indeed, the greatest task for governments in preparing for the impact of aging on public health care liabilities may not be to tweak coverage and generosity of conventional systems but to make deep institutional reforms to health care systems so that beneficiaries have stronger incentives to seek low-cost health care options, reducing contingent liabilities stemming from unforeseeable shocks to health care costs.

TABLE 2.4 The path of age-related fiscal pressures will depend strongly on benefit and coverage levels

Country	$\left(\frac{F_{age}}{C_{age}}\right) \left(\frac{Y}{W}\right)$	Pensions (% GDP)			Health care (% GDP)			Education (% GDP)			Total change (% GDP)
		2010	2030	2050	2010	2030	2050	2010	2030	2050	
Brazil	constant	9.1	14.0	20.9	3.0	3.5	4.5	2.6	1.9	1.7	12.4
Brazil	→Sweden	9.1	10.9	12.8	3.0	5.9	13.2	2.6	4.9	6.9	18.2
Brazil	→United States	9.1	14.2	11.0	3.0	4.6	8.8	2.6	3.0	3.6	8.7
Chile	constant	5.5	8.8	11.7	2.2	2.6	2.9	2.2	1.7	1.5	6.3
Chile	→Sweden	5.5	11.1	18.2	2.2	6.3	15.0	2.2	4.8	7.2	30.5
Chile	→United States	5.5	9.5	11.8	2.2	4.7	9.8	2.2	3.0	3.8	15.5
China	constant	3.4	5.9	8.1	1.7	2.2	3.0	2.1	1.6	1.5	5.4
China	→Sweden	3.4	13.6	33.7	1.7	5.4	14.3	2.1	4.0	6.4	47.2
China	→United States	3.4	7.0	12.8	1.7	4.2	9.7	2.1	2.5	3.3	18.6
Costa Rica	constant	4.3	7.1	11.0	4.7	5.4	6.8	4.2	3.0	2.6	7.2
Costa Rica	→Sweden	4.3	9.8	20.3	4.7	6.8	13.4	4.2	5.4	6.7	27.2
Costa Rica	→United States	4.3	7.3	11.1	4.7	5.6	8.9	4.2	3.6	3.5	10.4
India	constant	1.0	1.2	1.4	2.3	2.4	2.6	1.7	1.3	1.0	0.1
India	→Sweden	1.0	1.6	2.9	2.3	4.4	8.1	1.7	5.7	8.2	14.3
India	→United States	1.0	3.6	6.9	2.3	3.4	5.7	1.7	3.3	4.4	12.0
Mexico	constant	1.5	2.3	3.2	2.1	2.2	2.6	3.5	2.5	2.0	0.8
Mexico	→Sweden	1.5	8.0	22.0	2.1	5.0	11.9	3.5	5.9	7.6	34.4
Mexico	→United States	1.5	4.1	9.8	2.1	3.8	8.0	3.5	3.7	4.0	14.8

Sources: World Bank projections, supplemented with calculations using data in the National Transfer Accounts (<http://www.ntaccounts.org/web/nta/show/>), United Nations Population Division 2011, IMF 2011, and World Bank World Development Indicators database.

Note: Figures in the table are estimated using age distribution data on public transfers (from the National Transfer Accounts [NTA]) and projected demographic change. The 2010 pension expenditures are calibrated to public pension expenditure estimates given in IMF (2011). The NTA data are combined with population projections by five-year age cohort from the United Nations. The methodology underlying the projections is given in online annex 2.2. $\left(\frac{F_{age}}{C_{age}}\right) \left(\frac{Y}{W}\right)$ denotes average expenditure on each person of a given age, relative to average output per working-age person; additional details are given in box 2.7.

Overall, these simple scenarios suggest not only that the fiscal challenge of rising old-age-related costs in the coming decades will be significant but also that gradual changes in benefits or coverage can have an impact as great as that of demographic change. These scenarios should be viewed as illustrating the potential impact of aging on fiscal balances, not as forecasts of expenditure levels. Additionally, it is important to recognize that the evolution of government saving patterns in the future will depend on other changes that have the potential to moderate the fiscal impact of aging: for example, pension reform, tax reform, labor market reform, changes in labor market participation, and changes in non-age-related public expenditures.

Aging will increase the cost of public pensions

When considering a broader sample of countries than that of the National Transfer Accounts project, it is clear that pension expenditures are set to rise substantially relative to GDP across the developing world (table 2.5).²⁴ This scenario assumes no change in pension coverage or policies, so that expenditures per person at each age are held constant relative to GDP per working-age person, and changes in expenditures as a share of GDP are driven purely by the changing age distribution of the population. Lacking data on the distribution of expenditures across age cohorts for most of these countries, an approximation is made by assuming that average pension payments are the same for all ages 50 and older, and zero for ages under 50. Under this assumption, pension expenditures as a share of GDP change proportionally to a modified dependency ratio (the methodology is given in online annex 2.3).

Developing countries vary widely in their exposure to rising pension costs. Countries in Latin America, Eastern Europe, and the Middle East and North Africa (to the extent that a generalization can be made based on the Arab Republic of Egypt and Jordan) generally face significant increases in their pension liabilities in the decades ahead. These increases are due mainly to ballooning retirement-age populations and much less to declining working-age population shares,

although, from the 2030s on, the latter will be a significant factor in China and also in Brazil given the enormous scale of Brazil's current public pension system and thus the sensitivity of its fiscal balance to even modest demographic shifts. Some East Asian countries, as well as India, Mexico, Pakistan, and South Africa, do not face enormous pressure because they do not have large public pension systems.

Increases in pension expenditures as a share of GDP can imply significant increases in dollar values. For example, if Turkey's GDP growth averages 4.2 percent from 2010 through 2030 (in line with a range of projections), then an increase in pension expenditures from 6.3 percent of GDP in 2010 to 9.6 percent in 2030 would imply annual growth of 6.4 percent—more than tripling expenditures in constant dollars. Countries facing the prospect of this kind of sustained growth in pension liabilities will need to consider means of reducing coverage and/or benefits or make large cuts in other areas of expenditures.

The two most dramatic projections in table 2.5 are for Brazil and Ukraine, where pension costs would exceed 20 percent of GDP by 2050. Brazil made significant reforms in 1999 and 2003, but more will be necessary soon because the aged dependency ratio is set to nearly double by 2030. In 2011, Ukraine enacted overdue but politically unpopular reforms to overhaul its already quite fiscally burdensome, Soviet-era public pension system, in part by raising retirement ages (this change is not reflected in the scenario).

For countries with unsustainable pension systems, several avenues of reform are available.²⁵ It may be necessary to reduce payments per recipient, relative to contributions. Policy makers can generally adjust the generosity and coverage of pension systems, subject to political constraints; in most cases, the promise of future pension payments is implicit—an intergenerational agreement that is not legally binding—and is subject to renegotiation. But significant headway can also be made by the relatively straightforward route of raising retirement ages. This change would have the added benefit of expanding the labor force, thus adding to economic growth and tax revenues. There is considerable scope for later retirement in some countries, and pension systems are

TABLE 2.5 Population aging will put severe pressure on some countries' public pension systems

	Public pension costs (% of GDP)			Age 65+ (% of population)			Age 20–64 (% of population)		
	2010	2030	2050	2010	2030	2050	2010	2030	2050
Latin America and the Caribbean (62.8% of population covered)									
Argentina	7.4	8.8	11.2	10.6	13.6	19.1	56.1	58.2	56.9
Brazil	9.1	13.8	20.1	7.0	13.7	22.5	59.1	61.7	57.5
Chile	5.5	8.1	10.6	9.3	17.3	23.5	59.9	58.8	56.0
Mexico	1.5	2.3	3.2	6.3	11.7	19.9	54.9	59.6	57.7
East Asia and Pacific (90.2% of population covered)									
China	3.4	5.5	7.7	8.2	16.5	25.6	64.5	63.3	56.3
Indonesia	0.7	1.1	1.6	5.6	10.5	19.2	58.4	62.1	58.4
Malaysia	3.0	4.3	5.5	4.8	10.3	15.0	55.7	57.9	58.2
Philippines	1.7	2.2	3.0	3.6	6.7	10.8	50.5	55.5	58.2
Thailand	1.0	1.6	2.1	8.9	17.6	25.1	63.0	61.6	55.5
Eastern Europe and Central Asia (72.9% of population covered)									
Bulgaria	7.2	9.2	11.0	17.5	22.3	28.7	63.4	58.1	51.0
Latvia	6.1	7.6	8.9	17.8	21.3	25.7	62.4	57.2	53.6
Lithuania	7.6	9.6	11.3	16.0	20.4	24.2	62.0	57.5	55.2
Romania	7.5	10.0	12.9	14.9	19.2	27.9	64.3	61.1	52.7
Russian Federation	8.1	10.7	12.6	12.8	19.1	23.1	66.4	58.9	54.7
Turkey	6.3	9.6	13.8	6.0	11.4	19.6	58.7	61.8	58.6
Ukraine	17.7	21.8	26.2	15.5	19.5	24.1	64.2	59.2	54.6
South Asia (85.7% of population covered)									
India	1.0	1.3	1.8	4.9	8.3	13.5	54.7	59.7	60.8
Pakistan	0.6	0.7	1.1	4.3	6.0	10.4	49.1	57.5	61.7
Middle East and North Africa (26.7% of population covered)									
Egypt, Arab Rep.	4.0	5.2	7.3	5.0	8.7	14.2	53.8	57.9	59.2
Jordan	4.1	5.8	9.3	3.9	5.6	12.8	47.6	59.5	60.7
Sub-Saharan Africa (5.9% of population covered)									
South Africa	1.9	2.3	2.9	4.6	7.8	10.1	55.3	58.2	61.2

Sources: World Bank projections, supplemented with calculations using data in the IMF 2011 and United Nations Population Division 2011.

Note: These projections assume that the ratio of average expenditures per person of retirement age (50+) to GDP per person of working age (20–64) remains constant. Given this simplifying assumption, these projections are less precise than those given in table 2.4, and, for this reason, the paths for countries that are in both sets of projections (Brazil, China, Chile, India, and Mexico) differ somewhat between the two tables. Also, any pension reforms that had not come into effect by 2010 are not accounted for. Details are given in online annex 2.3.

not always designed well to encourage labor force participation by those in their mid-50s to 60s who are still able to work productively. For example, even after the last round of reforms, the average retirement age of those who retire under Brazil's Length of Contribution rule²⁶ is 54 for men and 51 for women (Gragnotati et al. 2011). In China, the statutory retirement age is 60 for men and 55

for women. With adult mortality rates and fertility both falling, the average length of retirement and the ratio of retirees to the labor force is set to rise dramatically in China, and policies aimed at later retirement have been among the main reforms being discussed to address this.²⁷

A more fundamental reform is to transition from a pay-as-you-go to a funded system. A

number of countries are making the change, particularly in Latin America and Eastern Europe. The transition itself is costly, but the switch to a funded system is a long-term fix, relieving the government of the imbalance between inflows and outflows that results from demographic change. It is also noteworthy that the change can be expected to have a positive impact on total national saving, provided that the funding of the system is financed by taxation rather than public borrowing.²⁸

The fiscal burden of aging will affect the composition and level of national saving

As shown above, public saving has not shown any strong trend historically at the global level, either up or down. It did rise noticeably for a few years leading up to the 2007–09 global financial crisis but quickly returned to its normal historical range of 10–20 percent of global GDP when the crisis hit. Even if public saving does resume an upward trend in the next few years, the scenarios just discussed suggest that, in the medium to long run, most countries will face pressure on public finances—in some cases, quite severe pressure—from the aging of their populations, and this can be expected to constrain public saving. Furthermore, developing countries may face significantly greater demand for infrastructure as economic growth proceeds (see chapter 1); and if public saving levels need to be kept up to support rising infrastructure investment without running sustained fiscal deficits,²⁹ demographic considerations will be still more pressing.

Looking forward, gross public saving will likely stay in the range that it has been in for the past several decades, constituting roughly 10–20 percent of gross national saving. This is required for the public sector to play a significant role in any sustained investment in infrastructure. To maintain this level as age-related expenditures increase, policy makers will have a few options. In the short to medium term, they may run fiscal deficits, but this solution is not sustainable and only delays inevitable costly adjustments to long-term demographic shifts; indeed, running deficits will only burden the government with

debt, making the fiscal situation still worse in the future. One long-term option is to raise taxes, which may carry with it a political cost but will probably be a component of any balanced policy package to adapt to aging. Second, unnecessary and wasteful spending will have to be cut in non-age-related areas; the areas and scope for cuts vary by country, but most developing countries have space for non-age-related expenditure cuts that can go part of the way toward freeing fiscal space for age-related liabilities.³⁰ Third, reforming the scale and institutional design of public pension and health care systems will be essential. This process is already under way in a number of countries facing the most imminent pressure from aging, but it will need to be accelerated in many countries.

The path of age-related public expenditures has important implications for household saving as well as public saving. Increased generosity and coverage of public health care and social security programs is associated with significant reductions in household saving,³¹ all things equal; not only is there less need to smooth consumption over the life cycle, but precautionary saving is also reduced because public programs play an insurance role, pooling the risk associated with the uncertainty of lifespan and health care needs. The effect can work in reverse as well: China experienced this during the 1990s and 2000s, with urban household saving rates increasing as social safety nets were scaled back.³²

Over the coming decades, developing countries will experience some of the typical increases in demand for public services that have, historically, accompanied rising incomes. But at the same time, governments' ability to ramp up pension and health care programs will be constrained by aging to a much greater extent than high-income countries experienced when they were going through a similar stage of economic development. If governments do not follow the path that high-income countries did in the past, and instead reduce the generosity or coverage of age-related programs in the face of a swelling number of beneficiaries, then private saving can be expected to rise because a greater proportion of retirement and health care costs will be paid for out of pocket. Increased generosity and coverage

of education systems should be feasible because the fiscal impact will be offset by the decreasing number of children as a share of the population. Pensions and health care are a different story, and there will likely be an important role here for markets, and private saving, alongside public programs. Higher tax rates will also affect household saving, so even if public saving does not fall, private saving can be expected to fall if tax hikes constitute a large part of the policy response, and, in this case, total national saving will fall.

Conclusion and policy directions

The downward pressure on saving rates associated with the aging of the global population through 2030 is unlikely to become a severe constraint on growth overall. However, some crucial policy challenges lie ahead, especially for those countries affected by more rapid aging and with less potential for productivity catch-up. This chapter outlines two of the main challenges: first, the potential pressure of old-age-related public expenditures on government finance, and second, the concentration of saving, in terms of both amounts and rates, within a restricted segment of the population.

Looming policy challenges with respect to government finances include uncertainty about the rate at which old-age-related expenditure will increase and the lack of policy frameworks to deal with this long-term issue. As Heller (2003) clearly put it: “While budgets increasingly encompass a medium-term framework of three to five years, few countries provide *long-term scenarios*. . . . Most countries’ sustainability analyses focus on their ability to service current debt and anticipated future deficits. . . . Projections of broader fiscal aggregates lack credibility, because they are based on unchanged policy assumptions, current laws, or constant shares of revenues and expenditure in output. Budget processes also lack mechanisms to foster debate on policy commitments or guarantees whose fiscal consequences emerge only over the *long term*.” (emphasis added)

A fundamental policy choice with respect to the allocation of the burden of demographic change is about its distribution between future retirees and future workers. The menu of policy

choices includes lower standards of living for retirees, longer working lives, higher saving during the working life, and larger transfers from workers to retirees.

Most developed countries have opted for (or are considering) a mix of a delayed retirement age, increased private saving for retirement (through favorable tax regimes), and reformed public pension systems—while most have rejected the option of declining living standards for the elderly (see Pensions Commission 2005 for the United Kingdom).

Depending on its position in the demographic transition, a specific developing country will more likely be successful in applying one or a mix of these options. For example, countries at early stages of their demographic transition, such as the Sub-Saharan countries, could probably set up tax incentives to encourage saving. A key issue is assessing whether tax-deferred individual retirement saving crowds out other forms of saving. The literature on the United States finds little evidence that 401(k) contributions substitute for other forms of personal saving (Poterba, Venti, and Wise 1996; Benjamin 2003; Gelber 2011).

For other regions, longer working lives and larger transfers may be a better solution. As described in the chapter, there are some strong rationales for transfers to elderly households: (a) redistribution (productivity growth will raise incomes of future cohorts, and public programs are replacing family transfers); and (b) correction of market failures such as limited insurance markets against the risk of long-term care needs.

For developing countries with an increasingly large share of old people, an often overlooked policy challenge consists of recognizing the heterogeneity among the elderly. This is not a homogeneous group, but it varies in terms of financial disparities, health status, capacity to work, and life expectancy. For example, recent research on labor market conditions at older age (Gruber and Wise 2007) has found that higher tax on earnings from ages 55 to 69 is positively correlated with unused labor capacity (workers aged 55 to 65).

Regarding the second issue—the concentration of saving within restricted population segments—this chapter highlighted that the within-countries high concentration of saving

and wealth may create inequality traps that have negative implications for economic mobility and thus for the political and social consensus essential for growth. In fact, the recent literature has emphasized other, more direct channels through which inequality may affect productivity and growth. A main lesson from this body of work (see World Bank 2005) is that in the highly imperfect markets of poor countries, individuals without enough wealth or social status would tend to underinvest or use their resources for some less productive purpose, reducing economy-wide productivity. And the related broad policy advice has been to reduce the unequal access to finance. A simple initial step could include improving financial literacy: many households lack adequate knowledge and decision-making tools when it comes to credit markets. An interesting example is offered by a policy intervention in Mexico consisting of an information campaign on how to use the banking system to channel remittances toward investment rather than immediate consumption.

The chapter has also shown that consistently the least-educated groups have low or no savings, suggesting an inability to improve their earning capacity and, for the poorest, to escape a poverty trap. Leveling the playing field in terms of education opportunities would thus have the added benefit of boosting private saving.

Notes

- Note that for maximizing country coverage for comparison across time, the figures in this paragraph represent ratios of saving to gross domestic product (GDP). Following standard practice, the rest of the chapter uses ratios of saving to gross national income (GNI).
- Undoubtedly, the composition of countries is not static over time, and the data reported generally use the maximum available sample coverage. However, these variations in the sample over time do not alter the main qualitative messages in the text.
- As discussed more extensively in relation to the scenarios of saving in the coming two decades, financial deepening is associated with lower rates of saving, which may also help explain why saving rates have tended to stay low in Latin American countries.
- There are, however, some empirical findings that are inconsistent with the life-cycle model: for example, preference for default saving plan options, demand for commitment devices that tie one's hands in making saving decisions, and evidence of habit formation in saving behavior (Attanasio and Weber 2010).
- Detailed results are reported in online annex 1.5, and for a technical description of how the econometric estimates are used in the CGE model, see online annex 1.6; all annexes are available at <http://www.worldbank.org/CapitalForTheFuture>.
- "Conditional" in the sense that the relationship between saving rate and per capita income growth takes into account the effects from other determinants—in this specific case: lagged saving, per capita GDP, financial development, aged dependency ratio, social protection (and other controls as shown in specification S4 in online annex 2.5)—whose contributions are held constant.
- The UN's high scenario estimates that the world population will reach 36.4 billion by 2300, and the low scenario estimates 2.3 billion.
- The global demographic transition is assumed to last three to four centuries. It started in Europe around 1700, and it will probably be complete for the whole world in 2100. Figure 2.12 thus depicts only a "snapshot" of about 60 years of this three- or four-century process.
- Note that the heterogeneity highlighted in figure 2.13 still masks the full heterogeneity because countries within each group differ in their demographic transition. In the case of high-income countries, there are sharp differences between Europe and the United States. In the former, fertility rates are quite below the replacement rate and net migration has been slow.
- The dominance of the financial development effect can also be verified by separately running the scenario with only the change in productivity or only the change in financial development (not reported, but available on request). Performing such a decomposition makes it clear that the effect of a reduction in the saving rate in developing countries is, indeed, due primarily to more rapid financial development.
- Economists have been interested in the relationship between economic inequality and saving since the original observation of Kaldor (1957) that the rich should have a higher propensity to save than the poor, and thus higher inequality should have a positive effect on saving. In fact, various post-Keynesian models (Lewis 1954; Pasinetti 1962)

- stress the link between the *functional* distribution of income and saving. These models conclude that redistribution (for example, via differential tax rates) toward profits from wages should increase saving because capitalists tend to have higher propensities to save than workers. More recent research has focused on the *personal* distribution of income, but empirical analyses have not yet found a significant relationship between income inequality and saving (see Leigh and Posso 2009 for a recent example).
12. These micro decisions can sometimes be aggregated to create a representative household within an economy. In these cases, an aggregate “macro” approach and a “micro” approach provide the same type of results and could be used interchangeably. But this is not always possible, and, for the many cases where there is an “aggregation problem,” these two approaches provide different and complementary insights. This problem exists whenever the aggregate agents’ behavior, such as aggregate private demand, cannot be “treated as if it were the outcome of the decision of a single maximizing consumer” (Deaton and Muellbauer 1980, 148). The conditions for aggregation are quite severe and break down easily in the presence of discontinuities and nonlinearities. Consider, for example, the case of participation in the labor market. Theory says that participation should increase with the wage rate. At the micro level, this can be obtained as increasing hours for an already employed individual or as the entrance in the market of someone who was not working. The effects, in terms of income distribution, may be very different in these two cases. However, at the macro level, it is impossible to model these two alternatives with an aggregate representative worker (even if the number of representative workers is greatly increased). And comparable cases, where aggregation conditions do not hold, arise in almost all markets with imperfection and asymmetric information: goods, credit, education, and others.
 13. Note that this simulated growth rate approximates the growth rate of the rapid convergence scenario of the global general equilibrium model described in the macroeconomic projection section.
 14. In the simplest version of the life-cycle model, consumption-smoothing individuals save during their working years to purchase assets that they will sell later in life to finance consumption (in other words, they dissave later in life). Without income or population growth, the model predicts that there will be a constant ratio of wealth to earnings in the economy and no economywide net savings. However, if the population is expanding, the total amount of saving by the young will be larger than the total amount of dissaving by the elderly. Similarly, even if the population shares of savers and dissavers are constant, growth in income (per capita) implies that the working-age population has a higher lifetime income and that the economy will accumulate more wealth than that held by the elderly. Thus, the saving rate rises as population or income (or both) grow.
 15. The fact that the lines representing these education proportions for the various cohorts tend to be quite flat means that as cohorts proceed along their life cycles, their composition in terms of education does not change much.
 16. Note that this long-term trend is captured by the cohort effect given the estimation restrictions imposed on the time dummies, as these sum to zero and are orthogonal to a time trend and thus they pick up deviations from a long stable trend.
 17. Income is more likely to be underestimated for poor households because of greater informal and in-kind components, thus biasing imputed saving downward for these households. Underestimation could also arise from temporary fluctuations in income; temporary low-income levels in a cross-section would correspond to negative saving rates.
 18. For Ghana, Mexico, Russia, and Thailand as a group, the share of households with a head with tertiary education has risen from 6–10 percent of the total in the 1980s or early 1990s to 20–25 percent in the late 2000s.
 19. This is consistent with findings in the literature. For example, López-Calva and Lustig (2010) show that a large part of the recent reduction of inequality in Latin America is due to the entry of a greater number of educated people into the labor market and the related reduction of skill premia in wages.
 20. The vertical distance between cohorts—in this case, the difference in household sizes for two cohorts at the same age—cannot always be interpreted as a pure cohort effect. Because cohorts are observed at the same age but in different time periods, the vertical distance may be due to a year effect. However, it may be difficult to justify that year effects are important for a variable such as household size (or number of children). Therefore, in this specific case, the vertical distances can be assumed to represent the cohort effect.
 21. The general equilibrium model includes government saving; however, consistent with its long-run nature, it assumes that each government’s deficit

- (or surplus) remains small and fixed throughout the projection period. Any change in public expenditure is compensated by an immediate counterbalancing change in direct taxes. In other words, households' disposable incomes are affected directly by changes in public expenditures, and this affects their saving decisions.
22. For a recent set of pension projections for both developing and advanced economies, see IMF (2011). For a detailed survey of official projections of age-related expenditures for Europe, see EC (2006). For a concise survey of projections and literature on the health care component of future public expenditures, see Gray (2005).
 23. Heller and Hauner (2006) discuss reform of fiscal institutions to address the problem of uncertainty of long-term paths of public liabilities.
 24. In the case of pensions, paths of public expenditures can be reasonably approximated without detailed cohort-level data because transfers come almost entirely from one age group and go almost entirely to another. Thus, the projections given in table 2.5 are not limited to countries with NTA data. Details are given in online annex 2.3.
 25. For a primer on public pension reform, see Jousten (2007).
 26. Under Brazil's Length of Contribution rule, men are eligible for a pension after making contributions for 35 years (30 for teachers), and women are eligible after making contributions for 30 years (25 for teachers).
 27. It is worth noting that an increase in retirement age tends to reduce household saving because lifetime income rises and expected length of retirement falls (Barrell, Hurst, and Kirby 2009). Also, the increased expected future size of the labor force should tend to raise investment demand.
 28. Samwick (2000) estimates that a country with a provident fund or fully funded system tends to have an average saving rate that is 3.68 percentage points greater than a country with a pay-as-you-go system, all things equal. Part of the explanation is that intergenerational Ricardian equivalence does not hold; Loayza, Schmidt-Hebbel, and Servén (2000) find that Ricardian equivalence does not hold empirically, even in the long run.
 29. Gross public saving is linked with public investment; because gross public saving is defined as current revenues minus current expenditures, and public investment is not included in current expenditures, for a given fiscal balance (total revenues minus total expenditures) gross public saving must rise 1-for-1 with public investment.
 30. For an example of methodology for estimating the scope for cutting non-age-related expenditures (applied to European countries), see Heller and Hauner (2006).
 31. Baldacci et al. (2010) finds that for OECD countries from 1990 to 2008, an increase in social security spending of 1 percent of GDP reduced household saving by 0.22 to 0.29 percent of GDP, and an increase in public health spending of 1 percent of GDP reduced household saving by 0.70 to 0.78 percent of GDP (evaluated at the respective sample means). Chou, Liu, and Hammitt (2006) find a qualitatively similar impact of public health care provision in Taiwan, exploiting the natural experiment of an expansion of public health insurance coverage.
 32. Although there are many factors behind high saving in China, Chamon and Prasad (2010) identify the rising private burden of education and health care expenditures, and increased precautionary saving, as important drivers of a 7 percentage point increase in the urban household saving rate between 1995 and 2005.

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Capital Flows in the Third Age of Financial Globalization

COMING CHANGES IN THE patterns of investment and saving, as described in the first two chapters of this report, raise several imperative questions. Should a shortage of saving be anticipated at the global level, which would push up yields on investment? Or, on the other hand, will the future bring a global excess of saving and a lack of investment opportunities that can return current yields? Similar questions can be asked at the country level, but the analysis is more complicated. In a specific country, future domestic saving might be sufficient to finance all investment opportunities at current yields, but this domestic saving might also be invested abroad, and foreign saving may flow into the country as well. What are the resulting net capital flows, and what are the pressures on yields in individual countries? This chapter not only addresses all of these pertinent questions, but also goes beyond them to cover what may be the most dominant trend in international finance in the coming decades: the increase in gross capital flows and the role of developing countries in that process.

What the analysis in this chapter finds is that developing countries will become more important as both sources and destinations of capital through 2030, and for the first time in history they seem poised to play a significant role in global intermediation of capital. In tracing the potential path of capital flows across borders through 2030, this chapter focuses on the interplay of three key long-term structural forces: economic convergence, demographic transition, and financial globalization. Policy choices at the national and international levels, of course, will affect the speed and intensity of these forces on global capital flows, chief among them the management of what *Global Development Horizons (GDH)* identifies as the Third Age of Financial Globalization, when

developing economies will become much more deeply integrated into the fabric of global finance and will account for a growing share of the world's gross capital inflows and outflows. This age follows two previous eras: the first era was dominated by Great Britain through the 1930s, and the second, which began after World War II and now appears to be concluding, has been dominated by the United States (box 3.1).

Relative to their contribution to global output and trade, emerging and developing economies historically have accounted for a much smaller share of activity in global finance. In recent years, developing countries have accounted for 30 percent of world production and trade and more than half of global growth but only 22 percent of the world's capital market capitalization of \$49.5 trillion, merely 8 percent of gross capital flows, and 9.6 percent of global external assets. Of the 25 banks that set the London interbank offered rate (LIBOR) based on their costs of borrowing in one or more of the 10 currencies covered by the measure, not a single bank is based in a developing country. Even after the surge of cross-border capital flows in the 1990s and 2000s, global investors' exposure to developing countries remains limited relative to their exposure to developed countries. No emerging-market currency is used internationally to a significant extent. But all these statistics may change considerably through 2030.

The defining aspect of the Third Age of Financial Globalization will be a change in the dynamics of global capital flows. Because the relevance of capital flows extends well beyond the balance of a country's borrowing or lending captured by net inflows or outflows, the approach taken in this chapter is to examine the future paths of both gross flows and net flows.

As developing countries' volumes of gross inflows and outflows expand in the future, the potential benefits to these countries are significant: the diversification of idiosyncratic national risks, the imposition of greater market discipline on policy making, the opportunity to supplement domestic saving in ramping up fixed investment and growth, and the promotion of financial sector competitiveness.

Realization of these outcomes could be particularly valuable for developing countries with relatively young populations and significant potential for economic convergence with the developed

world. But the potential risks involved—particularly with developing countries' absorption of large amounts of capital inflows—cannot be overlooked. Exchange rate appreciation (and thus decreased trade competitiveness), the formation of asset bubbles, and economic overheating have all been problematic in the past. A potential reversal in capital inflows can also have detrimental effects. Designing policy frameworks at the national and international levels that take into consideration all of these potential benefits and risks will become more urgent as the amount of capital moving across borders rises in the decades ahead.

BOX 3.1 The Third Age of Financial Globalization follows two previous eras

During the First Age of Financial Globalization, starting in the second half of the 19th century, large amounts of capital were directed from European countries to the New World, mostly for investment in railways, real estate, and large-scale agricultural projects (Obstfeld and Taylor 2003). By the start of World War I in 1914, more than one-quarter of British wealth was invested outside of Great Britain, mainly in foreign government securities and railroads (Gilpin 1987). In 1913, almost half of Argentine and one-fifth of Australian capital stock was owned by foreign investors in Europe (Taylor 1992). This age wound down as European countries dramatically reversed their nondefense capital outflows during World War I, eventually giving way to the Bretton Woods arrangements shortly after World War II.

As noted by several observers of international monetary affairs, the Bretton Woods Agreement gave priority to multilateral trade expansion and investment at the expense of financial liberalization. To the extent that private capital moved across borders in the post-World War II era, it was confined to the foreign currency business of major banks, largely in the form of trade financing and payment services.

Progress toward full capital market liberalization among developed countries took a large step forward in the post-Bretton Woods period, which may be regarded as the Second Age of Financial Globalization (Bordo and

Eichengreen 2003). Obligations under the Organisation for Economic Co-operation and Development's Code of Liberalization were broadened to include virtually all capital movements, including short-term transactions by enterprises and individuals. Rapid globalization in the financial industry in the 1990s and 2000s brought even more dramatic change to the landscape of the global financial system, not only encouraging steep increases in cross-border capital flows as money market instruments, forwards, swaps, and other derivatives were created, but also allowing developing countries to be integrated into the global financial system in earnest.

At present, the world appears to be in a transition into a Third Age of Financial Globalization. The beginnings of this shift would likely have occurred in the early 2000s as developing countries became more integrated into the global financial system and capital inflows to them became significant in absolute terms for the first time. The trend became more noticeable during the global financial crisis, when gross inflows of capital to developing countries declined much less than inflows to advanced countries, after having increased more rapidly on an annual basis over 2003–07. Scenarios for gross capital flows produced for this chapter indicate that developing countries will likely account for a steadily increasing share of inflows in the future—a continuation of the trend that began in the precrisis years.

Several key messages emerge from the chapter:

- *Investment demand and saving are likely to remain more or less in balance at the global level, causing no substantial changes in global rates of return over the coming decades. At the country level, however, trends in investment and saving may result in significant tensions and current account imbalances.* At the global level, not only will returns stay relatively constant under the two scenarios considered, but global saving and investment relative to global gross domestic product (GDP) is also expected to be surprisingly stable: the effect of falling rates within countries will be offset by the rising share in the world economy of developing countries with relatively high saving and investment rates. At the country level, tensions exist for specific countries in terms of their excess demand for capital, relative to supply, at initial rates of return. These tensions will put pressure on rates of return, attracting capital inflows and affecting current account positions. Such tensions are more pronounced in the rapid convergence scenario.

Countries and regions with relatively young populations and those with the greatest scope for financial market development—both of which tend to moderate saving and at the same time boost investment—have the greatest potential to experience increases in investment relative to domestic saving and net inflows of capital from abroad. For example, India and, on aggregate, Sub-Saharan Africa will run current account deficits averaging 2.4 percent and 3.2 percent of GDP, respectively, over 2010–30 under the gradual convergence scenario. The corresponding net capital inflows will not come primarily from the North but from newly industrialized East Asian countries, most notably China.

- *Developing countries are poised to account for a growing share of global gross capital flows in the decades ahead.* Although establishing a picture of net capital flows in the future offers important information about the path of balance-of-payments imbalances,

from the perspective of financial market development and integration—and, crucially, global financial stability—gross flows are a much more relevant metric than net flows. To complement the computable general equilibrium (CGE)-based scenarios for saving, investment, and net capital flows, this chapter builds a picture of gross capital flows corresponding to the same gradual and rapid convergence scenarios. By 2030, gross capital inflows to developing countries will reach \$6.2 trillion under the gradual convergence scenario (47 percent of the global total) and more than \$13 trillion under the rapid convergence scenario (60 percent), rising from \$1.3 trillion (23 percent of the global total) in 2010.¹ The increase will be driven by more rapid economic growth and slower population aging in developing countries than in advanced countries, as well as by developing countries' relatively greater scope for increasing openness and strengthening financial sector institutions. The seemingly large increase in the share of gross flows destined for developing countries is not as dramatic when considered relative to output, however: the scenario analysis foresees gross inflows to developing countries of 6–11 percent of their GDP as of 2030. The previous all-time peak was 9 percent, in 2007.

Institutional improvement in developing countries, combined with greater perceived risk in high-income economies, is set to remove advanced countries' monopoly on supplying high-quality liquid assets in the decades ahead. Encouraged by positive business environment changes, solid economic growth, and demographic trends supportive of growing consumer demand in the long term, investors are showing increasing interest in developing countries far beyond the largest emerging markets.

- *As developing countries become more deeply integrated into the global financial system and account for a larger share of the world's gross capital flows, they will also have a greater impact on financial and monetary policy*

making. Because the use of international currencies in financial transactions extends beyond their home country borders, the monetary policies of the Euro Area and the United States currently have a disproportionate effect on global monetary conditions and developing countries' access to capital. Looking ahead, this suggests that developing countries may become increasingly exposed to spillovers of Euro Area and U.S. monetary policy shocks as their international balance sheets grow. This outcome is uncertain, however, considering that because developing countries account for a growing share of global capital flows, their own monetary policies might have a greater impact on the world. This is a possibility for China, in particular. There is also the potential for greater regional monetary policy spillover from large emerging economies such as Brazil and the Russian Federation.

For small and medium-size developing countries, a world in which China, the Euro Area, and the United States all have key international currencies could be stabilizing in that they will be less affected by monetary policy spillovers from any one source. At the same time, as growing amounts of capital are transferred among developing countries, monetary policy coordination between developing countries will become more critical in promoting stable financial and macroeconomic conditions among them. An increasing share of global flows going to and from developing countries indicates that these countries should have a larger role in management of capital flows within multilateral organizations as well as bilaterally. But, given that monetary policy coordination has never been perfectly feasible even among a small number of major players—and could become even more difficult in an increasingly multipolar world—second-best policy solutions at the national level may become increasingly crucial to stability as well.

- *Policy makers will need to prepare for a greater role of capital markets in international financial intermediation and promote the development of domestic capital markets.* Looking forward, as gross capital inflows and outflows grow in scale, the composition of these flows will become more important because different channels have different capacities for creating stabilizing or destabilizing conditions in recipient countries. Globally, capital markets will likely intermediate an increasing share of gross flows in the future, and bank loans will account for less. Whether this will be good news for countries that currently receive most of their inflows in the form of bank loans remains to be seen; bank lending tends to be highly procyclical and generally less supportive of risk sharing than foreign direct investment (FDI) or equity portfolio investment (Brunnermeier et al. 2012). In middle-income countries, portfolio investment has historically been even more volatile than bank lending, in relative terms (that is, adjusting for the smaller magnitude of this component of developing countries' inflows) (World Bank 2012). Moreover, as households and firms in developing countries increasingly demand not only greater access to credit but also greater choice and variety in financial assets and services, domestic financial markets will have to compete globally in terms of their structure and their depth. Although the many efforts under way to improve regulation of the international banking sector will remain highly relevant, policies should also be prepared to accommodate—and in some cases actively promote—the development of domestic capital markets. At the same time, regulatory authorities in developing countries should monitor the composition of both capital flows and domestic financial intermediation, and, more broadly, should develop regulatory institutions to be more forward-looking—ready to adapt to potentially destabilizing changes in the composition of balance sheets and financial market innovations.

Rates of return around the world

It has long been argued that large differences in output per worker across countries imply similarly large differences in capital-labor ratios and thus higher returns to capital in developing countries than in high-income countries. This result came to be viewed as something of a puzzle, with a number of hypotheses competing to explain why, given high rates of return to capital, investment is not much greater in the developing world or, alternatively, why returns are not in fact higher in developing countries despite lower capital stocks. This question was articulated most notably by Lucas (1990), who argued that accounting for disparate endowments of complementary factors, in particular human capital, goes a long way toward resolving the puzzle.² Some other potentially relevant factors are political risk and barriers to capital flows.

Empirically, the evidence on cross-country differences in returns is mixed. Observed interest rates tend to be significantly higher in developing countries, but these rates depend on default risk and, in some cases, on financial repression, both of which are not straightforward to quantify but almost certainly tend to have a greater impact on interest rates in developing countries than in advanced ones.³ The underlying return to capital is not directly observable, and alternative assumptions upon which its measurement can be based produce widely varying estimates. Gollin (2002) made an important advance in attempting to account for self-employment income, which is often incorrectly counted as capital income and is important for cross-country comparisons because self-employment typically constitutes a greater share of economic activity in developing countries than in developed ones. Caselli and Feyrer (2007) extended this line of reasoning to land and natural resources and used estimates of the stocks of these other factors to measure the return to reproducible capital distinctly from the income that should be attributed to them. This greatly reduces the variation in returns across countries because land and natural resources tend to play a larger role in production in developing countries than in developed countries.⁴

This report estimates each country's yield to suppliers of capital as the marginal product of reproducible capital, after adjusting for the relative price of capital to consumption goods and depreciation.⁵ By this measure, the average yield in developing countries for 2007 was 12.4 percent, compared with 5.3 percent in high-income countries.⁶ Of course, the true extent of differences in yields across countries remains an open question, and an important one. Steps toward resolving this question can shed light on a wide range of policy questions, such as the potential for official aid flows to stimulate growth, effects of political instability on investment, and the role of policies designed to spur human capital accumulation and knowledge spillovers in driving investment and growth.

There will not be much pressure on global rates of return to investment

Saving and investment are set to remain more or less in balance at the global level, so there will not be significant pressure on equilibrium yields. The global saving rate can be expected to hold more or less steady over the next two decades. This is because, at least up to 2020, acceleration of economic growth in developing countries will moderate the negative impacts of aging and financial market development on developing countries' saving rates, so that they tend to fall only moderately. More important, the effect of falling saving rates across countries on the global aggregate saving rate will be offset by the growing weight of relatively high-saving developing countries in the world economy.

To compare trends in demand for capital to trends in its supply, a measure of investment demand must be constructed that is independent of yields. This measure—"notional" demand for investment—reflects the level of investment that producers desire, at a given fixed yield.⁷ Of course, at the global level the quantity of investment demanded is ultimately determined by the supply of saving, with yields adjusting so that the two are equal.

In the scenario of gradual economic convergence between the developed and developing worlds, global *notional* investment demand remains fairly close to global saving supply, which demonstrates that investment demand is not constrained by the availability of saving.⁸ Consequently, the global average yield stays essentially constant in this scenario. In the rapid convergence scenario, however, rapid growth and financial development in the developing world results in faster global capital demand growth relative to saving supply, which translates to some moderate upward pressure on yields.⁹ Even in this scenario, however, the deceleration of labor force growth (and even shrinking labor forces in some parts of the world) will mean that global investment will not be constrained by the supply of saving much more severely than it is today.¹⁰

The evolution of returns to capital at the country level has implications for net capital flows

At the country level, to better understand the forces that are shaping the direction of yields to capital, it is useful to conduct a thought experiment where not only the *ex ante* notional demand is estimated but also the *ex ante* notional supply. This will allow one to identify whether the demand for capital—at a fixed yield—is met by a supply of investment financing at the same fixed rate. If notional demand exceeds supply, for instance, there will be pressure for the rate of return to rise; the observed *ex post* rate of return is a reflection, in equilibrium, of the easing of such tensions, if any, between notional demand and supply of capital.

In the gradual convergence scenario, investment demand in most economies remains fairly muted, which translates to a fairly stable path for yields between 2014 and 2030 (figure 3.1, panel a). There is greater heterogeneity in investment demand in the rapid convergence scenario, with certain economies experiencing significant increases in capital demand; this results in sharply rising yields over the next 15 years in some countries (figure 3.1, panel b), in contrast to global average yields.

Consider, for example, the case of India in the gradual convergence scenario. Here, notional

demand for investment exceeds notional supply, therefore signaling a tension in favor of higher yields. However, the excess demand is modest and decreasing over time, hence yields in India between 2010 and 2030 remain fairly stable, at around 10 percent. The current account deficit for India—and hence capital inflows—likewise remains fairly stable, at around 2 percent of GDP.

The excess demand for investment is slightly higher for the case of Sub-Saharan Africa, and trending upward; this leads to a small increase in yields (by close to one percentage point over two decades), to around 13 percent. Were saving to remain unchanged, this would imply a worsening current account deficit over time; however, rising African saving actually offsets the increasing excess demand, resulting in an improvement in the current account (which nevertheless remains in slight deficit for the entire projection horizon).

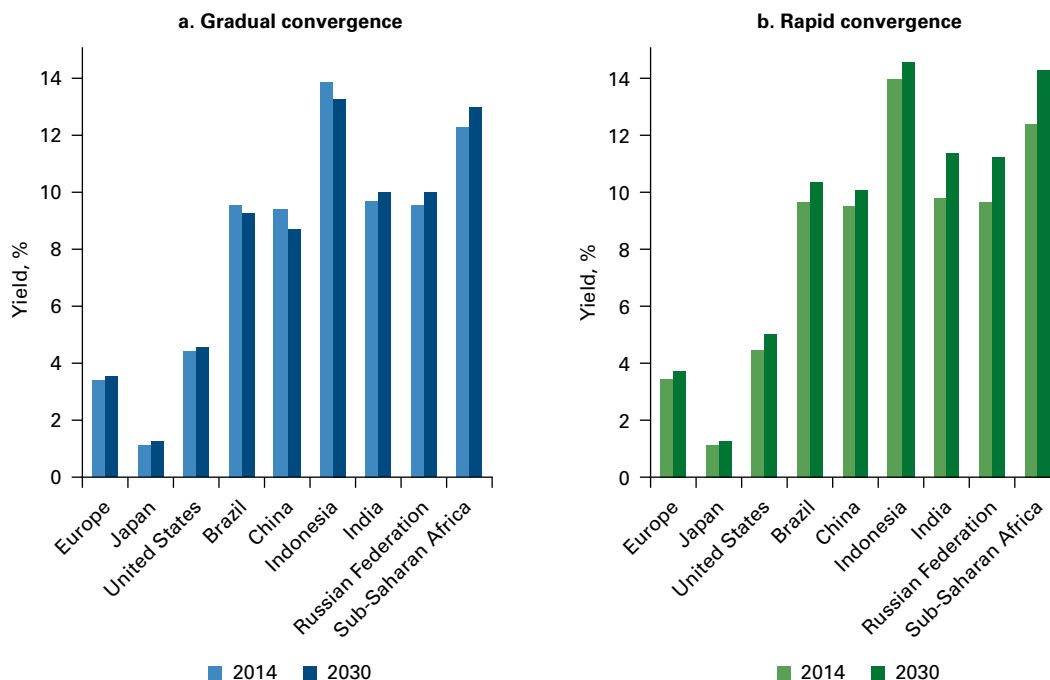
It is also illuminating to contrast these countries' experiences in the rapid convergence scenario, where brisk growth has a disproportionate effect on the demand for, relative to supply of, capital. In this scenario, for the case of India, excess demand remains high throughout the projection period. This induces a more substantial increase in yields, by almost two percentage points. This increase attracts more capital inflows and, as a consequence, current account deficits in India rise from -2 percent to -6 percent of GDP.

Sub-Saharan Africa, in the rapid convergence scenario, offers the starkest example of how tensions between notional investment demand and supply can affect the evolution of yields and resultant capital flows. Here, excess demand for capital rises substantially throughout the 20-year period—the ratio of notional demand to supply rises by five percentage points—and the region's yields reach 14 percent by 2030 (from slightly less than 15 percent). As a result, Sub-Saharan Africa as a whole eventually runs current account deficits of almost 7 percent of GDP.

Changing patterns in net capital flows

Capital flows, on a net basis, reflect the difference between a country's saving and investment; as

FIGURE 3.1 Changes in yields are more muted under the gradual convergence scenario than under rapid convergence



Source: World Bank calculations.

Note: This report estimates each country's yield to suppliers of capital as the marginal product of reproducible capital, after adjusting for the relative price of capital to consumption goods and depreciation. Yields are reported for 2014 (the first year where the model attains potential GDP) and 2030 (the end of the projection period). *Gradual* and *rapid* convergence refer to the relative pace of projected convergence between developed and developing economies in terms of productivity growth and structural changes.

such, the disparities in levels of saving and investment within individual economies through 2030 described in chapters 1 and 2 naturally imply the continued movement of capital across borders over that period (as detailed in online annex 3.2). In the decades ahead, financial markets in developing countries will become considerably deeper, more sophisticated, and more integrated regionally and globally; these countries will tend to face better growth prospects than advanced economies; and the timing of demographic change will vary widely across countries. These will be the key drivers of changes in the global pattern of net capital flows and net international asset positions.¹¹

Investment may be spurred by lower transaction costs in credit markets—for example, from more efficient collateralization—and at the same time, greater access to credit will tend to reduce saving. Taken together, these effects mean that

financial market development has the potential to reduce many developing countries' current account surpluses (or raise their deficits). China is a special case, facing relatively severe aging but also having less scope for a rapid expansion in credit, so that investment will likely fall at least as much as saving in the years ahead. To put the scenarios in context, box 3.2 provides a brief look at the historical record of shifts in the global pattern of net capital flows.

The evolution of net capital flows depends on the paths of growth and financial market development

The configurations of which countries are net importers or exporters of capital will continue to shift in the future.¹² Under the gradual convergence scenario, developing countries' saving rates will tend to fall somewhat because of a

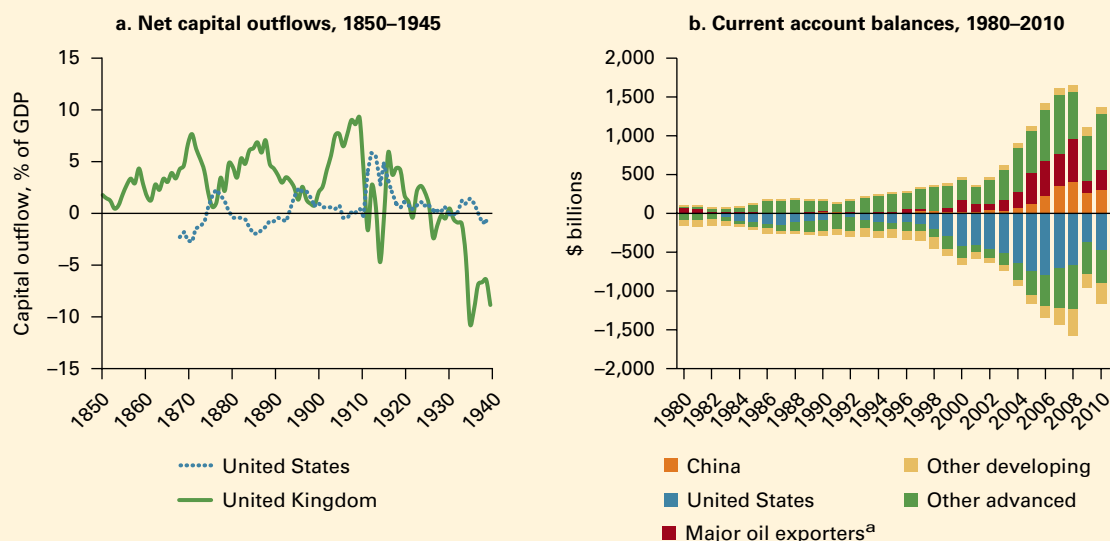
BOX 3.2 Historically, the dominant net providers and recipients of capital have not been fixed

Between 1850 and 1929, Great Britain was a net provider of capital to the rest of the world, on the order of about 3.5 percent of its GDP annually and as much as 8–9 percent in some years (figure B3.2.1, panel a), first by running a trade surplus as a major exporter of goods such as textiles, and later because repatriated earnings from overseas investments more than compensated for a declining trade balance. Following World War I, the United States gradually took over that mantle, running an annual balance-of-payments surplus of 1.9 percent in the interwar period and again through most of the post–World War II period until the mid-1970s. Japan and Germany became net lenders of significance in the 1980s.

More recently, the global pattern of balances of payments has undergone yet another transformation. Newly industrialized East Asian economies (particularly

China since around 2000), together with major oil exporters, have become significant net providers of capital to the rest of the world, with the United States and a diverse group of Latin American, African, and peripheral European economies serving as the primary recipients of that capital (figure B3.2.1, panel b). There has been much debate over the causes, consequences, and sustainability of large balance-of-payments positions (see, for example, Blanchard and Milesi-Ferretti 2010; Lin and Dailami 2010; Caballero and Krishnamurthy 2009; Chinn and Ito 2007; and Obstfeld and Rogoff 2007). But to the extent that such positions are believed to be destabilizing to the global economy, any sustainable long-run rebalancing must address underlying cross-country variations in incentives for investment and saving behavior.

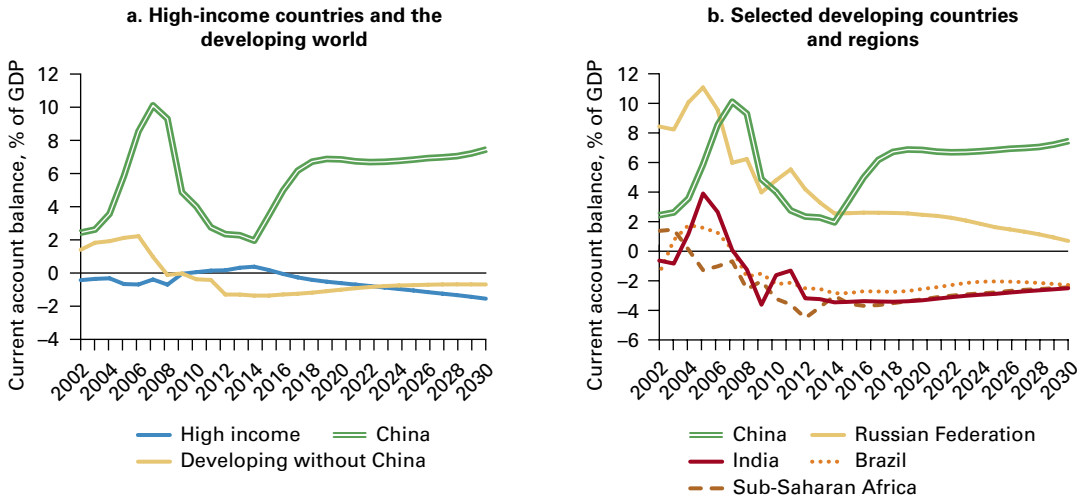
FIGURE B3.2.1 Net capital outflows (current account), the United Kingdom and the United States, 1850–1945 (panel a) and evolution of the global pattern of current account balances, 1980–2010 (panel b)



Sources: World Bank calculations using data in Jones and Obstfeld 2001 and the IMF International Financial Statistics database.

a. Major oil exporting countries, as defined by the IMF (International Monetary Fund), are Algeria, Angola, Bahrain, Canada, Colombia, Ecuador, the Islamic Republic of Iran, Iraq, Kuwait, Libya, Mexico, Nigeria, Norway, Qatar, the Russian Federation, Saudi Arabia, the United Arab Emirates, and the República Bolivariana de Venezuela.

FIGURE 3.2 In the gradual convergence scenario, there will be sizable net capital flows from China to high-income countries



Source: World Bank projections, supplemented with calculations using data in the World Bank Global Economic Monitor database.

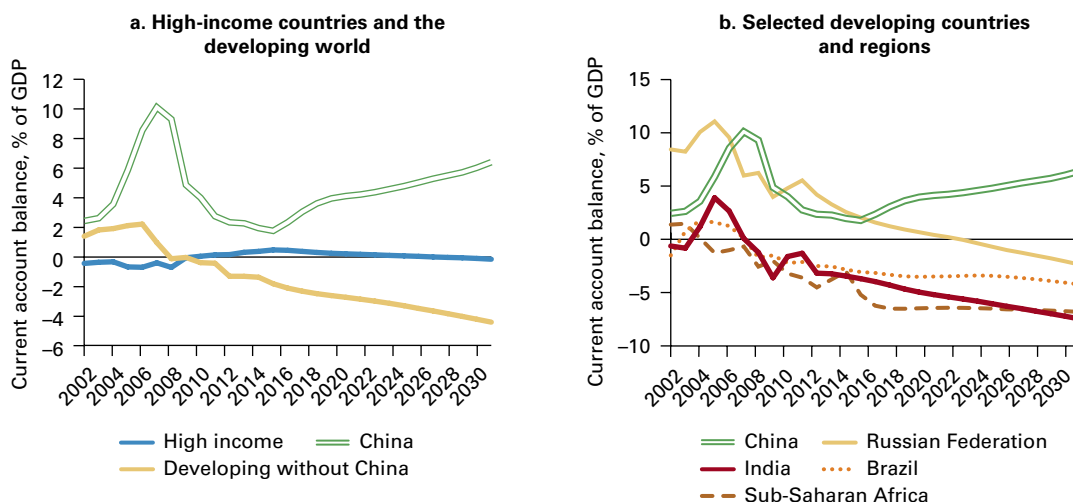
Note: Net capital flows are reported as the current account position, with surpluses indicative of capital outflows. The current account positions for the two groups do not exactly offset because they are computed as a share of each respective group's output. It is also well known that historical data on current account balances do not generally sum to zero at the global level, as required by theory, because of measurement problems.

combination of aging and moderate but steady financial market development. At the same time, investment will slow because of a moderate slowdown in growth. For most developing countries, these two effects will roughly cancel out and have fairly little impact on current accounts. Excluding China, the developing world will, on aggregate, maintain a moderate, gradually attenuating deficit between 2015 and 2030 (figure 3.2, panel a). For example, India and, on aggregate, Sub-Saharan Africa will follow this pattern, being fairly early in their demographic transitions and having significant scope for financial market development. Brazil will fit this pattern for most of the projection period as well, but, facing more severe aging, its deficit will level off and then begin to rise slightly in the mid- to late 2020s. Net capital flows from China to advanced countries, on the other hand, will increase substantially, leveling off after reaching 6–7 percent of China's GDP (figure 3.2, panel b); the flows will represent a rising share of high-income countries' output because these economies will expand relatively more slowly than China.

As discussed in chapter 2, under this scenario, aging and financial development lead to a fall in China's saving rate of roughly 7 percentage points, from 52 percent of GDP in 2010 to 45 percent in 2030. However, China's investment rate will decline even further, falling from 48 percent to 37 percent over the same period. The scenario analysis implicitly accounts for a transition from heavy state involvement in investment decisions to a more market-driven structure of investment in China.¹³ At the same time, steadily rising wages will result in a steep decline in its rental-wage ratio, rendering returns in China relatively less competitive, and this manifests in the investment rate falling from its very high historical levels, although it remains high by international standards. The net result will be that China maintains its role as a significant exporter of capital to the rest of the world.

Under the rapid convergence scenario, because of steady credit growth, saving rates in developing countries will be lower in the future. Conversely, their investment rates will fall only marginally, sustained by institutional development and

FIGURE 3.3 In the rapid convergence scenario, much of the developing world apart from China will be net capital importers



Source: World Bank projections, supplemented with calculations using data in the World Bank Global Economic Monitor database.

Note: Net capital flows are reported as the current account position, with surpluses indicative of net capital outflows.

robust productivity growth. The resulting outcome is a channeling of much of the world's saving to the developing world. However, there will be a widening imbalance between China and other developing countries, with most developing countries running gradually increasing deficits (figure 3.3).¹⁴ Relative to the gradual scenario, China's current account surplus will evolve more gradually, with smaller net flows to high-income countries due to relatively less attractive investment opportunities there, in a world in which global growth is driven almost entirely by the developing world.¹⁵

Scenarios of China's current account balance highlight looming policy challenges

Under the two scenarios explored in this report, China will run large current account surpluses over the next two decades. This will finance investment mainly in high-income countries in the gradual convergence scenario and mainly in developing countries in the rapid convergence scenario. These results highlight a major policy challenge faced by China and, indeed, by the international

policy community: how to manage China's current account surplus. Some reduction in China's surplus should be desirable for the country, at least to the extent that surpluses are the result of domestic distortions such as lack of social protection and weak corporate governance.¹⁶ Benefits to China include regaining monetary independence through reducing reserve accumulation, smoothing international relations, and improving global financial stability. At the same time, it must be acknowledged that a rapid reduction in China's reserve accumulation has the potential to destabilize the global financial system; thus, the timing and speed of adjustment are important.

But this result also highlights a caveat that must be made to the approach taken to generate these two scenarios. The determinants of investment and saving in the model were selected because they tend to be important across countries, and the sensitivity of saving and investment to these factors is assumed to be the same across countries (online annexes 1.6 and 2.6). This approach may miss some idiosyncratic factors that influence saving and investment behavior, and thus net capital flows, in any particular country. Given the institutional and policy challenges

faced by China in the context of its atypical economic system, such idiosyncratic factors might be especially important there, which deserves special mention because of the country's size and global economic influence.

In the context of investment rates moderating to more sustainable levels, current account imbalances can only be resolved by implementing policies to bring saving down more quickly than it would fall from demographic change alone. One policy avenue is institutional reform to promote broad-based financial market development. Most developing countries will experience a faster decline in saving rates than investment rates in the rapid convergence scenario because of credit growth, as discussed earlier, but China will sustain its surplus under this scenario.

This result for China is observed chiefly because the country starts out with a high initial ratio of credit to GDP and thus has less room for convergence. Domestic credit to the private sector as a share of GDP, a standard aggregate measure of financial sector development, was 130 percent of GDP in China in 2010, well above the average of 73 percent for middle-income countries (World Bank World Development Indicators database) and implying that China already has a highly developed financial sector. In Tunisia and Uruguay, also middle-income countries, domestic credit extended to the private sector was 69 percent and 22 percent of GDP, respectively. The situation in China is considerably more nuanced than this one metric indicates, however. On an index of household access to financial services developed by Honohan (2008), for example, China scored 42 out of a possible 100, the same as Tunisia and Uruguay. Financial underdevelopment has been identified as one of the factors behind increases in China's saving, as the need for credit-constrained households to save for big-ticket items and precautionary motives increased as social safety nets shrank (Chamon and Prasad 2010). On the corporate saving side, distortions such as barriers to competition, corporate governance weaknesses, undertaxation, and advantageous access to finance for state-owned enterprises have led to high retained earnings (Lin and Dailami 2010). Institutional reforms of the corporate sector, financial market liberalization,

and social safety net measures such as pension and public health reforms have the potential to significantly reduce Chinese savings and external imbalances, and these policy choices are only crudely captured by the scenario analysis.¹⁷ Of course, policy makers in deficit countries, particularly the United States, have a role to play in resolving global imbalances as well.¹⁸

Expanding volumes of gross capital flows to and from developing countries

Although the scenarios for the path of net capital flows offer important information on the extent of balance-of-payments imbalances in the decades ahead, assessing net capital flows alone overlooks important monetary and financial stability aspects of transferring capital across national borders. From the perspective of assessing these issues, measuring gross capital flows—along with the composition of those flows—is more informative than looking at net balances.

Furthermore, the impact of financial market development on developing countries' volumes of gross inflows and outflows is quite distinct from its impact on the net balance between the two. Although greater access to finance has the potential to both stimulate investment and reduce saving, thus narrowing current account balances, development and integration of developing countries' financial markets can be expected to expand *gross* flows significantly and to potentially alter the composition of capital flows as well. An expansion of developing countries' gross capital flows will also be driven by relatively favorable demographic conditions for attracting foreign investment as well as by healthy productivity improvements and growth. A country's pace of growth and path of financial market development and integration depend on institutional change and policy choices—a range of possibilities highlighted by considering alternative scenarios of how these variables may evolve in the future and the corresponding paths of gross capital flows.

International financial integration is reflected by growth in both inflows and outflows of capital as investors at home and abroad diversify and

their countries share risk. Greater gross flows can mean more access to finance for some types of investment projects because the composition of inflows and outflows tends to differ.¹⁹ Thus, investment projects can go ahead despite residents' relatively low tolerance for risk and without the country necessarily borrowing on net. Large amounts of gross flows can be destabilizing, though; cross-border banking flows, in particular, are volatile and highly procyclical, potentially magnifying risk instead of spreading it (Brunnermeier et al. 2012). Given that volumes of gross capital flows have been growing much more rapidly than net balances globally, and that the path of gross flows is both an essential underpinning of investment and a potentially destabilizing force with important policy implications, thinking about how gross flows will evolve in the future is a valuable exercise.

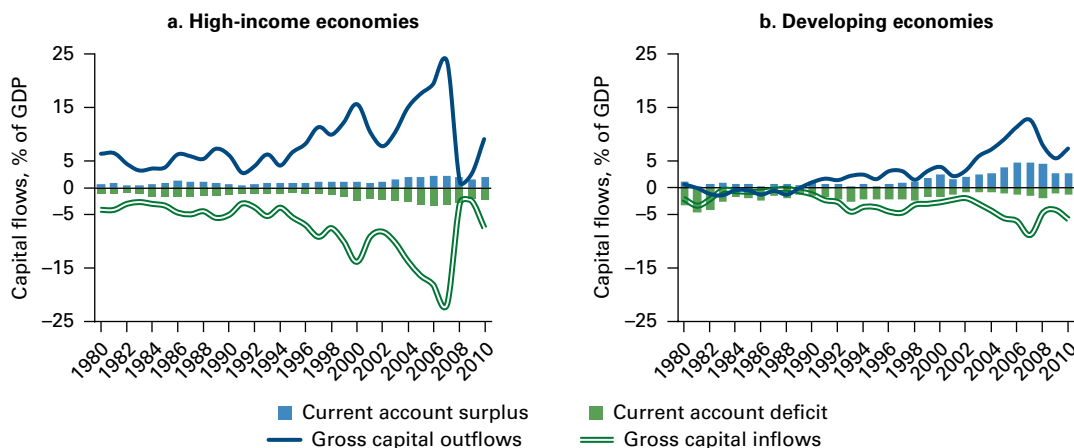
Developing countries' inflows and outflows of capital remain small relative to those of high-income economies, but they have begun to take off

Since the mid-1990s, financial globalization has meant that the significant expansion in total gross

capital inflows and outflows has vastly exceeded the increase in their net counterparts (figure 3.4). Initially, this was a high-income-country phenomenon, visible in the takeoff in gross inflows to and outflows from those countries. The upward trend continued for two decades, so that from 1990 to the peak in 2007, the sum of high-income countries' gross capital inflows and outflows grew tenfold, compared with a less than fourfold increase in trade flows (imports plus exports) and a less than two-and-a-half-fold increase in nominal GDP over that period.²⁰

Developing countries' integration into the financial system during the 1990s remained quite modest relative to their economic size, perceived investment opportunities, and engagement in global trade. Evidence to this effect can be observed in patterns of global capital flows, in the role of developing-country banks and other financial institutions in the process of international financial intermediation, and in developing countries' capacity to influence the rules of global finance. It was only during the expansionary years just prior to the global financial crisis that developing countries came to play a greater role in international financial intermediation and that gross inflows to and outflows from developing countries began to take off.²¹ By 2007, 11 percent

FIGURE 3.4 Gross capital flows have long expanded relatively faster than net flows in high-income economies, and in recent years a similar trend can be observed in developing economies



Source: World Bank calculations using data in the IMF International Financial Statistics database.

Note: Current account surplus (deficit) is equal to the sum of current accounts across surplus (deficit) countries in each group, divided by the group's GDP. Gross capital flows are summed across all countries in each group, divided by the group's GDP.

of gross global capital inflows went to developing countries, versus 4 percent in 2000.

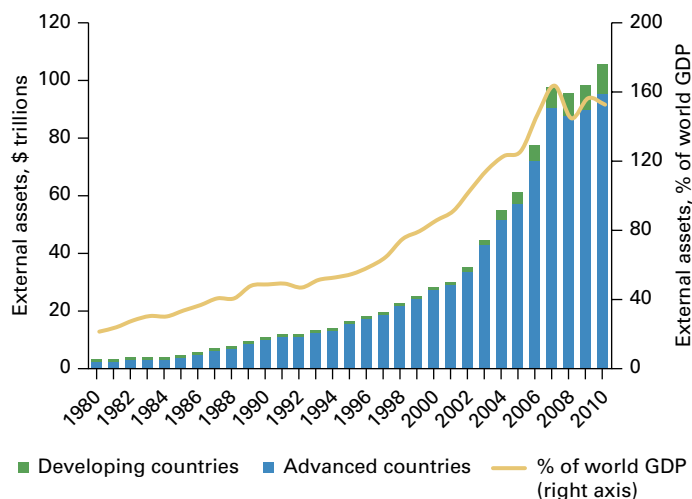
Although the financial crisis brought on a dramatic downturn in the volume of global capital flows, capital flows to and from developing countries were much less affected during the crisis than flows in and out of advanced countries.²² Before the crisis, not only did high-income countries account for the great majority of both global gross inflows and outflows, but current account balances also constituted a much smaller share of gross flows in high-income countries than in developing countries. Even as high-income countries' flows have recovered in the immediate post-crisis years, developing countries' share of global flows is significantly greater than a decade ago, although still not commensurate with their share of global output, growth, and trade. International investment positions reflect a large disparity in foreign asset holdings between advanced and developing countries as well (figure 3.5).

Several ongoing trends will support a rapid expansion of capital flows to developing countries in the future

Rapidly growing economies attract increased capital flows because that growth implies sizable investment opportunities and, often, improving creditworthiness and more opportunity for investment diversification. Stronger, more developed financial institutions, in particular, tend to allow developing countries to attract larger capital flows. In terms of intermediation, although stock markets would need to be of some threshold size to attract institutional investors, the internationalization of the banking industry has been an important vehicle of information transmission for global investors (Portes and Rey 2005), in turn allowing a growing amount of capital to be directed to developing countries.

Demographic conditions also matter: countries with a large share of working-age people tend to attract more capital inflows because of their relatively large labor pools and potential for high rates of productivity growth (Lane and Milesi-Ferretti 2002; Domeij and Flodén 2006, among others). The large diversity in the demographic conditions across the world, as well,

FIGURE 3.5 International investment positions still reflect a large disparity in foreign asset holdings between advanced and developing countries

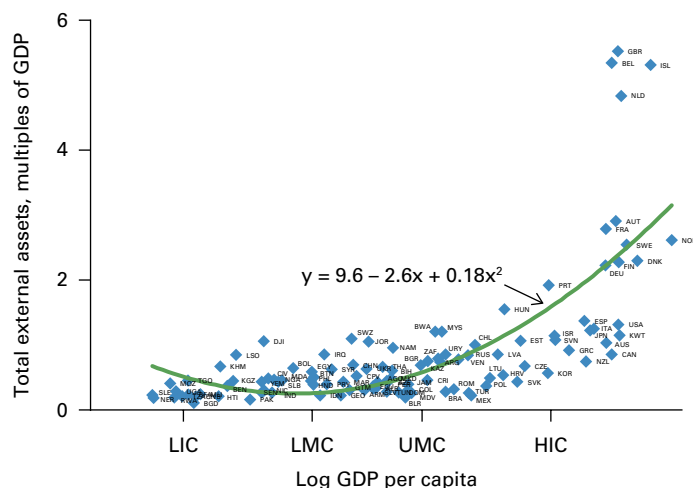


Source: World Bank calculations using data in the IMF International Financial Statistics database.

provides structural support for cross-border capital movement in that capital tends to flow out of countries with high saving rates.

One promising line of research views gross capital flows from the perspective of international trade in financial assets; as such, a country's engagement in global finance depends on its residents' demand for foreign assets as well as its capacity to supply assets with return and risk characteristics sufficiently appealing to foreign investors (Broner et al. 2013). Thus, gross capital flows into and out of a country can be expected to be related not only to the country's generation of profitable investment opportunities but also to its level of financial market sophistication and global integration.²³

It has been a longstanding stylized fact that international portfolio diversification has occurred much less than implied by models of risk sharing unless they incorporate frictions such as asymmetric information or other sources of transaction costs.²⁴ A reduction in these frictions would imply a large increase in gross flows into and out of a given country, as domestic agents diversify by sending capital abroad and foreign agents diversify by sending capital in. Advanced countries seem to have been following this

FIGURE 3.6 The relationship between GDP per capita and external balances across countries is nonlinear

Sources: World Bank calculations using data in the IMF International Financial Statistics and World Bank World Development Indicators databases.

Note: The external balance sheet is measured as total external assets plus total external liabilities, divided by two. Countries identified as offshore financial centers are excluded. On the horizontal axis, mid-points (of the log) of the 2011 World Bank income classification ranges are shown, where LIC denotes low-income, LMC lower-middle income, UMC upper-middle income, and HIC high income.

pattern at least until the onset of the global financial crisis, as their financial markets integrated and gross flows expanded rapidly.

The relationship between gross flows and overall development, proxied by per capita GDP, is also evident when the accumulation of gross flows into stocks of international assets and liabilities is examined. As presented in figure 3.6, the relationship between GDP per capita and external balances across countries is nonlinear: a 1 percent difference between countries in GDP per capita corresponds to an increasingly large difference in external assets as a percentage of GDP as countries at higher levels of GDP per capita are compared.

Were countries to follow a similar curve over time (which is admittedly a strong assumption but makes for an interesting thought experiment), then developing countries would first move along the downward-sloping and relatively flat portions of the curve. This is consistent with the observation that these countries' shares of gross capital flows and international investment positions have

lagged behind their shares of global output and trade. This line of reasoning is also consistent with the prospect that developing countries' volumes of capital flows are set to accelerate.

The expansion of developing countries' gross capital flows will depend on the pace of growth and financial development

The econometric work underlying this report's forecast of gross capital flows is supportive of previous literature in that it finds that higher levels of capital inflows—encompassing FDI, portfolio flows, and bank lending—are associated with increasing financial development and openness (measured by domestic credit to the private sector as a percentage of GDP and the Chinn and Ito [2006] index of capital account openness, respectively) as well as with higher GDP growth, a lower dependency ratio, and global monetary conditions. This work provides the basis for two scenarios of projected gross inflows to 2030, corresponding to the gradual and rapid convergence scenarios presented in the previous two chapters (box 3.3 and online annex 3.4).

Under the gradual convergence scenario, global gross capital inflows will reach \$13 trillion in 2030 (figure 3.7, panel a), with the share destined for developing countries rising to 47 percent (\$6.2 trillion). In the rapid convergence scenario, developing countries' comparatively stronger growth and convergence with developed countries in terms of financial sector development and globalization will contribute to a faster increase in the growth of capital flows than in the first scenario. Global gross capital inflows will reach nearly \$22.6 trillion by 2030 in the rapid convergence scenario, with a larger share of the total (60 percent, or \$13.5 trillion) expected to go to developing countries (figure 3.7, panel b).

One factor behind the increase in developing countries' share of global gross flows is simply the change in their relative size. Under the gradual scenario, gross inflows to developing countries will change little relative to their output (figure 3.8), so the increase in their share is due largely to their growing relative economic size, coupled with a moderate decline in high-income

BOX 3.3 Gross capital flow scenarios are based on historical evidence on the relationship between the flows and their determinants

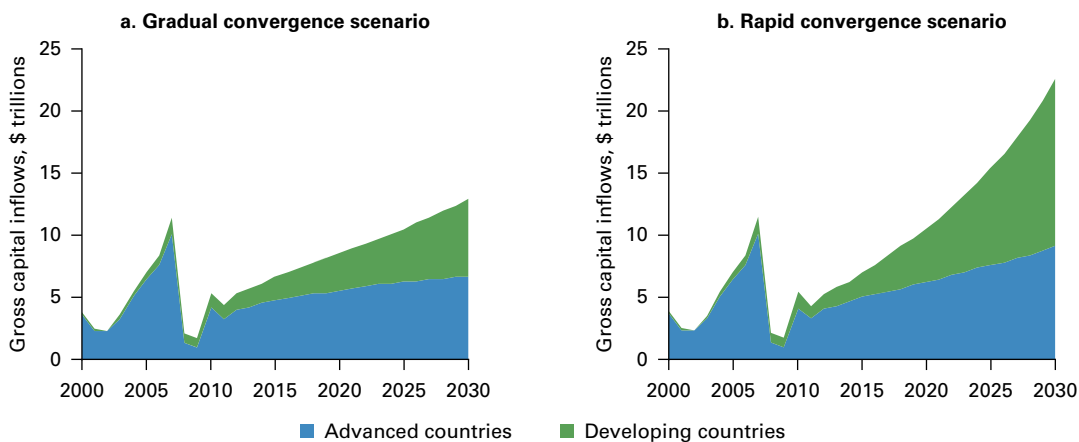
The construction of gross capital inflow projections begins with the estimation of four specifications of a model capturing the determinants of gross capital inflows along five broad categories of explanatory variables. These categories include country-level demographic factors, country-level macroeconomic factors, country-level structural and institutional factors, global economic factors, and controls for global shocks over time and country and income group effects. The model is estimated for a large number of developing and developed countries using data for the period 1980–2010.

Using the results of the preferred specification of the model (column 4 in table 3A.1 of online annex 3.3), forecasts of gross capital inflows to 172 countries through 2030 are constructed, treating developed and

developing countries as distinct groups. The paths of the key explanatory variables correspond to the paths of these variables as assumed, or endogenously generated by the CGE model, in the two global scenarios (gradual convergence and rapid convergence) developed in chapters 1 and 2. The only exception is the measure of capital account openness, which is not a variable in the CGE model; scenario paths for capital account openness are built specifically for the gross capital flows projections.

Finally, estimates of gross capital outflows are inferred from the difference between gross inflows and net flows (the current account). A full explanation of the variables, the modeling process, and the projection process is presented in online annexes 3.3 and 3.4.

FIGURE 3.7 By 2030, most gross capital flows may go to developing countries



Source: World Bank projections, supplemented with calculations using data in the IMF International Financial Statistics database.

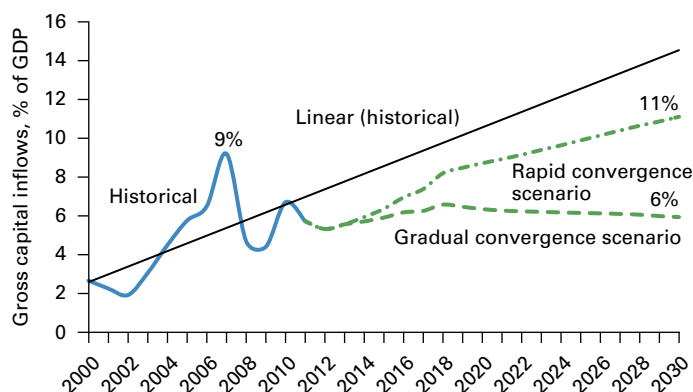
Note: Inflows are depicted in nominal U.S. dollars, assuming a constant 3.5 percent world inflation rate that is based on the 2003–07 five-year average from the World Bank Global Economic Monitor database. *Gradual* and *rapid* convergence refer to projected scenarios concerning the relative pace of convergence between developed and developing economies in terms of productivity growth and structural changes.

countries' inflows as a share of output due to a slowdown in growth.

The potential contribution of financial development and integration to an expansion in gross

capital inflows to developing countries is illustrated by the rapid convergence scenario. Here, the rise in gross capital inflows to developing countries will outstrip economic growth, so that

FIGURE 3.8 Relative to developing countries' GDP, gross inflows may hold steady or trend upward, depending on the pace of growth and financial development



Source: World Bank projections, supplemented with data in the IMF International Financial Statistics database.

Note: *Gradual* and *rapid* convergence refer to projected scenarios concerning the relative pace of convergence between developed and developing economies in terms of productivity growth and structural change.

inflows reach 11 percent of their GDP in 2030, exceeding the level in 2007 (9 percent) when capital flows peaked in the lead-up to the global financial crisis. This works together with their growing relative size to raise their share of global capital flows substantially under this scenario, although it is still somewhat conservative relative to the growth rate of capital flows to developing countries between 2000 and 2011 (represented by the linear trend line in figure 3.8).

The likelihood of one scenario or the other playing out depends not only on several factors that are out of the hands of developing-country policy makers—such as global productivity advancements and demand for exports—but also on factors that are very much influenced by policy at the national level. These include (a) education reform; (b) efforts to reduce corruption, barriers to competition, and distortions in factor markets that limit the adoption of technologies and thus constrain economic growth; (c) policies to promote financial market development, along with complementary reform of regulatory institutions to limit volatility and risk and enhance corporate governance and transparency; and (d) trade and financial market integration.

Developing economies' growing importance as sources and destinations of capital flows will not be a BRICs story alone

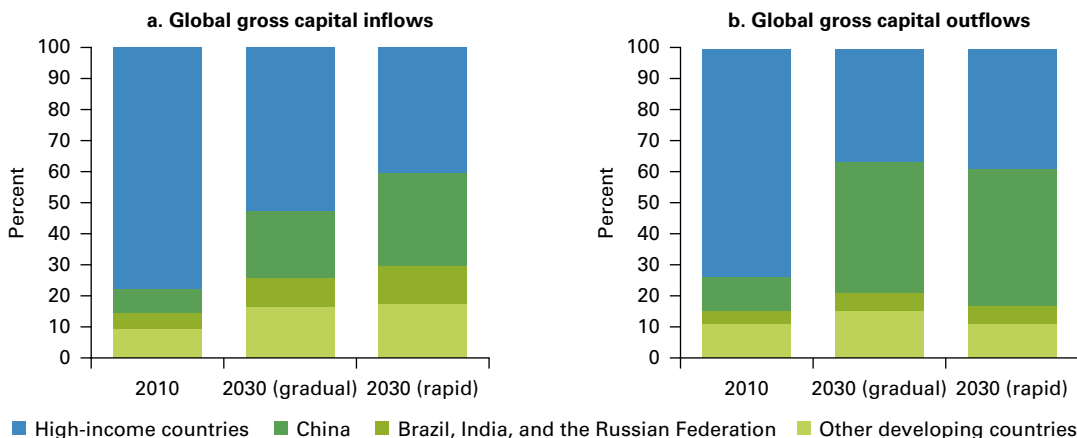
Disaggregating the scenario results by country shows that China will be an important part of the story, but by no means will changing future patterns of capital flows be a China story alone (figure 3.9), nor will it be a BRICs (Brazil, the Russian Federation, India, and China) story alone. Financial development and integration have the potential to boost gross capital flows across the developing world. Sub-Saharan Africa, for example, can be expected to not only receive a growing volume of capital flows, but also to attract an increasing share of total capital flows to developing countries (box 3.4). Under the gradual convergence scenario, developing countries other than the BRICs will collectively account for 17 percent of global gross inflows in 2030 and 15 percent of outflows. In this multipolar world, no single country will attract as great a share of global inflows as the Euro Area or the United States do today, not even China; small and medium-size developing countries will collectively matter much more in the global economy than they do today, particularly in terms of their role in the global financial markets and capital flows.

On the other hand, by 2030, China may be as important a *source* of capital flows as Europe and the United States are today. Under both the gradual and rapid convergence scenarios, China is expected to account for over 40 percent of global outflows in 2030.²⁵ This will be driven mainly by its robust growth, greater integration with global financial markets, and significant current account surpluses stemming from its investment rate (currently very high) falling somewhat faster than its saving rate as wages rise (some details are provided in chapters 1 and 2).

The composition of global capital flows in terms of financial instruments may be poised for change

Financial market development and integration can be expected to affect the composition, as

FIGURE 3.9 Small and medium developing countries as well as the BRICs will be important sources and destinations of capital flows



Source: World Bank projections for 2030; World Bank calculations using data in the IMF International Financial Statistics database for 2010.

Note: Gross capital flows include portfolio, foreign direct investment, and banking transactions. *Gradual* and *rapid* refer to projected scenarios concerning the relative pace of convergence between developed and developing economies in terms of productivity growth and structural change. BRICs = Brazil, the Russian Federation, India, and China.

well as the overall levels, of capital flows. A brief examination of trends in recent decades shows long-standing differences in the composition of capital inflows to developed countries versus developing countries. Developing countries receive mainly equity inflows, while their outflows are predominantly into relatively safe securities, meaning that a disproportionate amount of risk is borne abroad (compensated for by higher returns on these foreign liabilities than on foreign assets). Indeed, most capital inflows to developing countries were in the form of FDI during the 1990s and early 2000s (figure 3.10). Inflows to advanced countries were more diverse, with the lion's share in the form of loans and portfolio investment. The pattern of inflows to developing countries changed somewhat in the 2000s, however, with loans representing a rising share.

The relative shares of FDI, bank lending, and portfolio investment in gross inflows have important implications for macroeconomic stability and policy making; banking and portfolio flows tend to be more procyclical and volatile than FDI. Currency denomination varies by component as well. Because bonds are typically issued in only a handful of international currencies,

changes in the composition of inflows thus may affect an economy's exposure to exchange rate risk and monetary policy spillovers.²⁶

There is widespread speculation that a larger percentage of the world's capital flows will be intermediated by capital markets in the future, implying that banking and FDI inflows will represent relatively less of the total. This is an uncertain outcome, however, considering that portfolio flows currently make up a relatively small share of capital flows into and out of developing countries and that these countries' flows can be expected to constitute a growing share of global aggregate flows in the future. But even if the predicted increase in the use of capital markets as a channel of financial intermediation is not borne out globally, capital markets are likely to be increasingly important in developing countries as their financial markets mature, with the long-term effect of developing-economy convergence with advanced economies in terms of the composition of their capital inflows.

Ultimately, the extent to which capital markets play a greater role in funding investment in these countries depends to some degree on policy choices. Historically, policies deliberately designed to promote FDI, such as tax incentives,

BOX 3.4 Encouraged by the continent’s growth prospects, demographic trends, and improved investment climate, global investors and creditors are increasingly attracted to Sub-Saharan Africa

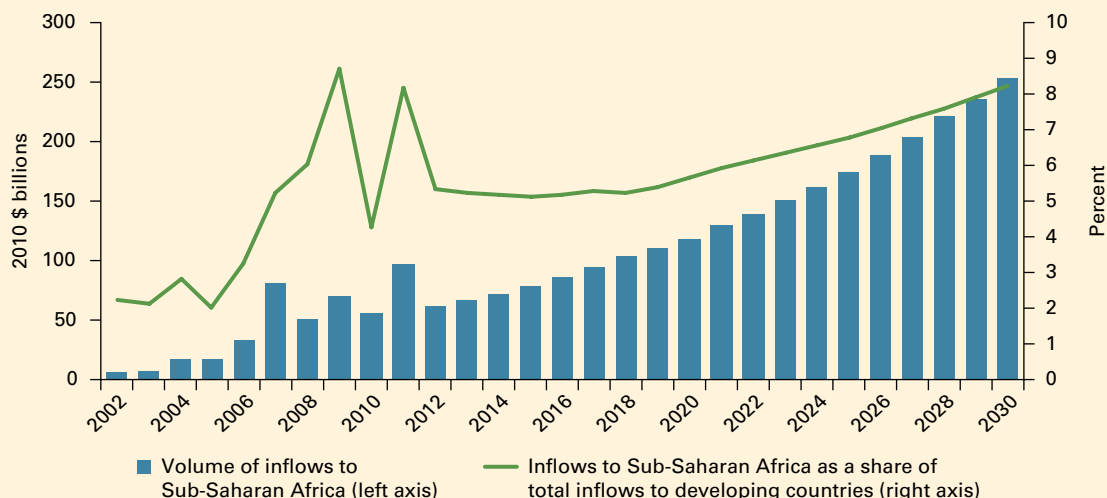
Sub-Saharan Africa is poised to receive steadily increasing amounts of capital inflows over the next two decades. In the gradual convergence scenario presented in this chapter, gross capital inflows to the region will reach \$254 billion in 2030 (figure B3.4.1), compared with \$62 billion in 2012. As a share of gross inflows to developing countries, Sub-Saharan Africa will rise from 5.4 percent in 2012 to 8.2 percent in 2030 under the gradual convergence scenario. Although the share of developing-country inflows going to Sub-Saharan Africa is not expected to reach the peaks observed during periods of severe economic tension in recent years, it will remain well above the level observed during most of the 2000s.

The largest single stream of gross capital inflows to Sub-Saharan Africa is in the form of FDI, and much of this is directed to the natural resources sector—oil in Angola, Nigeria, and other West and Central African countries; copper in the Democratic Republic of Congo and Zambia; bauxite in Guinea; and natural gas in a number of countries. In recent years, the level of FDI inflows has been driven in part by the rapid expansion of

large developing economies such as Brazil, China, and India. Notwithstanding the decline in the level of FDI inflows to Sub-Saharan Africa in the aftermath of the global financial crisis, the long-term expansion of the global economy and rich natural resource endowments of countries in the region are likely to keep Sub-Saharan Africa’s FDI inflows at robust levels in the years ahead. Guinea alone contains 26 percent of the world’s known bauxite reserves; the Democratic Republic of Congo accounts for 45 percent of cobalt reserves; Botswana, the Democratic Republic of Congo, and South Africa together represent 58 percent of industrial diamond reserves; and South Africa accounts for more than 95 percent of platinum-group metals (USGS 2012). Strong global demand for energy indicates that international capital will continue to flow to oil development projects, even in challenging governance environments such as that in South Sudan.

Although extractive industries are set to be an important target of capital inflows to Sub-Saharan Africa in the future, there are also signs of increasing investor interest in financing the infrastructure, retail,

FIGURE B3.4.1 Gross capital inflows to Sub-Saharan Africa will rise as a share of inflows to developing countries



Sources: World Bank projections, supplemented with calculations using data in the IMF International Financial Statistics database.

BOX 3.4 (continued)

and financial services sectors. Infrastructure financing is especially important because insufficient power generation, lack of basic water and sanitation systems, overcrowded urban roads, and inefficient ports pose major constraints to productivity and international trade in the region and have a significant impact on livelihoods. Reversing these deficiencies will require significant amounts of capital from domestic and foreign sources, but at the same time infrastructure improvements promise to make doing business in Africa significantly easier.

Estimates produced for chapter 1 indicate that aggregate water and sanitation sector investment needs among Sub-Saharan African countries will rise from \$2.2 billion in 2012 to \$3.8 billion in 2030. This figure will be dwarfed by investment needs in the power sector, expected to nearly triple, from \$4.9 billion to \$13.8 billion, over the same years. Roads will require an estimated \$11.2 billion of investment in 2030. Nigeria, with the region's largest (and rapidly growing) population, will require power sector investment of almost three-and-a-half times its 2012 level in 2030. Relatively rapid population growth in Sub-Saharan Africa means that infrastructure financing needs will grow faster than in other developing regions. At the same time, the growing proportion of global economic growth attributable to developing countries suggests that other developing countries will be a key source of capital flows to Sub-Saharan Africa in the decades ahead. China and India are already active investors in infrastructure projects and telecommunications projects in the region.

Another driver behind the growth in capital inflows to Sub-Saharan Africa over the next two decades will be the region's rising per capita incomes. The expectation that Africa's emerging middle class will support a range of consumer goods industries—processed food and beverages, ready-to-wear clothing, cosmetics, household appliances, and home improvement—is increasingly becoming reality for multinational companies and retail banks, their confidence was bolstered by the very visible success of the mobile phone industry on the continent. Just as important are key demographic statistics: 42 percent of Sub-Saharan Africans are under the age of 15, versus a range of 17 percent (Eastern Europe and Central Asia) to 32 percent (South

Asia) in other developing regions. The large proportion of young people in Africa means that the region is at an advantage in terms of accumulating savings over the long term and in terms of having a large proportion of working-age population for decades to come.

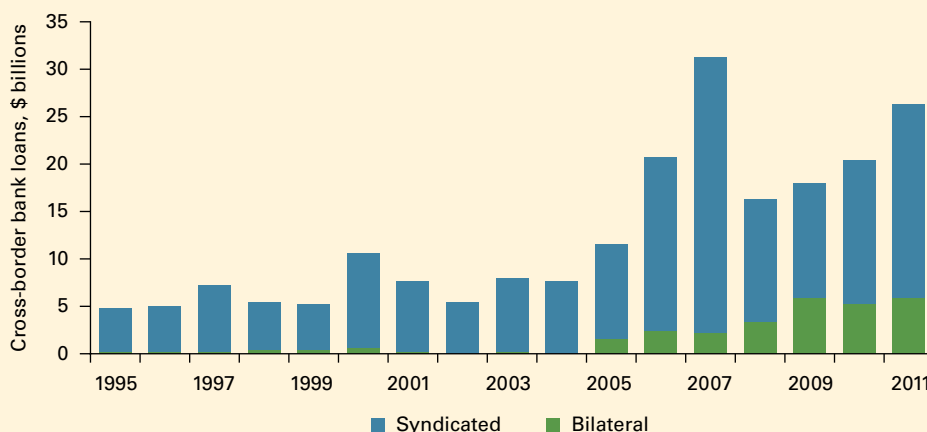
One clear signal of the world's growing assurance of the power of the African consumer was Walmart's \$2.4 billion purchase of the South African retail giant Massmart in 2011. Although intraregional investment currently accounts for a small proportion of total FDI inflows—only 4 percent (in terms of value) of cross-border mergers and acquisitions and greenfield FDI projects undertaken in Sub-Saharan African countries between 2003 and 2010 were funded by other countries in the region—such projects can help convince companies elsewhere in the world considering investing in Africa to move forward. Good examples include high-profile investments such as Mauritius-based SEACOM's \$600 million investment in an underwater fiber-optic cable that linked South Africa, Mozambique, Tanzania, and Kenya to Europe and South Asia in 2009. Ecobank, for another example, a bank operating in some 30 Sub-Saharan Africa countries, was among the top FDI investors in the region during 2003–11 (Ernst & Young 2012).

Looking ahead, there may be an adjustment in the type of capital going to Sub-Saharan Africa. A long-standing trend is that most capital inflows to the region have been in the form of FDI. But in recent years, access to bank lending and international bond markets has improved. Figure B3.4.2 tracks capital inflows in the form of cross-border bank loans, clearly depicting a rising trend. In 2007, the peak year for cross-border capital flows, nine international syndicated loans of more than \$1 billion went to borrowers in Angola, Mauritius, Nigeria, and South Africa in the retail, telecommunications, construction, oil, and mining industries. The lenders in these transactions are broadly based geographically. Despite dropping in 2008 in the face of the global financial turmoil, the volume of bank lending has increased in each subsequent year. Here, too, there is evidence of growing intraregional involvement: Standard Bank group, the largest commercial bank in Sub-Saharan Africa, was among the top three arrangers of syndicated loans in 2011 (Bloomberg 2012).

(continued)

BOX 3.4 (continued)

FIGURE B3.4.2 Cross-border bank loans to Sub-Saharan Africa are on the rise



Source: World Bank calculations using data in the Dealogic Loan Analytics database.

Note: The figure includes intra-African cross-border loans.

Raising capital on international bond markets has also become a possibility for some African countries. The governments of Gabon, Ghana, Namibia, Senegal, and the Seychelles raised a total of \$3.18 billion on international bond markets between 2006 and 2011. Though few corporations based in the region have access to markets outside their home countries, the increased ability of sovereigns to issue debt on international markets is likely to pave the way for enhanced corporate access in the future. A similar narrative can be found in access to international capital markets: only 37 Sub-Saharan African companies are listed on equity markets outside the region—17 on European exchanges and 11 on U.S. exchanges (Bloomberg database). That said, international investors have demonstrated increasing interest in African capital markets, albeit from a low starting point.

a. For all three of the regions mentioned, the figure does not include countries classified as high-income by the World Bank. Thus, for Sub-Saharan Africa, Equatorial Guinea is excluded.

For all the positivity, Sub-Saharan Africa faces undeniable challenges in creating an environment suitable for large capital inflows, not least of which is the relative underdevelopment of its domestic banking sector. Only 24 percent of people age 15 and above have an account at a formal financial institution, compared with 33 percent in South Asia and 55 percent in East Asia and the Pacific (World Bank Global Financial Inclusion database).^a Domestic credit to the private sector as a percentage of GDP is less than 30 percent for most Sub-Saharan African countries, and in several countries that rate is in the single digits. Investors still shy away from some countries because of entrenched corruption and other risks. In the immediate future, increased consumer spending by the middle class will remain concentrated in commodity-exporting and other relatively wealthy countries.

have been one factor behind the predominance of FDI in inflows to the developing world, along with trade barriers, shallow financial markets, barriers to competition in the economy, and, at the broadest level, informational asymmetries

and transaction costs.²⁷ These constraints can generally be expected to relax as income levels rise, but these changes do involve shifts in policy. Policy makers should recognize that initiatives designed to deepen and better integrate financial

markets may also promote portfolio inflows, and that regulatory institutions should be strengthened in tandem with liberalization, given the volatility of private capital flows (portfolio flows in particular).

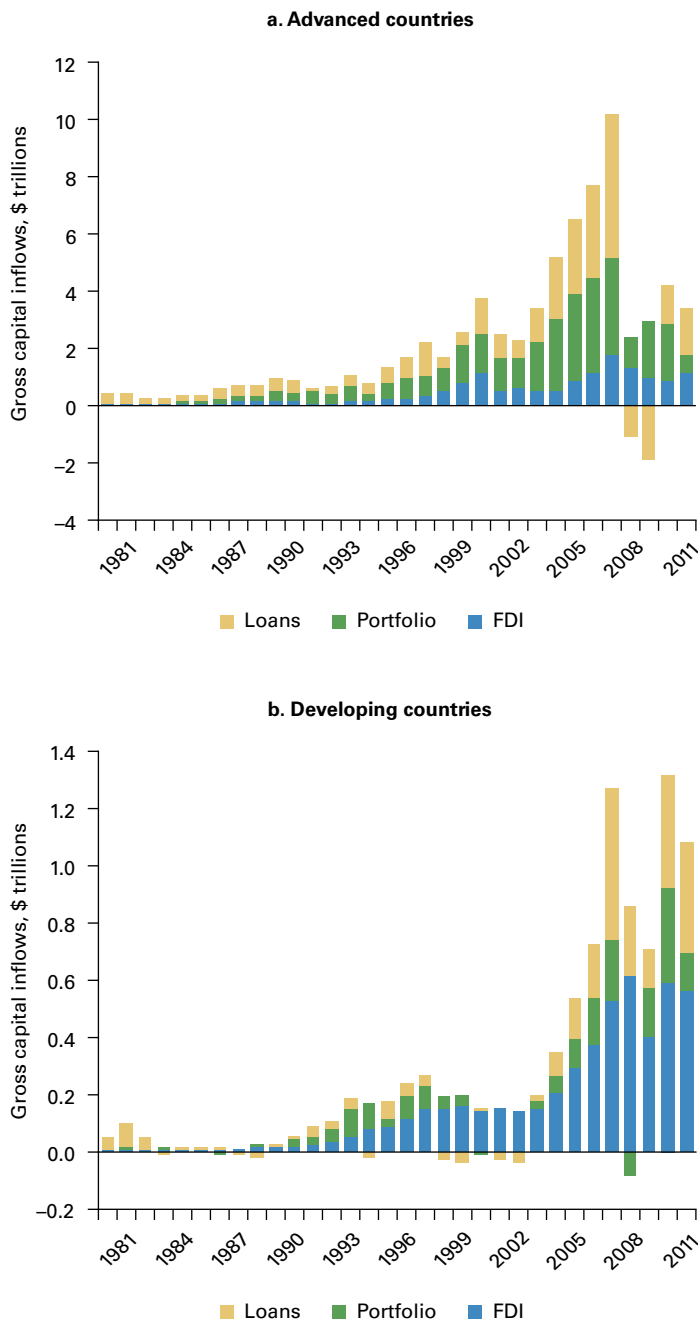
In addition to changes in the composition of capital flows that are likely to accompany the increasing share of inflows and outflows attributable to developing countries, the two scenarios of gross capital flows in this chapter indicate that the coming decades are likely to see much greater South-South capital flows (as illustrated in online annex 3.5). *GDH 2011* documented the rise of South-South FDI, which is already under way and will become an increasingly important component of investment in developing countries in the future (World Bank 2011). As developing countries' banks grow in size and become more internationally active, as their stock and bond markets continue to develop, and as their financial markets become more regionally integrated, they will have an opportunity to intermediate a greater share of South-South flows and, broadly, to play a much larger role in intermediating global capital flows than they do today.

At present, more than half of capital outflows from developing countries are in the form of government reserve accumulation, while external investment activity in advanced countries is mainly accounted for by private sector entities. But reserve accumulation among developing countries can be expected to decelerate, perhaps dramatically, as more countries move toward floating exchange rate regimes and as capital markets are allowed to become more open, meaning that developing countries will become more similar to advanced countries in terms of the composition of their capital outflows. China will be a major determinant of the speed and extent of developing countries' changing capital outflow composition.

Capital flows and monetary policy spillovers

As discussed above, in the years ahead the volumes of gross capital flows to and from developing countries are likely to expand dramatically. The developing world's financial markets will

FIGURE 3.10 Historically, the composition of capital inflows has differed between income groups, with FDI providing stability in flows to developing countries



become deeper, more sophisticated, and more globalized. These economies' capital flows and stocks of international assets and liabilities will not only grow in size but also change in terms of their composition, rates of return, and risk profiles. South-South investment will increase. Developing countries' banks and capital markets will intermediate a growing share of global capital flows, both between developing countries and between developing and advanced economies.

An implication of these developments is that developing countries may become more exposed than ever to spillovers of monetary policy shocks through their international balance sheets. However, the dominant position of today's global financial centers will be eroded to some extent. Thus, the configuration of the sources and channels of international shocks may become more dispersed than today, reducing the exposure of the world economy to shocks originating in any one economy and offsetting the potential for greater instability that developing countries face as their financial markets expand and integrate.

The international monetary system is anchored to the U.S. dollar and the euro

Use of the national currencies of a few major advanced countries as the world's dominant international currencies has been a prominent feature of the post-World War II global financial system. Currently, the international monetary system is anchored to the U.S. dollar and, to a lesser extent, the euro (Dailami and Masson 2011). This situation has long had strong relevance for developing countries, which rely more than advanced countries on credit denominated in foreign currencies. Monetary policy may be neutral in the long run, but at any given time prevailing monetary conditions have real effects, and the instability that can result from an inability to control monetary conditions is an important issue facing developing-country policy makers. A long-term shift in which currencies are most prominent at the global level, as well, has policy implications.

Demand for international currency originates from four sources: accumulation of official foreign exchange reserves, international bank credit, international securities issues, and turnover in

foreign exchange markets. The first three of these sources, at least, will be in flux over the coming two decades as developing countries come to account for a much greater share of global capital flows than they do today, as their domestic financial markets mature and become more sophisticated, and as South-South flows increase.

As of the end of 2010, the bulk of capital flows were still conducted in U.S. dollars and euros; 83 percent of international bonds outstanding and 80 percent of international banking assets were denominated in one of these two currencies (figure 3.11). Despite the increasing importance of the euro, the U.S. dollar remains the dominant international reserve currency. The share of reserves held in dollars is more than double the share of reserves held in euros.²⁸

In the current multipolar international monetary system—in which the U.S. dollar and euro serve as the principal reserve currencies, most emerging economies operate under some variant of a managed floating exchange rate regime, and there is high capital mobility across national borders—advanced countries with international currency status have a disproportionate influence on global monetary conditions.²⁹ Should very low interest rates (such as those currently in place in key currency countries) be maintained over an extended period, they could potentially lead to excessive risk-taking behavior on the part of financial market participants, including banks, and stimulate portfolio and banking flows to developing countries as investors and financial intermediaries “reach for yield” and seek to maintain returns. Under these conditions, policy makers in developing countries face a difficult challenge in deciphering whether capital inflows are the result of improvements in their domestic fundamentals or rather are a transitory effect triggered by low yields in advanced countries, subject to reversal when world interest rates rise.

One gauge of the extent of the international domain of the U.S. dollar and euro in international monetary affairs is the volume of international bank claims denominated in those currencies, which is particularly relevant for the large number of developing countries where international banks account for the bulk of capital flows. As the international banking industry has grown, the U.S. dollar has persistently played a major

role as the preferred currency for global banking transactions, although there are signs that this may change in the future as the dollar gradually gives way to other currencies (World Bank 2011). It is interesting to note that loans by non-U.S. banks, mainly European banks, account for a significant part of dollar-denominated loans.

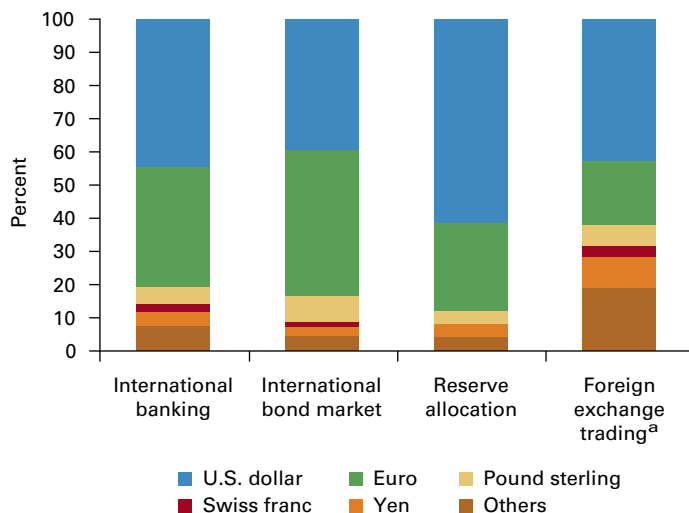
Global credit denominated in both dollars and euros grew rapidly in the decade leading to the 2007–09 global financial crisis, although it has been fairly flat from 2008 to 2011 (figure 3.12). U.S. dollar credit stood at \$31.4 trillion at the end of 2011, up from \$12.6 trillion at the end of 1999. Global credit in euros was €23.9 trillion (\$31.4 trillion) at the end of 2011, up from €11 trillion (\$11.1 trillion) at the end of 1999. Although the amounts of credit outstanding globally that are denominated in dollars and euros are roughly equal, dollar-denominated credit makes up a substantially greater share of credit outside of the United States than the euro does outside the Euro Area—\$11.8 trillion compared with \$4.4 trillion. One implication is that because the U.S. dollar is more internationalized, the global economy is more sensitive to U.S. monetary policy than it is to Euro Area monetary policy, in part through the international banking system.

For emerging-market economies, the ability to insulate domestic monetary policy depends on their willingness to fully accept the exchange rate movements that would result from changes in the monetary policy stance of international currency countries. Because many countries fear the resulting volatility, they intervene to limit the exchange rate changes through accumulation of foreign exchange reserves. Though countries may be successful in the short run in sterilizing the effects on domestic liquidity, empirical evidence shows that there are limits to sterilization. In the current environment, for example, this means that some of the U.S. monetary expansion is likely to appear domestically in emerging-market countries as well.³⁰

The international monetary system will be in flux in the future

Looking forward, developing countries as a whole will account for a much greater share of gross capital inflows and outflows than they do today, and

FIGURE 3.11 International assets and foreign exchange trading are mainly denominated in the U.S. dollar and the euro



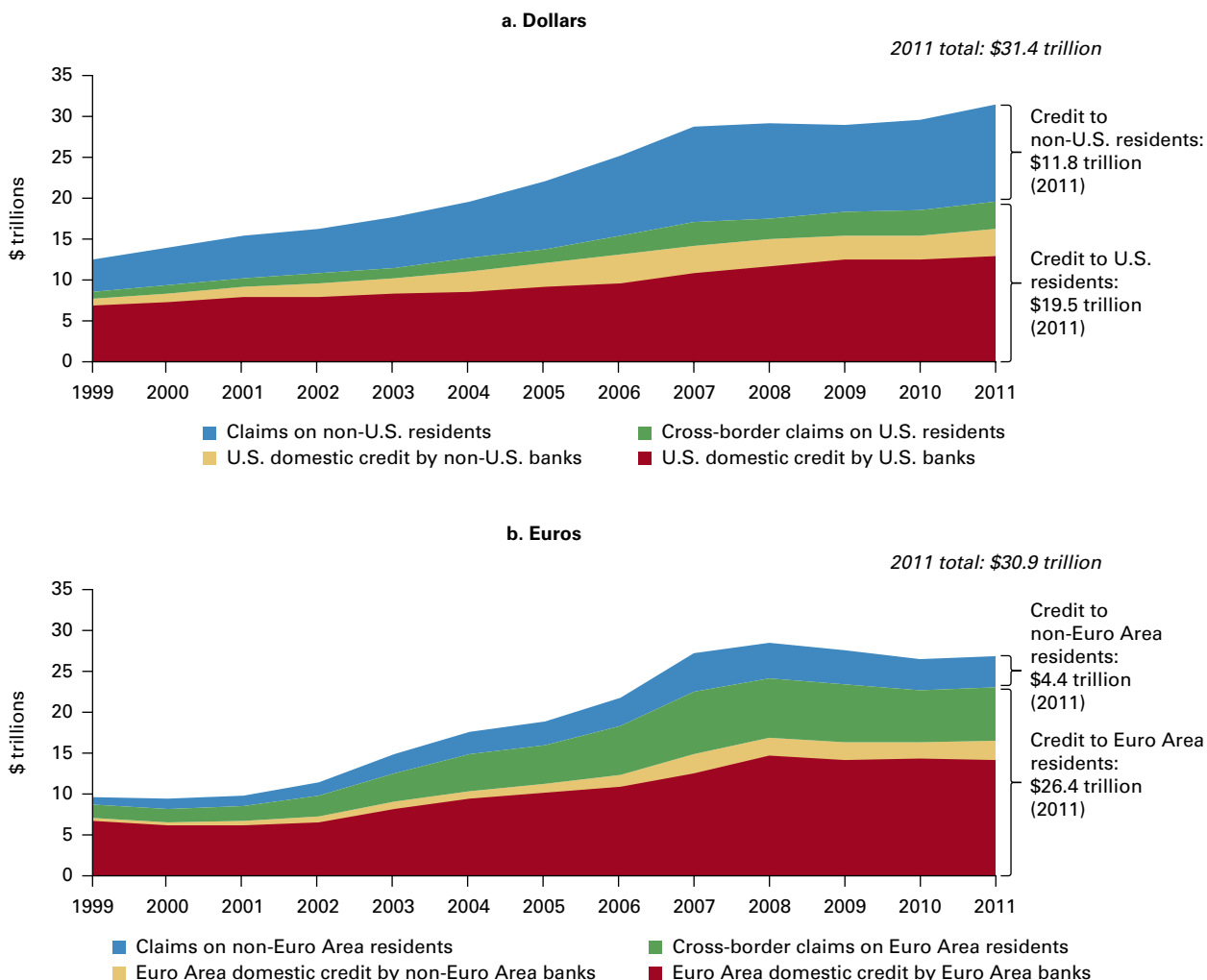
Sources: World Bank calculations using data in the BIS Locational Banking Statistics and IMF COFER databases.

Note: Data are for 2010. Denomination of assets is calculated in terms of shares of the global stocks of banking assets and bonds for which the denomination was reported to the BIS, and shares of reserves for which the denomination was reported to the IMF (in 2010, these accounted for 56 percent of total reported reserve holdings).

a. Because each foreign exchange transaction involves two currencies, the shares of transaction volume in which each currency was involved sum to 200 percent of the total volume.

it is likely that some developing countries will become major players in international financial intermediation. Regarding how monetary policy spillovers will evolve, these trends in capital flows have two main, countervailing implications: First, were the present composition of capital flows (in terms of type and currency denomination) to remain roughly the same through 2030, as developing countries become more deeply integrated in global financial markets, the impact of U.S. and euro monetary policy on these countries would increase. Second, developing countries' financial markets are likely to become deeper and more sophisticated in the years ahead, meaning that their capital markets and banks have the potential to intermediate a growing share of the world's capital flows, and key developing countries' monetary policy may become more influential on a global scale. Monetary spillovers from key developing countries to other developing countries are particularly plausible given that South-South capital flows are expected to increase in the coming years. This change, on its own, would mean

FIGURE 3.12 The U.S. dollar is still the main currency in global credit markets



Sources: World Bank calculations using data in the BIS Consolidated Banking Statistics and IMF International Financial Statistics databases.

Note: U.S. (Euro Area) domestic credit by non-U.S. (non-Euro Area) banks is measured as local currency claims on local residents of the United States (Euro Area) using BIS Consolidated Banking Statistics data. Domestic credit provided by home banks is estimated by subtracting local currency claims on local residents from total domestic credit using IMF International Financial Statistics data. Cross-border claims on residents are from the BIS Locational Banking Statistics. Claims on nonresidents are approximated by adding cross-border claims on nonresidents and local claims on nonresidents from the BIS Locational Banking Statistics; this underestimates this component slightly because it omits credit to nonresidents by their countries' domestic banks denominated in the currency in question; data on this subcomponent are not readily available, but it is likely to be quite small relative to foreign banks' claims in the currency.

that the share of developing countries' capital flows denominated in advanced-country currencies would likely shrink as a growing share are intermediated by developing country-based capital markets and banks.

Thus, the evolution of developing countries' exposure to advanced countries' monetary policy

is uncertain. One can even imagine a scenario in which greater liberalization and integration of developing countries' financial markets proceeds hand in hand with a trend toward greater consolidation and concentration of global financial intermediation, with only a few countries in the world specializing in financial services. In such

a scenario, developing countries might not play a significant role in international intermediation despite becoming increasingly important as a source and destination of international capital flows. The 2007–09 global financial crisis appears to have interrupted a trend toward greater concentration. Whether a reversion to this trend occurs depends, in part, on whether policies are pursued at the national and regional levels to promote the deepening and strengthening of local financial markets.

It is likely, in any case, that developing countries will have a more central place in the global financial system in the years ahead than they do today. China, in particular, has the capacity to have a much larger impact on global interest rates and other monetary conditions if the renminbi follows a path toward becoming an international currency.³¹ And as developing countries account for a greater share of global gross capital inflows and outflows, the composition of those flows may very well change as well. Reserve accumulation will likely diminish relative to private flows as developing countries move toward more flexible exchange rate regimes. This will likely mean that fewer foreign assets will be denominated in dollars and euros;³² even more important, returns on foreign assets will rise as reserves are displaced by private investments intermediated by more mature financial markets.

Conclusion and policy implications

The rapid expansion in the volume of global capital flows expected during the next two decades in the two scenarios presented in this chapter will render the world's economies more financially interconnected than at any time in history. Interpreting how this increased integration will affect the global economy in the long term, or how policy makers should react to it, is by no means a straightforward task. History can certainly provide guidance, but there is also value in estimating the scope of international financial links in the future, and additionally in envisioning potential policy responses that might be appropriate.

The costly string of banking and sovereign debt crises the world has experienced in recent years has left policy makers keenly aware of the trade-off between the instability that can accompany a highly complex and integrated global financial system and the benefits of deepening global integration via capital flows. Capital inflows can be key in supporting economic growth, and open cross-border financial channels are essential in channeling capital from countries with excess savings to productive projects in countries with insufficient savings. Over the years, the steady integration of developing countries into the international financial system by way of international capital flows has provided investors with an important means of diversification. But it is the risks of an increasingly integrated international financial system featuring the movement of capital across countries on a massive scale, and how to best manage the system to avoid future crises, that continue to dominate the minds of financial sector policy makers and regulators at the moment.

Several major concerns lie at the forefront of policy discussions related to the stability of the international financial system: (a) the longstanding underpricing of sovereign risk in some advanced economies, (b) the global impact of unprecedented easy monetary policy in countries containing major financial centers, and (c) the ability of the international financial system to fulfill its primary task of intermediating capital across national borders in a manner that promotes productive investment and sustained growth rather than fueling asset bubbles and instability. Regardless of the short-term versus long-term nature of each of these issues, the magnitude of the expected expansion in the volume of international capital flows through 2030, in both absolute amounts and as a percentage of GDP, means that having an appropriate policy framework in place to manage international capital flows will become even more crucial in the future.

There is broad agreement that central banks and other economic planning authorities must be well equipped to respond quickly and resolutely to mitigate contagion across countries during times of financial distress, and must be vigilant in monitoring and acting upon conditions that

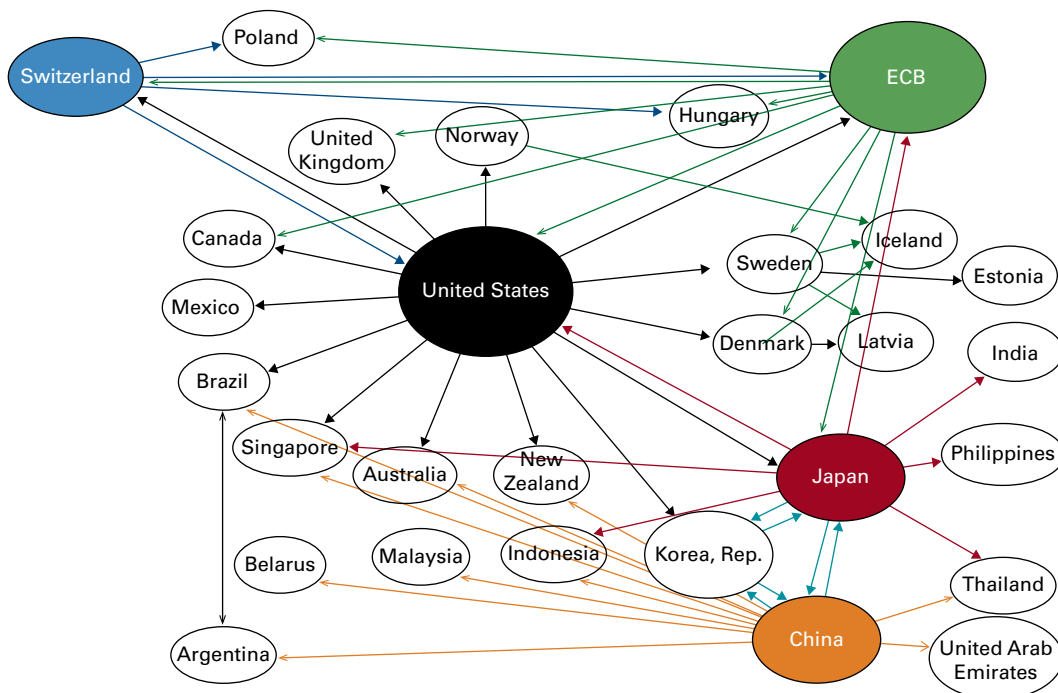
contribute to instability. Expanding the capacity of economic policy makers to act in a coordinated manner at the international level in monitoring and responding to episodes of instability is, by many accounts, also important. Although international coordination efforts are complicated by a host of political economy and other issues, crises offer strong incentive to overcome such obstacles.

Financial crises can provide strong incentive for international monetary policy and financial stability coordination

An obvious place to look for evidence on these policy matters is the global financial crisis of several years ago, which saw unprecedented coordination of monetary policy among national monetary authorities. For example, central banks

around the world set up a large network of liquidity swap lines starting in late 2007 (figure 3.13). Under these arrangements, the home central bank of currencies in short supply globally at the time could provide its currency to commercial banks operating in other countries, with the central banks of the countries in which the commercial banks were located operating as intermediaries (Allen and Moessner 2010). The People’s Bank of China, for instance, agreed to provide a total of RMB 650 billion under swap lines with the central banks of Argentina; Belarus; Hong Kong SAR, China; Indonesia; the Republic of Korea; and Malaysia.³³ After implementing several prior rounds of swap agreements with other major central banks, the U.S. Federal Reserve agreed to swap lines of unlimited size with the Bank of England, Bank of Japan, European Central Bank, and Swiss National Bank for a period of

FIGURE 3.13 A number of new central bank liquidity swap lines were extended between December 2007 and December 2010



Source: Based on Allen and Moessner 2010, with updates.
 Note: Color of the arrows indicates the swap network, generally according to the central bank at the center of the network: blue is Switzerland, green is the ECB (European Central Bank), orange is China, red is Japan, and black is the United States; aqua arrows show a multilateral swap network between the central banks of China, Japan, and the Republic of Korea.

six months starting in October 2008 (the height of the crisis).

Global and regional organizations responded to the crisis by increasing their volume of lending to client countries. Among multilateral development banks, significant capital infusions also allowed more resources to be devoted to development initiatives in their member countries.³⁴ International negotiations surrounding postcrisis measures to reduce the probability of future financial crises have been led by organizations such as the International Monetary Fund (IMF) and the Group of 20 Finance Ministers and Central Bank Governors (G-20). The IMF's revised Flexible Credit Line, for example, together with its newly established Precautionary and Liquidity Line, are intended to improve the institution's capacity to assist countries heavily affected by the crisis and to prevent future crises. In 2010, the IMF also launched three new concessional financing facilities specifically for low-income countries. The IMF's proposed Global Stabilization Mechanism would provide liquidity in conjunction with bilateral and regional arrangements with the specific goal of arresting contagion across countries during financial crises.

International commitment to preventing episodes of financial contagion is currently being put to the test by the ongoing sovereign debt crisis in the Euro Area. In one sense, the world is signaling its recognition of the gravity of the situation by allocating additional resources to safety nets. As of the June 2012 meeting of the G-20, 37 IMF member countries had contributed a total of \$456 billion to the institution's firewall fund, which the institution intends to disburse only as a secondary line of defense after resources available via its standard quota arrangements and the New Arrangements to Borrow are significantly drawn down. Developing countries have been remarkably active in contributing to this fund, with the BRICS, along with Mexico and Turkey, pledging a combined \$95 billion of the total. This level of involvement by developing countries in international crisis prevention and resolution mechanisms will become increasingly important as developing countries account for a growing share of gross global capital flows in the years to come.

New modes of cross-country cooperation may be beneficial as the international financial system becomes ever more interconnected

Moving forward, a potentially fundamental question is whether the current decentralized model—in which national (or regional) central banks have control over their own monetary policy and financial regulation is crafted at the country level—is adequate for the task of managing an increasingly globalized financial system. The reality is that any model must fit into the constructs of a world made up of sovereign states. In such a world, perhaps the best way to arrive at outcomes that serve the needs of the most countries possible is to encourage cooperation at both the bilateral and multilateral levels, while acknowledging that a high degree of coordination is not always politically feasible and that national policies will continue to be key in shaping the world's monetary and financial policy framework.

The scope for cooperative efforts is broad and could take a number of forms. One form is participation in multilateral initiatives—such as those on monetary and financial stability and banking supervision led by the Bank for International Settlements—or public commitments to timelines for policy objectives within the G-20. One potential contribution of the G-20 process would be to emphasize the spillover and mutual dependence aspects of key currency countries' financial sector and monetary policy, and to ensure that key currency countries move away from a narrow policy focus on just their own economies. Synthesizing the efforts of multilateral institutions might also be called for.

Another form of cooperation is at the bilateral level, such as strengthening and institutionalizing the swap lines that provide liquidity to non-key currency countries during periods of instability or sharing knowledge and experience across countries. Recent crises in advanced economies hold valuable lessons for developing countries whose financial markets will become increasingly sophisticated and globally integrated in the years ahead. Regulatory institutions must be more forward-looking, with systems in place

to monitor new innovations in financial markets in real time—for example, by making this an explicit part of the job description for bank supervisors—and to quickly evaluate and adapt to innovations before they cause systemic risk.

The bottom line is that cooperation in monitoring and managing the international financial system cannot be overemphasized. In a highly interconnected system, international cooperation in managing the system is key for its stability. Multilateral institutions will continue to have a role in this management in the future, particularly in helping countries establish the conditions supporting the development and functioning of financial markets and assisting in coping with periods of crisis or near-crisis. But initiatives within international forums must be considered in light of efforts by authorities in individual countries. Regarding the response to the global financial crisis, the unprecedented provision of liquidity by major central banks to help resolve the crisis has fueled heated debate about the scale and nature of risks being taken in the process of unwinding their positions. At the same time, there is concern that extremely low interest rates in advanced economies could result in an overabundance of capital inflows to emerging and developing countries as investors search for yield elsewhere, with potentially destabilizing effects in those countries in the future.

As developing countries come to account for half or more of the world's capital outflows, their policies regarding capital flows are likely to become more influential at the global level

For a given country, the challenges of managing surges of capital inflows are by now well understood and continue to be relevant in understanding how emerging and developing countries may react to accommodative monetary policy conditions that persist in advanced economies. For emerging economies with fixed exchange rates, excessive capital inflows can present a difficult choice between allowing currency appreciation and intervening in foreign exchange markets to hold down the value of the currency. Monetary

authorities in emerging economies—facing strong capital inflows as a result of low interest rates in major economies—may feel it is necessary to ease interest rates to discourage inflows even if domestic macroeconomic conditions do not otherwise call for such a move, although the inflationary pressure of lowering rates must also be considered. Macroprudential responses might also be considered, perhaps targeting a specific sector, such as real estate, that is subject to overheating.

Faced with strong demand for their assets, even economies with floating exchange rates may resort to capital controls, such as Brazil and Taiwan, China, did in 2009, or as Switzerland implicitly began to do in 2011 when it committed to maintaining an exchange rate floor of the Swiss franc against the euro. In the longer term, countries reliant on capital inflows representing a large share of their GDP risk fiscal distress and recession should there be a sudden turnaround in those flows, at which point monetary authorities must step in to assist. It could be argued that there is potential danger for policy makers to err on the side of overly strict capital controls, choking off access to finance, when what is really needed is careful reform of regulatory institutions and greater international regulatory coordination.

Understanding the nature of capital inflows to emerging and developing economies—whether they are driven by good economic fundamentals within the country or by more transitory forces such as low yields in advanced economies or heavy use of carry trades—can help policy makers determine the best response. Deciphering whether fundamental or transitory forces are more powerful in driving capital inflows to a country is no doubt a difficult task, but one that has clear implications for policy. In the case of the former, it has been argued that allowing exchange rate appreciation is the most appropriate response; in the latter, monetary, fiscal, and financial policies should be employed (Sidaoui 2011).

Recognizing the potential impacts of prevailing conditions in advanced economies on the rest of the world is no doubt essential to crafting policy responses to those conditions. But how might policy responses need to change in the long term? The two scenarios presented in

this chapter anticipate sharp transitions in the regional patterns of capital flows through 2030. Under both scenarios, the share of global capital inflows going to Europe and the United States is projected to decline substantially, while the share going to China will increase considerably. A similar trend is expected in terms of the share of capital outflows. Several future policy implications follow from the scenarios.

Broadly, the course of global monetary and financial policy making will need to be adjusted at national and international levels to account for the implication that developing countries will become responsible for an expected half or more of the world's capital outflows. The two scenarios presented in this chapter envisage that developing countries will account for 49–58 percent of the world's global capital outflows by 2030, rising from 28 percent in 2010. This shift implies that developing countries' monetary and financial sector policies could be more influential at the global level—although, as noted previously, this notion must be balanced against the currency composition of global capital flows.

Among developing countries, China is unique in its potential to position its currency as a truly global currency during the coming years. Should the increase in the share of global capital flows attributable to China be accompanied by greater use of the renminbi as the currency denominating these flows (internationalization of the renminbi is a stated policy goal in China), then China's monetary policy stance can be expected to exert considerably stronger influence on the international financial system than it does at present. Under such a scenario, the world would also experience a decrease, to some extent, in the dominance of U.S. and Euro Area monetary policy on the global stage. One conceivable arrangement is that the U.S. dollar, the euro, and the renminbi will all be globally significant currencies by 2030 (World Bank 2011). Of course, alternate scenarios consider that either the dollar remains preeminent in global finance during the next two decades, or there is no clearly preeminent currency by 2030.

For small and medium-size developing countries, a world in which the United States, the Euro Area, and China all have key international

currencies implies that developing countries will become less affected by monetary policy spillovers from any one country. This could be stabilizing on a global level because liquidity shocks will be more diversified, but it could also be destabilizing as it becomes more difficult to assess the timing and extent of monetary policy spillovers. Regardless of the currency composition of capital flows in the future, an increasing share of global flows going to and from developing countries indicates that these countries should have a larger role in management of capital flows at the international level, within both bilateral and multilateral organizations.

There are also exchange rate regime implications of a potential shift in the currency composition of global capital flows. With more diversification in the currency makeup of capital flows, countries with fixed exchange rate regimes may find that it is more sustainable to peg to a basket of currencies (for example, the dollar, the euro, and the renminbi) than to any one of those currencies.

The rise in the volume of global capital flows in the decades ahead will increase the influence of foreign investors on capital accumulation in many countries. For some countries, it is conceivable that most of their total investment will be determined by overseas investors and creditors in the future, thus bringing an even greater international dimension to financial policy-making efforts. The efforts of the G-20, IMF, and BIS will be key in developing a financial supervisory architecture that enhances global financial market stability through, by other measures, avoiding excessive volatile speculative capital transactions.

Policy makers will need to monitor the channels of capital inflows (bank loans, portfolio investment, and FDI) because these channels have different capacities for stabilizing or destabilizing conditions in recipient countries. There is wide speculation that capital markets will intermediate a growing amount of global capital flows in the future and that banks will account for less. Whether this will be good news for countries that currently receive most of their inflows in the form of bank loans remains to be seen; bank lending tends to be highly procyclical and generally less supportive of risk sharing than FDI

or equity portfolio investment (Brunnermeier et al. 2012). But, in middle-income countries, portfolio investment has historically been even more volatile, in relative terms (that is, adjusting for the smaller magnitude of this component of developing countries' inflows), than bank lending (Broner et al. 2013).³⁵ Though the share of bank loans in global capital flows may well recede in the long term, it must also be acknowledged that loans will continue to represent a significant portion of global capital flows for years to come. The many efforts under way to improve regulation of the international banking sector thus will remain highly relevant.

Finally, as growing amounts of capital are transferred among developing countries, there is even capacity for greater regional monetary policy spillover from large emerging economies such as Brazil and Russia. These countries are not expected to have the global reach that China may, but it is conceivable that their influence could become increasingly apparent at the regional level. Certainly, in a multipolar world, South-South monetary policy coordination will become more critical in promoting stable financial and macroeconomic conditions in developing countries.

Notes

1. As in other recent scholarship, gross capital inflows in this report are measured as purchases of domestic assets by foreigners net of sales of domestic assets by foreigners, and gross outflows are measured as purchases of foreign assets by domestic residents net of sales of foreign assets by domestic residents. Net capital flows are defined as gross inflows minus gross outflows.
2. Lucas (1990) noted that if positive spillovers from human capital accumulation are sufficiently great and sufficiently local (spilling over more within countries than across borders), then differences in human capital might eliminate differences between countries in the return to capital entirely. However, not enough progress has been made in quantifying the scope of external benefits from knowledge spillovers or the degree to which these benefits spill across borders to resolve this question empirically.
3. Interest rates can also vary as widely between sectors within countries as they do between countries.

Estimates for the informal agricultural sector in Ghana, for example, place nominal rates there at as much as 350 percent (Udry and Anagol 2006), and real returns to microenterprises in Sri Lanka have been placed at several percentage points higher than prevailing market interest rates (De Mel, McKenzie, and Woodruff 2008).

4. Some approaches effectively lump land and natural resources together with capital by estimating the income share of capital as one minus the income share of labor, in which case the income share of capital is overestimated. Caselli and Feyrer (2007) estimate that only about half of this amount, on average, should actually be attributed to reproducible capital, but this follows from estimates of the contribution of land and natural resources to production that may be overly aggressive.
5. Details are reported in online annex 3.1, available at <http://www.worldbank.org/CapitalForTheFuture>.
6. Averages for each income group were computed by weighting yields for each country by their relative share of the group's capital stock.
7. The notional investment demand equation is calculated across time at the country level, holding yields constant at 2014 levels, and this is summed across countries to estimate a path of global notional investment demand. This straightforward measure of notional demand abstracts from the endogeneity of variables such as output on the right-hand side of the factor demand equation, as these variables follow the path generated by the model, which is codetermined with the realized path of investment as opposed to the path of notional investment demand. In the special case when, globally, yields tend to change little over time, the distortion from not accounting for endogeneity is quite minor because notional demand barely differs from realized demand in this case.
8. More precisely, 2030 global *notional* investment demand is within 0.04 percent of the supply of saving. Note that, at the global level, the supply of capital will be equal to the pool of saving, and this represents the notional global supply of saving for investment because—by the assumptions of the model—saving is not affected by yields.
9. More precisely, 2030 global notional demand exceeds global supply by 2.6 percent; this pressure corresponds to a cumulative increase in global average yields (weighted by capital stocks) of roughly half a percentage point between 2014 and 2030.
10. It is also important to recognize that a scenario with rapid growth alone (unaccompanied by changes in

- structural factors) does not result in global saving and investment deviating significantly from the gradual convergence scenario. This underscores the importance of allowing structural variables to experience substantial change—as is considered in the rapid convergence scenario—to grasp the full extent of potential transformations in the developing world for global saving and investment outcomes.
11. Higgins (1998) and Lane and Milesi-Ferretti (2002) point to potential effects that changes in the age structure of populations have on current account balances, but the theoretical direction of the effect is ambiguous because aging can affect both saving and investment negatively (and potentially nonlinearly). In the scenario analysis in this report, the impact of demographic change on net capital flows is not directly identified, but the model generating the scenario results does incorporate projected changes in the age structure. Further details are given in online annex 1.6.
 12. Details of how the two scenarios are constructed can be found in online annex 1.6. Details of the current account balance projection calculations are in online annex 3.2.
 13. In the CGE model, the parameters in the investment equation are calibrated uniformly across countries based on results from a panel regression, with an implicit assumption that the future path of investment will be determined similarly across countries. Details are given in online annexes 1.5 and 1.6. For China, investment has historically been higher than would be predicted by the model, so its projected path reflects an adjustment down to what would be expected for a typical country, given the paths of the right-hand-side variables.
 14. The relatively large differential in high-income versus developing-country yields described earlier raises the Lucas (1990) question of why capital can flow “uphill” from the South to the North in the model. The reason for this is that the key endogenous variables in the World Bank’s LINKAGE model are calibrated to observed 2007 data, allowing surpluses (deficits) to coexist with positive (negative) yield differentials. Consequently, only subsequent movements of yields, along with the other determinants of investment financing, have the potential to alter the path of net capital flows. The mitigation of the Lucas paradox relative to levels today in the rapid convergence scenario thus has two interrelated reasons: first, investment demand in many developing countries is greater, which raises country-specific relative yields and hence capital inflows to finance realized investment; second, realized investment is also greater because developing countries can attract more investment financing as their financial development and institutional quality improve substantially.
 15. Under the rapid convergence scenario, high-income countries’ investment falls from 17.3 percent of the group’s GDP in 2010 to 14.9 percent in 2030, compared with 16.4 percent in 2030 under the gradual convergence scenario. The group’s saving rate in 2030 does not differ significantly between the two scenarios, so the difference in the group’s aggregate current account balance is due mainly to this difference in investment rates.
 16. Blanchard and Milesi-Ferretti (2010) distinguish between “good imbalances” and “bad imbalances,” and provide a summary of how domestic and systemic distortions can give rise to potentially destabilizing imbalances. The main role of national-level policy makers is to address domestic distortions of incentives to save and invest in their economies, whereas there is also a role for international policy coordination in addressing systemic distortions—for example, by improving global liquidity provision.
 17. In the LINKAGE model, national saving does depend negatively on the degree of social security protection. Details are given in online annexes 1.5 and 1.6.
 18. Advanced economies might reduce current account deficits by increasing public saving and encouraging private saving by avoiding negative real interest rates over extended periods (see, for example, Blanchard and Milesi-Ferretti 2010).
 19. Lane and Milesi-Ferretti (2001, 2007), for example, document a transition in the composition of emerging markets’ international balance sheets to a large FDI and portfolio equity component of liabilities, with heavy reserve accumulation on the asset side.
 20. At the peak in 2007, global gross capital flows amounted to \$11 trillion—an amount equivalent to 19 percent of world GDP—up from \$0.4 trillion in 1980 and approximately \$3.7 trillion in 2000. At the nadir in 2009, total global gross capital flows had dropped to \$1.8 trillion.
 21. In 2010, for example, among majority foreign-owned banks in developing countries, 34.6 percent (350 banks) had another developing country as the main nationality of ownership, up from 29.3 percent (212 banks) in 2000 (authors’

- calculations based on bank shareholder data on banks in Bankscope).
22. Didier, Hevia, and Schmukler (2011) show, however, that the crisis affected economic performance in high-income and developing countries similarly when differences in precrisis growth rates are accounted for, and also that there was wide variation among developing countries, with Eastern European countries among the most affected and low-income countries relatively isolated from the global crisis.
 23. For example, Martin and Rey (2004) build a theoretical model with transaction costs in which financial assets are imperfect substitutes and the number of assets is endogenous, which gives rise to a link between market size and integration, and asset returns. Another formal model of how greater integration of financial markets can drive an expansion of capital flows is developed by Evans and Hnatkowska (2005); the model implies a relationship between integration and changes in the composition and volatility of capital flows as well.
 24. Lucas (1990) compares international diversification to that predicted by a portfolio model and reviews a range of possible sources of home bias. Kraay et al. (2005) incorporates sovereign risk in such a model to reconcile the predictions of the model to the data. A growing body of literature supports the idea that informational asymmetries are important in explaining capital flows; see, for example, Kang and Stulz (1997); Ahearne, Grier, and Warnock (2004); and Leuz, Lins, and Warnock (2009).
 25. The scenarios for outflows are calculated as a residual of the gross inflow and current account projections, rather than being explicitly modeled (as in online annex 3.4), and thus are admittedly less theoretically grounded. Some factors that drive residents' capital outflows from a country are not taken into account, and these may differ significantly from the factors that drive foreigners' capital flows into the country and the determinants of current accounts. To the extent that income growth and the development and global integration of financial markets are likely drivers of gross outflows, however, these effects are accounted for by the modeling strategy via their intermediary impact on gross inflows.
 26. In addition, the currency makeup of the components themselves may evolve with financial market development. For example, in some larger developing countries, domestic bond market development could lead to more inflows in the form of bonds denominated in domestic currency.
 27. Hooper and Kim (2007) estimate the association of various measures of transparency with the three main components of capital inflows to developing countries and find that the relationships vary widely, both by dimension of transparency and by type of inflow, so that, broadly speaking, an increase in transparency over time can be expected to affect the composition of capital flows. For example, an index of competitiveness is found to have a much larger positive association with portfolio flows than with FDI, and a negative association with bank lending; stock market depth similarly has a positive association with portfolio flows and a negative association with bank lending (and, in this case, an association with FDI that is not statistically significant).
 28. These shares are based only on the portion of reserves voluntarily identified by central banks to the International Monetary Fund to be denominated in a specific currency. In 2010, the currency of 56 percent of total reserve holdings was identified.
 29. These effects may not be additive because liquidity in each of the currencies may not be easily substitutable, particularly during times of financial distress, as experienced during the recent crisis when acute dollar shortage in international markets pushed up the costs of borrowing in foreign currencies and swapping the proceeds into dollars. In particular, the intensive funding pressures experienced by European banks increased the euro-dollar implied swap basis spread.
 30. A second source of monetary policy spillover is that, given the importance of the United States in the world economy, spillovers from the United States may influence economic conditions in other countries, such that business cycles become synchronized and corresponding fiscal and monetary policy stances become similar across countries. For instance, a demand shock in the United States may increase both U.S. economic activity and U.S. imports, inducing a rise in interest rates in the United States and abroad.
 31. This outcome depends on political commitment in China to move toward full currency convertibility and institutional transparency. An expanded discussion of the conditions necessary for the renminbi to become an international currency is in World Bank (2011).
 32. In the context of the present uncertainty surrounding the institutional arrangement of the Euro Area, it should be noted that the extent to

which the euro will be used as an international currency over the next one or two decades depends to some extent on the resolution of inconsistencies between the Euro Area's monetary and fiscal institutions.

33. East Asian countries had a network of swap lines already in place, part of the legacy of the 1997–98 Asian financial crisis, although the People's Bank of China created new swap lines and expanded existing ones (Allen and Moessner 2010).
34. The International Monetary Fund, traditionally considered the global lender of last resort for countries facing financial crises, tripled its lending capacity in response to the crisis. Multilateral development banks (MDBs), as well, expanded their volume of lending to client countries. The increase in lending by MDBs was possible following significant capital increases within many of the institutions. In March 2011, the International Bank for Reconstruction and Development's board of governors approved an \$86.2 billion (31 percent) increase in subscribed capital, including \$5.1 billion over the next five years. Shareholders of the Asian Development Bank agreed in April 2009 to triple the institution's capital base, from \$55 billion to \$165 billion, the largest general capital increase among the major MDBs, including a 4 percent increase of paid-in capital over the next five years. In 2010, the Inter-American Development Bank approved a \$70 billion (70 percent) increase in general capital, and the African Development Bank approved a \$63 billion (200 percent) increase.
35. At the same time, rapid adjustment of asset prices means that foreign holders of equity absorb much of a negative shock before they can exit, and thus may be less likely to exit in response to the shock. However, investors face high costs of monitoring a fund manager's medium- to long-run performance, and this can tend to induce a focus on short-term returns and herding behavior (De la Torre, Ize, and Schmukler 2011; World Bank 2012).

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The gradual acceleration of growth in developing countries is a defining feature of the past two decades. This acceleration came with major shifts in patterns of investment, saving, and capital flows. This second volume in the *Global Development Horizons* series analyzes these shifts and explores how they may evolve through 2030.

Average domestic saving in developing countries stood at 34 percent of their GDP in 2010, up from 24 percent in 1990, while their investment was around 33 percent of their GDP in 2012, up from 26 percent. These trends in saving and investment, along with higher growth rates in developing countries, have resulted in developing countries' share of global savings now standing at 46 percent, nearly double the level of the 1990s.

The presence of developing countries on the global stage will continue to expand over the next two decades. Analysis presented in this report projects that by 2030, China will account for 30 percent of global investment activity, far and away the largest share of any single country, while India and Brazil (at 7 percent and 3 percent, respectively) will account for shares comparable to the United States and Japan (11 percent and 5 percent, respectively). The complex interaction

among aging, growth, and financial deepening can be expected to result in a world where developing countries will contribute 62 of every 100 dollars of world saving in 2030, up from 45 dollars in 2010, and where they account for between \$6.2 trillion and \$13 trillion (47 percent to 60 percent) of global gross capital flows, rising from \$1.3 trillion (23 percent) in 2010.

Trends in investment, saving, and capital flows through 2030 will affect economic conditions from the household level to the global macroeconomic level, with implications not only for national policy makers but also for international institutions and policy coordination. Policy makers preparing for this change will benefit from a better understanding of the unfolding dynamics of global capital and wealth in the future.

This book is accompanied by a website, <http://www.worldbank.org/CapitalForTheFuture>, that includes a host of related electronic resources: data sets underlying the two main scenarios presented in the report, background papers, technical appendixes, interactive widgets that allow the interested reader to explore variations to some of the assumptions used in the projections, and related audio and video resources.