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
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). 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). 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). 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). 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.
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 B1.1.1** Differentials in investment rates (panel a) and capital-output ratios (panel b) are greater when measured in PPP terms


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.
The Emerging Pattern of Global Investment

Global Development Horizons

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

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


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


Note: Shaded area corresponds to the period from 2000 onward, where a break in the series occurred in a simple linear regression on time in the 1965–99 period for the full developing country subsample is $I = -0.0117 + 21.360$, where $I$ is total gross investment and $t$ is the year, while that for the 2000–10 period is $I = 0.024 - 49.312$; the Chow test $F = 52.06$ is significant at the 1 percent level.
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

![Investment Rates Chart]


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

<table>
<thead>
<tr>
<th>Number of booms</th>
<th>Economies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>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</td>
</tr>
<tr>
<td>2</td>
<td>Jordan; Malaysia; Venezuela, RB</td>
</tr>
<tr>
<td>4</td>
<td>Lesotho</td>
</tr>
</tbody>
</table>


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)
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).
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). 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...
The Emerging Pattern of Global Investment

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

<table>
<thead>
<tr>
<th></th>
<th>Brazil</th>
<th>China</th>
<th>India</th>
<th>Indonesia</th>
<th>Mexico</th>
<th>Russian Federation</th>
<th>Turkey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economywide</td>
<td>0.17</td>
<td>0.22</td>
<td>0.24</td>
<td>0.26</td>
<td>0.27</td>
<td>0.03</td>
<td>0.48</td>
</tr>
<tr>
<td>Agriculture</td>
<td>0.28</td>
<td>0.29</td>
<td>0.19</td>
<td>0.14</td>
<td>0.10</td>
<td>0.03</td>
<td>0.34</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>—</td>
<td>0.08</td>
<td>0.35</td>
<td>0.11</td>
<td>0.27</td>
<td>—</td>
<td>1.17</td>
</tr>
<tr>
<td>Services</td>
<td>—</td>
<td>8.78*</td>
<td>0.19</td>
<td>—</td>
<td>0.24</td>
<td>—</td>
<td>0.19</td>
</tr>
</tbody>
</table>

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 $MPK_j = \alpha_j Y_t / K_t$, where $Y$ and $K$ are gross domestic product (GDP) and the capital stock formation, respectively, and $\alpha$ is computed from the share of compensation to physical capital in that sector (or economywide), excluding natural capital. Sectoral GDFPs 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-Oczan and Sørensen 2012), Eastern Europe (Bartrelsen, Haitiwanger, 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
Global Development Horizons

The Emerging Pattern of Global Investment 27

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)


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 (Mostroux, 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). 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, and India—to pick up the slack as major financiers of infrastructure projects in Africa.
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
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. In 1980, global capital (measured using the perpetual inventory method), 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.
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 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.

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)
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 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

---

**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, creditworthy 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**

<table>
<thead>
<tr>
<th>Sector</th>
<th>Country</th>
<th>Value ($ billions)</th>
<th>Financing breakdown ($ billions)</th>
<th>Sponsors (country, stake)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dolphin Gas Pipeline</td>
<td>Oil and gas</td>
<td>United Arab Emirates</td>
<td>4.1 Bond (1.3); syndicated loan (1.4); covered loan (0.2); shareholder loan (1.2)</td>
<td>Mubadala (United Arab Emirates, 61%); Total (France, 25%); Occidental Petrol (United States, 25%)</td>
</tr>
<tr>
<td>Shuweihat 2 IWPP</td>
<td>Power</td>
<td>United Arab Emirates</td>
<td>2.6 Syndicated loan (2.1, 2 tranches); sponsor equity (0.5)</td>
<td>Abu Dhabi Water and Elec (United Arab Emirates, 60%); Suez (France, 20%); Marubeni (Japan, 20%)</td>
</tr>
<tr>
<td>Rabigh IPP</td>
<td>Oil and gas, power</td>
<td>Saudi Arabia</td>
<td>2.5 Syndicated loan (1.9); sponsor equity (0.5)</td>
<td>ACWA Power (Saudi Arabia, 40%); Kepco (United States, 40%); Saudi Electricity (Saudi Arabia, 20%)</td>
</tr>
<tr>
<td>Ras Laffan LNG Project</td>
<td>Oil and gas</td>
<td>Qatar</td>
<td>2.2 Bond (0.5 3-yr, 1.1 5-yr, 0.6 10-yr)</td>
<td>n.a.</td>
</tr>
<tr>
<td>Al Dur IWPP</td>
<td>Power and desalination</td>
<td>Bahrain</td>
<td>2.2 Syndicated loan (1.3); senior public bond (0.1), sponsor equity (0.6)</td>
<td>Suez (France, 40%); GIC (Singapore 20%); SIO (Bahrain, 10%); Cap Mgmt Hse (Bahrain, 25%); Instrata (Bahrain, 5%)</td>
</tr>
</tbody>
</table>

Note: IPP = independent power project, IWPP = independent water and power project, LNG = liquefied natural gas, n.a. = not applicable.
The geographical distribution of capital stocks has gradually shifted to developing countries over the past three decades.

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

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

![Graph showing adjusted capital stocks](image)


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.

### 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).
The Emerging Pattern of Global Investment

**Global Development Horizons**

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), 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

---

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


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.
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. 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.

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. 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
The emerging pattern of global 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.
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). Therefore, increased uncertainty about future economic prospects may dampen aggregate investment as firms retain their option value by postponing capital formation decisions. 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).
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 $Q$s (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 $Q$s 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 $Q$s 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


*Note: Data are for 2010. Country-level Tobin’s average $Q$s 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

![Graph showing investment rate response to uncertainty](image-url)
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.

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


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.
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 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
The Emerging Pattern of Global Investment

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).

The rapidly converging 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 1.14](image_url)
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).
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. In the gradual convergence scenario, 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). There will also be significant upsticks 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 healthcare 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).
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, biofuels, 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 are projected to rise by 3.4 and 5.8 percentage points, respectively. In contrast, investment in manufacturing is expected to grow at a slower pace in most developing countries, with Eastern Europe and Central Asia and Latin America and the Caribbean showing the most significant gains in share (1.8 and 3.0 percentage points, respectively).

### 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

<table>
<thead>
<tr>
<th>Developing countries</th>
<th>Agriculture</th>
<th>Manufacturing</th>
<th>Services</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Share (%)</td>
<td>Growth (%)</td>
<td>Share (%)</td>
</tr>
<tr>
<td>East Asia and Pacific</td>
<td>11</td>
<td>6.4</td>
<td>34</td>
</tr>
<tr>
<td>China</td>
<td>10</td>
<td>7.4</td>
<td>35</td>
</tr>
<tr>
<td>Indonesia</td>
<td>22</td>
<td>4.5</td>
<td>24</td>
</tr>
<tr>
<td>Eastern Europe and Central Asia</td>
<td>12</td>
<td>1.8</td>
<td>18</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>17</td>
<td>1.7</td>
<td>11</td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>10</td>
<td>3.0</td>
<td>19</td>
</tr>
<tr>
<td>Brazil</td>
<td>11</td>
<td>3.4</td>
<td>16</td>
</tr>
<tr>
<td>Mexico</td>
<td>4</td>
<td>2.8</td>
<td>20</td>
</tr>
<tr>
<td>Middle East and North Africa</td>
<td>39</td>
<td>3.1</td>
<td>16</td>
</tr>
<tr>
<td>South Asia</td>
<td>14</td>
<td>5.1</td>
<td>17</td>
</tr>
<tr>
<td>India</td>
<td>13</td>
<td>5.4</td>
<td>17</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>26</td>
<td>5.4</td>
<td>17</td>
</tr>
<tr>
<td>South Africa</td>
<td>4</td>
<td>1.6</td>
<td>21</td>
</tr>
<tr>
<td>High-income countries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Europe</td>
<td>3</td>
<td>−0.9</td>
<td>16</td>
</tr>
<tr>
<td>Japan</td>
<td>1</td>
<td>−1.2</td>
<td>15</td>
</tr>
<tr>
<td>United States</td>
<td>3</td>
<td>−0.8</td>
<td>13</td>
</tr>
</tbody>
</table>


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.
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. 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 policymakers.

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 policymakers 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. 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). 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 intra-country 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. As these needs taper off, fixed-line infrastructure will increase in importance. Power and transportation needs are likely to
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 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 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 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).

**Conclusion and policy directions**

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

### 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 Loury 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.
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 \( \widehat{r} \) 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 Valentin 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.

References


18048, National Bureau of Economic Research, Cambridge, MA.
Dobbs, Richard, Susan Lund, Charles Roxburgh, James Manyika, Alex Kim, Andreas Schreiner, Ricardo Boin, Rohit Chopra, Sebastian Jauch, Hyun Kim, Megan McDonald, and John Piotrowski.


GTAP (Global Trade Analysis Project) database. Center for Global Trade Analysis, Department of Agricultural Economics, Purdue University, West Lafayette, IN. https://www.gtap.agecon.purdue.edu/#2.


