

Financing Productivity- and Innovation-Led Growth in Developing Asia: International Lessons and Policy Issues

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Abstract

Growth in developing Asia will need to rely more on improvements in productivity growth and less on capital deepening. Although there is no single reform path to spur productivity growth, financial system deepening is central to a more efficient allocation of capital across sectors and can facilitate innovation and technology transfer. But malfunctioning financial systems can also result in the misallocation of resources, making it important that policymakers focus less on increasing the size of the financial sector and more on improving its intermediation function. The paper discusses the general policy priorities for further financial development in Asia based on financial sector realities in the region and the level of country income. Steps to mobilize Asia's ample private savings for long-term financing, especially to tackle the region's infrastructure deficit and improve access to financing for small and medium enterprises, can help raise productivity. Further, as many countries in Asia shift from a development model based on technology absorption to one that promotes innovation, specialized finance and investors can play a critical role in allowing innovative firms to conduct research, adopt technologies necessary for inventions, and ultimately commercialize innovations.

JEL codes: G21, G23, G24, G28, O30, O40, O53

Keywords: Asia, financial sector, productivity

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Developing Asia's strong growth record over the last three decades has been the envy of the world. The region's growth was dented during the 1997–98 Asian financial crisis and the 2008–09 global crisis but rebounded quickly from both episodes. The impressive growth record, which has been largely dependent on investment and factor accumulation, not only raised income and reduced poverty but also expanded the region's global influence. In the future, however, growth in much of developing Asia will need to rely progressively more on higher productivity growth and less on capital deepening. Richer countries in developing Asia will also need to shift from a development model based on technology absorption to one that fosters innovation.

It will therefore be important for developing Asia to implement productivity-enhancing reforms to facilitate structural transformation into higher productivity sectors, improve the allocation of resources, and spur technological catchup. There is, however, no single reform path to spur productivity growth. Rather, higher productivity growth has been associated with more and better infrastructure and human capital, open trade, efficient and well-developed financial systems, and economic institutions that promote competition and encourage entrepreneurship and innovation. This makes it vital to implement a set of targeted and interlocking reforms to achieve the necessary structural change, reduction in resource misallocation, and technology transfer.

Furthermore, the reform priorities to spur productivity- and innovation-led growth will vary across income groups and the degree of technological advancement attained relative to advanced countries. Empirical studies suggest the following calibration of reform priorities to the stage of development (Dabla-Norris et al. 2013):

- In low-income countries, reforms should focus on strengthening economic institutions needed for market-based economic activity, reducing trade barriers, reforming agricultural and banking sectors, and improving basic education and infrastructure.
- In lower-middle-income countries, the focus should be on reforms in banking and agriculture, reducing barriers to foreign direct investment (FDI), and increasing competition in product markets to spur a more dynamic service sector, improving secondary and tertiary education, and alleviating infrastructure bottlenecks.
- And in upper-middle-income countries, deepening capital markets, developing more competitive and flexible product and labor markets, fostering a more skilled labor force, and investing in research and development of new technologies will be paramount.

Regardless of the stage of development, this is a wide-ranging reform agenda. A common element for all income groups, however, is the importance of building strong domestic financial systems to sustain

high growth. Although the precise needs vary across income groups, financial system deepening is central to a more efficient allocation of capital across sectors and can facilitate innovation and technology transfer.

This paper focuses on the policies required for Asia's financial systems to better support growth that is led by productivity and innovation. The next section reviews studies on developing Asia's historical growth record and long-term prospects to establish that future growth will need to rely progressively more on improvements in productivity growth and less on capital deepening. The risk of falling into a "middle-income trap" is also discussed. The third section discusses the policy implications of empirical research that has emerged in the aftermath of the 2008–09 global financial crisis, which highlights nonlinearities in the relationship between financial development and economic growth and the danger that malfunctioning financial systems can result in the misallocation of resources. An important implication is that policymakers, especially in countries at the higher end of the income scale, should focus less on increasing the size of the financial sector and more on improving its intermediation function.

The fourth section outlines the general policy priorities for further financial development in developing Asia based on existing financial sector realities in the region and the level of country income. In view of the link to productivity, focus is put on mobilizing Asia's ample private savings for long-term financing, especially to tackle the region's infrastructure deficit, and on improving access to financing for small and medium enterprises (SMEs). As many countries in Asia shift from a development model based on technology absorption to one that promotes innovation, fifth section discusses the critical role of specialized finance and investors in allowing innovative firms to conduct research, adopt technologies necessary for inventions, and ultimately commercialize innovations. Concluding remarks are offered in the last section.

LONG-TERM GROWTH PROSPECTS AND ROLE OF PRODUCTIVITY

Asia's admirable economic growth and transformation has been the subject of numerous empirical studies. Jong-Wha Lee and Kiseok Hong (2010) and Donghyun Park and Jungsoo Park (2010) of the Asian Development Bank (ADB) use a growth accounting framework and find that growth in capital accumulation was a key factor behind developing Asia's remarkable economic expansion, especially in the 1980s and 1990s.¹ By contrast, their results show that the contribution of labor input, education, and total factor productivity (TFP) to real GDP growth was more moderate. Park and Park, however, found an important structural shift in the pattern of developing Asia's economic growth around 2002, with TFP beginning to play a larger role in the region's growth.

1. The analyses in Lee and Hong (2010) and Park and Park (2010) cover the People's Republic of China; Hong Kong, China; India; Indonesia; Malaysia; Pakistan; the Philippines; the Republic of Korea; Singapore; Taipei, China; Thailand; and Viet Nam, which together account for 95 percent of developing Asia's GDP, thus making this group representative of regional trends.

Lee and Hong (2010) also address the central question of whether developing Asia's rapid growth can continue in the next two decades. Their baseline projections (without significant reforms) suggest that future growth will tend to be lower than historical performance in most of the Asian economies they analyze. In particular, as these economies have already registered high rates of capital accumulation in the last three decades, the marginal productivity of capital is set to decline. Furthermore, for many economies the demographic dividend is projected to wane, constraining the contribution to growth from labor. Park and Park (2010) reach a similar conclusion and highlight the importance of policymakers pursuing supply-side policies that foster productivity growth to sustain developing Asia's future growth.

In a more recent study, David Roland-Holst and Guntur Sugiyarto (2014) use a calibrated general equilibrium (CGE) model, rather than a growth accounting framework, to capture detailed trade and domestic market interactions between and within Asia and in its relationship to the rest of the world to generate long-term forecasts for Asian economies. Their long-term forecasts also suggest that TFP growth will be essential to improve livelihoods generally and promote regional convergence in particular. Looking at a variety of policies that facilitate productivity growth, they also find that deeper Asian financial integration results in the biggest growth dividend.

Estimates in Luis Cubeddu et al. (2014) confirm that the contribution of TFP to real GDP growth in emerging market Asia picked up markedly in the period 2000–12.² But notwithstanding the improvement in TFP, factor accumulation remained an important driver of growth, with strong terms of trade growth and easy financing conditions facilitating higher investment. Furthermore, they suggest that the increase in productivity growth likely reflects gains from reforms in earlier decades (e.g., increased trade and financial liberalization); the reallocation of factors to higher productivity sectors (e.g., employment shifts out of agriculture to higher productivity manufacturing); and spillovers from increased foreign direct investment. But they also warn that such productivity gains could be partly temporary because productivity measures tend to be procyclical and are often overestimated in boom years, and that without additional reforms TFP growth may be lower over the medium term.

Fear of a sustained growth slowdown in middle-income economies after a period of sustained rapid growth has prompted a literature on the so-called middle-income trap.³ Unless they move up the value chain, countries that get caught in this trap find it difficult to compete with either low-income countries that have the advantage of lower labor costs or high-income countries that rely more on high-tech products and services. Barry Eichengreen, Donghyun Park, and Kwanho Shin (2013) analyze the

2. The emerging-market Asia group analyzed in Cubeddu et al. (2014) includes the same countries as in Lee and Hong (2010) and Park and Park (2010), except that it does not include Pakistan and it adds Brunei Darussalam and Sri Lanka.

3. In Asia, only the Republic of Korea; Taipei, China; Hong Kong, China; and Singapore have moved up from middle income to high income, as classified by the World Bank as economies with a gross national income per capita of \$12,476 or more.

historical experience with growth slowdowns to shed light on future prospects. Their analysis indicates that slowdowns are more likely when old age dependency ratios are high, investment rates are elevated (as this may translate into low future returns on capital), and real exchange rates are undervalued (as this provides a disincentive to move up the technology ladder). They also point out that these patterns are consistent with conditions and policies in the People's Republic of China (PRC). Eichengreen, Park, and Shin also find that slowdowns are less likely in countries with high levels of secondary and tertiary education and where high-tech products account for a large share of exports, underscoring the importance of moving up the technology ladder to avoid the middle-income trap.

Similarly, Shekhar Aiyar et al. (2013) find that a number of emerging Asian economies run the risk of falling into a middle-income trap.⁴ They emphasize that whether a country will experience a sustained growth slowdown depends on the quality of its policies and institutions and also a range of structural features such as trade structure, infrastructure, demographics, and macroeconomics (e.g., investment and capital inflows). Lant Pritchett and Lawrence Summers (2013), however, take a different approach, arguing that regression to the mean is the empirically most salient feature of economic growth, a feature that shows greater robustness in the data than the middle-income trap. But even they highlight the importance of the quality of policies and institutions, noting that the risk of an abrupt end of episodes of growth well above the mean is much higher with weak institutions and organizations for policy implementation.

The common conclusion of various studies of Asia's historical growth record and future prospects is that growth will need to rely progressively more on improvements in productivity growth and less on capital deepening. This is not to say that investment and factor accumulation will not be important drivers of growth, especially in low- and middle-income countries with large infrastructure gaps, but rather that productivity will need to become a more important driver of growth in developing Asia.

Although there is no single reform path to spur productivity growth and policy needs vary across income groups, financial system deepening is central to a more efficient allocation of capital across sectors and can facilitate innovation and technology transfer. Before turning to the central issue of the policies required for Asia's financial systems to better support growth that is led by productivity and innovation, it is worthwhile to review some of the recent developments in the literature on the nexus between finance and growth, prompted in part by the 2008–09 global financial crisis and its aftermath.

4. See also Tho (2013) and Felipe (2012) for an analysis of the middle-income trap in Asia.

FINANCIAL DEVELOPMENT AND GROWTH: IMPLICATIONS OF THE EVOLVING LITERATURE

The theoretical and empirical literature on the role of the financial system in influencing economic growth is vast and continues to evolve. A classic survey by Ross Levine (2005) concluded that the predominant evidence suggests that both financial intermediaries and markets matter for growth and that this relationship is not driven solely by reverse causality.⁵ An important insight of this literature is that financial development and deepening affect growth primarily by fostering more efficient allocation of capital across firms and industries and spurring productivity growth and not by raising the rate of aggregate saving or capital accumulation (Beck, Levine, and Loayza 2000; Rajan and Zingales 2001; Tresselt 2008).

The financial system's impact on growth depends on how well it performs its critical functions of mobilizing savings, allocating those savings, monitoring the use of those funds by firms and individuals, pooling and diversifying risk, and easing the exchange of goods and services. Levine (2011, 276–77) summarizes the channels through which a well-performing financial system tends to promote growth and expand economic opportunities:

Financial systems that perform these functions well promote growth. For example, when banks screen borrowers effectively and identify firms with the most promising prospects, this is a first step in boosting productivity growth. When financial markets and institutions mobilize savings from disparate households to invest in these promising projects, this represents a second crucial step in fostering growth. When financial institutions monitor the use of investments and scrutinize their managerial performance, this is an additional, essential ingredient in boosting the operational efficiency of corporations, reducing waste and fraud, and spurring economic growth. When securities markets ease the diversification of risk, this encourages investment in higher-return projects that might be shunned without effective risk management vehicles. And, when financial systems lower transactions costs, this facilitates trade and specialization, which are fundamental inputs into technological innovation and economic growth.

But Levine (2011) also emphasizes that growth is hindered when financial systems perform poorly. Examples he highlights include when financial systems simply collect funds and pass them along to cronies, the wealthy, and politically connected, the result is a misallocation of resources and slower economic growth. Or when financial institutions fail to exert sound corporate governance, managers find it easier to pursue projects that benefit themselves rather than the firm and the overall economy.

5. The issue of causality, however, is not settled and Joan Robinson's (1952) dictum that "where enterprise leads, finance follows" also has resonance. Recent skeptics include Rodrik and Subramanian (2009), whose focus is on financial globalization. In addition, whether finance matters for steady-state growth or for convergence has also been questioned, with Aghion, Howitt, and Mayer-Foulkes (2005) suggesting that financial development speeds up convergence but does not affect long-run growth.

Similar concerns have given rise to a new strand of empirical research that raise new doubts about the relationship between financial development and economic growth.⁶ The origins of this literature are related in part to questions raised by academics and policymakers in the aftermath of the 2008–09 global financial crisis about the possibility that malfunctioning financial systems can discourage saving and encourage speculation, resulting in underinvestment and a misallocation of resources (Law and Singh 2014).⁷ Using a variety of methodologies, a number of papers in this new literature find troubling results about the relationship between financial development and economic growth.

A key conclusion of the new literature is that there are nonlinearities in the relationship between finance and growth—namely, the level of financial development is good only up to a point, after which it can inhibit growth (Arcand, Berkes, and Panizza 2012; Beck et al. 2012; Cecchetti and Kharroubi 2012 and 2013; Gambacorta, Yang, and Tsatsaronis 2014; Law and Singh 2014).⁸ At low levels, a larger financial system does go hand-in-hand with higher productivity growth, but at what point does increased financial activity become associated with lower growth? The studies examining this question suggest that finance starts to have a negative effect on output growth when credit to the private sector reaches a threshold of between 90 and 120 percent depending on the country sample and estimation methodology used.

The data samples in these studies have typically included both advanced and emerging-market economies, with the negative relationship more relevant for high-income countries. Focusing only on a sample of 21 advanced economies, Stephen G. Cecchetti and Enisse Kharroubi (2012) also find that a fast-growing financial sector is detrimental to aggregate productivity growth, suggesting that financial booms are bad for trend growth. But by the same token, there is evidence that the effect of financial deepening is stronger for low- and middle-income countries; for financial development below the credit-to-GDP threshold, increased financial depth will exert a positive effect on growth.

Various explanations, which are not mutually exclusive, have been offered for the nonlinear relationship between finance and growth. A partial list includes, first, that financial development helps countries catch up to the productivity frontier, but it has limited or no growth effect for countries that are close to the frontier (Aghion, Howitt, and Mayer-Foulkes 2005). Second, who gets the credit matters. The growth effect of financial deepening comes through credit to firms rather than credit to households

6. Panizza (2013) provides a selective summary of this new literature, which qualifies the results of what he calls the “traditional” literature covered in the Levine (2005) survey. Beck (2012) and Sawyer (2014) also review some of this new literature.

7. Such concerns are not new. For example, Jose De Gregorio and Pablo Guidotti (1995) find that higher financial intermediation when the financial system is liberalized but allowed to operate in a poor regulatory environment may have negative effects on growth performance. An important point made in much of the new literature, however, is that the correlation between financial depth and growth may dissipate even for countries with good policies and institutions.

8. Other notable cautionary studies on the efficiency of modern finance include Barajas et al. (2013), Greenwood and Scharfstein (2013), Philippon (2012), Rousseau and Wachtel (2011), and Demirguc-Kunt and Huizinga (2010).

(Beck et al. 2012). To the extent that financial deepening in high-income countries comes through additional household lending, it might explain the insignificant finance-growth relationship across high-income countries. Thus, the issue might not be “too much finance” but rather “too much household finance” (Panizza 2013). Third, as financial systems grow too large relative to the real economy, they compete for resources with the rest of the economy, requiring not only physical capital but also highly skilled workers (Philippon 2010). As put by Cecchetti and Kharroubi (2012, pp. 1-2): “Finance literally bids rocket scientists away from the satellite industry. The result is that people who might have become scientists, who in another age dreamt of curing cancer or flying to Mars, today dream of becoming hedge fund managers.” Finally, although the empirical literature focuses on financial depth as measured by credit to the private sector as a share of GDP, this might be too crude to capture quality improvements at higher levels of financial development as banks move toward “nonintermediation” financial activities (Demirguc-Kunt and Huizinga 2010).

More generally, the 2008–09 global financial crisis has been a stark reminder that the way in which finance helps the real economy and growth—namely, through maturity and liquidity transformation from short-term savings and deposit facilities into long-term investments—also makes the system fragile and susceptible to shocks, the so-called dark side of finance (de la Torre, Ize, and Schmukler 2012; Beck 2012). Furthermore, financial crises are costly, both in terms of output loss and fiscal costs, although Luc Laeven and Fabian Valencia (2012) find that emerging-market and developing countries tend to experience smaller output losses and increases in public debt than advanced countries, which to some extent is because advanced countries have deeper banking systems, making crises more disruptive.⁹ However, Jean-Louis Arcand, Enrico Berkes, and Ugo Panizza (2012) point out that their result showing that financial deepening has a negative effect on growth after reaching a threshold is robust to controlling for growth-reducing financial crises. Thus, they conclude that the explanation for their result is not financial crises and volatility, but one of misallocation of resources. Regardless, the dark side of finance has critical implications for financial regulation.

Since the empirical findings of the new literature on the finance-growth nexus suggest that more finance is not always better and that it can harm growth after a point, what are the policy implications for developing Asia? First, it is important to emphasize that the level of income and financial development matters. The evidence suggests that the positive effect of financial deepening on growth is stronger for lower-income countries than higher-income countries. Similarly, for financial development below the threshold, the empirical results indicate that finance will exert a positive effect on economic growth,

9. Specifically, Laeven and Valencia (2012) calculate that for banking crises from 1970 to 2011, the average cost, measured as a percent of GDP, for advanced countries was 32.9 percent for output loss and 21.4 percent for the increase in public debt. The corresponding figures for emerging market countries was 26 and 9.1 percent, respectively, and for developing countries was 1.6 and 10.9 percent, respectively. See the paper for details of how these figures were calculated.

which implies that growth will increase when financial development improves. Furthermore, it is important to keep in mind that although high-income countries have greater credit depth, they also have slower growth because of convergence, suggesting that the empirical threshold results need to be treated with caution.¹⁰ Therefore, it does not necessarily follow that countries where credit depth is above the threshold should aim to reduce total credit relative to GDP, although if the ratio has been boosted because of an unsustainable credit boom greater caution would be warranted.¹¹

Second, policymakers should focus less on increasing the size of the financial sector and more on improving its intermediating function. In other words, the quality of financial intermediation matters more than the quantity of intermediation.¹² The advice of Siong Hook Law and Nirvikar Singh (2014, 43) is worth echoing: “Measures to strengthen quality and moderate finance need to be undertaken, rather than just promoting more finance, in fostering economic development.” In the same vein, Thorsten Beck (2013) notes that because the relationship between financial deepening and economic growth goes through enterprise credit (as opposed to the insignificant relationship between household credit and growth), policies that refocus the financial system on intermediation, and especially enterprise credit, can be helpful. Another implication noted by Beck (2013) is that policies aimed at creating a financial center do not necessarily bring long-term growth benefits.

Third, Leonardo Gambacorta, Jing Yang, and Kostas Tsatsaronis (2014) focus on whether the structure of finance—that is, bank-based versus market-based intermediation—matters in the nonlinear relationship between financial activity and growth.¹³ Their results confirm the widely accepted view that both banks and markets are important for economic growth, although they also find that there is a point after which further growth in financial activity no longer contributes to growth and may even slow it down. But again, the level of income and development matters. Banks provide intermediation services that differ from those provided by financial markets and that are particularly beneficial for countries at an earlier stage of development. Notably, banks are especially beneficial in lower-income countries because they provide inexpensive risk management for standardized risks and can compensate for weaker

10. See William Cline (2015) for a skeptical assessment of the empirical threshold results. For example, he points out that the Cecchetti and Kharroubi (2012) results indicate that Canada would grow faster by 1.3 percent annually, and Switzerland by 0.7 percent, if they were to shrink the size of their financial sectors back to the growth-maximizing point.

11. See Dell’Ariccia et al. (2012) for a discussion of the consequences of credit booms and how to deal with them.

12. See Iftexhar Hasan, Michael Koetter, and Michael Wedow (2009) for an empirical confirmation of this point using data from 11 advanced European Union countries. They highlight the importance of specifying three distinct channels through which banks may foster productivity growth: more credit, more efficient intermediaries, and the interaction of the two. They find that the efficiency effect is approximately three times as large as that of the quantity channel.

13. The conclusion of the traditional literature surveyed in Levine (2005) was that financial structure per se does not matter because it is the overall provision of financial services by banks and financial markets taken together that is important for growth. For a more recent analysis, see also Demirguc-Kunt, Feyen, and Levine (2011).

institutions. But as countries mature and become richer and their financial products become more elaborate, markets are better able to provide products tailored to specific users. Gambacorta, Yang, and Tsatsaronis also point out that as the demand for a broader set of risk management and capital-raising tools increases with economic maturity, countries would benefit from a legal and regulatory structure that supports market-based activities.¹⁴

Finally, prudential regulation and supervision are indispensable to make finance safer for taxpayers and society while promoting growth-enhancing financial sector development. Strong micro- and macroprudential measures will need to be deployed to defend against the region's internal and external financial vulnerabilities.

PRODUCTIVITY-ENHANCING POLICY PRIORITIES FOR FINANCIAL DEVELOPMENT

The design of policies to improve productivity and growth performance is context specific and depends on a country's distance to the global technology frontier (Aghion and Howitt 2006 and 2009). An empirical study by Era Dabla-Norris, Giang Ho, and Annette Kyobe (2013) uses the conceptual framework of distance to frontier to examine the association between productivity growth and a variety of reform measures. The reform and institutional measures they include in the analysis reflect recent theoretical and empirical findings on productivity and growth determinants, and they rely on indices of de jure reforms and liberalization in domestic financial systems, trade, liberalization of agriculture, and FDI. These measures were supplemented by variables that capture institutional quality (for example, the strength of property rights and protection and legal frameworks) and regulatory restrictiveness (for example, the extent of business and labor regulations), which previous studies have shown to influence economic outcomes. Their empirical framework also allows the authors to examine the role of policy and reform for both aggregate productivity (TFP and average labor productivity) and productivity growth in the services and manufacturing sectors.

The empirical results in Dabla-Norris, Ho, and Kyobe (2013) confirm that the reform drivers of productivity growth operate with differing force across country groups depending on their distance to the technology frontier, as approximated by a country's real per capita GDP or productivity gap with the United States, a proxy for the frontier. In the area of financial sector reforms to increase productivity growth, the general policy priorities they highlight are as follows for different income groups.¹⁵

14. Gambacorta, Yang, and Tsatsaronis (2014) also study the implications of financial structure on output volatility. They find that when it comes to moderating business cycle fluctuations, banks and markets differ considerably in their effects. In normal downturns, healthy banks help cushion the shock, but when recessions coincide with financial crises, they find that the impact on GDP can be three times more severe for bank-oriented economies than for market-oriented ones.

15. See also Dabla-Norris et al. (2013).

- *Low-income and lower-middle-income countries.* Countries in this group tend to have more bank-based financial systems, and the empirical results suggest that they could benefit most from further banking system reforms.¹⁶ Banking sector reforms in these countries should aim to mobilize domestic saving, lower the cost of and improve access to credit, and promote the allocation of financial resources to the most productive sectors. In addition, where financial repression—such as restrictions on the price or quantity of credit—is still present, reducing it can also help induce resources to move to their more productive uses across and within sectors. Recent firm-level evidence from ten Eastern European countries in Larrain and Stumpner (2013) confirms the positive outcomes of financial market liberalization. They found that reforms focused on reducing financial repression raised aggregate manufacturing productivity by 17 percent, with the main channel being through an improvement in the within-industry allocation of capital across firms. To prevent excessive risk taking and promote the quality rather than quantity of intermediation, reform measures will need to be complemented by strong prudential policies.
- *Upper-middle-income countries.* The empirical results in Dabla-Norris, Ho, and Kyobe (2013) suggest that upper-middle-income countries can reap significant productivity gains by further deepening their capital markets.¹⁷ They note that policies that encourage the formation and development of equity, bond (particularly local currency bonds), and securities markets can be particularly effective to increase TFP and labor productivity by lowering the cost of capital and facilitating the financing of new capital and innovation. Although there has been significant capital market development in many large emerging market countries (for example, a larger menu of available financial instruments, improved market infrastructure, and a more diversified investor base), capital markets in upper-middle-income countries still lag those in advanced economies in size, turnover, liquidity, and development of institutional investors.

The financial sector realities in Asia, as comprehensively documented by Tatiana Didier and Sergio L. Schmukler (2014), confirm that the broad agenda for productivity-enhancing financial sector reform outlined above are relevant for the region. Notably, their main finding is that although financial sector development in developing Asia has made significant strides in the last two decades, becoming deeper and more complex, the overall depth of financial systems in Asia remains less developed than in advanced

16. Lone Christensen, Martin Schindler, and Thierry Tresselt (2013) also provide empirical evidence that banking system reforms are positively and significantly associated with TFP growth in low- and middle-income countries.

17. For firm-level evidence of a positive relationship between the use of external finance (both debt and equity) and future productivity growth within firms, see Oliver Levine and Missaka Warusawitharana (2014), whose analysis is based on data from advanced European countries. The authors provide evidence against a reverse-causality explanation, and for one country in their sample (the United Kingdom) they find direct evidence that the firms use financing to invest in productivity-enhancing projects.

countries (but more developed than in Eastern Europe and Latin America).¹⁸ They document that bond and equity markets in Asia have increased in absolute and relative size and that the private sector is issuing longer maturity bonds in domestic markets, indicating a moderate transition from a mostly bank-based model to one that is more complete and interconnected.¹⁹ But they also report that a few large companies continue to capture most of capital market issuance and that, with a few exceptions, secondary markets remain relatively illiquid. Furthermore, the public sector captures a significant share of the bond market. Thus, their fundamental conclusion is that Asia's financial systems remain less developed than aggregate measures suggest.

Didier and Schmukler (2014) also point to the paradox that financial underdevelopment in Asia seems to coexist with a large pool of domestic and foreign funds in the economy. They observe that the availability of funds will naturally provide a continuing deepening of some markets, but that for some reason the financial system does not seem to intermediate those funds and service a broad and growing range of firms. They ascribe part of the problem to the financial intermediation process because many assets available for investment are not purchased by banks and institutional investors. Rather, consumer and mortgage lending have grown relative to corporate financing and banks seem to have moved to financing standardized retail products that are easy to commoditize and involve relatively low risk (for example, leasing and collateral lending). Similarly, they note that capital markets seem to prefer to finance large firms over small ones and institutional investors seem to shy away from risk.

It is beyond the scope of this paper to conduct an indepth analysis of financial sector developments in a broader range of developing Asian countries. But a glimpse can be obtained by grouping countries by income level and examining simple metrics such as credit to the private sector (figure 1); banking system assets (figure 2); private domestic debt securities (figure 3); stock market capitalization (figure 4); and debt financing (loans, bonds, and securitized loans) obtained by nonfinancial corporations (figure 5). The following points stand out:

- For low-income and lower-middle-income countries, the ratio of private credit to GDP has risen somewhat since 2007 and was in the region of about 50 percent in 2012 (figure 1). Viet Nam is an

18. Didier and Schmukler (2014) focus on the seven largest countries in developing Asia, namely the PRC, India, Indonesia, the Republic of Korea, Malaysia, the Philippines, and Thailand. Based on World Bank country classifications, India, Indonesia, and the Philippines fall in the group of lower-middle-income countries; Malaysia, the PRC, and Thailand in the group of upper-middle-income countries; and the Republic of Korea is a high-income country. See also Goyal et al. (2011) for a broader discussion of financial deepening in emerging market countries.

19. Cline (2015) also documents the transition from bank-dominated systems to more diversified systems in emerging market Asian countries. In particular, he points out that there is a strong presence of bond, equity, and to a lesser extent nonbank loan financing in most Asian emerging market economies, rather than exclusive reliance on the traditional banking sector. He attributes this phenomenon in part to the process of globalization. Countries that continue to be bank-dominated in finance to the private sector are the PRC and Viet Nam.

exception, with a ratio of just under 100 percent in 2012. But Viet Nam, where unbridled credit growth resulted in the credit-to-GDP ratio soaring from 64 to 109 percent between 2006 and 2010, also illustrates that a credit boom can be distinct from financial deepening. The credit binge led to a hangover with weak banks facing liquidity problems and worsening asset quality, forcing abrupt deleveraging.

- Upper-middle-income countries in Southeast and East Asia show substantial credit depth, with a ratio of private credit to GDP above 100 percent. For those countries in this region where global liquidity and domestic policies have contributed to rapid credit growth in recent years, it will be important to ensure that credit standards are sufficiently tight to contain risks, especially if both credit growth and real property prices are well above norms.²⁰ In Central Asia, by contrast, the credit ratio for upper-middle-income countries is much lower and comparable to that in lower-income groups.
- The ratio of banking assets to GDP (figure 2) yields similar qualitative results for each income group as outlined above for the ratio of private credit to GDP.
- Outstanding private domestic debt securities as a proportion to GDP is highest in the Republic of Korea and Malaysia (about 70 to 80 percent), followed by Thailand and the PRC (around 30 to 40 percent) (figure 3). For other countries, this ratio is very small.
- For most countries across all income groups, the share of stock market capitalization as a percentage of GDP is a small fraction (about one-fifth) of their total banking sector assets (figures 2 and 4). By contrast, these two ratios are close for India, Indonesia, and the Philippines, and to a lesser extent for Malaysia and Thailand, where stock market capitalization is about half of total banking sector assets.²¹
- Corporate bond markets and securitized loans remain small outside the United States (figure 5), indicating that long-term finance depends on a narrow range of instruments in many countries, including Asia.

20. Early warning models of financial strain flash red when both credit growth and real property prices are significantly above trend (Borio 2012, BIS 2014). BIS (2014) points out that early warning indicators should be robust to changes in the equilibrium levels of debt due to financial deepening, but the banks' ability to screen potential borrowers and manage risks puts a limit on how fast this process can take place. Nicholas Borst (2013) documents the PRC's credit boom over the 2009–13 period, noting that because much of the credit growth came from the less regulated areas of the financial system, overall risk has increased.

21. Data for 2012 show that the two ratios are also fairly close in the United States, at 118 percent of GDP for banking sector assets and 115 percent of GDP for stock market capitalization. For a small group of other advanced countries (Australia, Canada, France, Germany, Japan, and the United Kingdom), the median stock market capitalization is about one-fourth the median of banking system assets (77 percent of GDP versus 319 percent of GDP).

Overall, the data for financial development in Asia support the general policy reform priorities for different income groups outlined above. The specific reform priorities for productivity-enhancing financial sector reform will vary from country to country depending on their distinct features and institutional context. Nevertheless, despite the diversity of developing Asia and the need to adapt reform policies to take advantage of individual country circumstances, some common themes for financial sector development and policies have the potential to enhance productivity-driven growth.

The focus in the rest of this section is on two such themes. First, channeling long-term finance into long-term investment in the assets that expand the productive capacity of a modern economy is essential. Because developing Asia has an infrastructure deficit that hampers productivity, particular attention is put on financing infrastructure needs. Second, improving SMEs' access to finance is vital because it can promote competition and dynamic efficiency. A separate section (section V below) is devoted to a third theme, specialized financing for innovation, which is particularly relevant for countries facing the danger of falling into the middle-income trap.

Promoting Long-Term Finance

Long-term finance and investment enhance the productive capacity of an economy. They cover a wide range of tangible assets (such as energy, transport and communication infrastructure, factories, commercial buildings, hospitals, and new housing) and intangible assets (such as education and R&D) that increase future prospects for innovation and competitiveness (European Commission 2013, Group of Thirty 2013). Many of these investments have an element of being a public good because they eventually generate greater returns for society. Furthermore, long-term finance is less procyclical than short-term finance and may hence be more supportive of sustained long-term growth, and it exerts a stabilizing influence on the financial system.²² This focus on long-term finance is also consistent with the emphasis on improving the quality rather than just the quantity of intermediation.

Long-maturity instruments and investors with long-time horizons are needed to finance long-term investment. Figure 6 from a report by the Group of Thirty (2013) depicts the flow of long-term finance from providers through the intermediation process to end users. Providers of long-term finance include domestic and foreign households, corporations, and governments. In the case of self-financing (corporate earnings, government revenue, or household income and wealth), a portion may go directly to end users without being intermediated. Otherwise, long-term finance flows through intermediaries such as banks, insurance companies, and pension funds, or alternatively capital markets may undertake the

22. By contrast, short-time horizons and procyclical investment strategies, such as bank lending that relies on imprudent short-term funding and excessive maturity transformation, are more prone to instability as demonstrated by the 2008–09 global financial crisis.

intermediation. The balance of intermediation by financial institutions versus markets varies across the globe.

However, despite a large pool of saving, the range of instruments for long-term financing in developing Asia remains narrow (Didier and Schmukler 2014). Banks still dominate the financial sector in Asia, as they do in Europe, in contrast to the United States, where equity and bond markets have a larger role. But commercial bank loan maturities average only 2.8 years in emerging economies and 4.2 years in developed economies, much shorter than bond maturities (Group of Thirty 2013). Moreover, as documented in various issues of ADB's *Asia Bond Monitor*, although many countries in developing Asia have improved the size and liquidity of their bond markets in recent years, these markets remain dominated by low-risk issues, especially those of governments. In addition to a lagging corporate bond market, securitization and equity markets remain underdeveloped in developing Asia despite the region accounting for a rising share of the world's wealth (see figure 5). And long-term institutional investors such as pension funds and insurance companies, which have long-dated liabilities, have not contributed sufficiently to the development of local markets, preferring to put the bulk of their portfolios in government bonds and deposits.²³

Didier and Schmukler (2014) refer to this situation in Asia as a “trap” where investors avoid local capital markets and the markets remain underdeveloped, which suggests that there is considerable scope for policy actions to help channel available funds to foster local long-term financing markets. The policy requirements to address the barriers to long-term finance are inevitably multifaceted, but the following are worth highlighting in the Asian context.²⁴

- First, policy should be designed to ensure that investors are better able to take a long-term horizon in their investment decisions. This will require action by national and international regulatory bodies to remove biases in asset allocation of investors who might otherwise invest for the long term. For example, at the national level, regulatory and accounting treatments that favor short-term horizons should be reconsidered, and the pros and cons of gradually phasing out the preferential treatment of sovereign debt in insurance and bank regulation over a period of time should be weighed (Group of Thirty 2013). Such steps would remove the distortion that favors “safe” assets such as government bonds and increase insurers’ incentives to invest in corporate bonds, equity, and other long-term instruments. And at the international level, standard-setting bodies should review the regulatory and

23. On average in East Asian countries, insurance companies are usually the largest institutional investors (26 percent of GDP), while mutual funds average 17 percent and pension funds, 15 percent (Didier and Schmukler 2014).

24. For a more comprehensive list of policy proposals in an international context for advanced and emerging market economies see Group of Thirty (2013). For policy proposals in the European context, which like Asia is largely bank-based, see European Commission (2013). For policy proposals more specific to the Asian context see, among others, Ding, Lam, and Peiris (2014), Felman et al. (2014), Walsh (2014), and Zhu (2014).

accounting treatment of assets held with long-term horizons to avoid excessive focus on short-term market volatility.

- Second, further efforts are needed to develop debt and equity capital markets to promote a broader spectrum of financing instruments. Although local currency bond markets in Asia have grown over the last decade, continued heavy reliance on bank financing tends to make long-term investment decisions dependent on risky and volatile maturity transformation. Policies should therefore continue to aim to build deeper and more liquid bond markets, especially for corporate bonds, as this could reduce risk premiums and lower the cost of capital in addition to enhancing financial stability.²⁵ Generating turnover and improving liquidity will require a more active role for market makers, development of hedging instruments including derivatives, and repo and securities lending (Zhu 2014). Furthermore, opaque bankruptcy law and procedures in many Asian countries will need to be addressed to lower risks for investors and speed development of corporate bond markets (Walsh 2014).²⁶ And for equity markets, improvements in the regulation of securities markets could enhance their role as a stable and reliant source of financing. Further, if the tax system creates a bias against equity investment, such biases should be removed or at least substantially reduced. Other impediments that will need to be addressed include the embryonic legal and regulatory framework for nonbank financial institutions—shadow banks—and a lack of information provision including pricing transparency (Zhu 2014).
- Third, encouraging a broader and more diverse long-term investor base and promoting institutional investors and foreign participation will be important to build a stable source of finance. For example, the development of long-term pension- and insurance-based savings could be fostered by setting up compulsory auto-enrollment saving programs (Group of Thirty 2013). Such institutions would aggregate more savings into funds with long investment horizons, especially where household wealth is concentrated in bank deposits and other short-term instruments. The low penetration of institutional investors also hampers the development of debt and equity capital markets. The growth of traditional domestic investors such as contractual saving schemes can, however, be slow. Overseas firms can help expand the investor base, compensating for this slow growth, and because global bond funds are large compared to local bond markets, even a modest increase in the weight of emerging markets in their portfolio could lead to a significant increase in demand (Felman et al. 2014).

25. A number of initiatives are already underway on this front, including the ASEAN+3 Bond Market Initiative and the Asian Bond Fund. See various issues of the Asian Development Bank's *Asia Bond Monitor* for details. These periodic monitors also cover country-specific topics. For example the June 2014 issue (ADB 2014b) includes a detailed analysis of developments and challenges in Kazakhstan's bond markets.

26. Walsh (2014) points out that the small budget deficits in many Asian countries have affected the evolution of a government yield curve, making it more difficult for investors to price corporate bonds, thus slowing development of the market.

Furthermore, greater participation by foreign investors will improve liquidity because they are more likely to trade the securities than domestic institutional investors, whose strategy is more likely to be to buy and hold. Joshua Felman et al. (2014) also point to a potential virtuous circle—as interest rates fall and liquidity improves, more firms will find it attractive to issue bonds, thereby expanding the size of the market and attracting more investors.

- Finally, in view of the importance of cross-border capital flows to support the efficient global allocation of capital to long-term investment, enhanced regional and global perspectives will be essential to address increasing regulatory and supervisory challenges as financial systems deepen and become more integrated and complex (Group of Thirty 2013; Zhu 2014). In particular, as regulators and supervisors encourage prudent financial innovation, they will need to ensure that they have good cross-border cooperation and adequate regulatory powers to act and stay alert to risks.

Issues concerning the long-term financing of Asia's infrastructure needs are worth examining for two reasons. First, building infrastructure can improve productivity growth, including by reducing travel times and the cost of freight, power, and communications. Better infrastructure thus increases the potential growth rate of an economy.²⁷ Second, emerging Asia generally scores lower on the adequacy of infrastructure than its industrialized peers in the region and elsewhere.²⁸ In a comprehensive study, the ADB (2009) put Asia's total infrastructure investment needs at \$8 trillion over ten years, or about 4 percent of the region's GDP per year.

Apart from public infrastructure investment, mobilizing financial resources for infrastructure investment has been difficult in many countries. Although commercial banks are a source of infrastructure funding through project finance, bank liabilities are short-term while infrastructure projects have payback periods of 20 to 30 years, which exacerbates maturity mismatches and impedes long-term infrastructure finance.²⁹ Furthermore, the problem has not been the lack of funds because Asia is a region with a saving surplus. Rather the problem is that Asia as a whole is a net capital exporter—instead of investing in Asia, the savings are invested in low-yield treasury bonds or other securities in Europe and the United States

27. For empirical evidence see David Canning and Peter Pedroni (2008), who use cross-country data to show that infrastructure positively contributes to long-run economic growth despite substantial variations across countries.

28. This assessment is based on the World Competitiveness database published by the International Institute for Management Development (IMD). The assessment is made more vivid in metrics cited by Groff (2014), who notes that ASEAN has barely 10 kilometers of roads and 0.25 kilometers of rail per 1,000 people, compared to more than 200 kilometers of roads and five kilometers of rail in Organization of Economic Cooperation and Development (OECD) countries. And the electrification rate in ASEAN is 72 percent, versus 99.8 percent in OECD countries, and only 86 percent of ASEAN's population has access to clean water, compared to 99.6 percent in the case of the OECD.

29. Basel III capital requirements mandate banks to hold more capital against long-term finance typical in public-private partnerships. In addition, the large size of investments could run up against banks' single borrower limits even with syndication (Ding, Lam, and Peiris 2014).

(Groff 2014; Ding, Lam, and Peiris 2014). The challenge, therefore, is to better direct Asia's large pool of savings into long-term financing that will help close the infrastructure deficit and raise productivity.

The policy agenda to meet this goal is similar to the one outlined above, namely fostering long-term horizons in investment decision, further developing local currency bond markets, and promoting a long-term investor base. However, more specialized approaches are necessary for infrastructure assets because they are complex to evaluate and heterogeneous in nature, making it more difficult for traditional long-term institutional investors such as pension funds and insurance companies to invest. Ding, W. Raphael Lam, and Shanaka J. Peiris (2014) have a detailed discussion of the issues specific to infrastructure financing, three of which are highlighted here. First, unlisted funds set up by management companies on behalf of institutional investors would provide them with exposure to infrastructure projects without having to develop in-house expertise.³⁰ Second, it will be important to develop an infrastructure bond market to help draw nontraditional investors into financing infrastructure projects. Packaging long-term bonds that can be sold to investors tends to be more feasible once the construction phase of an infrastructure project is over and it is generating a steady stream of revenue over a long horizon.³¹ Third, in addition to further financial deepening, greater regional financial integration would facilitate intraregional financial flows and mobilize resources from the aging savers in industrialized Asia to finance infrastructure investment in emerging Asia. The degree of financial integration within Asia is currently low, in part because of capital account restrictions in a number of countries in the region. Thus, strengthening financial ties within the region and globally, together with strong prudential frameworks, would help diversify sources of financing and reduce the cost of funding in emerging Asia.³²

Expanding Financial Access for SMEs

There is evidence that financial development is especially helpful for smaller firms. Beck et al. (2008) find that underdeveloped financial systems are particularly detrimental to the growth of firms with less than 20 employees, and that financial development boosts the growth of small-firm industries more than large-firm industries. Going beyond finance and looking also at legal constraints to firm growth, Thorsten

30. Drawing on data from the *Asia Bond Monitor* of November 2013, Ding, Lam, and Peiris (2014) point out that there are 88 unlisted infrastructure funds that invest in Asia, with a growing total of \$22 billion of funds committed. Although this is a start, it is important to keep this figure in perspective—it is tiny relative to the \$8 trillion needed for infrastructure over ten years.

31. Ding, Lam, and Peiris (2014) note that in some Asian markets, bonds issued by infrastructure-related companies already represent a substantial share of total bonds outstanding. Notably, in Malaysia, 40 percent of bonds outstanding are issued by infrastructure-related firms. Nevertheless, given the small size of debt markets in Asia, the magnitudes of financing from this source remains small.

32. This conclusion about the benefits of greater financial integration is supported by the model simulations presented in Ding, Lam, and Peiris (2014). David Roland-Holst and Guntur Sugiyarto (2014) reach similar conclusions about the important benefits of deeper Asian financial integration for more efficient regional capital allocation.

Beck, Asli Demirguc-Kunt, and Vojislav Maksimovic (2005) provide evidence that SMEs face greater financial, legal, and corruption obstacles compared to large firms, and that small firms stand to benefit the most from improvements in financial development and a reduction in corruption. And in one of the first cross-country studies on the links between SMEs and economic growth and poverty alleviation, Beck, Demirguc-Kunt, and Levine (2005) find a strong positive relationship between the relative size of the SME sector and economic growth. The data, however, do not support the conclusion that SMEs exert a *causal* impact on long-run growth. Furthermore, the authors did not find evidence that the size of the SME sector alleviates poverty or decreases income inequality.

These studies, all of which use cross-country data, do not shed much light on the channels through which finance helps firm or productivity growth. Moreover, they do not rule out that firm size is endogenous. A more recent study by Karthik Krishnan, Debarshi Nandy, and Manju Puri (2014), however, analyzes how increased access to financing by small firms affects their TFP by exploiting a natural experiment in the United States following interstate banking deregulation that increased access to bank financing. Using the Small Business Administration's funding eligibility criteria the authors show that TFP increases following the deregulations are significantly greater for financially constrained firms. Their results suggest that greater access to financing allows financially constrained small firms to invest in productive projects that may otherwise not be taken up.

Although not explicitly focused on firm size, Virgiliu Midrigan and Daniel Yi Xu (2014) use producer-level data from the Republic of Korea, the PRC, and Colombia to evaluate the role of financial frictions in reducing aggregate productivity. They show that financial frictions can have a large negative effect on productivity because they prevent credit constrained entrepreneurs from entering the modern sector and decisions about technology adoption. In contrast, the misallocation of capital among modern-sector producers due to borrowing constraints has only small productivity effects for those already in this sector because financial frictions can be mitigated by self-financing.

Overall, the evidence confirms that expanding access to finance for SMEs and aspiring entrepreneurs can promote dynamic efficiency, including through the adoption of new technologies that could result in new industries, products, and services. In addition, ensuring the availability of credit and financing for all types of firms, including new entrants rather than just established ones, could stimulate competition that is favorable for productivity growth.

The policy issues associated with expanding SMEs' access to finance are covered well in a number of ADB studies. ADB (2014a), produced jointly with the Organization for Economic Cooperation and Development (OECD), is a comprehensive study on expanding SMEs' access to finance, drawing lessons from international experience and the recent crisis that resulted in a sharp credit crunch for SMEs. In addition, an SME finance monitor has been launched (ADB 2014c) to support efforts by developing

Asian countries to design a comprehensive range of policy options to promote SMEs by providing timely and comprehensive data and analysis. Shigehiro Shinozaki (2014) focuses on the diversification of financing modalities beyond conventional bank lending and the steps that will be needed to develop capital market financing for SMEs in emerging Asia. In particular, equity instruments, hybrid debt-equity instruments, and asset-based finance all have underexploited potential.

Other recent studies on this topic include Beck et al. (2014), which, based on data from 21 countries in Central and Eastern Europe, concludes that although the literature has pointed to the benefits of having diverse lending techniques within a banking system, “relationship lending” can be particularly helpful in alleviating credit constraints for SMEs during a cyclical downturn. A key policy message based on these findings is to support the collection of the necessary “hard” information about SMEs through credit registries and thus improve incentives for banks to invest more in generating “soft” information themselves. And focusing on alleviating a credit crunch, which can have a disproportionate adverse effect on smaller firms, Gert Wehinger (2014) provides a review of government programs (e.g., government loan guarantee programs, strengthening the capital base of support institutions, direct credit, export facilitation, and credit mediation and monitoring) adopted by OECD countries to facilitate SMEs access to financing.

FINANCING FOR INNOVATION

As discussed in the previous section, the reforms required to enhance productivity-driven growth depends on the distance to the global technology frontier. As a country gets near it, innovation instead of imitation becomes more important to sustain productivity and output growth (Acemoglu, Aghion, and Zilibotti 2006). A considerable body of research now shows that the capacity to innovate and bring innovation successfully to market is crucial to increase productivity and global competitiveness and thus contributes to job creation and economic growth (OECD 2007). In addition, a major study by the ADB (2014d), *Innovative Asia: Advancing the Knowledge-Based Economy*, makes a persuasive case that knowledge and innovation will become increasingly important as a source of the productivity and output growth necessary for middle-income Asian countries to avoid getting stuck in the middle-income trap and converge more quickly to per capita incomes in OECD economies. The ADB report also points out that although investing in knowledge-based economies has major advantages for middle-income countries, it can also benefit low-income countries because it can promote higher productivity and efficiency and thus help transform low-income economies. The nature of knowledge-based investment in the two cases, however, tends to differ.

An effective innovation system that creates and diffuses new knowledge is integral to knowledge-based economies, but it is not the only pillar on which such economies are built.³³ The ADB (2014d) report also discusses the other three pillars—education and skills, the information and communications infrastructure, and the economic and institutional regime. For the Asia and Pacific region, the average “knowledge economy index” for all four pillars is 4.4, compared to an average of 8.25 for OECD countries. And, as shown in figure 7, for the innovation pillar alone, the result is similar—the Asia and Pacific average index of 4.5 is still well below the average index of 8.5 for OECD countries, despite the impressive improvements made by some Asian countries (for example, the PRC, India, and Indonesia) over the last decade.³⁴ ADB (2014d) also documents that although some emerging economies in Asia have substantially increased their expenditure on R&D, a key ingredient for innovation, they still significantly lag behind advanced countries in the OECD and there is still substantial catching up to do for many countries.³⁵

As Asia shifts from a development model based on technology absorption to one that fosters more productivity-enhancing innovation, strengthening the financing available for such innovation becomes increasingly important. In view of the risk of falling into the middle-income trap, enhancing financing for innovation is an immediate issue, and one where policymakers should start making headway now. The remainder of this section therefore deals with a number of related questions, drawing on the “financing innovation” module of the *Innovation Policy Platform* developed by the OECD and World Bank.³⁶ The questions are, Why is finance important for innovation? Why does innovation often require specialized finance and what are the sources of finance for innovation? What supporting framework is needed to finance innovation? What policy interventions are needed to encourage finance for innovation? And what

33. Drawing on work by the World Bank, ADB (2014d) defines *innovation* as the scope of activities that lead to the creation and diffusion of new and better products and processes, and the concomitant accumulation of intellectual assets to capture returns from the value they create. An effective “innovation system” is composed of firms, research centers, universities, and other intermediaries that engage in these knowledge-intensive activities: monitor and accrue technologies and processes from the growing stock of global innovation, assimilate and adapt them to local needs, and create new knowledge-based innovations.

34. These relative indices for Asia and the OECD are based on World Bank’s Knowledge Economy Index. The qualitative conclusions from the World Bank’s indices are broadly comparable to the Global Innovation Index 2014 available at www.globalinnovationindex.org/ (accessed on January 21, 2015).

35. The PRC is an important exception. It is now the second largest spender on R&D in the world in purchasing power parity (PPP) terms and has emerged as a leader in registering patents (ADB 2014d).

36. See *Innovation Policy Platform*, <https://innovationpolicyplatform.org> (accessed on January 21, 2015), for the main platform, and *Financing Innovation*, <https://innovationpolicyplatform.org/content/financing-innovation?topic-filters=11384> (accessed on January 21, 2015), for the “financing innovation” module. The web-based platform aims to provide policy practitioners in advanced and developing countries with a simple, easy-to-use tool to support them in the innovation policymaking process. In addition, see UNECE (2009) for a comprehensive discussion of the policy options and instruments for financing innovation based on international experience. Hall (2009) also provides a valuable review of the theoretical and empirical research related to the financing of innovative firms.

are the implications for policymakers in Asia based on the experience in high-income Asia and OECD countries?

Why Is Finance Important for Innovation?

Innovation requires resources, which makes access to finance an essential ingredient for many forms of innovation activity. Finance allows firms and organizations to conduct research, adopt technologies needed for inventions, and commercialize and market these inventions. If appropriate finance is not available, it may prevent firms from investing in innovative projects, improving their productivity, funding their growth, covering working capital requirements, or meeting market demand. Furthermore, there is evidence that access to finance is a key determinant of entrepreneurship (Kerr and Nanda 2009). Access to finance is thus an important driver in the creation, survival, and growth of innovative firms.

Why Does Innovation Often Require Specialized Finance?

Innovation typically requires investment of patient capital (with incentives that reward everyone who contributes to the process), while financial systems instead often promote impatient capital that avoids long connections with investment projects that might be inherently risky (FINNOV 2012). But by nature, innovative firms are involved in processes whose outcome is uncertain, and they own assets (e.g., patents) that are intangible and difficult to evaluate. Innovative firms may therefore face considerable barriers for accessing financing. This “finance mismatch,” where the supply of finance does not meet demand, undermines their ability to undertake innovative projects.

A key reason for such a capital market imperfection is information asymmetries because firms may have the relevant information that is not available to lenders and investors. In addition, monitoring difficulties, such as principal-agent problems related to the shareholder-manager relationship, may leave potential borrowers unable to obtain finance at any price. Liquidity constrained small and new ventures are particularly affected by these capital market imperfections. The smaller and younger the business, the less likely it is to have a sufficient track record or collateral, and the more opaque the information on its business performance and financial solidity.

It should be emphasized that although credit rationing and difficulty in accessing finance also affect traditional SMEs and traditional entrepreneurs (as discussed in section IV), for many of the reasons mentioned here, they have a disproportionately severe effect for new innovative SMEs and innovative entrepreneurs (Hall 2009, Auerswald 2007). This is confirmed by OECD data suggesting that innovative small and new enterprises are at a particular disadvantage in receiving debt financing compared to traditional businesses (OECD 2010).³⁷

37. The OECD data are for European countries and take fast enterprise growth as a proxy for innovation. The data show that the success rate for bank loans in European countries is consistently higher for average enterprises than for enterprises with fast growth.

The stages of development of the firm and its innovation projects have major implications for its funding needs and funding availability. The innovative firm's upfront feasibility and product development costs, and the length of its market development and entry process, will affect its financing needs. The "funding escalator" metaphor is often used to describe how the sources of funding available evolve as a firm's innovation project develops. As figure 8 shows, the cash flow follows a J-curve pattern over time, with an initial drop at the seed stage (the so-called valley of death) because of the financial resources innovative young firms need to spend on the proof of a business concept.

In this initial seed and startup phase, when inventions are developed and research is conducted, there is considerable uncertainty about the innovation that will emerge, if any, which makes it difficult to obtain funding. In this initial phase, self-financing is particularly important for technology-driven SMEs because innovative entrepreneurs cannot overcome information asymmetry and therefore rarely find any lenders or investors, even for projects that are potentially profitable. Consequently, in addition to resources from the founder and other entrepreneurs, the main sources of funding are family and friends.³⁸ As discussed further below, these financial constraints are a key reason why public policy often plays an important role at funding the early stages of technological development.

In due course, as firms advance up the escalator and prototypes and the commercialization of inventions is developed, specialized investors who are skilled in assessing new technologies and can handle risk become more willing to provide funding. In particular, financing may be provided by capital investment from informal private investors (e.g., business angels) and in some cases by financing funds and venture capitalists. Subsequently, in the final stages, once technological and market uncertainty have been largely addressed and technology adoption and diffusion come to the fore, more traditional suppliers can provide the required funding to scale up operations and to finance purchasers interested in adopting new innovations. In this expansion stage, innovative young firms generally require increasing amounts of equity to maintain R&D and to expand marketing and sales activities, amounts that are typically available only through sources such as initial public offerings on stock exchanges.

The innovation process may involve the same stages in large established firms and small startup firms, but there is significant variation in the sources of finance that they may have available. Established firms, especially those at the larger end of the size spectrum, can finance their R&D activities more easily by using internal resources, such as retained earnings. These firms often prefer to use internal financing rather than external financing, which can be more costly. Thus, if they have sufficient internal resources, they may choose to undertake projects that would not be undertaken if they need access to external

38. As pointed out in UNECE (2009) there is sometimes another potential funding source, namely "fools." Friends, family, and fools make up the "3Fs" in figure 8. In some funding escalator diagrams, there is a reference to 4Fs—founders, family, friends, and fools.

finance to develop the project. In some cases, they may not even have access to external financing. External financing, when available, includes getting a loan from a bank using tangible assets as collateral if required, issuing bonds, or raising equity finance in stock markets. A review of empirical research by Bronwyn H. Hall and Josh Lerner (2009) concludes that (1) debt tends to be a disfavored source of financing R&D investment compared to other sources of financing, and (2) established firms prefer internal funds to finance R&D investments and they manage their cash flow to ensure this.

By contrast, startups do not have sufficient assets to use as collateral and they lack a track record. In addition, for startups that focus on innovative activities, their innovation investment tends to be less diversified and may represent a larger share of their overall activities. Therefore, the traditional sources of financing are not fully available for such enterprises. As the *United Nations Economic Commission for Europe* (UNECE 2009) pointed out, because of the negative cash flow and high risk of failure at their early stages of development, traditional sources of finance are not suitable for such young enterprises, and they ideally need forms of financing that do not seek guaranteed repayment. Thus, the main distinguishing characteristic of developing innovative firms lies in the need to overcome early stage uncertainty to reveal or create their commercial potential.

Data limitations make it difficult to get a clear picture of the availability of specialized risk capital in developing Asia and other emerging markets. However, based on regional (as opposed to country-level) information, Didier and Schmukler (2014) note that private equity and venture capital funds are better developed in Asia than in Latin America. And of the two sources, private equity has a significantly larger presence than venture capital, raising on average \$46 billion per year in Asia between 2003 and 2009.³⁹ Therefore, although nascent and small, a risk capital industry does exist in Asia.

What Supporting Framework Is Needed to Finance Innovation?

Before discussing the rationale and objectives of public policy interventions to encourage finance for innovation, it is important to outline the underlying supporting framework for possible policy interventions to succeed. Specifically, markets require a set of well-functioning institutions to work well, and hence institutional shortcomings can thwart access to finance for innovators. The *Innovation Policy Platform* highlights three important institutional priorities.

First, bankruptcy regulation affects innovative businesses by shaping the perceived risk of innovating and the conditions for access to finance. Evidence shows that countries with poorer investor protection tend to have smaller and narrower capital markets, which may make access to finance more difficult.

39. Didier and Schmukler (2014) do not provide a corresponding figure for venture capital funds raised by Asia, but they note that an average of \$12 billion of venture capital was raised per year outside the United States and Europe during the 2003–09 period, representing 25 percent of the total raised.

Public policy can support innovative businesses by achieving the right balance in bankruptcy legislation to fit both firms' and creditors' interests. An efficient judicial system is also important to ensure that the objectives of bankruptcy law are met. The World Bank's Doing Business indicator for resolving insolvency suggests that the 2008–09 global financial crisis has helped spur improvements in bankruptcy legislation in many economies, including the following in Asia: Armenia; Cambodia; Georgia; Hong Kong, China; India; Japan; Kazakhstan; Kyrgyz Republic; Malaysia; the Philippines; the PRC; the Republic of Korea; Samoa; Solomon Islands; Tajikistan; and Uzbekistan. Nevertheless, Asia still lags high-income OECD countries in terms of the time taken (which is longer) and the recovery rate (which is smaller), making this an important area of policy that will need to be addressed (see figure 9).⁴⁰

Second, adequate intellectual property rights can facilitate access to finance for innovative firms because they help turn knowledge into a commodity that can be used as collateral to obtain funding, and as an asset that can be salvaged by equity investors if the firm fails.

And third, developed bank-based and market-based financial institutions are indispensable for firms that need external funding to invest in innovation. The reform priorities on this front were covered in section IV. Additionally, banking sector reforms that promote competition and reduce concentration can help fight discrimination in credit markets, especially toward innovative entrepreneurs (OECD 2013a). Such reforms help prevent banks from engaging in discriminating behavior, while providing greater choice for borrowers. Financial market development needs to be complemented with appropriate financial market regulation. Such regulation can shape how intermediaries evolve and the resulting structure of financial institutions in a country, which in turn can have an impact on the types and sources of financing available for innovation activity.

UNECE (2009) also stresses that policy initiatives aimed at improving the environment for early stage financing of innovative enterprises need to establish an appropriate framework by addressing the problem of simultaneity of (1) capital, (2) specialized financial intermediaries, and (3) entrepreneurs. In order to create a vibrant risk capital market, each of these elements will emerge and develop only if the other two are present and active. For the three components—capital, specialized intermediaries, and entrepreneurs—to simultaneously engage and operate in a self-propelling process, several elements need to interact. First, intermediaries need to be able to access sufficient amounts of capital (fundraising). Second, they need to be able to allocate the capital to promising entrepreneurs (investing). Third, they need to provide appropriate additional value to these enterprises to enhance their potential for success (value-adding). And fourth, they need to be able to liquidate their investments and redeploy their capital

40. See World Bank, *Doing Business* (2014). It should be emphasized that comparing bankruptcy legislation across countries is not straightforward, and the indicators in the reports should be viewed as proxies for the overall efficiency of the insolvency regulatory framework.

to a new wave of enterprises (exiting). The complementary character of these components of the private financing cycle needs to be kept in mind when designing policies.

What Policy Interventions Can Encourage Finance for Innovation?

The rationale for public policy intervention on finance for innovation is to correct for market failures that negatively affect the performance of innovative businesses. Without public intervention, markets generally provide less finance for innovation than would be socially desirable. One market failure relates to the issue of capital market imperfections because of information asymmetries and principal-agent problems, which is discussed above (under the question “Why does innovation often require specialized finance?”). Another market failure relates to the positive externalities of knowledge creation. The nonrival nature of many knowledge creations (that is, the use of a piece of knowledge does not prevent its simultaneous use by another party) means that knowledge can create spillovers: The innovator benefits but so do others, including competitors and follow-on innovators. Thus, unless there is compensation through monopoly rights created by the intellectual property system or grants for conducting innovation, the social rate of return for knowledge creation may exceed the private rate of return resulting in investment in the production of new knowledge that is below the socially optimal level. Such risks might reduce the financial resources firms will mobilize internally to fund innovative activities and might also reduce external financial resources available.

In view of such market imperfections, public policies play an important role in facilitating finance through a wide range of instruments. The *Innovation Policy Platform* categorizes these instruments to increase the availability of finance for innovation as follows.

Direct Funding of Firms’ R&D. Governments frequently use direct funding to stimulate firms’ R&D through various instruments, including grants of various types (for example, matching grants, proof-of-concept grants, and patent application grants), subsidized loans, and venture capital and seed funds. In addition to basic research and product development, eligible activities for funding could include training, process innovation, technology commercialization, and early stage funding for technology startups. A key objective of direct funding programs is to induce an “additionality” effect in firms so that they invest more of their own resources in R&D than originally planned. Public funding may produce a signal effect that facilitates firms’ access to external sources of finance in addition to providing much needed funding to complement internal resources. The most common practice in providing direct funding is to run a competitive merit-based selection process that targets specific areas and types of firms. This allows R&D grants to be aligned with strategic priority areas and to contribute to other policy goals such as promoting innovation in SMEs, entrepreneurship, collaboration among firms, or university-industry collaboration.

Direct funding, however, requires relatively higher bureaucracy and administrative costs and often raises concerns about the prospect of governments “picking winners.” If the private sector has sufficient entrepreneurial knowledge, the selection process can be outsourced. But when private expertise is scarce, government agencies may choose to rely on the advice of scientists and public research organizations. UNECE (2009) suggests that to produce positive effects such government schemes should support large numbers of new enterprises instead of focusing on a few potentially best business ideas, although budget constraints will need to be observed.

Debt and Risk Sharing Schemes. The aim of such schemes is to reduce the risk for lenders and investors to facilitate access to external finance for innovative firms. Credit guarantee schemes are a common tool to facilitate access to finance for firms with a higher risk profile since they limit the loss that a bank faces if the firm defaults. They can help address lack of access to finance for young innovative firms that have insufficient collateral or credit histories. Typically, bank losses on the loans covered by the guarantee are only partially insured by the government, and banks are left to decide which loans to give to take advantage of their credit assessment expertise (or to build such expertise). Alternative types of debt financing, such as convertible and subordinated loans, can also be supported by public policy through fiscal incentives to lenders or partial coverage of losses in case of bankruptcy or liquidation. Business training and coaching to minimize the risk of business failure can increase the success of such a program and make it less costly.

But credit guarantee schemes also have potential pitfalls that put a premium on designing them with care. The design needs to minimize potential misalignments of incentives because they can otherwise make banks less careful when screening what companies to fund. Although funding higher-risk loans is usually the intended aim of the policy, governments sometimes have little control on whether the “wrong type” of risky company is being selected and whether banks are putting sufficient effort into monitoring loans. Furthermore, a higher share of the loan guaranteed by public institutions might allow more constrained borrowers to get access to external financing, but it could also result in greater adverse selection and moral hazard as lenders become more complacent about screening and monitoring. Credit guarantee programs should be designed to ensure that reliable borrowers are progressively phased out of the scheme because they should be expected to receive loans through traditional channels.

An alternative to credit guarantee schemes is direct lending through a specialized government-owned bank. Although this provides greater control than credit guarantee schemes, it requires expertise and attention to ensure that soft budget constraints and political objectives do not lead to poor credit cultures and insufficient discipline.

Government Support for Private Finance for Innovation. Increasing the availability of equity finance is a common goal of government intervention. Instruments include public fund-of-funds and public/private coinvestment funds. A fund-of-funds is a holding of other investment funds rather than investing directly in start-up firms. These public funds invest in private venture capital firms often with the requirement that other private institutional investors also invest. Coinvestment funds use public money to match private investment. These programs usually match public funds with those of approved private investors on the same terms. Coinvestment schemes not only leverage private money but also are seen as drivers in building, growing, and professionalizing the seed and early stage investment market by providing a more structured investment process.

These two hybrid public-private approaches have become increasingly prevalent in the last five years (OECD 2013b). Despite the growth of these programs, however, there is little evidence of the impact of these instruments and whether or not they crowd out private investors. This makes it important to consider various types of risks when designing such public interventions to support equity finance for innovation. For example, large interventions can be counterproductive, not only crowding out current investment—that is, replacing innovative activities that firms would undertake even in the absence of public support—but also damaging the future development of the risk capital industry.

In addition to stimulating the venture capital industry, public policy can play a role in setting framework conditions for new sources of private capital such as crowdfunding, which refers to money raised from society at large through the use of online platforms. In addition to raising funds for innovative projects by tapping a large number of people for small contributions, crowdfunding can improve attitudes toward entrepreneurship.

Fiscal Measures. Tax incentives based on expenditure or income are a common instrument. Typical expenditure-based tax incentives include R&D tax credits. In addition, business angels can be supported by providing tax incentives to private individuals investing in specific investments and businesses. Income-based tax incentives include preferential rates on royalty income and other income from knowledge capital.

What Are the Implications for Policymakers in Asia?

Although there is a clear rationale for policy intervention in the area of finance for innovation, the limitations of the various interventions outlined above need to be recognized. There is no guarantee that government policy can address market failure in a way that effectively improves the outcome. In addition, the policy may fail to achieve its goals because of inadequate policy design, implementation issues, and governance failure. Furthermore, evidence on the effectiveness of many programs tends to be scarce or

mixed, in part because only a small proportion of programs in OECD countries have been formally evaluated, and empirical analysis is constrained by data on firms at the seed or early stage.

But these difficulties do not negate the need for policy action. In her book *The Entrepreneurial State: Debunking Public vs. Private Sector Myths*, Mariana Mazzucato (2013) documents that countries that today lead in terms of smart innovation-led growth have had state support. The ADB (2014d) emphasized that it will be important for developing Asia to cultivate new forms of innovation financing that go beyond just R&D funding and “there is a need for public sector funding to bridge the so-called valley of death, which prevents new technologies and knowledge from being commercialized by local start-ups and SMEs” (p. 49). The potential pitfalls of public intervention should therefore be viewed as challenges that need to be overcome, and international experience shows that it is possible to design programs with positive outcomes. In particular, the decision to intervene needs to weigh benefits and risks, and the achievements of government intervention need to be scrutinized not only *ex ante* but also *ex post*. Furthermore, different countries face different problems, requiring adjustments in policy instrument and design. For example, merit-based research grants require a more knowledge-based approach by governments than some other types of support, affecting the choice of instrument that should be used.

Examples of policies and institutions that have been found to be effective in advanced countries include the Small Business Innovation Research (SBIR) program in the United States.⁴¹ The evidence shows that recipients of SBIR grants were able to obtain more funding elsewhere and that such firms grew faster afterwards when compared with a matched sample of firms that did not receive SBIR funds (Hall 2009). An important strength of the program contributing to its success is the decentralization of funding decisions spread across 11 federal agencies (UNECE 2009). SITRA, a Finnish innovation fund, invested equity in Nokia early, when its mobile phone venture was viewed as an odd aberration by a paper company; when Nokia blossomed, SITRA made a direct return, which it used to fund new companies (Mazzucato 2013). In Israel, the Yozma program has been successful in kick-starting the venture capital industry, although not on the first try (Hall 2009). And in Latin America, Bronwyn H. Hall and Alessandro Maffioli (2008) found that the effectiveness of technology development funds they analyzed depends on the financing mechanism used, on the presence of nonfinancial constraints, on firm-university interaction, and on the characteristics of the target beneficiaries. In addition, they also found that the funds do not crowd out private investment; instead, they positively affect R&D intensity, and participation in the funds induces a more proactive attitude of beneficiary firms towards innovation

41. For a more comprehensive list of diverse programs and their operational details, see UNECE (2009), which features 34 programs in a range of countries (the United States, the European Union, Germany, France, the United Kingdom, Canada, the Netherlands, Denmark, Finland, Spain, Norway, Israel, the Czech Republic, Slovakia, and the Russian Federation). In addition, Mazzucato (2013) describes a variety of programs, and ADB (2014d) contains some relevant examples. However, there is little systematic and rigorous analysis of whether these programs have succeeded or failed.

activities. In general, programs have been more successful when there has been a critical mass of growth-oriented entrepreneurs and private investors.

State investment banks offer a more direct tool for funding innovation. In addition to the example of Germany's KfW, Mazzucato (2013) highlights two emerging-market state banks that have been successful in meeting their innovation objectives. The Brazilian state development bank, BNDES, has been actively investing in innovation in clean technology and biotechnology. In 2010, the bank's return on equity was 21 percent, much of which was reinvested in new sectors focusing on the valley of death stage of biotechnology (in which private venture capital tends to be absent). The author points out that the role of state investment banks goes further, as in the case of the China Development Bank (CBD), which is not only a substitute for private finance that is too risk averse to invest in Chinese high-tech manufacturers but also a means of creating opportunities for these and other manufacturers by providing financing to foreign purchasers of their products (for example, for wind farms using wind turbines manufactured in the PRC).

Patarapong Intarakumnerd and Juruhee Wonglimpiyart (2012) do a comparative study of Singapore and Taipei, China, economies with strong national innovation systems, and Malaysia and Thailand, whose innovation systems are less strong, with the result that they have been less successful in technological catching up and industrial development.⁴² The authors depict the stages of catching-up industrialization in figure 10. To gain insight into how countries can move from stage two to stage three or four, the authors (i) do a macro-level analysis of the national innovation systems in the four economies, and (ii) an operating level analysis of the content, efficiency, and effectiveness of the economies' schemes in taxation, grants, loans, direct equity financing, and capital market financing.

Intarakumnerd and Wonglimpiyart (2012) summarize the factors underlying successful government innovation financing programs as follows.

- First, in the more successful cases of Singapore and Taipei, China policy instruments to finance innovation and levels of technological and innovative capabilities of firms have evolved together. Thus it is important to adopt a dynamic rather than static approach, requiring the ability to initiate and implement new policy instruments to fit the changing needs of firms at different levels of capability.
- Second, the key success factors, generally present in Singapore and Taipei, China and to a lesser extent in Malaysia, were (1) a higher level of flexibility and policy coordination and learning and (2) the use of a greater variety of policy instruments and catering them selectively to the particular needs of industrial sectors, clusters, technologies, types of firms, or even individual firm demands.

42. The study is summarized in a detailed presentation by Intarakumnerd (2012).

- Third, developing technological and innovative capabilities takes a long time, which makes the amount, duration, and continuity of government support schemes crucial.
- Fourth, policymakers need to develop a deep understanding of what constitutes innovation systems and how they evolve over time. For example, Thailand narrowly focused on R&D-led innovation, while Singapore and Taipei, China broadened their activities to other innovation processes.
- Fifth, financing innovation policies require other corresponding policy initiatives to make them work successfully, for example: improving the quality of human resources, attracting foreign talent, and helping organizations such as research institutes work together with financing innovation schemes.
- Finally, institutional factors—namely, laws and regulations, unity and capability of government bureaucracy, trust, entrepreneurship, attitudes toward corruption and the role of government in supporting private firms—shape the choice and effective implementation of policies. But institutional shortcomings can be corrected, at least to some extent.

Three misconceptions about access to finance for innovation have implications for the design of public policy in Asia. First, there is a misconception that private venture capitalist funds are essential to drive innovation. However, as pointed out in OECD (2010), venture capital is a niche phenomenon that touches a tiny share of entrepreneurs and moves a relatively small share of capital at the global level. In addition, it typically addresses the expansion stage of business rather than the startup phase and is highly sensitive to the economic cycle. Hall and Lerner (2009) also provide evidence of the limits to venture capital as a solution to the funding gap faced by innovative firms, especially in countries where public equity markets for venture capital exit are not fully developed. Furthermore, Mazzucato (2012 and 2013) reports that because of venture capital's emphasis on returns that are high but quick and low risk, it has had a detrimental effect on the ability of venture capital-backed companies to produce real value for the economy, that is, new products and jobs. In a similar vein, FINNOV (2012) notes that over half of early stage venture capital investment in Europe is provided by “hybrid” funds that are supported with public money. The hybrid approach has been important because private venture capital funds have performed poorly and have trouble raising enough money to reach the size needed to be commercially viable. Finally, Laura Bottazzi (2009) concludes that although venture capital has been effective in helping innovative firms overcome credit constraints, it has had a limited effect on their ability to grow and create jobs.⁴³ Therefore, the role of venture capital should be considered within the architecture of financing for innovation, which includes complementary and alternative instruments.

Second, there is a misconception that most growth is driven by new innovations brought by new entrants and creative destruction, as described in Joseph Schumpeter's endogenous growth models.

43. Bottazzi (2009), however, points out that her result clashes with the evidence on the role of venture capital for US companies.

Concomitantly, it is sometimes argued that more entrepreneurs and SMEs are needed to drive economic growth and innovation because they engage in more “radical” innovations to replace incumbents. However, Daron Acemoglu and Dan Vu Cao (2010) point out that a large fraction—but not all—of US industry-level productivity is accounted for by existing firms and continuing establishments because they have access to technology for incremental innovations and can improve their existing machines and products. Daniel Garcia-Macia, Chang-Tai Hsieh, and Peter J. Klenow (2014) reach similar conclusions based on data on US manufacturing firms. And based on data from Europe, FINNOV (2012, 6) concludes, “While some SMEs and entrepreneurs contribute to innovation and growth, most do not and the ones that do are atypical. The majority of start-ups end up as marginal, undersized, poor performance enterprises that can drive down profits, increase factor prices for high-potential firms, confuse investors, and fail to generate benefits commensurate with the amount of public support they receive.” Accordingly, as emphasized by Mazzucato (2012), what matters for policy is finding ways to target the high growth innovative companies, regardless of their size and whether they are incumbents or new entrants. That is, the point of finance for innovation should be to allow new things to happen and to create better SMEs rather than more SMEs.

Third, there tends to be a misconception that the state is incapable of “picking winners” because it is clumsy, bureaucratic, and not suited for entrepreneurial risk taking, and therefore losers end up picking the state. But Mazzucato (2013, chapter 1) argues that operating in difficult territory makes the probability of failure higher. As she puts it, “Public venture capital, for example, is very different from private venture capital. It is willing to invest in areas of much higher risk, while providing greater patience and lower expectations of future returns. By definition this is a more difficult situation. Yet the returns to public versus private venture capital are compared without taking this difference into account.” She asserts, therefore, that the policy debate needs to go beyond the worry about picking winners and that more thought should be dedicated to how to reward the wins when they happen. As a result, returns would be available to cover losses from inevitable failures and to fund future wins. Instruments that meet these goals are income contingent loans, equity, and returns earned by state investment banks. In addition, it will be important to design programs and processes in a way that reduces the likelihood of political capture, which previous experience with industrial policy in East Asia suggests could be a greater drawback than one of government bureaucrats picking winners (Noland and Pack 2005).⁴⁴

44. In a study of industrial policy in East Asia, Noland and Pack (2005) argue that although Japan, the Republic of Korea, and Taipei, China pursued intervention policies to promote preferred high-technology sectors, the actual pattern of interventions observed were largely determined by political, not analytical, considerations. The political capture by special interests, which also affected bureaucrats who might be thought of as being less susceptible, resulted in resource transfers via direct and indirect subsidies going to declining natural resource sectors (e.g., agriculture, forestry, fisheries, mining), with the manufacturing sector being a net taxpayer.

CONCLUDING REMARKS

Much of developing Asia will need to rely more on improvements in productivity growth and less on capital accumulation to drive growth in the future. Middle-income countries in the region will need to move up the technology ladder and improve the quality of infrastructure to avoid falling into the middle-income trap. Enhancing productivity-led growth is, however, a complex and multidimensional task, with reform priorities that vary across income groups and distance to the global technology frontier.

This paper has focused on the role of the financial sector in facilitating developing Asia's transformation to productivity- and innovation-led growth. Financial development and deepening affect growth primarily by fostering more efficient allocation of capital across firms and industries and spurring productivity growth, and not by raising the rate of aggregate saving or capital accumulation. Moreover, policymakers should focus less on increasing the size of the financial sector and more on improving its intermediating function. Micro- and macroprudential regulatory policies will be indispensable to make finance safer for taxpayers and society while promoting growth-enhancing financial sector development.

Low-income and lower-middle income countries in Asia tend to have more bank-based financial systems and could benefit most from further banking system reforms. Such reforms should aim to mobilize domestic savings, lower the cost of and improve access to credit, and promote the allocation of credit to the most productive sectors. Where financial repression is present, reducing it would help induce resources to move to their most productive uses. Upper-middle-income Asian countries can reap significant productivity gains by further deepening their capital markets. Policies that encourage the further development of equity, bond, and securities markets can contribute to better TFP and labor productivity by lowering the cost of capital and facilitating the financing of new capital and innovation.

Developing Asia must also build and continually replenish the tangible and intangible capital that induces productivity growth and innovation. Such investments require long-term finance. However, despite Asia's large pool of savings, the range of instruments for long-term financing in the region remains narrow. Addressing the barriers to long-term finance in Asia should therefore be a priority. In view of the infrastructure deficit in much of developing Asia, particular attention will need to be devoted to the long-term financing of infrastructure projects. Greater access to loans allows financially constrained SMEs to invest in productive projects that may otherwise not be taken up. The emphasis put by policymakers in developing Asia to improve SMEs' access to finance, supported by analysis and advice from the Asian Development Bank, is therefore appropriate.

As a country approaches the global technology frontier, innovation instead of imitation becomes more important to sustain productivity and output growth. For middle-income Asian countries, knowledge and innovation are becoming increasingly important as a source of productivity growth necessary for them to avoid the middle-income trap and converge more quickly to per capita incomes in

OECD countries. Promoting the specialized financing needed for innovation is hence an immediate issue for policymakers in the region. In view of capital market imperfections and positive externalities from knowledge creation, there is an important role for public policy interventions to promote such specialized finance for innovation. Successful government innovation programs in more advanced countries in Asia and elsewhere provide valuable lessons.

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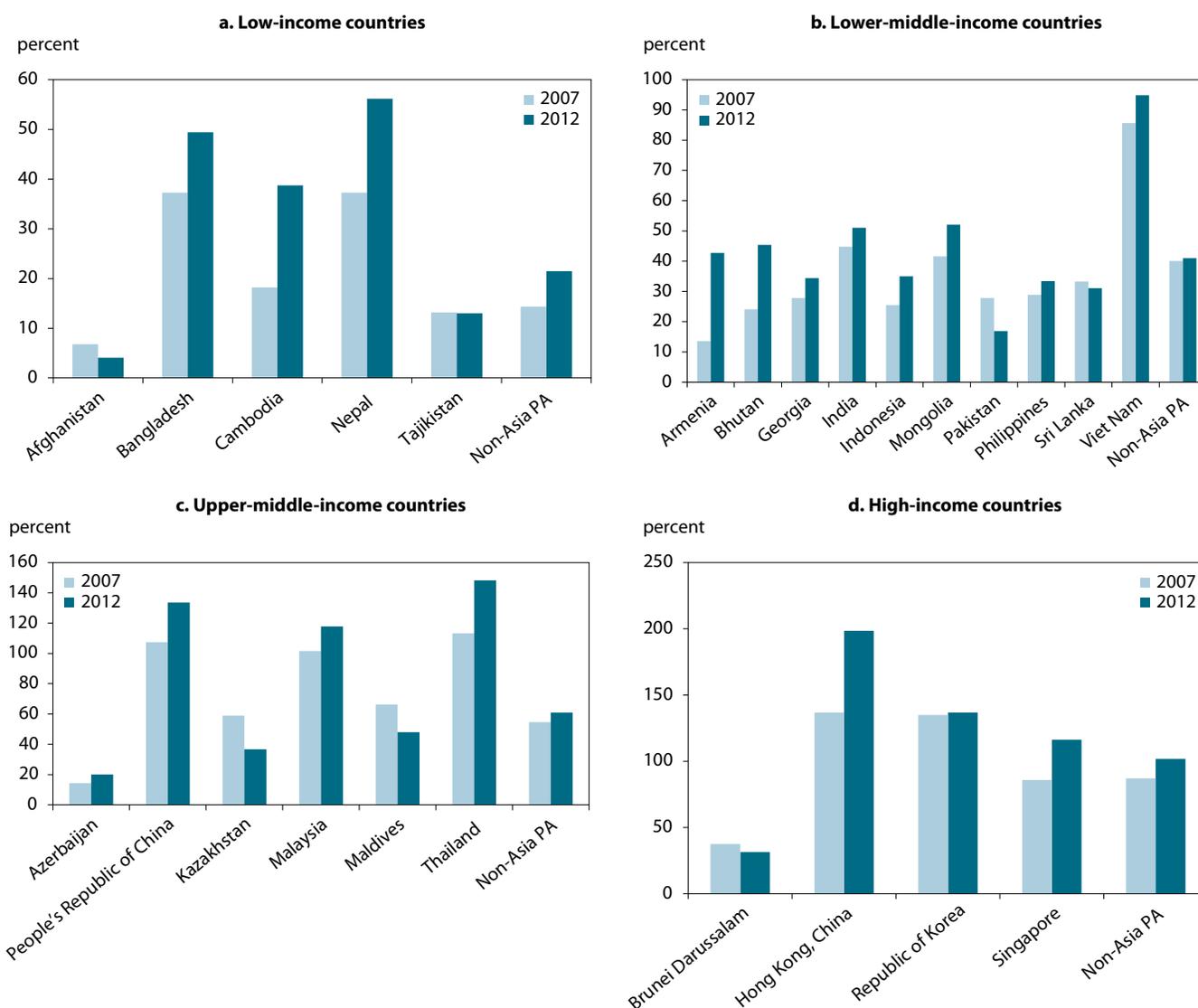
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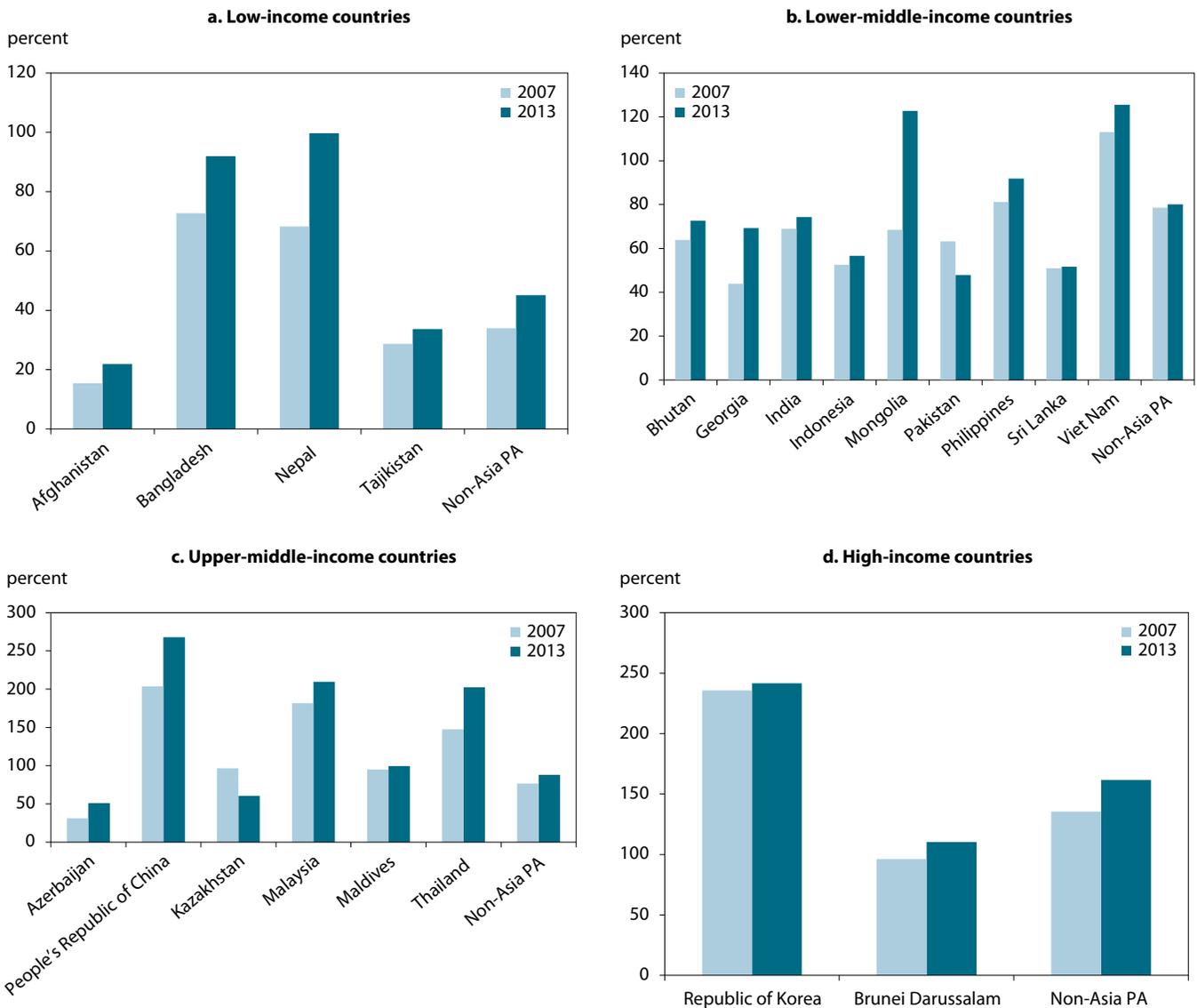
Figure 1 Private credit to GDP ratio, 2007 and 2012



Note: Non-Asia PA is non-Asia peer average. For country income levels, the World Bank's 2014 country classifications are used. Low-income non-Asia peers comprise Kenya, Madagascar, Malawi, Mozambique, Tanzania, and Uganda. Lower-middle-income non-Asia peers comprise Bolivia, Cote d'Ivoire, Egypt, Morocco, Nigeria, and Ukraine. Upper-middle-income non-Asia peers comprise Bulgaria, Colombia, Hungary, Mexico, Peru, Romania, South Africa, and Turkey. High-income non-Asia peers comprise Chile, Croatia, Poland, and Portugal.

Source: World Bank, *World Development Indicators* database.

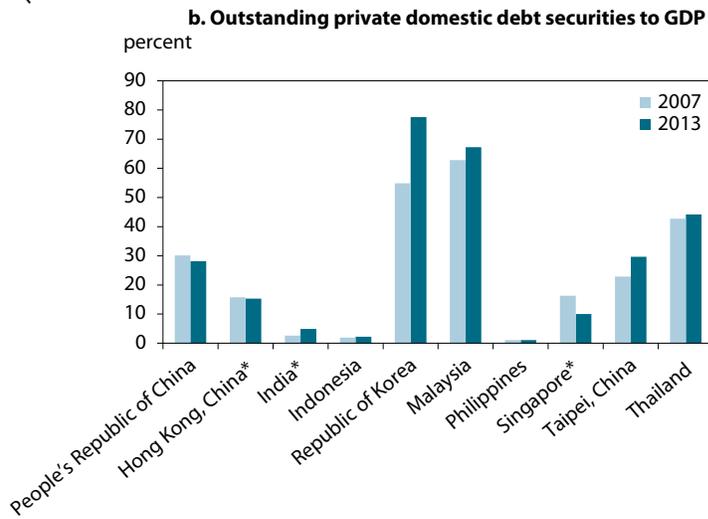
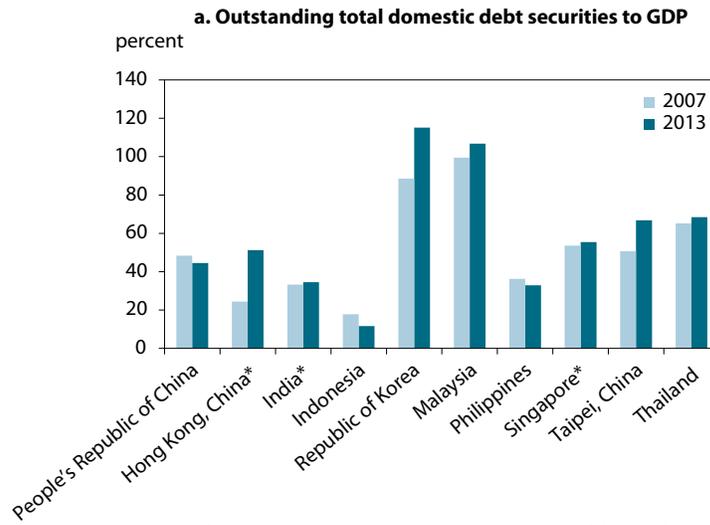
Figure 2 Banking sector assets to GDP ratio, 2007 and 2013



Note: Non-Asia PA is non-Asia peer average. For country income levels, the World Bank's 2014 country classifications are used. Low-income non-Asia peers comprise Kenya, Madagascar, Malawi, Mozambique, Tanzania, and Uganda. Lower-middle-income non-Asia peers comprise Bolivia, Cote d'Ivoire, Egypt, Morocco, Nigeria, and Ukraine. Upper-middle-income non-Asia peers comprise: Bulgaria, Colombia, Hungary, Mexico, Peru, Romania, South Africa, and Turkey. High-income non-Asia peers comprise Chile, Croatia, Poland, and Portugal.

Sources: IMF, *International Financial Statistics*; IMF, *World Economic Outlook* database.

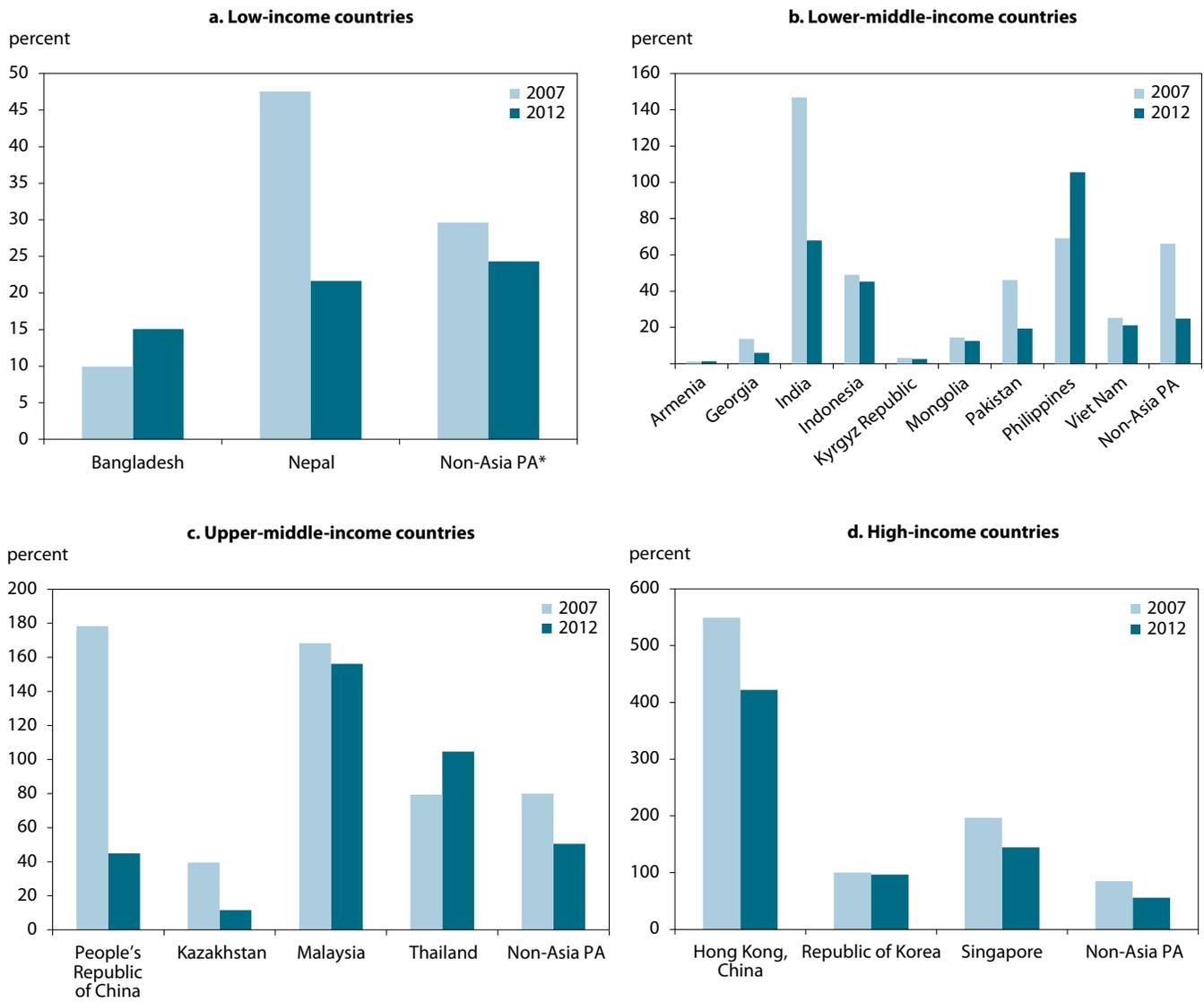
Figure 3 Domestic debt securities to GDP ratio, 2007 and 2013



* = data unavailable for 2013, so replaced with 2011 data.

Sources: Bank for International Settlements; IMF, *World Economic Outlook* database; World Bank, *World Development Indicators* database.

Figure 4 Stock market capitalization to GDP ratio, 2007 and 2012

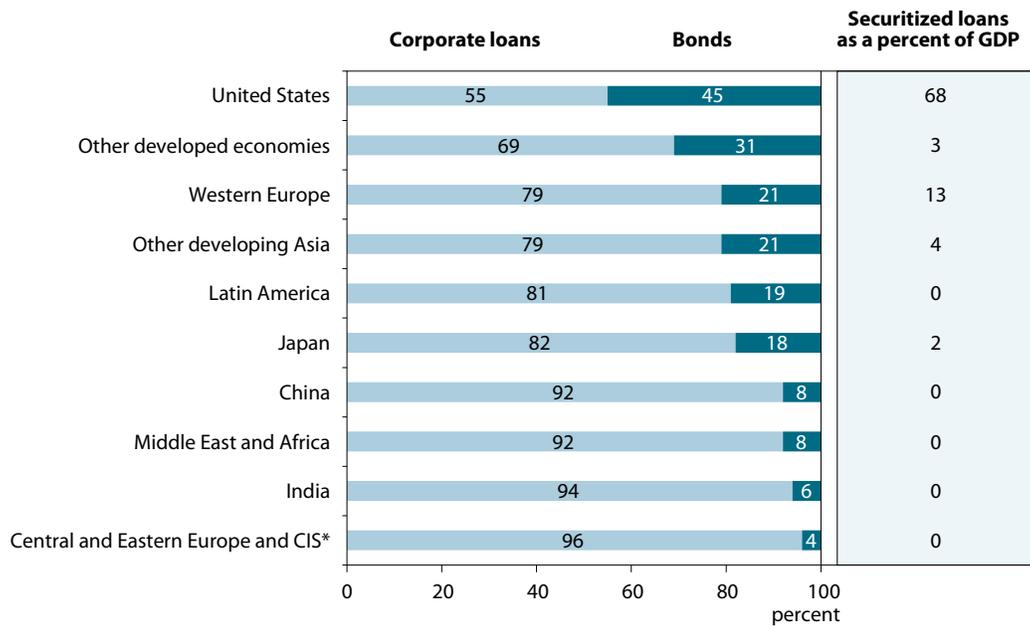


* = 2007 data unavailable for Malawi, Tanzania, and Uganda so 2008 data are used for these three countries.

Note: Non-Asia PA is non-Asia peer average. For country income levels, the World Bank's 2014 country classifications are used. Low-income non-Asia peers comprise Kenya, Malawi, Tanzania, and Uganda. Lower-middle-income non-Asia peers comprise Bolivia, Cote d'Ivoire, Egypt, Morocco, Nigeria, and Ukraine. Upper-middle-income non-Asia peers comprise Bulgaria, Colombia, Hungary, Mexico, Peru, Romania, South Africa, and Turkey. High-income non-Asia peers comprise Chile, Croatia, Poland, and Portugal.

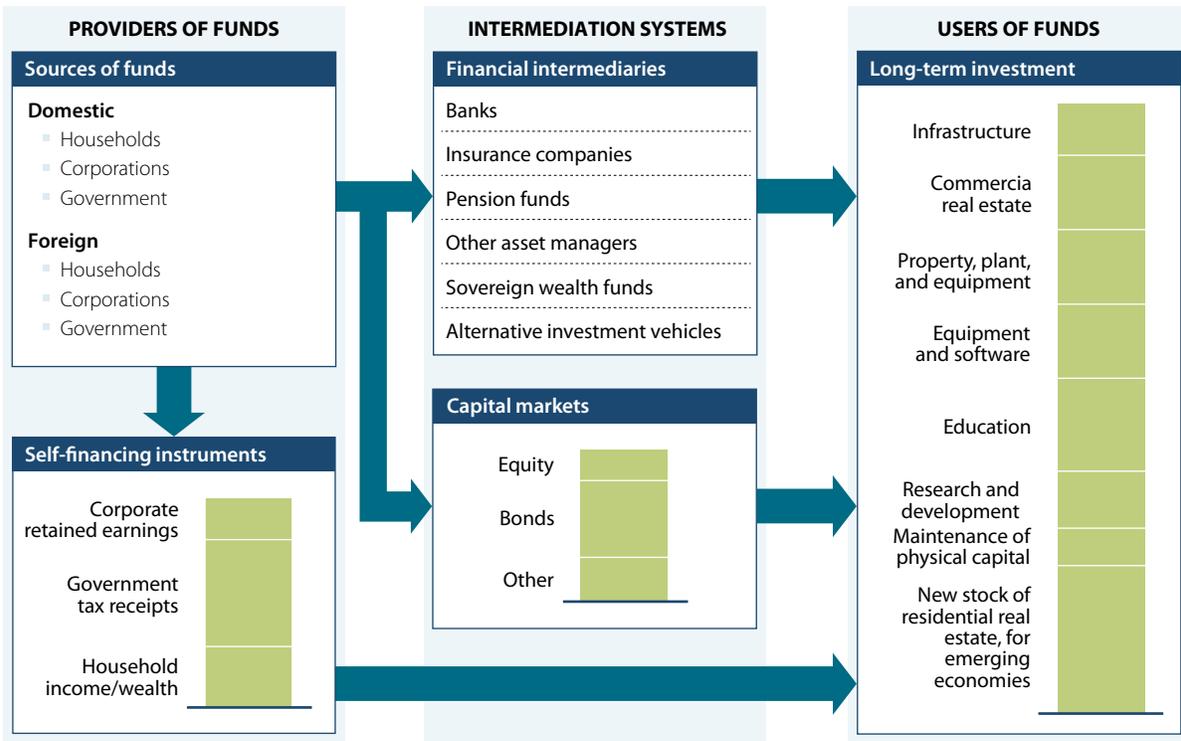
Source: World Bank, *World Development Indicators* database.

Figure 5 Debt financing obtained by nonfinancial corporations, 2011



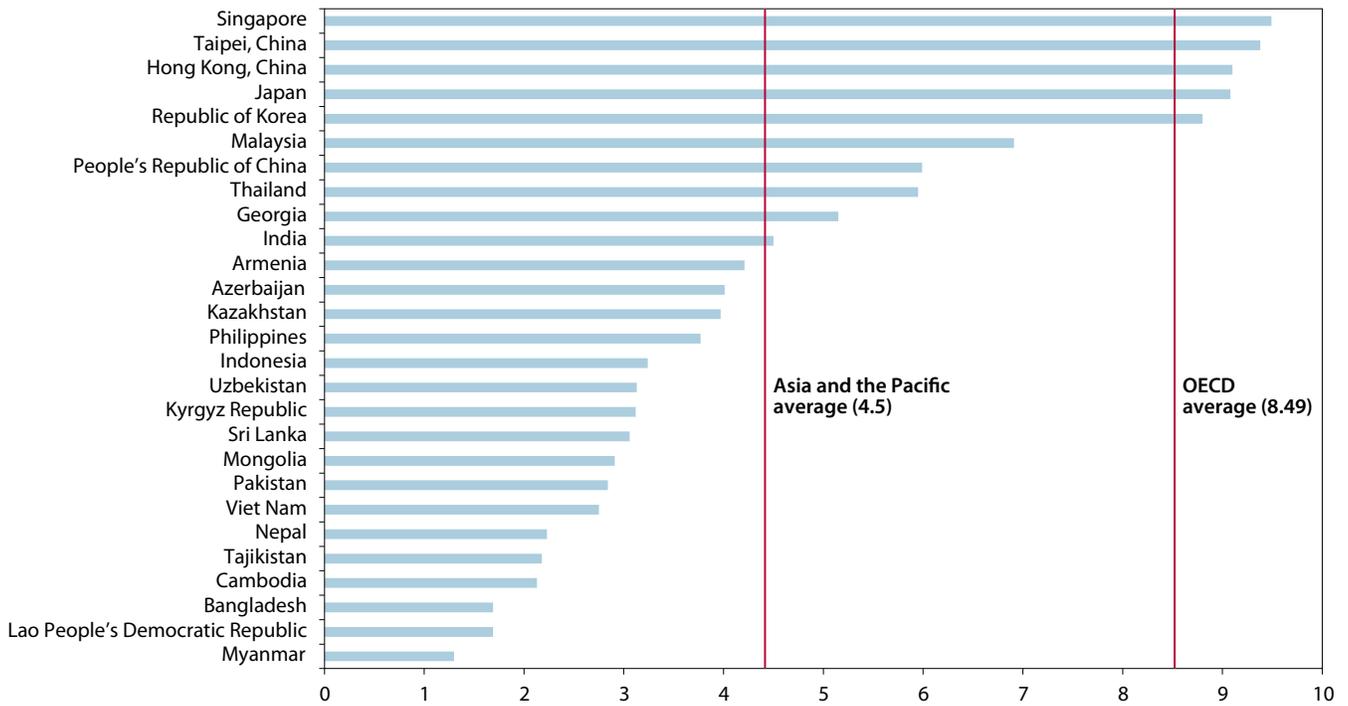
CIS = Commonwealth of Independent States
 Source: Group of Thirty (2013); McKinsey Global Institute.

Figure 6 Framework for the provision of finance for long-term investment



Source: Group of Thirty (2013); McKinsey Global Institute.

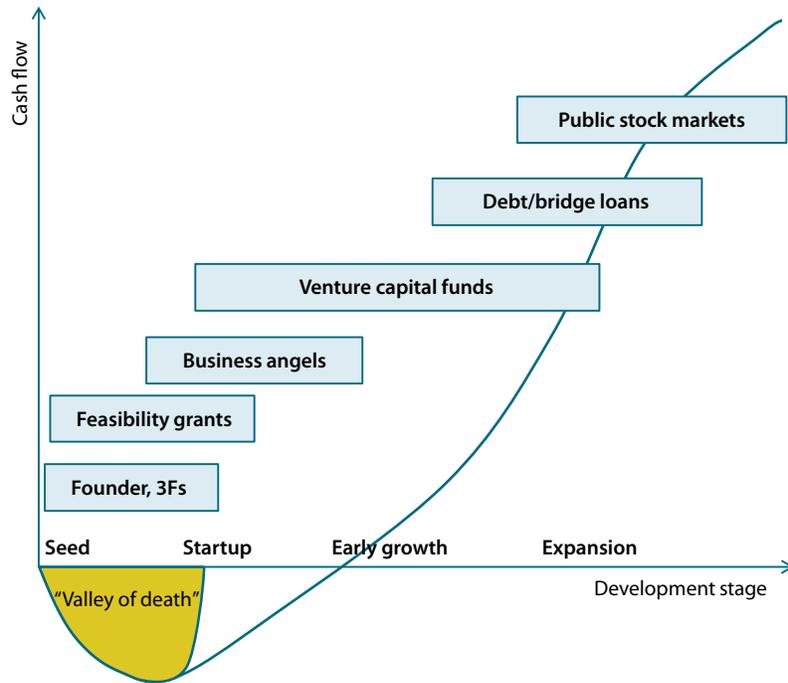
Figure 7 Innovation index



Note: Three variables are used to construct this index: royalty and licence fee payments and receipts; patent applications granted by the US Patent and Trademark Office; and scientific and technical journal articles. Countries are ranked in order from "best" to "worst" using their actual scores on each variable and then their scores are normalized from 0 to 10 against all the countries in the comparison group. For a full explanation of the methodology, see <http://web.worldbank.org/WBSITE/EXTERNAL/WBI/WBIPROGRAMS/KFDLP/EXTUNIKAM/0,,contentMDK:20584281~menuPK:1433234~pagePK:641-68445~piPK:64168309~theSitePK:1414721,00.html>.

Source: World Bank Innovation Sub-index from the World Bank Knowledge Economy index, 2012.

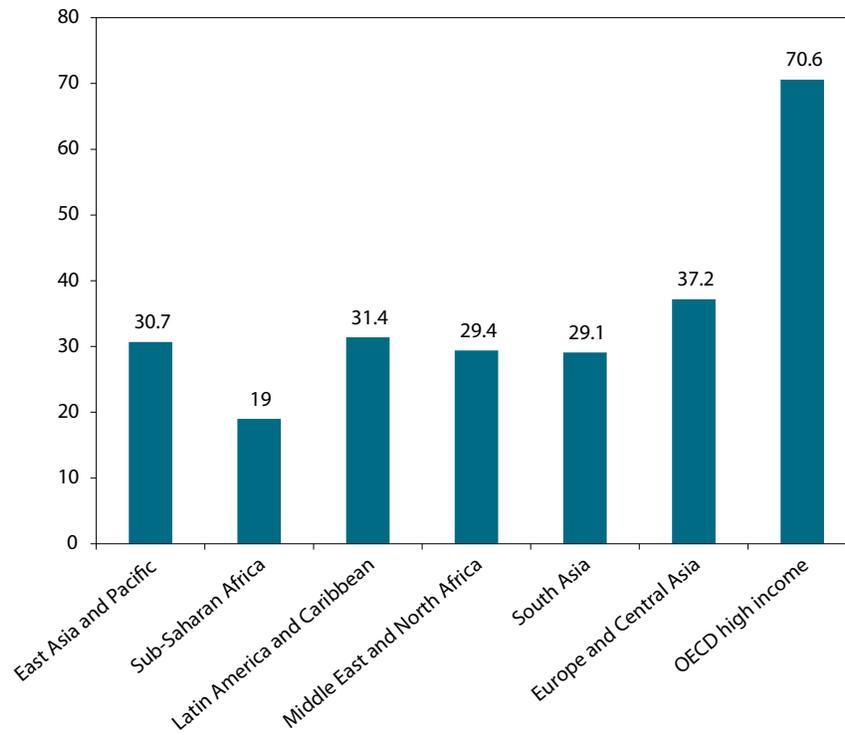
Figure 8 Development stages, cash flow, and sources of finance



3Fs = friends, family, and fools
Source: UNECE (2009).

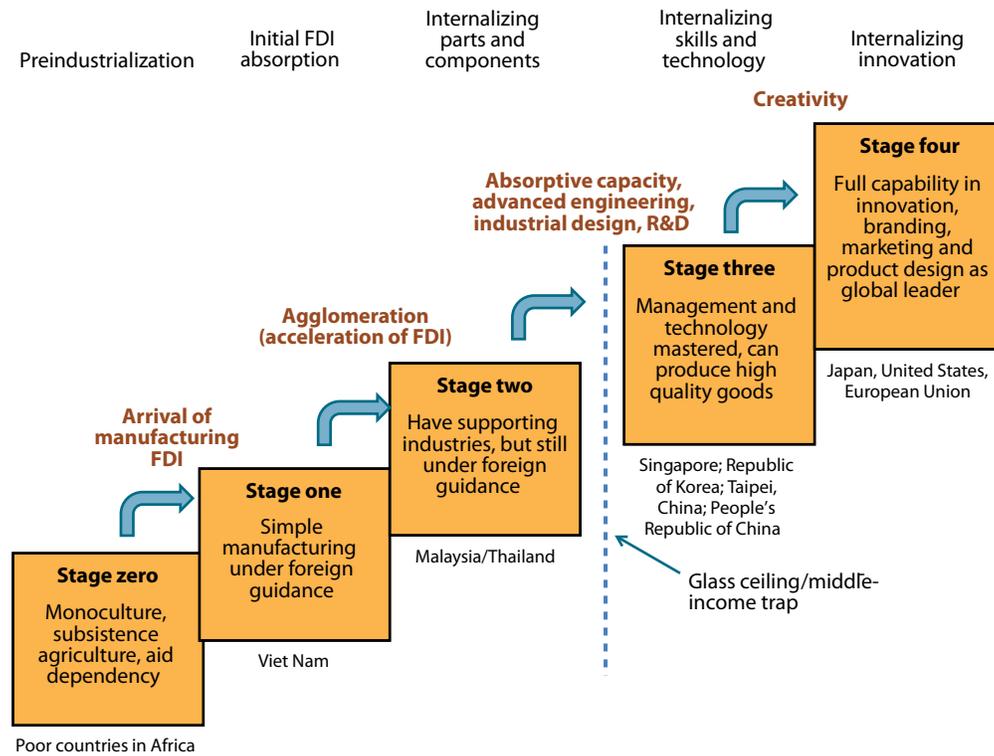
Figure 9 Recovery rate in case of insolvency

cents on a dollar



OECD = Organization for Economic Cooperation and Development
Source: World Bank (2014).

Figure 10 Stages of catching-up industrialization



FDI = foreign direct investment; R&D = research and development

Sources: Intarakumnerd and Wonglimpiyart (2012), adapting Ohno (2011), www3.grips.ac.jp/~gist/en/events/document/gistseminar_35.pdf.