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Preparing for Choppy Seas

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Contents

Tables

Figures

Definitions

In this *Regional Economic Outlook: Asia and Pacific*, the following groupings are employed:

"ASEAN" refers to Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam, unless otherwise specified.

"ASEAN-5" refers to Indonesia, Malaysia, the Philippines, Singapore, and Thailand.

"Advanced Asia" refers to Australia, Hong Kong SAR, Japan, Korea, New Zealand, Singapore, and Taiwan Province of China.

"Emerging Asia" refers to China, India, Indonesia, Malaysia, the Philippines, Thailand, and Vietnam.

"Frontier and Developing Asia" refers to Bangladesh, Cambodia, Lao People's Democratic Republic, Mongolia, Myanmar, Nepal, and Sri Lanka.

"Asia" refers to ASEAN, East Asia, Advanced Asia, South Asia, and other Asian economies.

"EU" refers to the European Union

"G-7" refers to Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States.

"G-20" refers to Argentina, Australia, Brazil, Canada, China, the European Union, France, Germany, India, Indonesia, Italy, Japan, the Republic of Korea, Mexico, Russia, Saudi Arabia, South Africa, Turkey, the United Kingdom, and the United States.

The following abbreviations are used:

AAM	automatic adjustment mechanism
ASEAN	Association of Southeast Asian Nations
BIS	Bank for International Settlements
CDIS	Coordinated Direct Investment Survey
CPI	consumer price index
CPIS	Coordinated Portfolio Investment Survey
DSGE	dynamic stochastic general equilibrium
DVA	domestic value added
EBA	External Balance Approach
ECI	economic complexity index
FCI	financial conditions index
FDI	foreign direct investment
FSI	Financial Soundness Indicators
FX	foreign exchange

GDP	gross domestic product
GFCF	gross fixed capital formation
GMM	generalized method of moments
GVC	global value chain
IS	investment saving
LFPR	labor force participation rate
LICs	low-income countries
NAFTA	North American Free Trade Agreement
OECD	Organisation for Economic Co-operation and Development
PICs	Pacific island countries
QQE	quantitative and qualitative easing
R&D	research and development
REER	real effective exchange rate
RFI	rapid financing investment
TFP	total factor productivity
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
VAR	vector autoregression
VIX	Chicago Board Options Exchange Market Volatility Index
WEO	*World Economic Outlook*
WTO	World Trade Organization

The following conventions are used:

In tables, a blank cell indicates "not applicable," ellipsis points (. . .) indicate "not available," and 0 or 0.0 indicates "zero" or "negligible." Minor discrepancies between sums of constituent figures and totals are due to rounding.

In figures and tables, shaded areas show IMF projections.

An en dash (–) between years or months (for example, 2007–08 or January–June) indicates the years or months covered, including the beginning and ending years or months; a slash or virgule (/) between years or months (for example, 2007/08) indicates a fiscal or financial year, as does the abbreviation FY (for example, FY2009).

An em dash (—) indicates the figure is zero or less than half the final digit shown.

"Billion" means a thousand million; "trillion" means a thousand billion.

"Basis points" refer to hundredths of 1 percentage point (for example, 25 basis points are equivalent to ¼ of 1 percentage point).

As used in this report, the term "country" does not in all cases refer to a territorial entity that is a state as understood by international law and practice. As used here, the term also covers some territorial entities that are not states but for which statistical data are maintained on a separate and independent basis.

This *Regional Economic Outlook: Asia and Pacific* was prepared by a team coordinated by Ranil Salgado of the IMF's Asia and Pacific Department, under the overall direction of Changyong Rhee and Kenneth Kang. Contributors include Serkan Arslanalp, Sergei Dodzin, Xinhao Han, Thomas F. Helbling, Minsuk Kim, Tidiane Kinda, Dongyeol Lee, Jaewoo Lee, Dirk Muir, Ryota Nakatani, Shanaka J. Peiris, Umang Rawat, Jacqueline Pia Rothfels, Sandra Valentina Lizarazo Ruiz, Jochen Markus Schmittmann, Tahsin Saadi Sedik, Marina Mendes Tavares, Volodymyr Tulin, Niklas Westelius, and Yiqun Wu. Xinhao Han, Ananya Shukla, and Qianqian Zhang provided research assistance. Alessandra Balestieri and Socorro Santayana provided production assistance. Rosanne Heller, former IMF APD editor, and Linda Long of the IMF's Communications Department edited the volume and coordinated its publication and release, with editing help from David Einhorn and Lucy Morales. The Grauel Group provided layout services. This report is based on data available as of April 3, 2017, and includes comments from other departments and some Executive Directors.

Executive Summary

The outlook for the Asia-Pacific region remains robust—the strongest in the world, in fact—and recent data point to a pickup in momentum. The near-term outlook, however, is clouded with significant uncertainty, and risks, on balance, remain slanted to the downside. Medium-term growth faces secular headwinds, including from population aging and sluggish productivity. Macroeconomic policies should continue to support growth while boosting resilience, external rebalancing, and inclusiveness. The region needs structural reforms to address its demographic challenges and to boost productivity.

The recent growth momentum in the largest economies in the region remains particularly strong, reflecting policy stimulus in China and Japan, which in turn is benefiting other economies in Asia. More broadly across the region, forward-looking indicators such as the Purchasing Managers' Index suggest continued strength in activity into early 2017.

Against this backdrop, growth is forecast to accelerate to 5.5 percent in 2017 from 5.3 percent in 2016. Growth in China and Japan is revised upward for 2017 compared to the October 2016 *World Economic Outlook*, owing mainly to continued policy support and strong recent data. Growth is revised downward in India due to temporary effects from the currency exchange initiative and in Korea owing to political uncertainty. Over the medium term, slower growth in China is expected to be partially offset by an acceleration of growth in India, underpinned by key structural reforms.

While additional stimulus in the United States and stronger growth in China could provide short-run support, the risks to the outlook, on balance, are still tilted to the downside. In the near term, tighter global financial conditions could trigger capital flow volatility, which could interact with and exacerbate balance sheet weaknesses in a number of economies. More inward-looking policies in advanced economies would significantly impact Asia, given the region's trade openness. A bumpier-than-expected transition in China would also have large spillovers. Geopolitical tensions and domestic political uncertainties could burden the outlook for various countries. Over the medium term, growth faces secular headwinds, including from population aging in some countries and slowing productivity catch-up, topics covered in Chapters 2 and 3.

Chapter 2 highlights the demographic challenges facing Asia—namely that parts of Asia risk "growing old before becoming rich." The speed of aging is especially notable compared to the experience in Europe and the United States. For many countries in the region, on current trends, per capita income (benchmarked against the United States) will be much lower than that reached by advanced economies at a similar peak in their aging cycle. The drag on future growth from aging could be significant especially in relatively old Asian countries.

Chapter 3 finds that productivity growth has slowed since the global financial crisis, with limited catch-up ("convergence") toward the United States and other countries at the technological frontier. The slowdown has been most severe in the advanced economies of the region and in China. Many factors behind the productivity slowdown identified elsewhere apply to Asia as well, including sluggish investment, little impetus from trade, slowing human capital formation, reallocation of resources to less productive sectors, and the aging population. Without reforms, productivity growth will likely remain low for some time, with headwinds from rapid aging becoming increasingly important.

On policies, appropriate demand support and structural reforms are needed to reinforce growth momentum where it is weak. Monetary policy should remain accommodative, given that inflation is below target and there is slack in most economies in the region. However, some central banks should stand ready to raise the policy rate if inflationary pressures gather pace. Some others need to tighten macroprudential settings and gradually raise interest rates to slow credit growth. Fiscal policy should support and complement structural reforms and external rebalancing, where needed and fiscal space is available. At the same time, countries with closed output gaps should start rebuilding fiscal space. Delivering on medium-term fiscal consolidation plans is also critical in some countries, especially where debt levels are high and fiscal credibility needs to be enhanced. Structural reforms are needed to help reduce external imbalances, mitigate domestic and external vulnerabilities, and promote faster and more inclusive growth. The appropriate policy mix varies across economies, depending on the output gap, policy space, and reform priorities, as well as the need for external rebalancing.

In addition, addressing vulnerabilities while safeguarding against external shocks will help preserve financial stability. Exchange rate flexibility should generally remain the main shock absorber against a sudden tightening in global financial conditions or a shift toward protectionism in major trading partners. Policymakers should continue to rely on macroprudential policies to mitigate systemic risks associated with high corporate and household leverage and rising interest rates, while over time addressing underlying balance sheet vulnerabilities. Macroprudential policies could also be used to increase the resilience to shocks, including shocks associated with reversal of capital flows.

To sustain long-term growth, structural reforms are needed to deal with challenges from demographic transition and to boost productivity. Given the rapid pace of demographic transition, policies aimed at protecting the vulnerable elderly, raising labor force participation (especially for women and the elderly), and boosting potential growth take on a particular urgency. Priority structural reforms to tackle these challenges include labor market and pension system reforms. Macroeconomic policies should adjust early on before aging sets in, particularly with a view to safeguarding debt sustainability. The other major policy challenge is to raise productivity when external factors might not be as supportive as in the past. Overall, the empirical results stress the importance of openness and foreign direct investment (FDI) in boosting productivity, particularly for emerging market and developing economies. In these economies, the priority should be to capitalize on recent achievements, including with respect to increased FDI inflows, through further increases in absorptive capacity and domestic investment. Advanced economies should focus on strengthening the effectiveness of research and development spending and taking measures to raise productivity in the services sectors, as well as supporting trade integration and liberalization in services.

1. Preparing for Choppy Seas

Recent Developments and Near-Term Outlook

The Asia-Pacific region continues to be the world leader in growth, and recent data point to a pickup in momentum. Growth is projected to reach 5.5 percent in 2017 and 5.4 percent in 2018. Accommodative policies will underpin domestic demand, offsetting tighter global financial conditions. Despite volatile capital flows, Asian financial markets have been resilient, reflecting strong fundamentals. However, the near-term outlook is clouded with significant uncertainty, and risks, on balance, remain slanted to the downside. On the upside, growth momentum remains strong, particularly in advanced economies and in Asia. Additional policy stimulus, especially U.S. fiscal policy, could provide further support. On the downside, the continued tightening of global financial conditions and economic uncertainty could trigger volatility in capital flows. A possible shift toward protectionism in major trading partners also represents a substantial risk to the region. Asia is particularly vulnerable to a decline in global trade because the region has a high trade openness ratio, with significant participation in global supply chains. A bumpier-than-expected transition in China would also have large spillovers. Medium-term growth faces secular headwinds, including population aging and slow productivity catchup. Adapting to aging could be especially challenging for Asia, as populations living at relatively low per capita income levels in many parts of the region are rapidly becoming old. In other words, parts of Asia risk "growing old before becoming rich." Another challenge for the region is how to raise productivity growth—productivity convergence with the United States and other advanced economies has stalled—when external factors, including further trade integration, might not be as supportive as they were in the past. On policies, monetary policy should generally remain accommodative, though policy rates should be raised if inflationary pressures pick up, and macroprudential settings should be tightened in some countries to slow credit growth. Fiscal policy should support and complement structural reforms and external rebalancing, where needed and fiscal space is available; countries with closed output gaps should start rebuilding fiscal space. To sustain long-term growth, structural reforms are needed to deal with challenges from the demographic transition and to boost productivity.

This chapter was prepared by Tahsin Saadi Sedik (lead), Sergei Dodzin, and Minsuk Kim, under the guidance of Ranil Salgado and in collaboration with country teams. Alessandra Balestieri and Socorro Santayana provided excellent production assistance, and Xinhao Han, Ananya Shukla, and Qianqian Zhang provided invaluable research assistance.

Global Developments: Stronger Near-Term Momentum amid Rising Uncertainty

The global economy is gaining momentum. The pace of economic activity has strengthened in advanced economies, including the United States, as well as in some emerging market and developing economies. Market sentiment has been favorable. Asset price changes generally reflect both a more optimistic market environment, with stronger risk appetite, and shifting expectations regarding policy setting in major economies. In particular, markets expect a shift toward looser fiscal and tighter monetary policy in the United States. At the same time uncertainty remains high, both on the specifics of U.S. fiscal policy and on other aspects of the new administration's policy agenda, including trade and regulation.

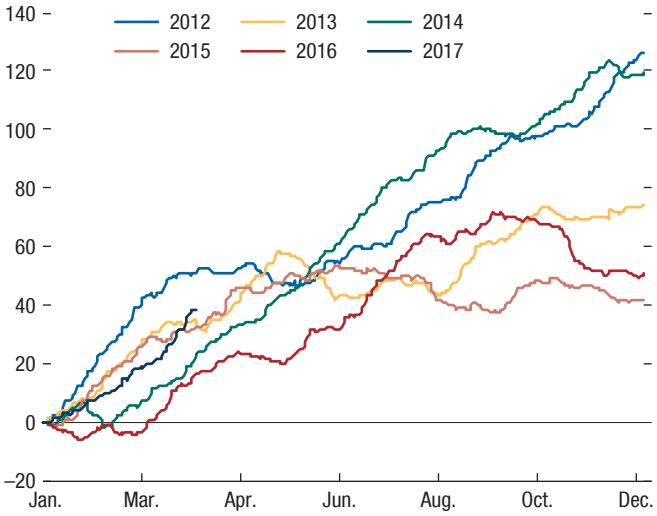
World economic growth is forecast to accelerate from 3.1 percent in 2016 to 3.5 percent in 2017 and 3.6 percent in 2018—a slight upward revision for 2017 compared with the October 2016 *World Economic Outlook* (WEO) forecast. Underlying the forecast is also a shift in expectations about the strength of economic activity across country groups. In line with the stronger-than-expected pickup in growth in advanced economies and weaker-than-expected activity in some emerging market economies along with the assumed fiscal stimulus in the United States, the forecast

envisages a faster rebound in activity in advanced economies and marginally weaker growth in emerging market and developing economies. Headline inflation has increased in advanced economies, but core inflation remains subdued and heterogeneous (consistent with the diversity in output gaps). In emerging market economies, the revival in headline inflation is more nascent. Core inflation is generally muted and broadly stable in most emerging market economies. For 2017 and 2018, with the uptick in commodity prices, a broad-based increase in headline inflation rates is projected in advanced, emerging market, and developing economies (see the April 2017 *World Economic Outlook*).

While global financial conditions have started to tighten, they remain accommodative on balance with favorable market sentiment. Expectations of looser fiscal policy and tighter monetary policy in the United States have contributed to a stronger dollar and higher U.S. Treasury interest rates, pushing up yields elsewhere. Yet market sentiment has generally been strong, with notable gains in equity markets in both advanced and emerging market economies, as well as higher risk appetite and relatively low financial market volatility.

With buoyant market sentiment, there is now more tangible upside potential for the near term, particularly owing to policy stimulus in some larger economies. Nonetheless, in light of broad policy uncertainty, risks remain slanted to the downside, including a possible sharp increase in risk aversion. The uncertainty over the likely effects of U.S. policy actions implies a wide range of upside and downside risks to the current baseline forecast for the United States as well as for the global economy. Risks of adverse feedback loops between weak demand and balance sheet problems in parts of Europe persist. A disruption of global trade, capital, and labor flows resulting from an inward shift in policies in some advanced economies would disrupt the operation of global value chains, deter investment, reduce productivity, and lower global growth. A tightening of economic and financial conditions in emerging market economies, given continued balance sheet

Figure 1.1. Asia: Cumulative Portfolio Flows
(Billions of U.S. dollars)



Sources: Bloomberg L.P.; Haver Analytics; and IMF staff calculations.
Note: Equities coverage: India, Indonesia, Korea, Philippines, Sri Lanka, Taiwan Province of China, Thailand, Vietnam; bonds coverage: India, Indonesia, Korea, Thailand.

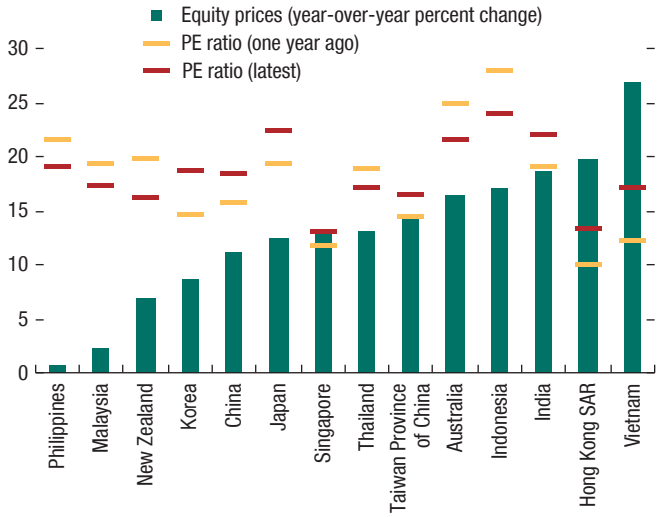
weaknesses in some economies and building vulnerabilities in China's financial system, would have large spillovers given their increased weight in the world economy. Noneconomic factors, including geopolitical tensions, domestic political discord, and terrorism and security concerns, have been on the rise in recent years, burdening the outlook for various regions.

Regional Financial Developments: Resilience amid Volatile Capital Flows

Asian financial markets have been resilient, reflecting global and regional factors. Net portfolio inflows rebounded after initial uncertainty about China's transition in early 2016 and stayed positive for most of the year. The region experienced net capital outflows for a short period following the Brexit referendum and in the last two months of 2016 following the change in market expectations after the U.S. elections. Capital flows stabilized by the end of the year, with cumulative portfolio inflows (bonds and equities combined) to major Asian emerging market economies (excluding China) reaching $51

Figure 1.2. Asia: Equity Prices and Price-to-Earnings Ratios

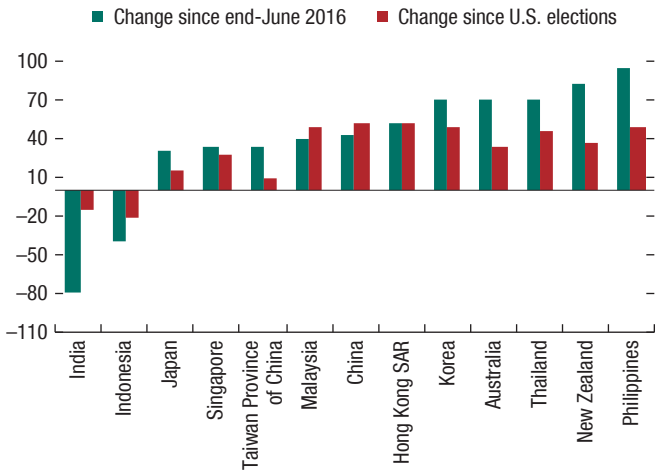
(Change in stock market index; percent)



Sources: Bloomberg L.P.; and IMF staff calculations.
Note: PE = price to earnings.

Figure 1.3. Asia: Ten-Year Sovereign Bond Yields

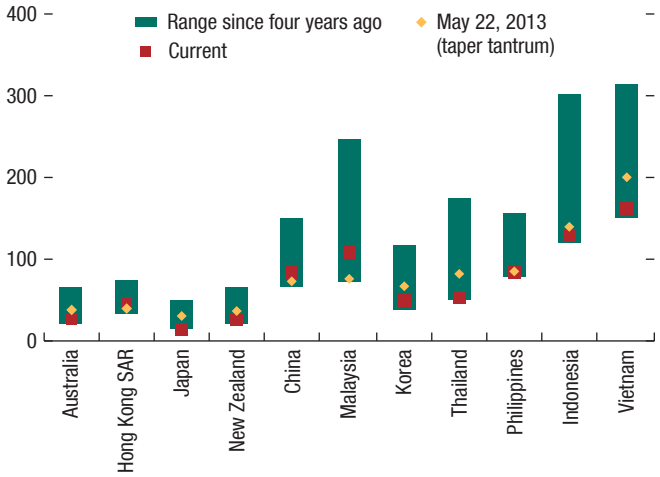
(Basis points)



Sources: Bloomberg L.P.; and Haver Analytics.

Figure 1.4. Sovereign Credit Default Swap Spreads

(Levels in basis points; five year)



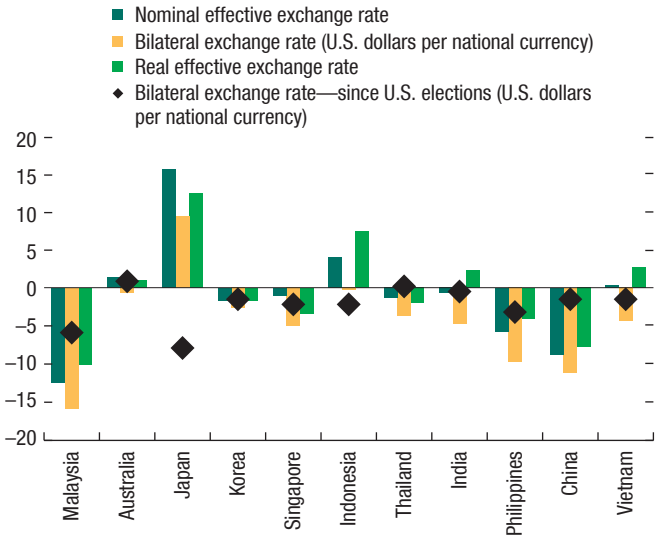
Source: Bloomberg L.P.

billion in 2016, well above the $42 billion in 2015, but below the peak of $72 billion prior to the U.S. elections (Figure 1.1). In China, capital outflows have accelerated since September 2016, with total outflows reaching an estimated $320 billion in 2016, driven by residents' asset purchases abroad. The pressure subsided in early 2017, amounting to $26 billion during January–February 2017, with the tightening of capital controls and resumed portfolio inflows. More broadly, portfolio inflows to Asia returned, reflecting the region's strong fundamentals, including favorable growth differentials.

Generally mirroring global markets, Asian stock markets overall rose significantly in the year prior to mid-March (Figure 1.2), and sovereign bond yields have increased since mid-2016 following the rise in yields in advanced economies (Figure 1.3). The increase in yields accelerated following the U.S. elections—one exception is India, where yields declined owing to the currency exchange initiative (Box 1.1). Sovereign credit default swap (CDS) spreads have also increased in some emerging market economies, but are now in general below their levels on the eve of the "taper tantrum" episode in May 2013. Demand for frontier and developing Asia's debt remains strong (for example, Mongolia's recent bond issue was heavily over-subscribed). In some economies (for example, Australia, Japan, and Korea), CDS spreads are at or close to the lowest levels reached during the past four years (Figure 1.4).

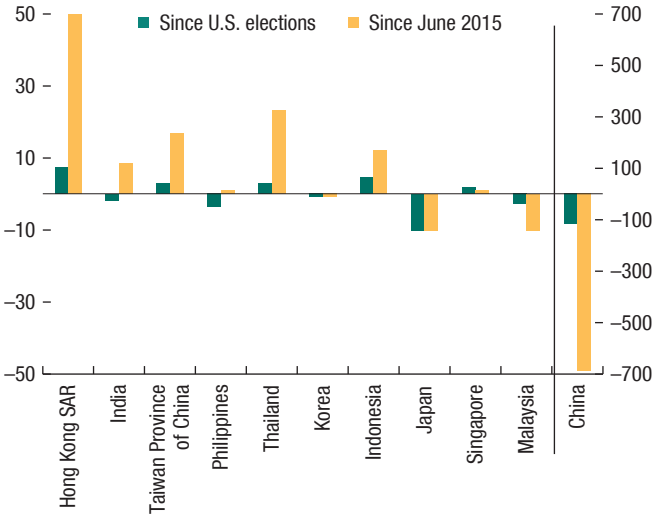
Exchange rates have generally depreciated over the past year and a half, reflecting a stronger

Figure 1.5. Selected Asia: Exchange Rates
(Percent change since June 2015)



Sources: CEIC Data Company Ltd; Haver Analytics; and IMF staff calculations.
Note: A positive value represents appreciation of the national currency.

Figure 1.6. Selected Asia: Foreign Exchange Reserve Accumulation
(Billion of U.S. dollars)



Sources: CEIC Data Company Ltd.; Haver Analytics; and IMF staff calculations.
Note: China on right scale.

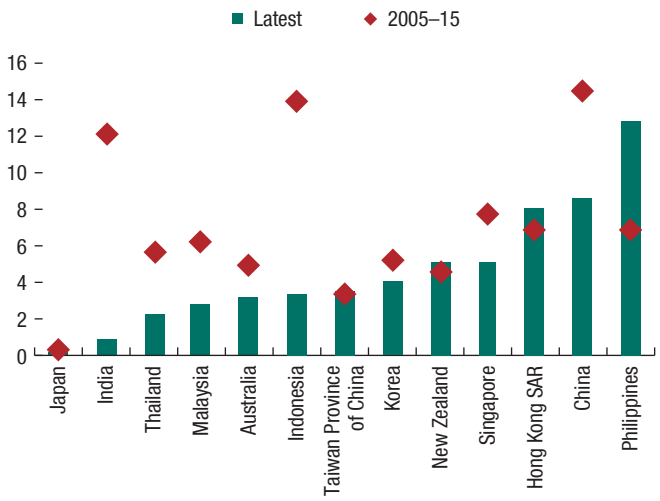
U.S. dollar. In particular, after the U.S. elections, exchange rates depreciated across most of the region, especially against the dollar, by an average of 2 percent (Figure 1.5). The yen depreciated against the dollar by 8 percent, owing to expectations about divergent monetary policies among major advanced economies. The renminbi weakened somewhat against the U.S. dollar, but by less than most emerging market currencies, and was broadly stable in effective terms, in part due to increased foreign exchange intervention and capital controls, which limited its further depreciation. While foreign exchange reserves were broadly stable for most countries, China's foreign exchange reserve losses picked up (Figure 1.6). China's reserves fell below $3 trillion temporarily in January 2017 for the first time since 2011, with an overall decline of about $1 trillion from their peak of nearly $4 trillion in mid-2014.

While financial conditions in the region are still accommodative, they have begun to tighten in some countries.[1] Domestic financial conditions in the region are sensitive to global factors, such as global risk aversion and U.S. interest rates (Box 1.2). Even though credit growth (adjusted for inflation) in 2016 remained robust in the region, it was well below the average of the previous decade in most economies, with the exception of Hong Kong SAR, New Zealand, and the Philippines (Figure 1.7). In China, credit growth continues at twice the pace of nominal GDP, as the stock of total social financing (adjusted for local government bond swaps) grew at a strong 16 percent in 2016. While foreign bank lending to Asia has risen (Figure 1.8), corporate debt issuance (including syndicated loans) is in general lower (Figure 1.9).

Private debt levels remain high across most of the region, owing to rapid credit growth and significant corporate bond issuance over the past decade. While corporate debt has been rising across the region, most notably in emerging Asia, the buildup of leverage accelerated following the global financial crisis. As a result, corporate debt levels in Asia are higher than in other regions, particularly in China and India (see the October 2015 *Global Financial Stability Report*

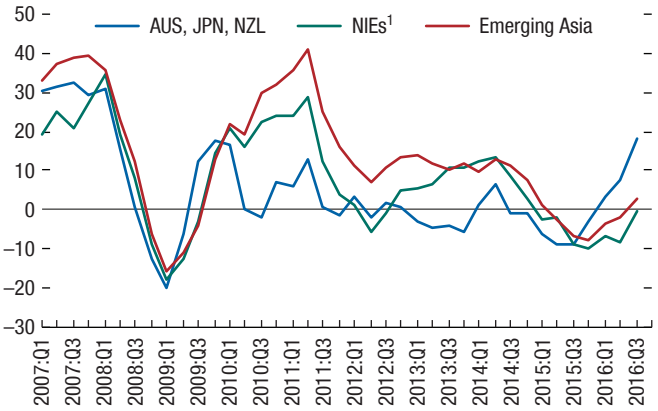
[1]Financial condition indices estimated for the largest 14 economies suggest that overall conditions have started to tighten across most of the region.

Figure 1.7. Selected Asia: Real Private Sector Credit Growth
(Year-over-year change; percent)



Sources: CEIC Data Company Ltd.; Haver Analytics; and IMF staff calculations.
Note: Private sector credit is based on the IMF's depository corporations survey.

Figure 1.8. Consolidated Foreign Claims
(Immediate risk basis; year-over-year change; percent)



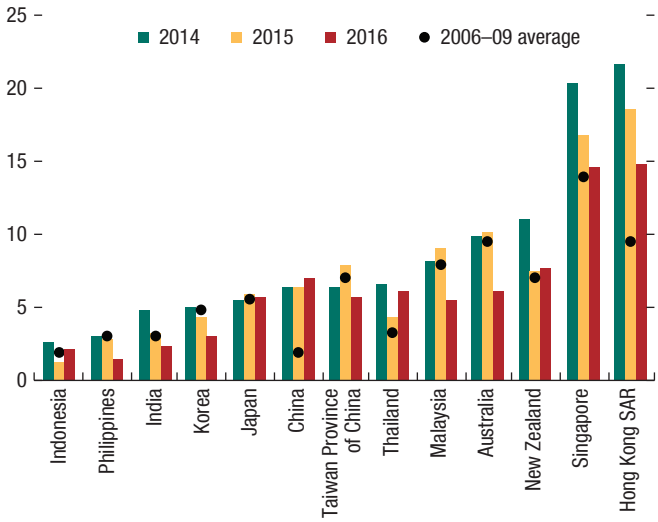
Sources: Bank for International Settlements, International Banking Statistics database; and IMF staff calculations.
Note: Data labels in the figure use International Organization for Standardization (ISO) country codes.
[1]Newly industrialized economies (NIEs) comprise Hong Kong SAR, Korea, Singapore, and Taiwan Province of China.

and the October 2016 *Regional Economic Outlook Update: Asia and Pacific*). Household debt has also increased considerably. For instance, between 2007 and 2015, the household-debt-to-GDP ratio increased by more than 20 percentage points in China, Malaysia, and Thailand (Box 1.3). Consequently, household debt is high in several economies in the region, including Australia, Korea, and New Zealand.

There is some evidence that excessive credit growth is decelerating in many major economies in the region. Although the credit-to-GDP gap or credit gap—a measure of excess credit—is declining in such economies as Hong Kong SAR, Indonesia, Malaysia, Singapore, and Thailand, it remains substantial in several economies, while still increasing in others (China).[2] While part of the credit gap reflects desirable financial deepening, excessive credit growth can lead to an unintended buildup of systemic risks, and a large credit gap has been found to provide an

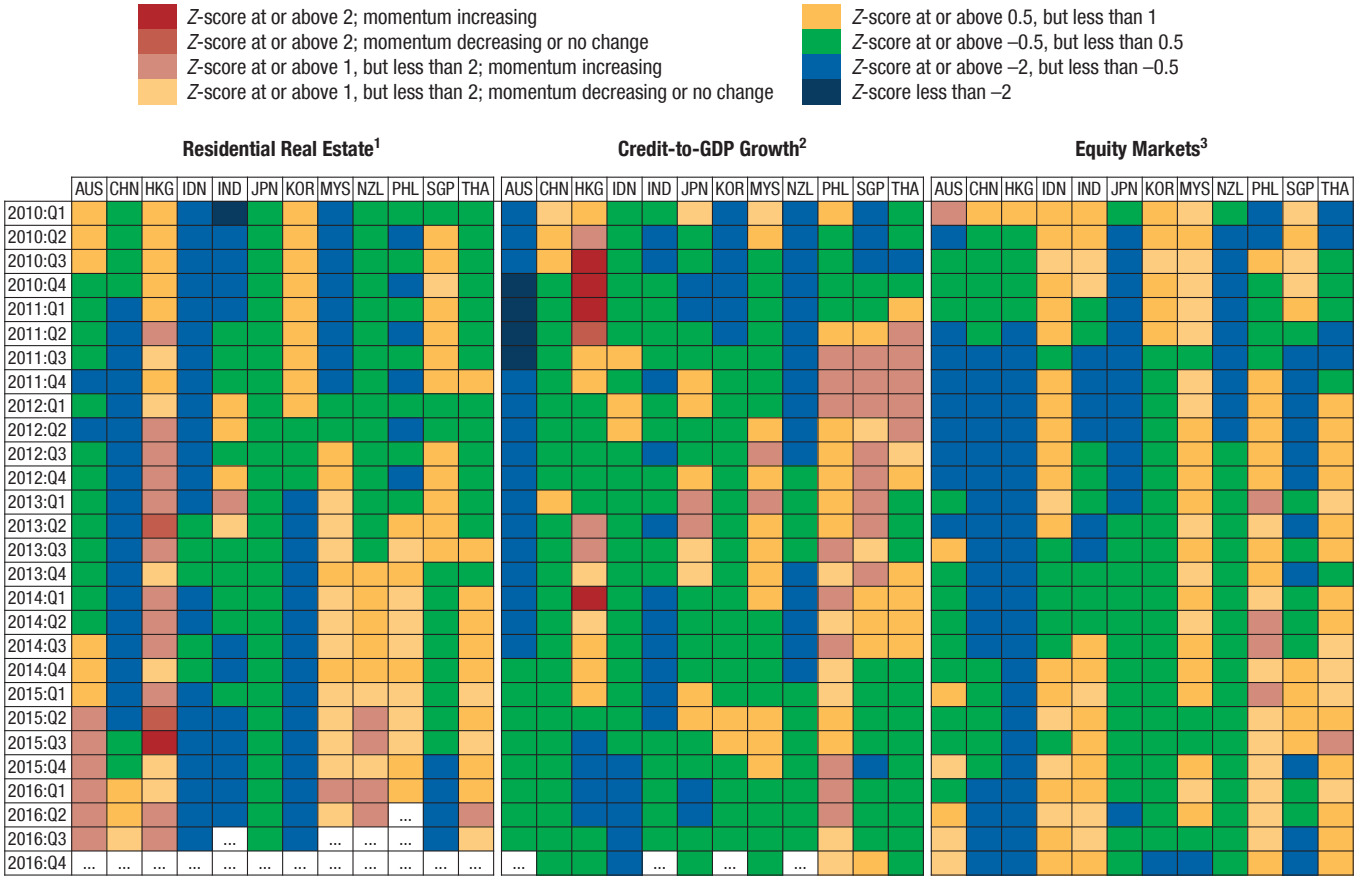
[2]Credit gaps were computed by the Bank for International Settlements (BIS) using the one-sided Hodrick-Prescott filter, with quarterly data and a relatively high smoothing parameter (lambda equal to 400,000 instead of 1,600). It is well documented that the results are sensitive to the choice of the filter and the smoothing parameter. Therefore, the results should be interpreted with caution.

Figure 1.9. Asia: Nonfinancial Corporate Sector Debt Issuance
(Percent of GDP)



Sources: Dealogic; and IMF, World Economic Outlook database.
Note: Includes both bond issuance and syndicated loan issuance. Data compiled on residency basis.

Figure 1.10. Asia: Financial Stability Heat Map



Sources: Bloomberg L.P.; CEIC Data Company Ltd.; Haver Analytics; IMF, Global Housing Watch data; and IMF staff calculations.
Note: Colors represent the extent of the deviation from long-term median expressed in number of median-based standard deviations (median-based *Z*-scores). Medians and standard deviations are for the period starting 2000:Q1, where data are available.
[1]Estimated using house price-to-rent and price-to-income ratios.
[2]Year-over-year growth of credit-to-GDP ratio.
[3]Estimated using price-to-earnings and price-to-book ratios.

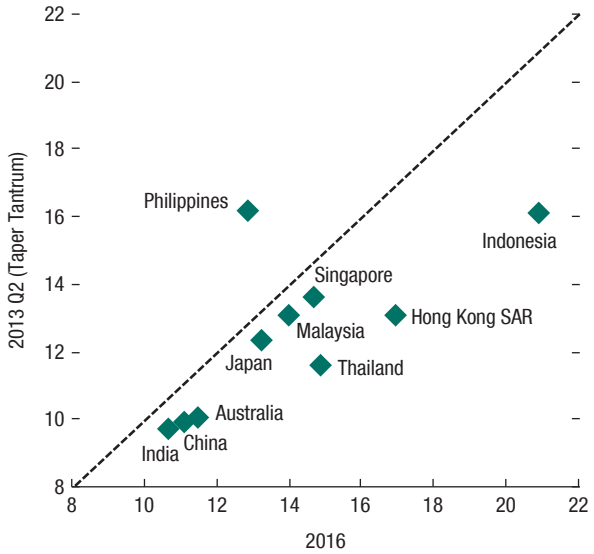
early warning signal of increasing vulnerabilities for advanced and emerging market economies (Drehmann and others 2010; Drehmann, Borio, and Tsatsaronis 2011; and Drehmann and Tsatsaronis 2014).

The financial stability heat map points to risks associated with house prices and equity market overvaluation in some economies in the region (Figure 1.10). Notably, house prices in Australia, China, Hong Kong SAR, Malaysia, New Zealand, and Thailand are above their long-term averages. In the case of equity markets, benchmark equity indices are above their long-term averages in several economies, including Australia, India, Indonesia, and the Philippines.

While banking sector capitalization has improved in general over the past few years and liquidity has been stable, asset quality and profitability have deteriorated in a number of Asian economies. Tier 1 capital ratios increased in most economies (Figure 1.11, panel 1)—particularly in Hong Kong SAR, Indonesia, and Thailand—while they declined in the Philippines. Bank liquidity, measured by loan-to-deposit ratios, was stable in major economies (Figure 1.11, panel 2). While nonperforming loan ratios remain relatively low across most economies, they have increased

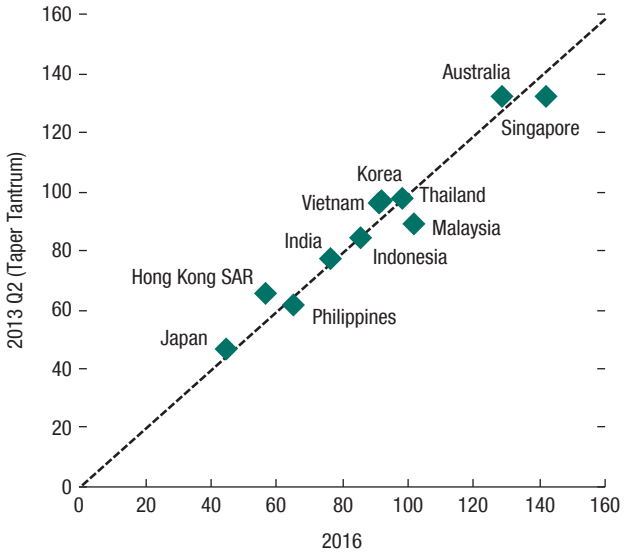
Figure 1.11. Selected Banking Indicators

1. Regulatory Tier 1 Capital to Risk-Weighted Assets
(Percent)



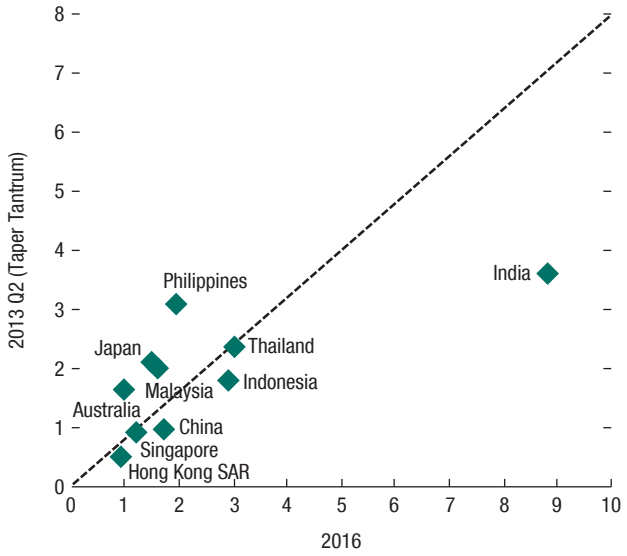
Note: For Japan, data as of 2013:Q3 and 2016:Q1; for China, data as of 2013:A1 and 2016:Q3; for Hong Kong SAR, India, the Philippines, Thailand, Singapore, and Australia, data as of 2016:Q3; for Malaysia and Indonesia, data as of 2016:Q4.

2. Loan-to-Deposit Ratio
(Percent)



Note: For India, data as of June 2016; for Vietnam, data as of October 2016, for Japan, data as of November 2016; for Australia, Hong Kong SAR and the Philippines, data as of December 2016; for Korea, Malaysia, and Thailand, data as of January 2017; for Indonesia and Singapore, data as of February 2017.

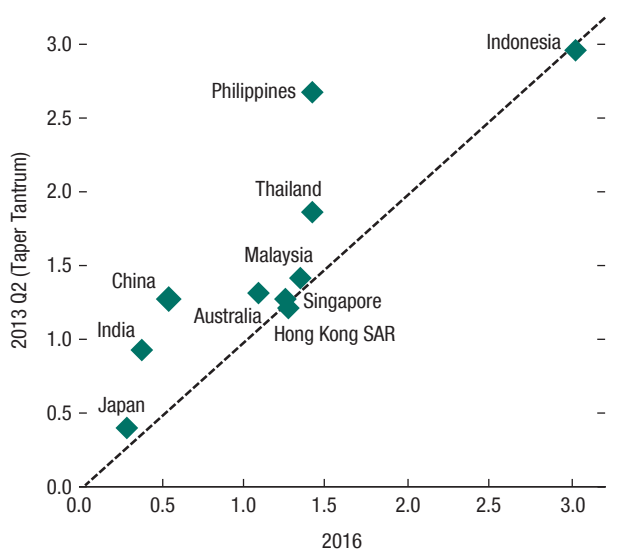
3. Nonperforming Loans to Total Gross Loans
(Percent)



Note: For Japan, data as of 2013:Q3 and 2016:Q1; for China, data as of 2013:A1 and 2016:Q3; for Hong Kong SAR, India, the Philippines, Thailand, Singapore, and Australia, data as of 2016:Q3; for Malaysia and Indonesia, data as of 2016:Q4.

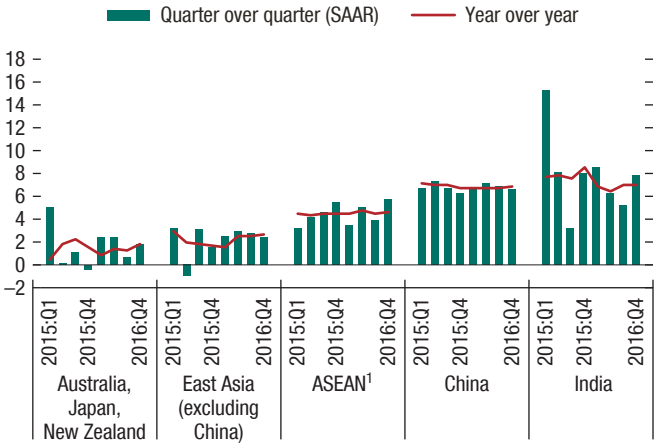
Source: IMF, Financial Soundness Indicators database.

4. Return on Assets
(Percent)



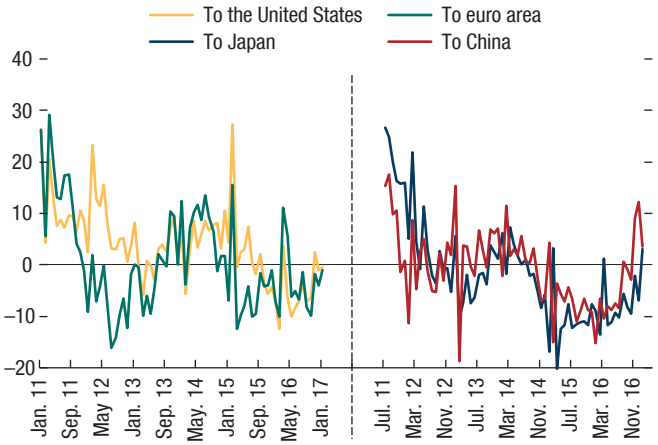
Note: For Japan, data as of 2013:Q3 and 2016:Q1; for China, data as of 2013:A1 and 2016:Q3; for Hong Kong SAR, India, the Philippines, Thailand, Singapore, and Australia, data as of 2016:Q3; for Malaysia and Indonesia, data as of 2016:Q4.

Figure 1.12. Asia: Changes in Real GDP at Market Prices
(Percent)



Sources: CEIC Data Company Ltd.; Haver Analytics; IMF, World Economic Outlook database; and IMF staff calculations.
Note: SAAR = seasonally adjusted annualized rate.
[1]ASEAN includes Indonesia, Malaysia, the Philippines, Singapore, and Thailand.

Figure 1.13. Selected Asia: Exports to Major Destinations
(Year-over-year change; percent)



Sources: CEIC Data Co. Ltd.; Haver Analytics; and IMF staff calculations.
Note: Selected Asia comprises China, Hong Kong SAR, Japan, Korea, Malaysia, Taiwan Province of China, Thailand, the Philippines, Singapore, and Vietnam. Indonesia is excluded due to data lags.

recently in several countries and are relatively high in India (Figure 1.11, panel 3). In addition, banks' profitability has in general declined (Figure 1.11, panel 4).

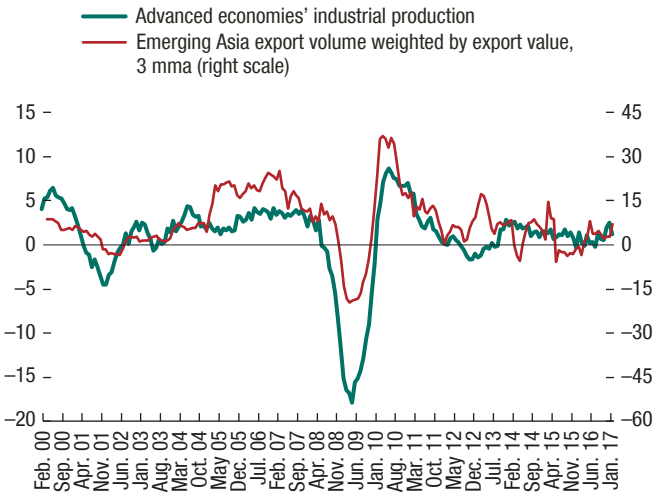
Regional Activity: Recovery since mid-2016 with Positive Momentum

Growth in the region decelerated overall in 2016 despite broad-based improvement in economic activity in the second half of the year (Figure 1.12):

- Asia's growth declined to 5.3 percent in 2016 from 5.6 percent in 2015 (Table 1.1). In some countries, idiosyncratic factors were key drivers of growth performance. For example, in India activity slowed as a result of cash shortages following the currency exchange initiative.
- Net exports continued to be a drag on growth for the region as a whole, subtracting 0.1 of a percentage point. However, Asia's export growth momentum (in values) to major economies recovered in the second half of 2016, particularly to China and Japan, and, to some extent, the United States (Figure 1.13). Exports to the euro area also recovered, but are still declining year over year. While export volumes increased less than the nominal values (partly reflecting higher commodity prices), they have started to show some improvement. Several factors are likely driving the export recovery, including strong growth in China and the recovery in advanced economies. Also, there is some evidence that inventory destocking, particularly in electronics, may have ended, as Asian exports now more closely follow demand in advanced economies (Figure 1.14).[3]
- Domestic demand remained strong, supported by robust private consumption owing to continued growth in household income. Retail sales have been relatively solid in general (Figure 1.15). However, high-frequency indicators suggest that retail sales declined sharply in India due to the currency exchange initiative. In Hong Kong SAR, retail sales remain depressed owing to a downturn in tourism arrivals from mainland China.

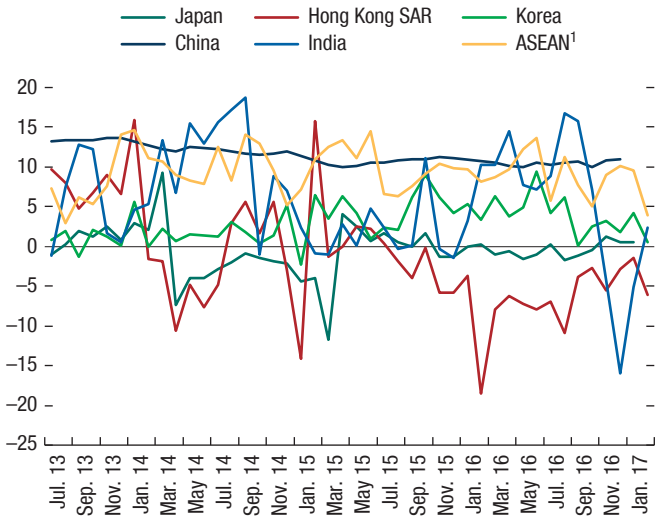
[3]During the inventory destocking phase, demand was met by a reduction in stocks.

Figure 1.14. Emerging Asia: Exports and Demand in the West
(Year-over-year change; percent)



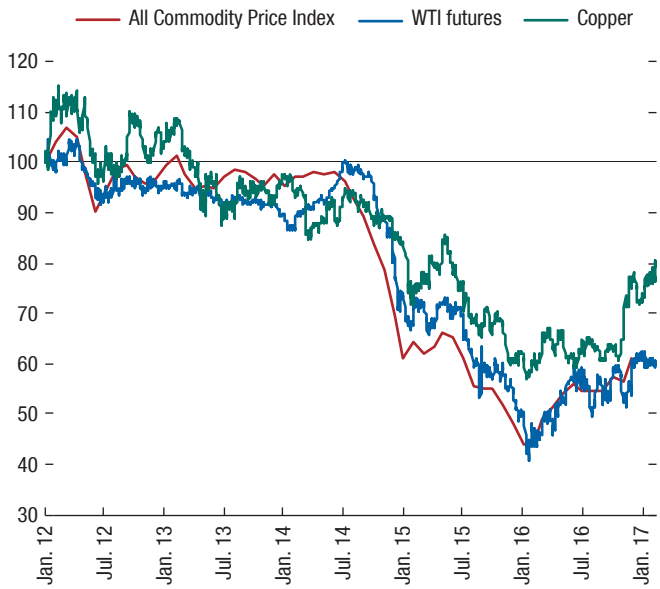
Sources: Haver Analytics; and IMF staff calculations.
Note: Emerging Asia comprises China, Indonesia, Malaysia, the Philippines, and Thailand.; 3 mma = 3-month moving average.

Figure 1.15. Selected Asia: Retail Sales Volumes
(Year-over-year change; percent)



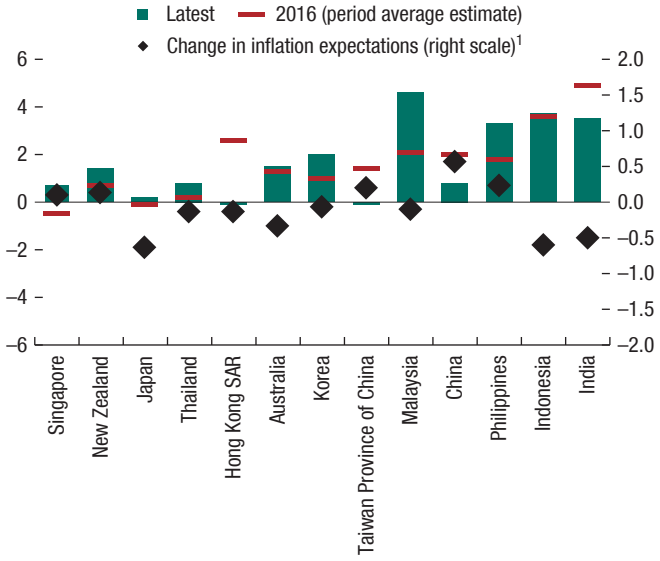
Sources: CEIC Data Company Ltd.; Haver Analytics; and IMF staff calculations.
[1]ASEAN comprises Indonesia, Malaysia, the Philippines, Singapore, and Thailand.

Figure 1.16. Global Commodity Prices
(Index, 2012 January 1 = 100)



Sources: Bloomberg L.P.; IMF data; and IMF staff calculations.
Note: WTI = West Texas Intermediate.

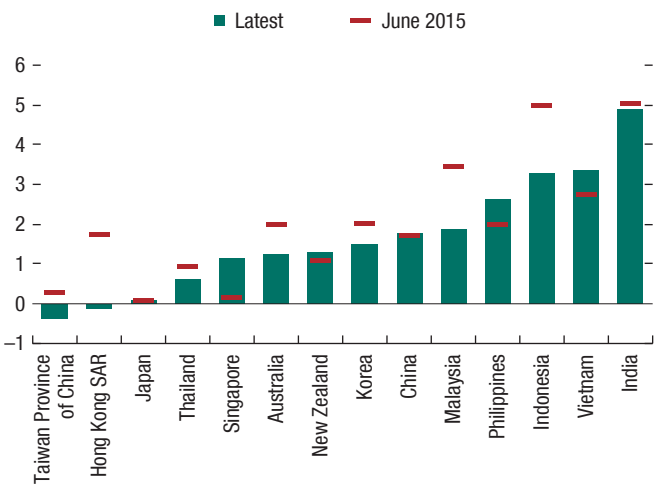
Figure 1.17. Selected Asia: Headline Inflation
(Year-over-year change; percent)



Sources: Haver Analytics; and IMF staff calculations.
Note: For India, inflation expectation and 2016 projection are on a fiscal-year basis.
[1]Based on Consensus Economics Forecasts.

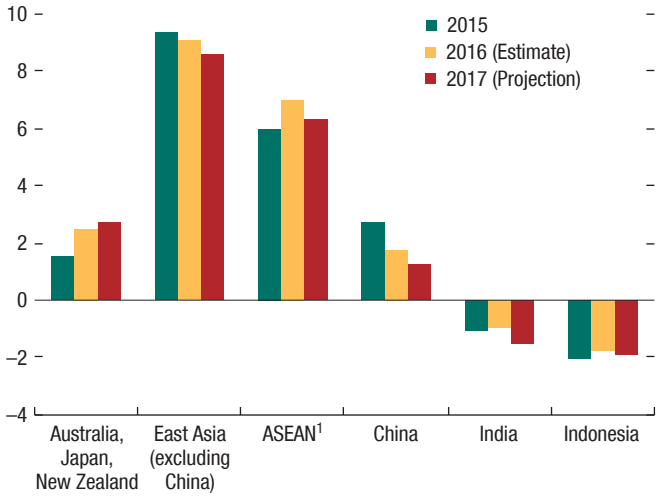
The recovery in commodity prices has modestly pushed up headline inflation in many Asian economies, while core inflation generally remains stable at low levels. While commodity prices have rebounded, commodity price levels are still comparatively low—barely reaching their mid-2015 levels (Figure 1.16). In China, producer price inflation turned significantly positive and

Figure 1.18. Selected Asia: Core Inflation
(Year-over-year change; percent)



Sources: CEIC Data Company Ltd; and Haver Analytics.
Note: Vietnam data as of August 2016.

Figure 1.19. Asia: Current Account Balances
(Percent of GDP)



Sources: IMF, World Economic Outlook database; and IMF staff calculations.
[1]ASEAN includes Malaysia, the Philippines, Singapore, Thailand, and Vietnam.

consumer price inflation picked up. Headline inflation in Japan fell during most of 2016, while core inflation remained negative but edged up closer to zero. Among the largest economies in the region, headline inflation exceeded 3 percent in 2016 only in a few economies (Figure 1.17). Inflation expectations (from *Consensus Forecasts*) remain weak in most economies and have declined recently, but a few economies saw a slight uptick (for example, China and the Philippines). Similarly, core inflation has been low across most of Asia, but has increased in several countries, including China, the Philippines, New Zealand, Singapore, and Vietnam (Figure 1.18).

Current account balances decreased slightly in major Asian economies in 2016. Overall, Asia's current account surplus declined to an estimated 2.5 percent of GDP for the year, down from 2.7 percent in 2015. However, this overall picture masks considerable heterogeneity across the region (Figure 1.19):

- *Industrial Asia:* Current account balances increased by 1.2 percentage points in 2016 to 2.4 percent of GDP. In *Japan*, the current account rose to 3.9 percent of GDP due to a stronger goods trade balance. In *Australia* and *New Zealand*, current account deficits narrowed, reflecting higher prices of commodity exports.
- *East Asia and the Association of Southeast Asian Nations (ASEAN):* These economies saw reduced current account surpluses in aggregate in 2016. In *China*, the current account surplus narrowed to 1.8 percent of GDP from 2.7 percent in 2015, driven by a lower trade surplus and an increase in the services deficit. In *Korea*, the current account surplus narrowed to 7 percent, owing to lower exports due to temporary disruptions in automobile and smartphone production, and the bankruptcy of a major shipping company. *Malaysia's* current account balance declined to 2 percent of GDP mainly on weaker oil and gas trade balances. In the *Philippines*, the current account surplus fell to 0.2 percent of GDP due to strong growth in imports, particularly capital goods. By contrast, in Thailand, the current account surplus increased to 11.4 percent of GDP due to buoyant tourism and weak imports, as domestic demand slowed.

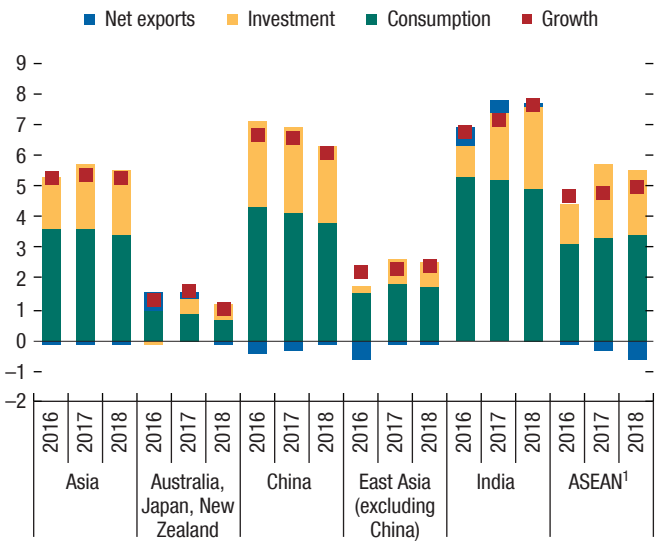
GDP growth trends in specific countries continue to show considerable heterogeneity:

- In China, growth gradually slowed amid continued rebalancing. Growth was 6.7 percent in 2016, slightly higher than projected in the October 2016 *World Economic Outlook*,[4] reflecting the rebounding housing market, robust consumption growth, and continued policy support, while net exports continued to be a drag on growth.
- Japan's growth in 2013–15 was revised upward due to a comprehensive revision of the national accounts, and growth in 2016 was 1 percent. Strong net exports played the most significant role in 2016, while private investment and consumption contributed modestly, supported by fiscal policy.
- India's currency exchange initiative and its associated cash shortages weighed on activity in the last couple of months of 2016 (see Box 1.1). Growth for FY2016–17 is now expected to decelerate to 6.8 percent, 0.8 of a percentage point lower than the projection in the October 2016 *World Economic Outlook*.[5] The post-November 8, 2016, cash shortages and payment disruptions caused by the currency exchange initiative have strained consumption and business activity, especially in the informal sector.
- In Korea, growth was 2.8 percent in 2016, mainly driven by stronger construction investment, while private consumption was weaker than expected, reflecting political uncertainties.
- In Hong Kong SAR, growth slowed to 1.9 percent in 2016 due to an anemic global trade environment and a sharp downturn in tourism arrivals from mainland China, but the economy showed signs of recovery in the second half on the back of strong public investment.
- Australia's growth was 2.5 percent in 2016, mainly reflecting the drag from mining investment and slightly weaker growth in consumption. New Zealand's growth accelerated to 4 percent, driven mainly by construction activity following the 2011 Canterbury earthquake, though more recently the expansion has been broad based across most sectors.
- Growth in the ASEAN economies increased in 2016, but economic cycles within the region continue to diverge. In Indonesia, growth accelerated to 5 percent, supported by robust private consumption. The Malaysian economy saw a moderate expansion, with growth at 4.2 percent—the slowest rate since the global financial crisis—driven mainly by private domestic demand, while net exports contributed negatively. Thailand's economy continued to recover at a moderate pace, with growth reaching 3.2 percent, primarily driven by exports of services (notably tourism) and public investment. In the Philippines, growth increased to 6.8 percent, mainly driven by the strength of domestic demand—investment growth was particularly strong, reflecting higher public infrastructure spending and private construction—while net exports were a drag on growth. Singapore's growth was 2 percent, consistent with the significant slowdown in recent years that reflects structural and cyclical factors—population aging, tighter limits on immigration, the turning of the financial cycle, and external headwinds. In Vietnam, growth slowed to 6.2 percent, reflecting the impact of a severe drought on agriculture and a sharp contraction in oil production.
- Growth in the frontier economies and small states, on average, slowed in 2016, though there have been considerable variations. Among countries where activity moderated, growth in Lao P.D.R. declined to 6.9 percent owing to a slowdown in major trading

[4]The October 2016 *Regional Economic Outlook Update: Asia and Pacific* uses the same data references as the *World Economic Outlook*.

[5]Data for India are on a fiscal year basis, with FY2016–17 (referred to as 2016 in Tables 1.1–1.4) being the year ending in March 2017.

Figure 1.20. Selected Asia: Contributions to Projected Growth
(Year-over-year change; percent)



Sources: IMF, World Economic Outlook database; and IMF staff calculations.
[1]ASEAN includes Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam.

partners, lower metals prices, and poor weather for agriculture. Growth in Mongolia slowed sharply as uncertainties sapped private sector confidence. In Nepal, growth decelerated sharply to 0.6 percent due to the 2015 earthquakes and the disruption to trade and economic activity resulting from border blockades. Sri Lanka's growth decelerated to 4.3 percent due to a contraction in agriculture driven by floods in May and drought since September.

- By contrast, activity generally accelerated in several other countries. Growth reached 6.9 percent in Bangladesh, largely driven by private consumption. Bhutan's growth recovered to 6.2 percent, driven by a pickup in services, mining, and hydropower-related construction. Growth in Maldives recovered to 3.9 percent following reduced policy uncertainty and political tension. In Cambodia, economic activity remained strong at 7 percent, driven by garment exports, real estate, and construction.
- Growth in *Pacific island countries* was dampened overall as a result of lower commodity prices. *Papua New Guinea's* growth decelerated owing to low commodity prices and a major drought, while growth in *Fiji* was disrupted by Cyclone Winston. Countries with significant tourism sectors (*Fiji* and *Vanuatu*) benefited from the strength of the U.S. dollar against the Australian and New Zealand dollars, as well as the rapid growth of Chinese tourism, although this was less noticeable in *Palau* due to the base effect (strong tourist growth in 2015).

Near-Term Regional Outlook: Steady Growth

Asia's growth outlook remains strong, with expectations of benign but rising inflation:

- GDP growth is forecast to reach 5.5 percent in 2017 and 5.4 percent in 2018 (Figure 1.20 and Table 1.1). Growth in 2017 was revised up by 0.1 of a percentage point compared to the forecast in the October 2016 *World Economic Outlook*. Accommodative policies will underpin domestic demand, offsetting tighter global financial conditions.
- The aggregate outlook for the region, however, masks significant revisions in a number of countries. For example, projected growth in China and Japan for 2017 was revised upward owing to continued policy support and strong data toward the end of 2016, with part of the upward revision in Japan due to the comprehensive revision of the national accounts in 2016. Growth was revised downward in India due to the currency exchange initiative and in Korea owing to political uncertainty. Asia's projected growth, excluding India and Korea, was revised upward in 2017 by 0.3 of a percentage point compared to the projection in the October 2016 *World Economic Outlook*. Over the near term, moderating growth in China is

expected to be partially offset by a rebound in India.

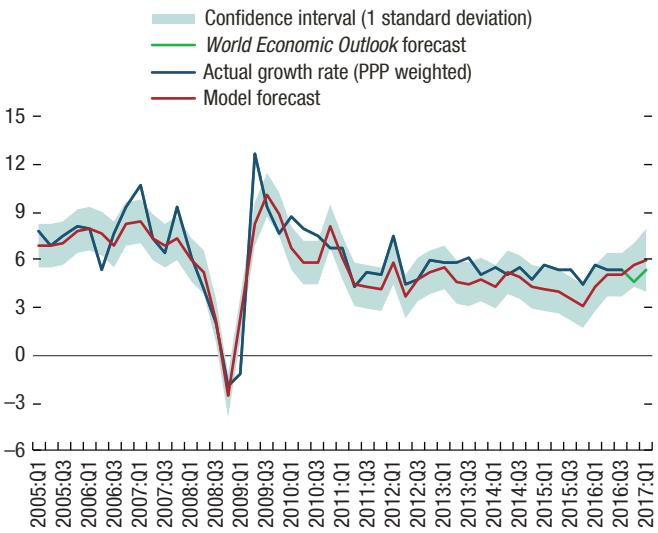
- Asian trade is expected to recover, with net exports projected to be less of a drag on growth for most economies in the region owing to the improved global growth outlook and higher commodity prices.
- Domestic demand remains resilient, with robust labor markets, healthy disposable income growth, and continued policy support. In addition, in most economies, real incomes are being boosted by continued low inflation.

High-frequency data and leading indicators point to a pickup in growth momentum, though the durability of the upturn remains uncertain. Recent momentum is particularly strong in the largest economies in the region, partly reflecting policy stimulus in China and Japan. This could create knock-on effects on other economies. More broadly across the region, forward-looking indicators such as purchasing manager indices suggest continued strength in activity into early 2017. The IMF's Asia and Pacific Department's indicator model for growth in Asia (which draws on a number of high-frequency indicators for several economies in the region) also points to strong growth momentum (Figure 1.21), with projections slightly higher than *World Economic Outlook* projections. Finally, while credit gaps have started to decline in several major economies in the region, credit growth is expected to remain mildly supportive of domestic demand in the near term.

Country-specific factors will continue to play an important role in shaping dynamics in the region (Tables 1.1, 1.2, and 1.3):

- In *China*, the near-term growth outlook has been revised up due to continued policy support (especially the rebound in the real estate market), and inflationary pressure is picking up. However, continued rapid credit growth exacerbates already-high vulnerabilities. GDP growth is projected to remain robust but continue to slow gradually to 6.6 percent in 2017 and 6.2 percent in 2018. The moderation assumes a cooling housing market as a result of recent tightening measures, consumption moderating with weaker wage growth, and a stable augmented fiscal deficit (that is, including contingent liabilities from estimated off-budget local government borrowing).
- In *Japan*, growth momentum is set to continue into 2017, but weaken thereafter as the effects of fiscal stimulus fade. Growth is projected at 1.2 percent, with the contribution from net exports expected to narrow as imports recover from exceptionally weak levels in 2016, while exports are boosted by foreign demand. The fiscal stimulus, combined with the postponement of the hike in the value-added tax (from April 2017 to October 2019), generated a slightly expansionary 2016–17 fiscal stance, supporting 2017 growth through higher consumption and private investment. The assumed dissipation of the impact stemming from the fiscal stimulus in 2018 is expected to reduce growth despite anticipated

Figure 1.21. Indicator Model for Asia: Projected versus Actual Real GDP Growth
(Percent; quarter-over-quarter annualized rate)



Source: IMF staff calculations.
Note: PPP = purchasing power parity.

private investment related to the 2020 Tokyo Olympics.

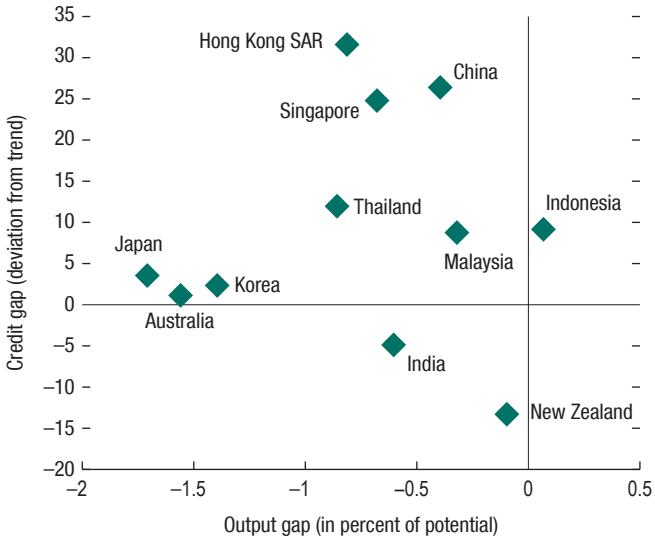
- *In India,* growth is projected to rebound to 7.2 percent in FY2017–18 and further to 7.7 percent in FY2018–19. The temporary disruptions (primarily to private consumption) caused by cash shortages accompanying the currency exchange initiative (see Box 1.1) are expected to gradually dissipate in 2017 as cash shortages ease. Such disruptions would also be offset by tailwinds from a favorable monsoon season and continued progress in resolving supply-side bottlenecks. The investment recovery is expected to remain modest and uneven across sectors as deleveraging takes place and industrial capacity utilization picks up. Headwinds from weaknesses in India's bank and corporate balance sheets will also weigh on near-term credit growth. Confidence and policy credibility gains, including from continued fiscal consolidation and anti-inflationary monetary policy, continue to underpin macroeconomic stability.
- In *Korea*, growth is expected to remain subdued at 2.7 percent in 2017 and increase to 2.8 percent in 2018. Lower consumption will weigh on growth, reflecting heightened uncertainty amid political turmoil.
- *Australia's* growth is expected to reach 3.1 percent in 2017 and 3 percent in 2018, with increasing contributions from domestic demand as the adjustment to the bust in commodity prices and rapid decline in mining investment advances further. Export growth is expected to slow, as the initial boost from new mining capacity should moderate. In *New Zealand,* growth is expected at 3.1 percent in 2017 and 2.9 percent in 2018, supported by a strong pipeline of construction activity and sustained strength in migration inflows, as well as improved prices of key dairy exports.
- In *Hong Kong SAR*, growth is expected to recover gradually to 2.4 percent in 2017 and to 2.5 percent in 2018 on account of soft external conditions—with the U.S. rate cycle turning up, tepid global trade growth, and mainland China rebalancing—and the financial cycle turning. The pace of tightening of monetary conditions is now expected to be somewhat faster in line with changes in expectations of U.S. monetary policy tightening.
- The outlook in *ASEAN* economies varies, reflecting the heterogeneity of those economies:
  - In *Indonesia*, growth is projected to accelerate slightly to 5.1 percent in 2017 and further to 5.3 percent in 2018. Private investment is expected to gradually recover in response to the recent rise in commodity prices.
  - Growth in *Malaysia* is projected to improve to 4.5 percent in 2017 and further to 4.7 percent in 2018. Domestic demand remains the main driver of growth, while a small drag from net exports will remain in 2017 and disappear in 2018. Improvements in the labor market and the 2017 fiscal measures will support private consumption, while higher inflation, high household debt, and macroprudential policy settings could hold consumption back.
  - In *Thailand*, growth is projected at 3 percent in 2017, increasing to 3.3 percent in 2018. Public investment is expected to increase, crowding in private investment and imports, while exports are projected to strengthen along with external demand. However, overall net exports are expected to be a bigger drag on growth.
  - In the *Philippines*, growth is projected at 6.8 percent in 2017 and at 6.9 percent in 2018, led by strong private domestic demand and a modest recovery in exports.
  - *Singapore*'s growth is projected at 2.2 percent in 2017 and 2.6 percent in 2018 on the back of recovering private domestic demand.
  - In *Vietnam,* growth is projected at 6.5 percent in 2017 and 6.3 percent in 2018 owing to healthy domestic demand, a rebound in agricultural production, and strong

manufacturing growth supported by foreign direct investment (FDI).

- *Frontier economies and small states* are expected to rebound in 2017 and 2018 owing to better global trade growth and a recovery in commodity prices. In *Sri Lanka*, GDP growth is projected to recover to 4.5 percent in 2017 and to 4.8 percent in 2018 as growth in manufacturing, construction, and services is expected to offset the drought-stricken agriculture sector. Under the IMF's Extended Fund Facility (EFF), 2016 fiscal performance has been solid, but the net international reserves fell short of the target. In *Mongolia,* growth is expected to remain subdued in 2017 on account of large fiscal consolidation, but the strengthening of policies under the EFF, along with some major expected mining developments, should boost growth substantially in 2018. Growth in *Pacific island countries* is projected to rebound in 2017 and 2018 owing to the recovery in commodity prices for gas and oil exporters, including *Papua New Guinea*. *Fiji* is expected to have a strong recovery from last year's cyclone. Tourism and fishery activities are expected to continue to support growth in the region.

The inflation outlook remains benign but with upside risks. Headline inflation is projected to rise to 2.9 percent in 2017 and 2018 (Table 1.4). Despite the recovery in commodity prices and the increase in producer price inflation, consumer price inflation is expected to remain low across most of the region given generally well-anchored inflation expectations and relatively low pass-through. Estimated output gaps for some regional economies also suggest that there is sufficient slack across the region, which will put downward pressure on inflation (Figure 1.22). Inflation in other countries—where output gaps are nearly closed and credit gaps remain significantly large—may face upside risks. In frontier economies with the highest inflation rates in the region, such as

Figure 1.22. Asia: Output Gap versus Credit Gap



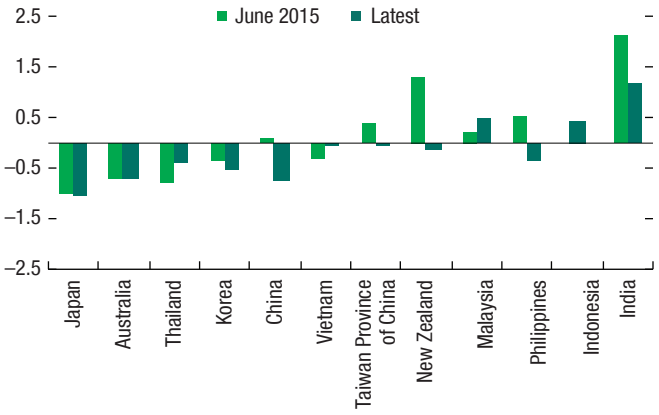
Sources: Bank for International Settlements; CEIC Data Company Ltd.; IMF, World Economic Outlook database; and IMF staff calculations.
Note: The output gap is based on IMF country team estimates for 2016. The credit gap is based on BIS estimates as of September 2016.

Myanmar and Nepal, inflation is expected to remain within single digits.

Current account surpluses are expected to narrow gradually for the region as whole (Table 1.3). The current account is expected to decline to 2.1 percent of GDP in 2017 and further to 2 percent of GDP in 2018. This mainly reflects the recovery in commodity prices and the pickup in import growth as domestic demand remains strong. However, there is considerable heterogeneity across the region. China's current account surplus is expected to decline further, driven by the lower trade surplus and an increase in the services deficit. In India, the current account deficit is expected to widen as domestic demand strengthens further and commodity prices gradually rebound. However, Japan's current account is projected to rise due to a stronger goods trade balance.

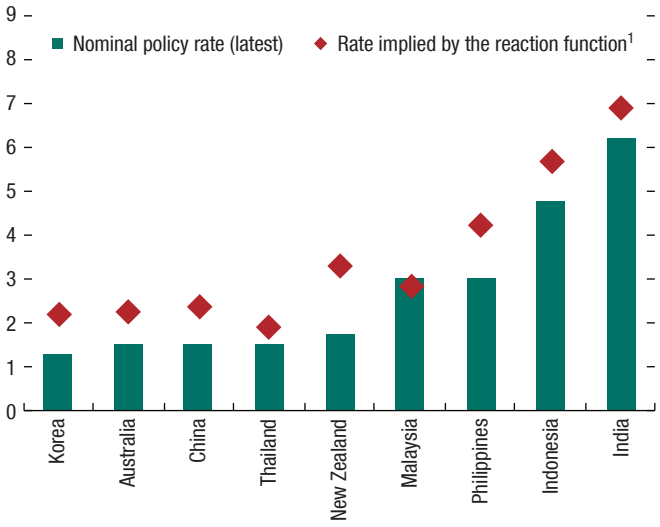
Monetary and fiscal policies are broadly accommodative across most of the region. Policy interest rates are generally low in nominal and real terms. For example, with the exception of India, real rates are below 1 percent in all major regional economies and are negative in a number

Figure 1.23. Selected Asia: Real Policy Rates
(Percent)



Sources: CEIC Data Company Ltd.; Haver Analytics; Consensus Economics; and IMF staff calculations.
Note: The real policy rate is based on one-year ahead inflation forecast from Consensus Economics. For Japan, the uncollateralized overnight rate is used. For India, the three-month Treasury bill rate is used as the proxy for the policy rate. To improve monetary transmission effectiveness, the Bank Indonesia Board of Governors changed its policy rate from the BI rate to the seven-day reverse repo rate effective August 19, 2016.

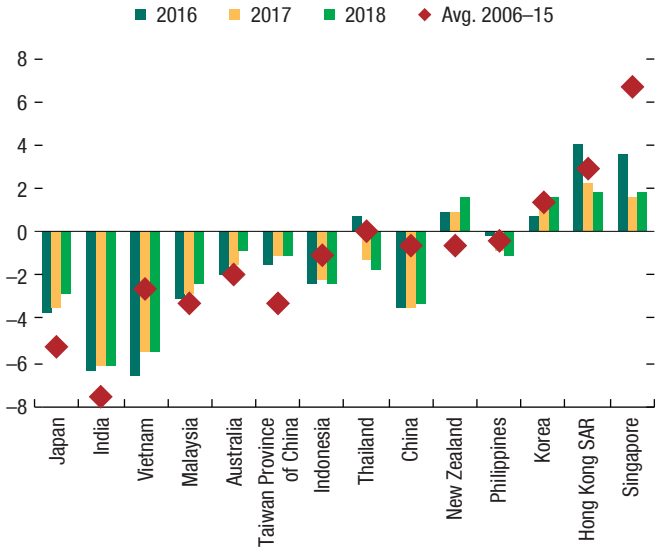
Figure 1.24. Estimated Central Bank Reaction Functions
(Percent)



Sources: Haver Analytics; and IMF staff estimates.
Note: As of February 2017, with monthly data.
[1]Estimated as $i_t = \alpha + \gamma_1 E_t[\pi_{t+1} - \pi^*] + \gamma_2 E_t \text{OutputGap}_{t+1} + \delta_1 \text{REER}_t + \delta_2 \text{US\_3Myield}_t + \varepsilon_t$.

of them (Figure 1.23). In several economies, nominal policy rates are broadly in line with or slightly below the levels implied by augmented Taylor rules (which include exchange rates and foreign interest rates) (Figure 1.24). Fiscal stimulus, measured by changes in the cyclically adjusted fiscal balances, is expected to increase in 2017 in several economies in the region, including China, the Philippines, Singapore, and Thailand (Figure 1.25). In other major economies, the fiscal stance, while still accommodative, is expected to be slightly less supportive of growth, including in India and Vietnam. In 2018, fiscal stimulus is projected to increase in Indonesia, the Philippines, and Thailand. In other economies, such as Japan and China, fiscal policy is projected to be less supportive of growth as the effects of fiscal stimulus fade.

Figure 1.25. Selected Asia: Cyclically Adjusted Fiscal Balance
(Percent of GDP)



Sources: IMF, World Economic Outlook database, and IMF staff calculations.

Risks to the Outlook: On Balance to the Downside

While there are some upside risks to near-term growth, the outlook, on balance, is clouded by significant downside risks, including a possible shift toward protectionism in major trading partners. In the near term, growth could be supported by economic stimulus in some large economies, particularly the United States. Continued tightening in global financial conditions

could, nonetheless, trigger further capital flow volatility, with repercussions to the region especially in light of balance sheet weaknesses in a number of economies. More inward-looking policies in major global economies would significantly impact Asia given that the region has benefited substantially from cross-border economic integration. A bumpier-than-expected transition in China would have large spillovers. Geopolitical tensions and idiosyncratic political problems could burden the outlook for various countries. Medium-term growth faces secular headwinds, including population aging and limited productivity convergence.

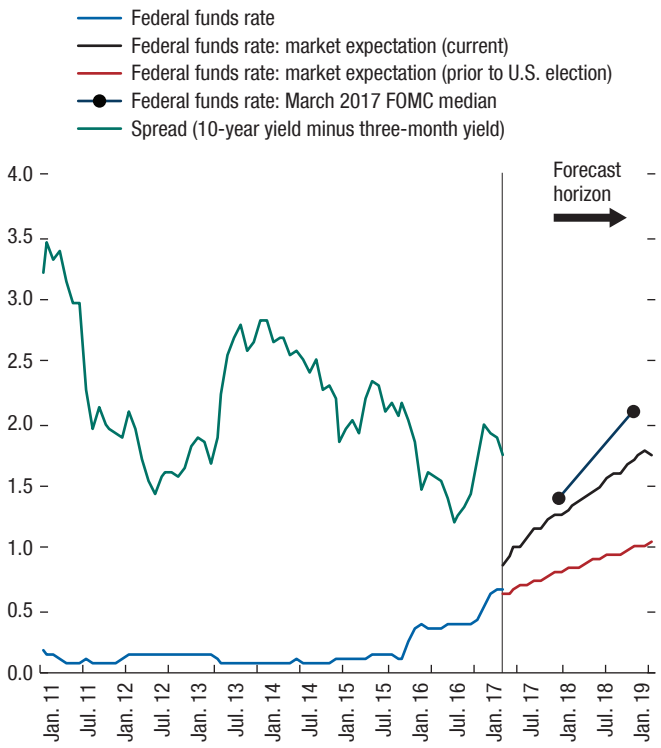
Upside Risks: Strong Momentum and Larger Policy Stimulus

Stronger global activity resulting from larger policy stimulus than currently projected, especially in the United States, is an upside risk for the region. Recent gains in business and consumer confidence in advanced economies, as reflected in survey outcomes as well as equity prices, could underpin stronger momentum in consumption and investment in the short term. If followed by supply-friendly structural reforms, the momentum could become entrenched and sustain a pickup in activity for a longer period. Another source of short-term upside risk stems from the possibility that policy easing exceeds expectations in the United States. A stronger U.S. fiscal stimulus than currently anticipated would further boost Asian exports and increase growth in the region, unless positive spillovers are tempered by significantly tighter financial conditions or protectionist trade policies.

Tighter Global Financial Conditions

Expansionary U.S. fiscal policy could lead to higher U.S. inflationary pressures and may require a tighter-than-expected monetary stance, including a steeper path for future increases in the federal funds rate and further decompression of the term premium (Figure 1.26). An even steeper path for interest rates would be necessary to contain inflation if the fiscal stimulus does not lead to a significant increase in supply potential (see the April 2017 *World Economic Outlook*). Expectations of these policy changes have already resulted in a significant repricing of assets, as noted earlier.

Figure 1.26. United States: Interest Rates



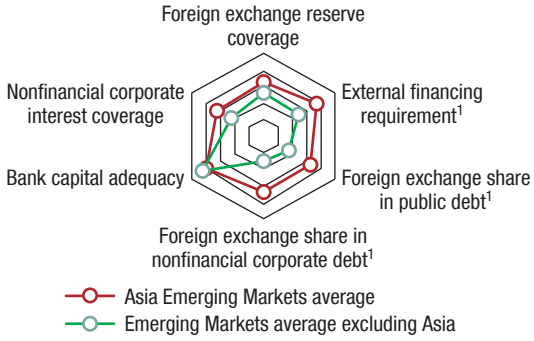
Source: Bloomberg L.P.
Note: FOMC = Federal Open Market Committee.

Stronger demand in the United States would benefit Asian exporters—and indirectly other countries in the region through potential knock-on effects—provided financial markets remain orderly and U.S. fiscal sustainability remains safeguarded. However, the size of these gains could hinge on the sequencing of U.S. policy implementation (see Box 1.4). For example, the benefits would be offset if the United States were to introduce new trade protection measures. At the same time, a substantial tightening of financial conditions, resulting from a significantly stronger U.S. dollar and higher interest rates, could have large negative spillovers for Asia. The impact would be greater in emerging and developing economies with external vulnerability, especially

the economies with high dollar-denominated corporate and sovereign debt. Capital outflows, higher financing costs, and concerns over fiscal sustainability could push a number of countries into an unwarranted tight policy mix, amplifying the macroeconomic consequences and risks to financial stability. A sudden upward shift in domestic yield curves would be a large shock to indebted firms and households, which could derail domestic-demand-based growth financed by low borrowing costs. In addition, corporate bonds, which have been an important source of financing for Asian firms, are largely held by domestic banks, so corporate stress could have implications for financial stability by weakening banks' balance sheets if downside risks materialize.

On average, Asian emerging market economies appear relatively better positioned to deal with external shocks than do emerging market economies in other regions (Figure 1.27). Asian emerging markets have relatively stronger external buffers, as measured by the level of foreign exchange reserves in terms of the IMF's Assessment of Reserve Adequacy metric, and lower external financing needs, both of which point to their relatively greater resilience to capital outflows compared to emerging markets in other regions. From a balance sheet perspective, Asian nonfinancial corporations and governments, on average, are less exposed to sudden exchange rate fluctuations, as indicated by lower foreign-currency-denominated debt shares. The banking system's capital adequacy ratio is lower than in other regions but only by a small margin. The comparison of regional averages, however, should be taken with caution in light of large intra-region heterogeneity for some of these indicators. For example, the external financing requirement in Malaysia is relatively high; and the foreign share of nonfinancial corporate debt in Indonesia is relatively high (Figure 1.28). In addition, as shown in the April 2017 *Global Financial Stability Report*, in a scenario with rising global risk premia or rising economic nationalism, corporate vulnerabilities in China and India would significantly worsen.

Figure 1.27. Selected Vulnerability Indicators



Sources: IMF, Vulnerability Exercise database; and IMF staff calculations.
Note: The diagram is designed to show decreasing vulnerability from the center to the periphery (see note 1). The indicator values are based on IMF staff estimates of 2015 for the nonfinancial corporate interest coverage and 2016 for all the other indicators. The indicators are defined as follows: Foreign exchange reserve coverage is the official foreign exchange reserves in percent of the IMF Assessing Reserve Adequacy metric; the external financing requirement is the short-term debt plus the long-term amortization paid plus the current account balance in percent of GDP; Foreign exchange share of nonfinancial corporate/public debt is the share of foreign-exchange-denominated debt in total nonfinancial corporations general government debt; the bank capital adequacy ratio is the banking system capital in percent of total risk-weighted assets; and nonfinancial corporate interest coverage is the ratio of total nonfinancial corporation earnings before interest and taxes (EBIT) to interest payments due. The minimum and the maximum axis values for each indicator are 0, and the cross-country distribution average plus one standard deviation in 2016 (2015 for nonfinancial corporate interest coverage), respectively.
[1]Inverted axis with the maximum axis value at the center and the minimum at the periphery.

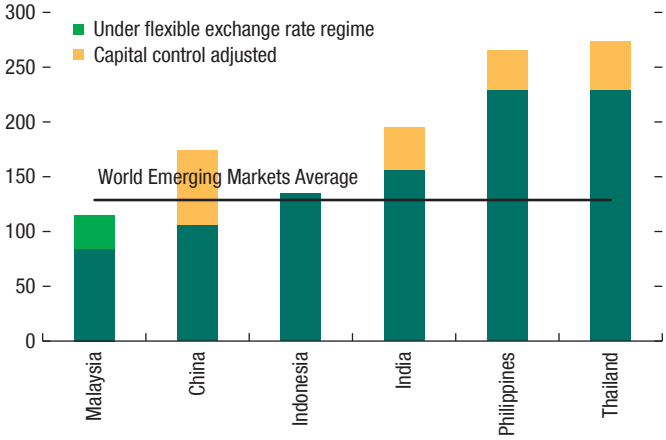
Risk of Deglobalization

Deglobalization poses a substantial downside risk to the region. Recent political developments in many advanced economies—notably the United States and parts of Europe—highlight the disenchantment of a large portion of the population with cross-border integration. A disruption of global trade, capital, and labor flows resulting from an inward shift in policies, including toward protectionism, would deter investment, reduce productivity, and lower global growth.

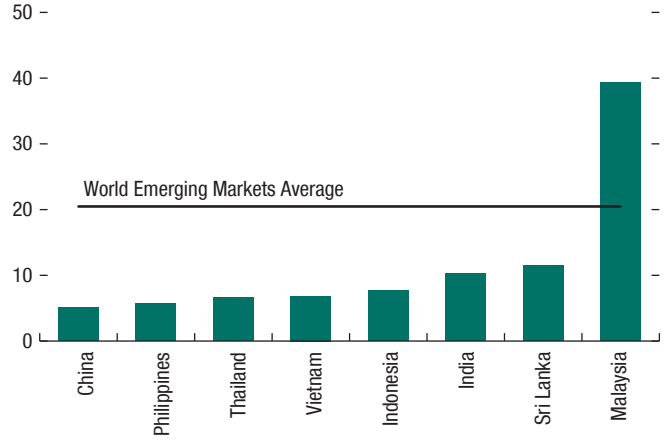
Asian economies are particularly vulnerable to trade shocks because they generally have high trade openness ratios, with significant participation in global value chains. Given the reliance of many Asian economies on exports, more protective trade policies would generate a significant negative impact on the region. Increased tension and uncertainty in the global trade climate could negatively affect the exports especially of

Figure 1.28. Selected Asia: Vulnerability Indicators

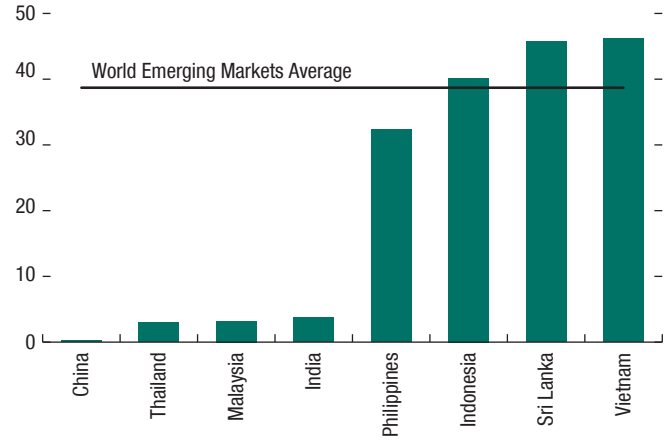
1. Foreign Exchange Reserve Coverage
(Percent of the IMF Assessing Reserve Adequacy metric)



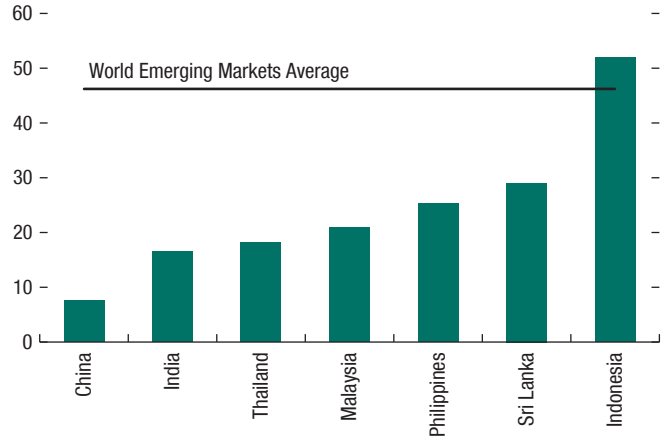
2. External Financing Requirement
(Percent of GDP)



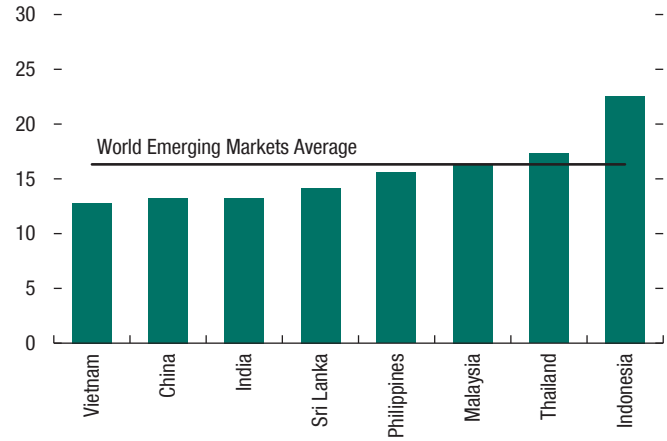
3. Foreign Currency Share of Government Debt
(Percent of total general government debt)



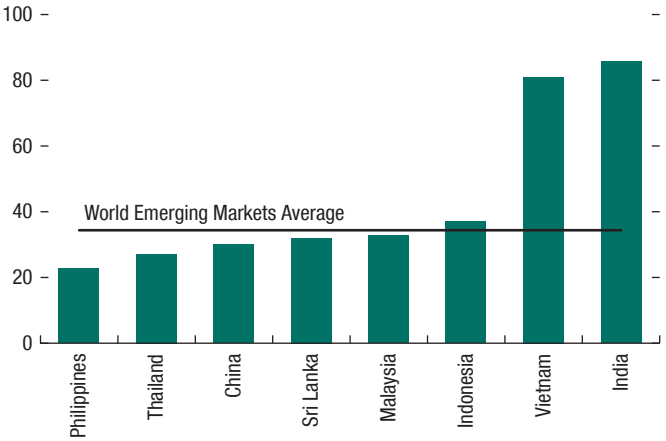
4. Foreign Currency Share of Nonfinancial Corporate Debt
(Percent of total nonfinancial corporate debt)



5. Capital Adequacy Ratio
(Banking system capital in percent of total risk-weighted assets)



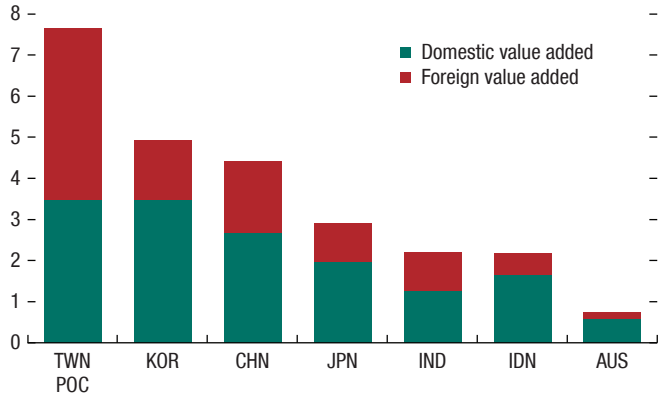
6. Interest Coverage Ratio
(Corporate earnings before interest and taxes in percent of interest payments due)



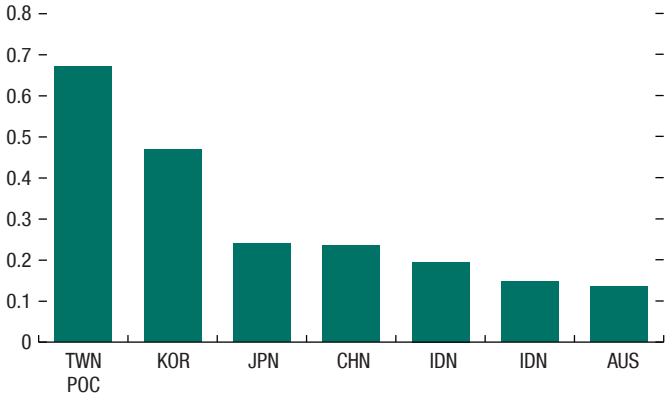
Sources: IMF Vulnerability Exercise Database; and IMF staff estimates.

Figure 1.29. Trade Exposure to Major Partners

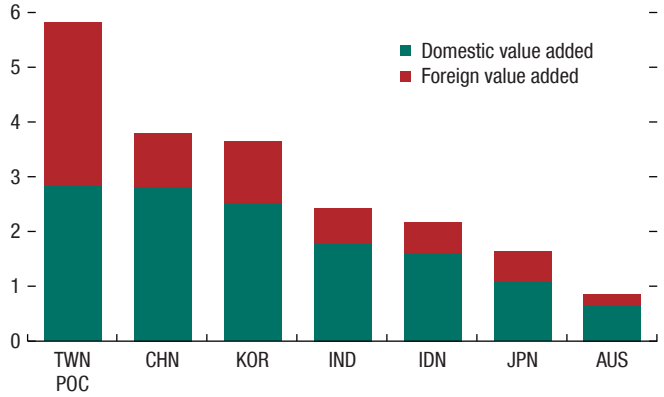
1. Exports and Value added to United States, 2014
(Percent of national GDP)



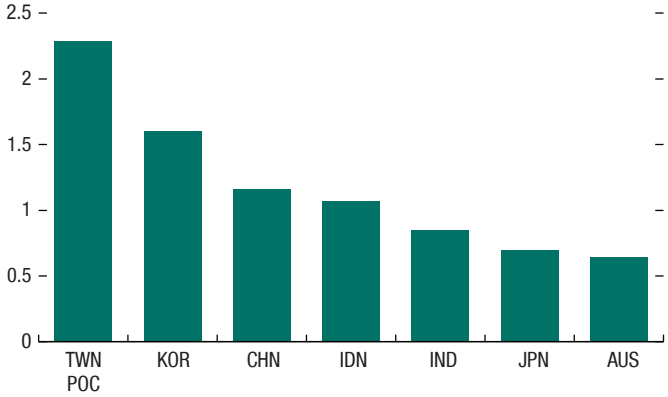
2. Value-added Contributions to U.S. Exports, 2014
(Percent of national GDP)



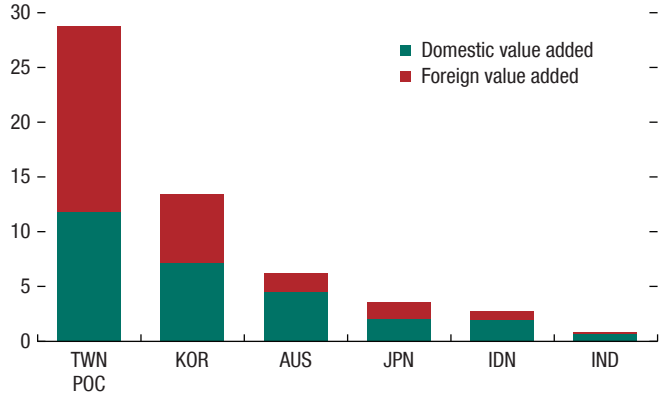
3. Exports and Value added to European Union, 2014
(Percent of national GDP)



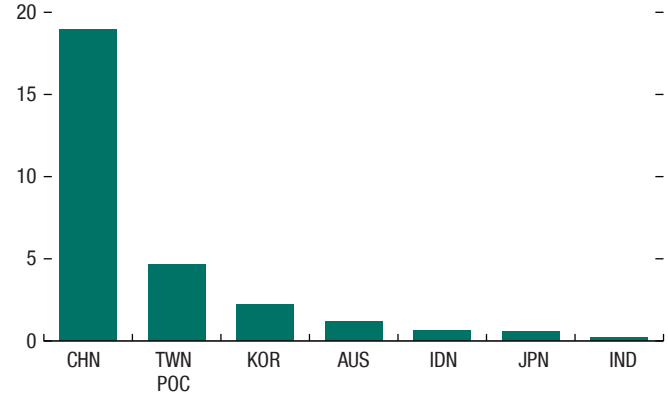
4. Value-added Contributions to EU Exports, 2014
(Percent of national GDP)



5. Exports and Value added to China, 2014
(Percent of national GDP)



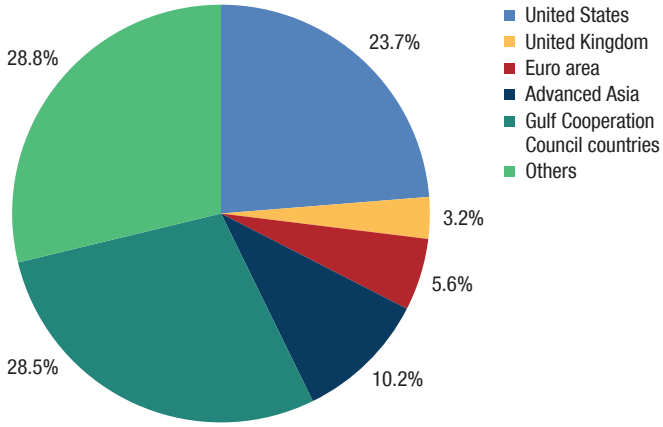
6. Value-added Contributions to China's Exports, 2014
(Percent of national GDP)



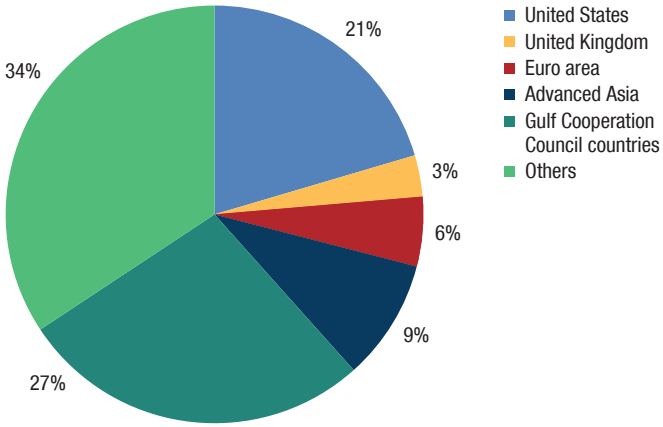
Sources: IMF, *Direction of Trade Statistics*; World Input-Output Table; and IMF staff calculations.
Note: Data labels in the figure use International Organization for Standardization (ISO) country codes.

Figure 1.30. Emerging Asia: Remittance Inflows and Migrant Stock

1. Emerging Asia: Remittance Inflows from Selected Sources
(Percent of total remittances to emerging Asia)



2. Emerging Asia: Stock of Migrants to Selected Destinations
(Percent of total migrant stocks)



Sources: World Bank Bilateral Remittances Matrix, 2015; World Bank Bilateral Migration Matrix, 2013; and IMF staff estimates.
Note: The recipient Asian countries consist of China, India, Indonesia, Malaysia, the Philippines, Sri Lanka, Thailand, and Vietnam; the Gulf Cooperation Council countries consist of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates.

Note: The source Asian countries consist of China, India, Indonesia, Malaysia, the Philippines, Sri Lanka, Thailand, and Vietnam; the Gulf Cooperation Council countries consist of Bahrain, Kuwiat, Oman, Qatar, Saudi Arabia, United Arab Emirates.

economies running large trade surpluses vis-à-vis the United States (for example, China, Japan, Korea, and Taiwan Province of China). Over the long run, a slowdown in global trade and FDI due to a U.S. pullback from cross border economic integration could hinder technology transfers through these linkages and thus undermine productivity growth and Asia's growth model (see Chapter 3). A disruption of global trade would have severe repercussions for economies deeply linked to trade supply chains (Figure 1.29).

A disruption of labor flows could also reduce remittance inflows to emerging Asian countries. According to estimates by the World Bank (2016), the remittances from countries of the Gulf Cooperation Council, the euro area, the United Kingdom, and the United States collectively accounted for about three-quarters of total remittance inflows to Asian emerging markets in 2015 (Figure 1.30). Those remittances were particularly significant in Nepal (almost 25 percent of GDP), followed by the Philippines, Sri Lanka, Bangladesh, and Vietnam (4.5 to 7 percent of GDP). The pattern of migration could also change. As of end-2013, emerging Asia's emigrants to these economies accounted for about 57 percent of their total population of migrants abroad. More restrictive immigration policies in these traditional countries could reduce the migration out of Asia and diversify destinations to other economies, including within Asia.

China's Slowdown and Its Spillovers

China's growth is slowing as it transitions to a more consumption-based economy. However, despite its slowing growth, China continues to drive global growth, accounting for about one-third of it. Sustained progress on reforms and the reining in of vulnerabilities will reduce downside risks, thereby boosting confidence and lifting investment in trading partners.

While China's transition is expected to be positive overall for the global economy over the medium term, the growth slowdown will continue to generate large spillovers that vary by country and region, and some of those spillovers may be negative in the near term. However, the

counterfactual to China's ongoing transition and slowdown will not be everlasting investment- and import-intensive, double-digit growth, but rather much slower growth and possibly a sharp and disruptive slowdown that would have much more significant negative spillovers. IMF staff analysis finds that spillovers from rebalancing in China are negative for most countries in the short term, as reform and rebalancing are projected to pull China's GDP growth below the no-reform scenario (IMF 2016). However, spillovers turn positive over the medium term as reform and successful rebalancing from investment to consumption puts the economy on a stronger and more sustainable footing and brings about growth dividends for both China and the world.

Spillovers from China's rebalancing and overall growth slowdown would be felt mainly through trade and commodity price channels. Consumption expenditure in China has much lower import intensity than investment or exports (see Chapter 2 of the April 2016 *Regional Economic Outlook: Asia and Pacific*). For example, the import intensity of investment is about 25 percent, compared to 15 percent for consumption. Hence, rebalancing away from investment and exports toward consumption will reduce China's imports and, therefore, is likely to have negative spillover effects (including through global value chains) on exporters of investment and intermediate goods such as Korea, Malaysia, and Taiwan Province of China. However, this rebalancing is likely to be in favor of exporters of consumption goods and services (including through Chinese tourism).

China is a major importer across a range of commodities, especially metals, where it accounts for about 40 percent of global demand. However, China accounts for only about 10 percent for crude oil demand. Hence, China's investment slowdown would have a significant impact on the demand for and prices of commodities closely related to investment activities. IMF staff analysis in Chapter 3 of the April 2016 *Regional Economic Outlook: Asia and Pacific* suggests that China's rebalancing accounted for between one-fifth and one-half of the declines in broad commodity price indices between mid-2011 and mid-2015, with marked difference across commodities.

With increasing vulnerabilities in China's economy arising from continued credit-driven growth and high leverage in the financial system, spillovers through financial markets become an increasingly important channel, especially in downside scenarios. IMF staff analysis in Chapter 2 of the April 2016 *Regional Economic Outlook: Asia and Pacific* shows that financial spillovers from China have increased significantly since the global financial crisis, in particular in equity and foreign exchange markets, magnified by direct trade exposures.

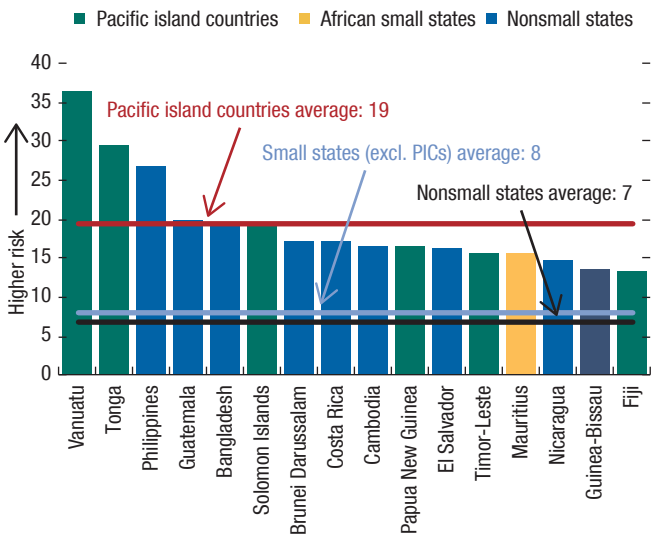
Geopolitical Uncertainties, Climate Change, and Other Risks

Asia faces risks stemming from an escalation of geopolitical tensions within and outside the region and in its main trading partners. As in the recent past, an escalation of geopolitical tensions could hurt tourism, FDI, and trade, disrupting major sources of growth. Climate change and natural disasters, along with the withdrawal by global banks of correspondent banking relationships (referred to as de-risking; see IMF 2016), also remain an important risk to the *small states and Pacific island countries* (Figure 1.31). Environmental shocks (cyclones, droughts, and El Niño effects) have been larger and more frequent in recent years (Cashin and others 2017). For example, in each of the past three years, at least one country in the region has been hit by a severe cyclone (Tonga in 2014, Myanmar and Vanuatu in 2015, and Fiji in 2016). These cyclones, as well as the 2015 earthquake in Nepal, show that natural disasters can severely disrupt economic activity in those economies.

Policy Recommendations

Growth in Asia is gaining momentum, but the environment looking forward is more uncertain, more complicated, and less supportive over the medium term. Policies should remain flexible and focused on

Figure 1.31. World Risk Index, 2016
(Percentage points)



Sources: United Nations University Institute for Environment and Human Security; and Alliance Development Works, *2016 World Risk Report.*
Note: Index combines exposure to natural hazards, coping, and adaptive capacities; Samoa is not included in the database. PICs = Pacific island countries.

addressing vulnerabilities and rebuilding buffers where needed, reducing domestic and external imbalances while safeguarding against external shocks, and preserving the gains from trade integration through balanced growth, trade initiatives, and inclusive policies. To sustain long-term growth, structural reforms are needed to deal with challenges from demographic transition and to boost productivity.

Reinforcing Growth Momentum: Appropriate Demand Support and Structural Reforms

Monetary policy should generally remain accommodative, given that inflation is below target and there is slack in most economies in the region. If growth slides further, some central banks in the region could have room to lower interest rates as long as external stability is not compromised (for example, Malaysia and Thailand). While the level of policy rates is generally appropriate given the output gap and inflation trends, interest rate cuts can also be considered if inflation expectations drop, fiscal space is limited, or reform measures have a contractionary effect on activity. Maintaining an accommodative monetary policy stance would help keep broader financial conditions supportive by offsetting the effects of higher U.S. interest rates and/or lower liquidity on domestic financial conditions. However, some central banks should stand ready to raise policy rates if inflationary pressures gather pace (for example, India, Indonesia, and Vietnam). Some other countries also need to weigh the benefits of prolonged monetary accommodation against the risks for inflation, asset prices, and domestic financial conditions more broadly, together with the scope for enhancing macroprudential settings (for example, China). Moreover, in some cases, large capital outflows and rapid exchange rate depreciations may warrant a tightening of policies to address balance of payments pressures.

Fiscal support should be considered in particular to support and complement structural reform efforts. Fiscal action should carefully consider the intersection of fiscal space and the need to support demand and external rebalancing in a consistent fashion (for example, Korea and Thailand), and with due consideration of the effects of other ongoing or planned policy adjustments. At the same time, delivering on medium-term fiscal consolidation plans remains critical in some countries, especially where debt levels are high and/or fiscal credibility needs to be enhanced (for example EFF aims at restoring debt sustainability in Mongolia and improving debt trajectory in Sri Lanka). Fiscal consolidation should be undertaken together with adjustments to the composition of spending to allow for further infrastructure and social spending in a number of economies (though in China, for example, the emphasis should be on reducing public investment in favor or consumption). Moreover, real growth in public spending has been high across most of the region, suggesting that there is room for a gradual adjustment over time, including in relatively rigid public spending components such as wages.

Policymakers in the region should move steadfastly to implement growth-enhancing

reforms. They need to capitalize on the solid growth momentum and use existing policy space judiciously and effectively to boost growth. Structural reforms are critical to buttress Asia's efforts to deliver rapid, sustained, and inclusive growth. Structural reforms are needed to help rebalance demand and supply, reduce external imbalances, mitigate domestic and external vulnerabilities, increase economic efficiency and potential growth, reduce poverty and inequality, and foster more inclusive growth. Complementary policies may be needed to mitigate the distributional effects of structural reforms (see Box 1.5 for the case of Myanmar) and ensure that the benefits are shared more broadly. In a number of economies, reforms could also help address climate change and improve the environment, particularly in large countries that rely heavily on fossil fuels.

Preserving Financial Stability: Addressing Vulnerabilities While Safeguarding against External Volatility

Exchange rates should generally remain the first line of defense against a sudden tightening in global financial conditions, a shift toward protectionism in major trading partners or a bumpier-than-expected transition in China, which could lead to the need for external adjustment. Financial volatility following the Brexit referendum and the U.S. elections as well as increasing global uncertainty underscore the need for flexible exchange rates to mitigate external shocks. Recent episodes of financial volatility have shown that even large reserve buffers can be insufficient to arrest such volatility. While exchange rate flexibility should remain the main shock absorber, where justified, judicious foreign exchange intervention can be deployed to prevent or mitigate disorderly market conditions or where rapid exchange rate movements threaten financial or corporate stability, provided there are sufficient reserve buffers. Foreign exchange intervention could also be considered if rapid exchange rate movements are the result of illiquid or one-sided markets. However, foreign exchange intervention should not be used to resist currency movements that reflect changing fundamentals (including changes in the global trade environment) or as a substitute for macroeconomic policy adjustments. Effective communication of policy goals can also play a role in bolstering confidence and lowering market volatility.

Preserving financial stability also requires a robust macroprudential framework. Policymakers should continue to rely on macroprudential policies to mitigate systemic risks associated with high corporate and household leverage and rising interest rates. With increasing debt in corporate and household sectors, efforts should be stepped up to better identify the pockets of leverage and fragility stemming from the concentration of debt. For example, a number of economies in the region have leaned heavily on macroprudential tools to contain risks associated with rising house prices and household leverage. Macroprudential tools could be used to increase resilience to shocks, including shocks associated with the reversal of capital flows. Countries with a significant net foreign currency position or foreign currency maturity gaps should monitor these developments closely. Capital flow management measures could also be considered should capital flow volatility lead to increases in systemic risk and dislocations in domestic financial markets. However, as in the case of macroprudential policies, capital flow measures should not be used as a substitute for necessary macroeconomic policy adjustments.

Challenges from Demographic Transition and the Need to Boost Productivity

Adapting to demographic transition in Asia could be especially challenging owing to rapid aging at relatively low per capita income levels. In this light, policies aimed at protecting the vulnerable elderly population and prolonging strong growth take on particular urgency. Specific structural

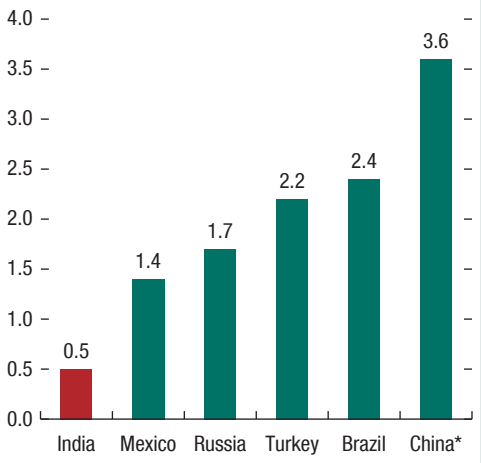
reforms can also help tackle these challenges, in particular in the areas of labor markets, pension systems, and retirement systems. Macroeconomic policies should adapt early on before aging sets in, for example ensuring debt sustainability (see Chapter 2).

These policies could be further supplemented by productivity-enhancing reforms, as the other major policy challenge for the region is how to raise productivity growth in the event that external factors, including further trade integration, are not as supportive as they were before the global financial crisis. Strengthening regional trade integration could provide some support. Other priorities vary across the different types of economies in Asia. In advanced economies, the focus should be on strengthening the effectiveness of research and development spending and measures to raise productivity in the services sectors. In emerging and developing economies in the region, priority should be given to capitalizing on recent achievements, including maintaining FDI inflows, by increasing absorptive capacity and domestic investment. Increasing education and human capital is also very important (see Chapter 3).

Box 1.1. India's Currency Withdrawal and Exchange and Its Economic Impact

On November 8, 2016, the Government of India withdrew the legal tender status of all existing 500 and 1,000 rupee banknotes, effective the next day, in a bid to nullify "black money" hoarded in cash, address tax evasion, tackle counterfeiting, and curb financing of terrorism. The initiative affected notes with a total value of about 15 trillion rupees, which accounted for about 86 percent of all cash in circulation. At the time of the withdrawal, the introduction of a new series of 500 and 2,000 rupee banknotes was announced. However, the supply of new banknotes in the months following the initiative was insufficient, even as the authorities took multiple steps to ease the currency transition. While there was no limit on the amount of bank deposits for the phased-out bills, the scarcity of new banknotes prompted the government to suspend cash exchanges and impose tight caps on cash withdrawals by individuals as well as by corporations. As disruptions to payments arose, several temporary exemptions were granted to ease the cash crunch. These exemptions aimed at easing transactions in some public offices and for the farming sector, as well as making payments for public utility services and purchasing key primary products.

Figure 1.1.1. Number of Payment Cards, 2015
(Per capita)



Source: Bank for International Settlements.
*China data are for 2014.

The key factor behind the short-term economic disruptions was the primarily cash-based nature of the Indian economy and its limited electronic payments infrastructure. At end-2015, currency in circulation in India stood at about 12 percent of GDP, one of the highest levels among countries covered by the Bank for International Settlements' Committee on Payments and Market Infrastructure. Cash accounted for about three-quarters of the narrow money base, as a large number of households (particularly in rural areas of India) rely on cash for everyday transactions. Numbers of bank branches and ATMs per capita are relatively low in India; few payment cards with a cash function exist (Figure 1.1.1); and the average number of transactions per Indian made with payments instruments in 2015 totaled 11 transactions (Figure 1.1.2).

The severity of the cash crunch, in conjunction with a slow pace of remonetization, led to a slowdown in economic activity. India's Purchasing Manager's Index for services, which also covers retail and wholesale trade, collapsed from 55 in October 2016 to 43 in November, 2016 (Figure 1.1.3). The growth of credit to the nonfood private sector decelerated from 9 percent at end-October 2016 to a 10-year low of just 4 percent by end-December, 2016. The consumer goods component of the index of industrial production declined by about 7 percent in December 2016, with production of consumer durables falling by 10 percent. Domestic sales of motor vehicles declined by 20 percent in December 2016 compared to December 2015, with the largest drop taking place in India's mass-consumer-oriented segment of three-wheel and two-wheel passenger vehicles. Although the slowdown in industrial activity has been relatively muted, with overall industrial production falling by less than ½ of 1 percent from the previous year, investment activity appears to have been severely affected. As per the data compiled by the Centre for Monitoring of Indian Economy, the number of new investment

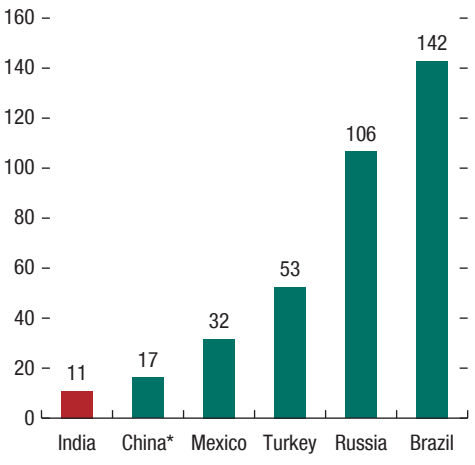
Prepared by Volodymyr Tulin.

Box 1.1 *(continued)*

projects announced during the October–December 2016 quarter was the lowest in over a decade, and their combined value was only about one-half of the average recorded during the previous two years. While the remonetization proceeded slowly over the first few months, about 75 percent of the predemonetization level of currency in circulation was restored by late March.

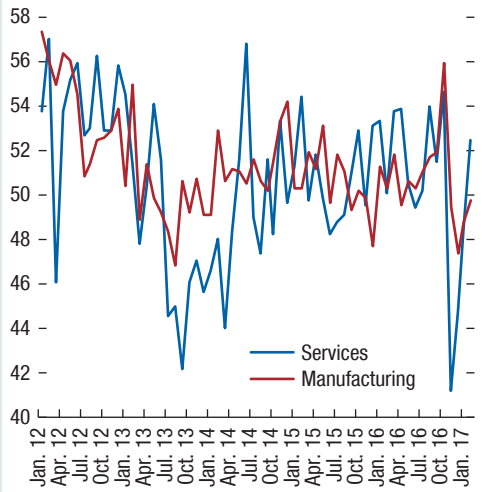
IMF staff analysis suggests that, compared to the October 2016 IMF *World Economic Outlook* forecasts, cash shortages are likely to slow FY2016/17 growth by about 4/5 of 1 percentage point and FY2017/18 growth by about ½ of 1 percentage point. A decline in currency supply can be calibrated as a temporary tightening of monetary conditions, using previous money demand studies for India.[1] The currency shortage associated with the currency exchange, assumed by the staff to gradually unwind through early 2017, corresponds to a substantial tightening of monetary conditions in the initial weeks of the initiative, which will ease as currency is replaced. Consequently, based on the IMF's India Quarterly Projection Model, GDP growth is expected to slow in the second half of FY2016/17, before gradually rebounding in the course of FY2017/18 (Figure 1.1.4).[2,3] An analysis of sectoral accounts that takes reliance on cash into account leads to similar estimates of growth for fiscal years 2016/17 and 2017/18. It is likely, however, that national accounts statistics, at least in the near term, may understate the economic impact of the cash crunch. Specifically, the impact on the informal economy and cash-based sectors, which are relatively large and have been affected the most by the cash crunch, is likely to be understated because these sectors are either not covered in the official statistics or are proxied by the formal sector activity indicators. Nonetheless, the economic repercussions

Figure 1.1.2. Number of Transactions with Payment Instruments, 2015
(Per capita)



Source: Bank for International Settlements.
*China data are for 2014.

Figure 1.1.3. India: Purchasing Managers' Index for Services and Manufacturing
(Index, > 50 signifies expansion)

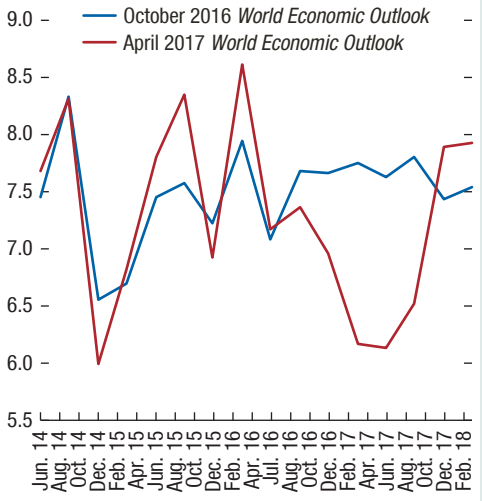


Source: Haver Analytics.

[1]See Kumar (2014).
[2]See Anand and Tulin (2016).
[3]See IMF (2017a,b).

Box 1.1 *(continued)*

Figure 1.1.4. India: GDP Growth Forecast
(Year-over-year change; percent)



Sources: Indian Central Statistical Office; and IMF staff forecasts.
Note: The two series differ for previous years due to revisions, released in February 2017, to the estimates of national accounts.

from the currency withdrawal remain a key domestic risk in India, in part as the near-term adverse economic impact of accompanying cash shortages remains difficult to gauge.

Notwithstanding the near-term economic disruptions, the currency withdrawal and exchange initiative may help secure some long-term gains, particularly if complemented by reforms to strengthen India's formal economy and the financial system. The scope for medium-term gains could span several dimensions:

- *Fiscal gains*. Bank deposits of large amounts (above US$4,000) were expected to attract high scrutiny from the Indian tax authorities and the information obtained as a result of income verification could lead to a durable impact on the tax revenue base. With only about 1 percent of the Indian population paying personal income taxes, the scope for broadening the tax base is clearly large. In principle, unreturned cash could also produce a one-off revenue gain for the Reserve Bank of India that can enable an increased dividend transfer to the Government of India. Any such windfall revenue would need to be clearly established, should be only realized once, and should be absorbed prudently and preferably in a non-recurring manner, for example through greater capital injections to public sector banks.
- *Banking sector liquidity*. The increase in banking system liquidity as a result of the currency exchange initiative has been massive, and it can reduce banks' funding costs and thereby lead to a decline in bank lending rates. With a surge in bank deposits and waning demand for credit, the weighted average lending rate of banks on new loans declined by 56 basis points during November 2016 to January 2017.[4] That said, even though the financial system is expected to weather the currency-exchange-induced temporary growth slowdown, the authorities should remain vigilant to risks—in view of the potential further buildup of nonperforming loans, including among private banks and elevated corporate sector vulnerabilities—and ensure prudent support to the affected economic sectors.
- *Digitalization and de-cashing*. The demonetization initiative can be seen as a follow-up to Indian authorities' strong policy push toward greater financial inclusion. Over the past few years, 250 million previously unbanked Indians have been provided with a bank account, and more efficient customer identification is now in place, including with the rollout of a unique identification number (Aadhaar) and the adoption of know-your-customer technologies. More recently, an important technological milestone was the rollout of the Unified Payment Interface, which is an instant virtual fund that transfers service between two bank accounts using a mobile platform that was accompanied by the roll out of e-payment and point-of-sale technologies. While the push for greater digitalization of the economy and the financial system is logical, large gaps in consumer access to digital technologies remain. For example, about 350 million Indians do not yet have cell phones, and only 250 million people own smartphones.

[4]See RBI (2017).

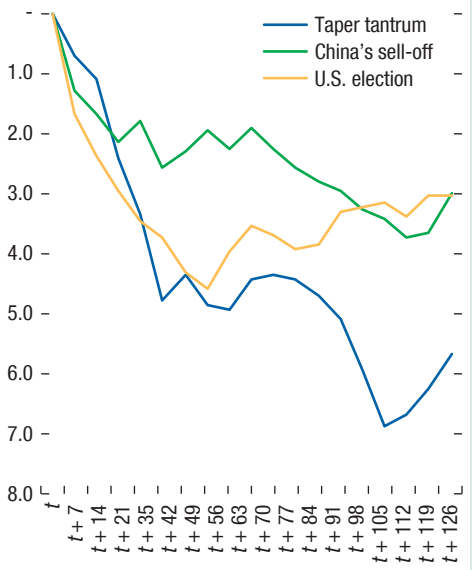
Box 1.2. Global Financial Spillovers to the Association of Southeast Asian Nations (ASEAN) Economies

Markets in Indonesia, Malaysia, the Philippines, Singapore, and Thailand (known as the ASEAN-5) have undergone significant corrections since the U.S. election, although they have generally performed better than other emerging markets since the 2013 taper tantrum (Figure 1.2.1). Following the change in expectations after the U.S. election regarding that country's fiscal stance and monetary policy normalization, the ASEAN-5 experienced capital outflows, with exchange rates depreciating vis-à-vis the U.S. dollar and 10-year sovereign bond yields rising in most countries (Figure 1.2.2).

Domestic financial conditions in the ASEAN-5 economies are sensitive to global factors. Following the approach of Miranda-Agrippino and Rey (2015), we estimate a principal component model to identify the underlying global factors that can explain the variability of a comprehensive set of domestic financial indicators. We find that, in the ASEAN-5 economies, there are two key macro-financial transmission channels of global financial shocks: one related to global risk aversion that largely impacts portfolio capital flows and asset prices and another linked to U.S. interest rates that mainly affects bond yields and credit conditions.

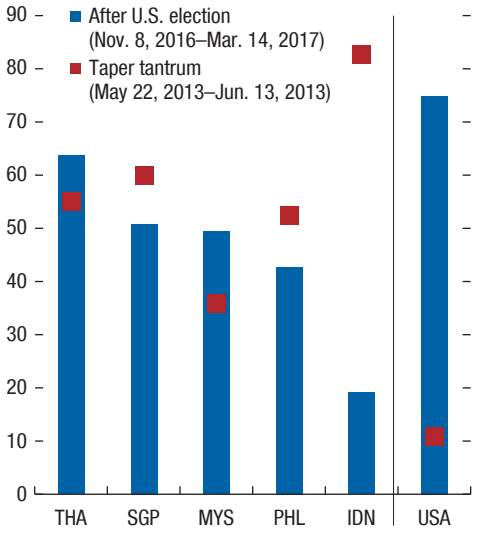
The tightening of global financial conditions and capital flow volatility would significantly impact ASEAN-5 economic growth. While global risk aversion measured by the Chicago Board Options Exchange Volatility Index has been low since the U.S. election, the strengthening of the U.S dollar has been associated with

Figure 1.2.1. ASEAN-5: Cumulative Portfolio Flows
(Billions of U.S. dollars)



Sources: Haver Analytics; Bangko ng Pilipinas; and IMF staff calculations.
Note: ASEAN-5 refers to Indonesia, Malaysia, the Philippines, Singapore, and Thailand.

Figure 1.2.2. ASEAN-5: Bond Yields after U.S. Election and Taper Tantrum
(Ten-year yields, change in basis points)

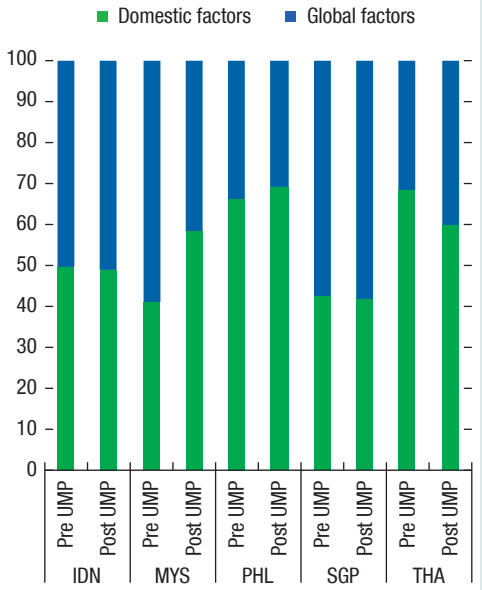


Sources: Bloomberg L.P.; and IMF staff calculations.
Note: ASEAN-5 refers to Indonesia, Malaysia, the Philippines, Singapore, and Thailand. Data labels in the figure use International Organization for Standardization (ISO) country codes.

This box was prepared by Shanaka J. Peiris with excellent research assistance by Mia Agcaoili. The empirical results are based on the *ASEAN-5 Cluster Report: Evolution of Monetary Policy Frameworks*.

Box 1.2 *(continued)*

Figure 1.2.3. Determinants of Sovereign Bond Yields in the ASEAN-5 before and after U.S. Unconventional Monetary Policies
(Percent)



Source: IMF staff analysis.
Note: UMP refers to the Federal Reserve's quantitave easing (that is, the period of unconventional monetary policy which started in November 2008 and ended in October 2014.

portfolio capital outflows more recently. Based on a preliminary Bayesian vector autoregression, capital outflows and weaker asset prices historically have been the largest exogenous driver of business cycle fluctuations in the ASEAN-5. While exchange rate depreciation may help cushion the tightening of domestic financial conditions, the rise in domestic bond yields that historically have been closely linked to U.S. rates could potentially lower property prices (and dampen construction) and soften domestic demand, an important driver of ASEAN-5 growth (Figure 1.2.3). Moreover, the balance sheet impact of exchange rate depreciation may outweigh the net export benefit in some countries that have high corporate leverage and foreign exchange exposures.

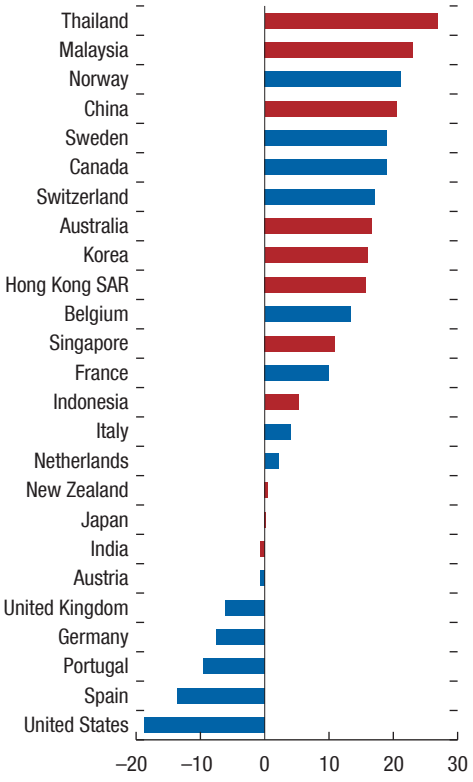
Box 1.3. Rising Household Debt in Asia

Household debt has risen sharply in several countries in Asia. Strengthening buffers, tightening macroprudential measures where needed, and addressing income inequality can help contain rising household indebtedness and its associated risks.

Household debt has risen rapidly in a wide range of countries since the global financial crisis and continues to increase rapidly. While the level of household debt is quite heterogeneous across Asian economies—ranging from 10 percent of GDP in India to 124 percent of GDP in Australia in 2015—such debt has been growing rapidly in most countries of the region. Between 2007 and 2015, the household-debt-to-GDP ratio increased by more than 20 percentage points of GDP in Thailand, Malaysia, and China (Figure 1.3.1). The rise was also sizable in Australia, Korea, and Hong Kong SAR, at more than 15 percentage points of GDP. As a result, total household debt currently stands above 60 percent of GDP in most Asian economies, with the exception of China, India, and Indonesia.

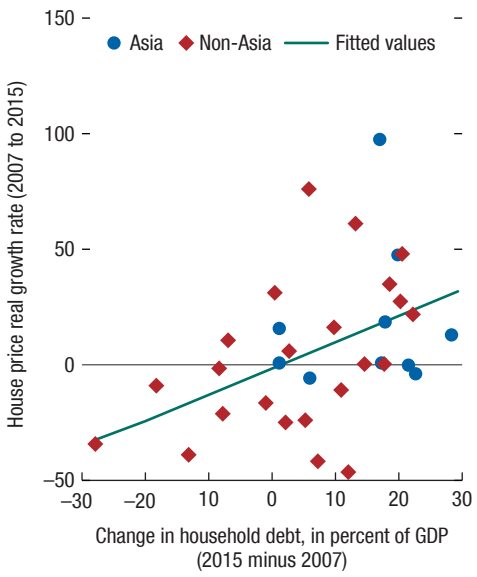
High and rapidly rising levels of household debt can pose risks to financial and economic stability. The recent increase in household indebtedness has been associated with rising house prices in many countries (Figure 1.3.2), including in Asia, where housing remains a key household asset (IMF 2011, 2014). While high household saving rates and strong capital positions of banks in many Asian countries provide significant buffers to mitigate risks, a decline in house prices could lower the value of

Figure 1.3.1. Change in Household-Debt-to-GDP Ratio from end-2007 to end-2015
(Percentage points)



Sources: Bank for International Settlements; and IMF staff estimates.

Figure 1.3.2. Household Debt and House Prices
(Change between 2007 and 2015, or latest)

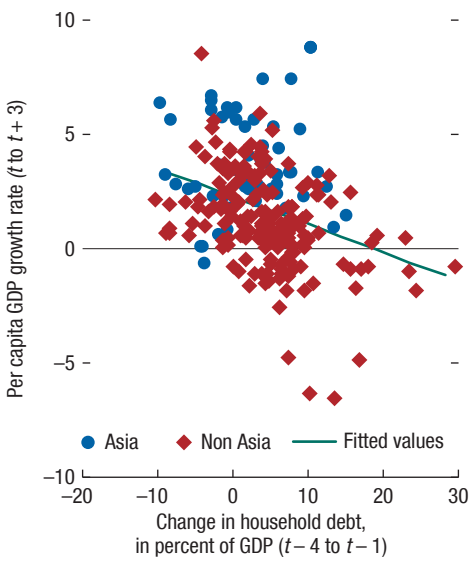


Sources: Bank for International Settlements; and IMF staff estimates.

This box was prepared by Tidiane Kinda.

Box 1.3 *(continued)*

Figure 1.3.3. Household Debt and Future Income Growth
(2007–15)



Sources: Bank for International Settlements; IMF, *World Economic Outlook*; and IMF staff estimates.

collateral, weaken household and bank balance sheets, and tighten credit availability. Falling house prices could also weigh on consumption and domestic demand through a wealth effect. The rapid increases in household debt observed since 2007 seem indeed to have been associated with lower future income growth in many countries (Figure 1.3.3). Recent cross-country studies also suggest that a rise in household debt predicts lower future output growth over the medium run, in contrast to standard open-economy macroeconomic models in which an increase in debt is driven by news of better future income prospects (Mian and others 2016).

Drivers of Household Debt

Recent cross-country empirical studies identified rising real income and falling interest rates as important determinants of rising household debt (Bordo and Meissner 2012; Mendoza and Terrones 2008). We build on existing studies and use the following single equation framework to assess the drivers of changes in household debt for an unbalanced panel of 19 countries (including six Asian countries) over 1973–2015:

$$\Delta D_{it} = \alpha \Delta D_{it-1} + \beta X_{it-1} + \gamma I_{it-2} + \nu_i + \eta_t + \varepsilon_{it},$$

in which ΔD_{it} denotes the change in household debt in percent of GDP for country i and year t; ν_i represents country fixed effects (to control for country-specific factors, including the time-invariant component of the institutional environment); η_t captures time fixed effects (to control for global factors); ε_{it} is an error term; and X_{it-1} is a vector of explanatory variables. The equation includes changes in the short-term interest rate and real per capita GDP growth and its level, as well as the change in the top 1 percent income share—a measure of inequality. For robustness checks, we control for additional variables such as trade openness, the use of macroprudential measures, investment, and the current account balance. All explanatory variables are lagged by one year to deal with simultaneity issues. We also include a two-year lag of the inequality variable (I_{it-2}) to capture its potentially long-lasting impact on household debt.

The empirical results illustrate that rising income and cheaper credit have been associated with increases in household debt, confirming previous findings in the literature (Table 1.3.1). The results also suggest that rising income inequality has been associated with an increase in household indebtedness. Asia does not seem to differ from other regions with regard to these key drivers. In addition to tackling income inequality, policies should further strengthen resilience to risks associated with rising household indebtedness, including by enhancing buffers and tightening prudential macro policies where needed.

Box 1.3 *(continued)*

Table 1.3.1. Drivers of Household Debt

	Dependent Variable: ΔHousehold Debt (percent of GDP)					
Explanatory Variables	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable, *t*-1	0.518***	0.565***	0.558***	0.556***	0.562***	0.574***
	(0.0465)	(0.0435)	(0.0438)	(0.0716)	(0.0439)	(0.0459)
Δ Short-Term Interest Rate, *t*-1	−0.141**	−0.118**	−0.118**	0.0604	−0.119**	−0.124**
	(0.0619)	(0.0584)	(0.0584)	(0.174)	(0.0586)	(0.0597)
Per Capita GDP, *t*-1	0.0306*	0.0383**	0.0298*	0.0955***	0.0382**	0.0383**
	(0.0173)	(0.0158)	(0.0169)	(0.0314)	(0.0158)	(0.0159)
Per Capita GDP Growth, *t*-1	0.255***	0.257***	0.271***	0.374***	0.240***	0.264***
	(0.0535)	(0.0522)	(0.0531)	(0.112)	(0.0614)	(0.0543)
Δ Top 1% Income Share, *t*-1	−0.165					
	(0.145)					
Δ Top 1% Income Share, *t*-2	0.390***	0.421***	0.412***	0.527***	0.426***	0.422***
	(0.143)	(0.131)	(0.131)	(0.169)	(0.132)	(0.132)
Trade Openness, *t*-1			−0.0144			
			(0.0103)			
Macroprudential Measures, *t*-1				−0.427		
				(0.417)		
Δ (investment/GDP), *t*-1					0.0351	
					(0.0681)	
Δ (current account/GDP), *t*-1						0.0243
						(0.0455)
Observations	416	438	438	180	438	430
R-Squared	0.518	0.547	0.550	0.587	0.548	0.550
Number of Countries	19	19	19	19	19	19
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Source: IMF staff analysis.

Note: Standard errors are in parentheses. All results are based on fixed-effects estimations. Country and time fixed effects as well as a constant term are included but not reported.

*$p < .10$; **$p < .05$; ***$p < .01$.

Box 1.4. Potential Policy Changes in the United States and Implications for Asia

Although the new U.S. administration has yet to announce policy specifics in many areas, the direction of U.S. policies could change significantly from the policies under the previous administration.

Macroeconomic Policy Mix

Over the short term, projections in the April 2017 *World Economic Outlook* assume a shift toward more expansionary fiscal policy and tighter monetary stance in the United States than projected in the October 2016 *World Economic Outlook*. The fiscal expansion could come mainly from the anticipated changes in U.S. federal government tax policies, including lower individual and corporate income tax rates. U.S. monetary policy would tighten in response to higher demand and inflation prospects, leading to a normalization of the U.S. term premium and an appreciation of the U.S. dollar.

Stronger demand in the United States would benefit Asian exporters—and indirectly other countries in the region through potential knock-on effects—provided financial markets remain orderly. This assumption may not hold, for example, if the U.S. fiscal expansion is not sufficiently productive. Under this scenario, the U.S. term premium would normalize faster and lead to more upward pressure on the U.S. dollar. As a result, the spillovers to Asia could become negative as opposed to being positive in a productive fiscal expansion scenario (see the April 2017 *World Economic Outlook* for illustrative scenarios on U.S. fiscal expansion).

Corporate Income Tax Reform

Based on available information, corporate income tax reform in the United States would focus on reducing rates and simplifying the system, including by lowering the highest tax rate; instituting a one-time tax rate reduction for repatriation of U.S. corporate profits overseas; and eliminating various tax credits and deductions. Furthermore, there are proposals to transform the current corporate income tax system to a destination-based cash flow tax (DBCFT) system. This would involve immediate expensing of capital investment and eliminating the deduction of net interest payments (the "cash flow" part); and the deduction of earnings from exports and the elimination of the deduction of imported inputs (the "destination-based" border tax adjustment part).[1]

The transition to a DBCFT would have major implications for Asian economies. Over the short term, the U.S. dollar would appreciate in real effective terms with the introduction of a border tax adjustment. To the extent that the real effective exchange rate appreciation is driven by the nominal exchange rate appreciation rather than an increase in U.S. domestic prices,[2] Asian economies with flexible exchange rates would face higher consumer price inflation owing to an increase in import prices and a higher external debt burden. Economies either pegged to the U.S. dollar or dollarized would see increased downward pressures on their foreign exchange reserves and domestic prices. The trade balance would also worsen in the absence of or with limited exchange rate depreciation.[3] Over a longer term, the incentive for U.S. companies to shift production or income to lower-tax-rate jurisdictions outside the United States would diminish. The Asian supply chains linked to the United States (notably in China, Malaysia, and Vietnam) could also weaken as foreign direct investment inflows into Asia slow. The one-time tax rate cut on repatriated U.S. corporate profits abroad could trigger capital outflows from the deposit countries, tighten offshore dollar funding conditions, and accelerate U.S. dollar appreciation.

This box was prepared by Minsuk Kim.

[1]See Box 1.1 in the April 2017 *Fiscal Monitor* for more details on the destination-based cash flow tax system.

[2]Among other things, the mix would hinge on how the U.S. Federal Reserve reacts to the expected increase in domestic prices due to the introduction of the border adjustment.

[3]More generally, whether the DBCFT fully complies with existing World Trade Organization rules remains unclear at this point.

Box 1.4 *(continued)*

International Trade Policies

The focus of U.S. trade policies is expected to pivot toward greater protection of domestic players and ensuring a level playing field, including through more active use of existing trade remedy and enforcement tools. The new administration also appears to favor bilateral trade negotiations over multilateral ones, as highlighted by the withdrawal from the Trans-Pacific Partnership. Increased tension and uncertainty in the global trade climate could negatively affect Asia's exports to the United States (for example, China, Japan, Korea, and Taiwan Province of China). Over the long run, a slowdown in global trade and foreign direct investment due to a U.S. pullback from cross-border economic integration could also hinder technology transfers through these linkages (see Chapter 3).

Box 1.5. Myanmar: Macroeconomic and Distributional Implications of Financial Reforms

This box analyzes the potential impact on income inequality of Myanmar's financial sector reform, a priority for the government.[1] A financial sector development strategy has been developed with the assistance of the IMF and the World Bank, and a financial inclusion road map has been launched. A key question for policymakers is how the reform will affect income distribution and poverty, as well as the country's overall economic growth. Against this backdrop, a recent IMF study attempts to shed some light on this issue by using a dynamic stochastic general equilibrium model tailored to capturing important features of the Myanmar economy (IMF 2017d).

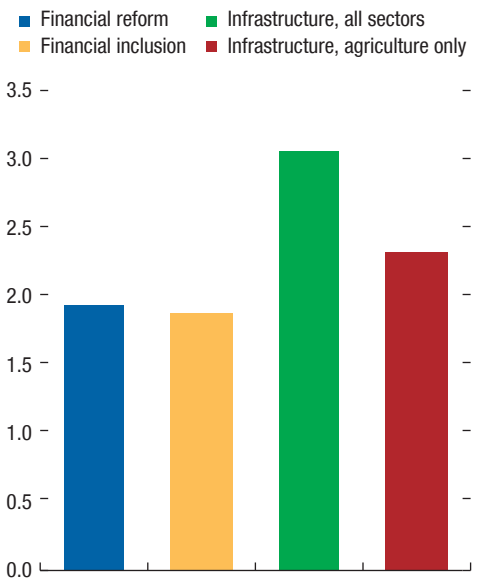
Despite recent progress, Myanmar's financial sector is in the early stages of development, and major distortions inherited from the prereform era remain. The Central Bank of Myanmar continues to finance a significant portion of the fiscal deficit, generating inflation and exchange rate depreciation pressures while placing a disproportional burden on the poor. Administrative controls on interest rates—a floor on deposit rates and a ceiling on lending rates—have led to financial suppression in the face of relatively high inflation. Meanwhile, access to basic financial services is very low, with over 75 percent of adults not having a bank account and the majority of the population relying on unregulated lenders, often at very high costs. While agriculture accounts for 30 percent of GDP and employs more than half of the population, it receives only a small fraction of total outstanding bank loans. Similarly, small and medium-sized enterprises are underserved by the formal financial system.

Four policy experiments were conducted for the analysis of Myanmar's financial sector reform:

1. Financial reform/liberalization: The government reduces central bank financing and pursues gradual liberalization of interest rates
2. Financial inclusion: Policy changes in the "financial reform/liberalization" scenario plus easier rural access to private credit
3. Higher infrastructure investment: Policy changes in the "financial inclusion" scenario plus the channeling of the reform-generated higher tax revenues toward economy-wide infrastructure investment
4. Higher infrastructure investment in agriculture: Policy changes in the "financial inclusion" scenario plus the channeling of the reform-generated higher tax revenues toward rural infrastructure investment

The analysis indicates that financial liberalization—that is, reducing central bank financing of the fiscal deficit and allowing higher real interest rates—would increase savings, private credit, and ultimately economic growth (Figure 1.5.1). A higher real interest rate as a result of lower inflation and a higher nominal interest rate on savings motivate households to save more, which in turn leads to a reduction in the real interest rate on private credit. As

Figure 1.5.1. Myanmar: Annual Average GDP Growth
(Deviation from trend, percentage points)



Source: IMF staff estimates.

This box was prepared by Yiqun Wu, Sandra Valentina Lizarazo Ruiz, and Marina Mendes Tavares.
[1]See IMF (2017c) for an analysis of Myanmar's financial sector reform strategy and priorities.

Box 1.5 *(continued)*

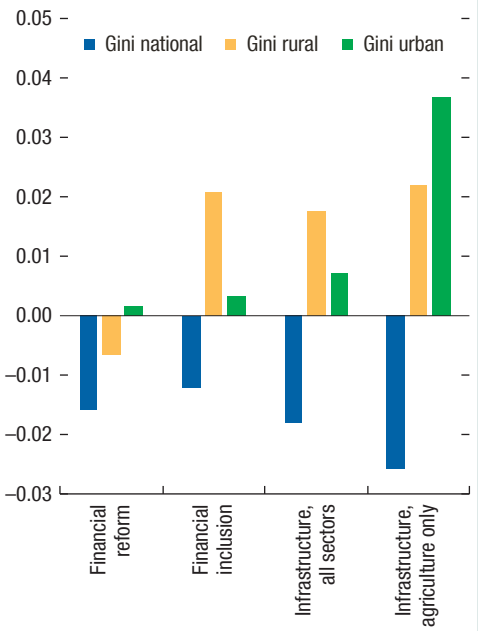
a result, investment increases and the industrial sector expands. The expansion in the industrial sector boosts labor demand and urban wages, inducing migration from rural areas. A larger and wealthier urban population increases the demand for consumption goods, and overall economic activity increases.

However, the analysis also shows that while financial liberalization would boost growth and reduce poverty, it may also increase some dimensions of inequality such as intra-rural and intra-urban income inequality (Figures 1.5.2 and 1.5.3). This distributional impact reflects the tendency for financial liberalization to disproportionally benefit those who already have financial access. Such an outcome may occur even when there is a general increase in credit access for the neediest sectors. For instance, the rural households that benefit most from increased credit access are usually those that are better-off, typically with larger land holdings, high productivity, and better managerial skills.

An adverse impact on intra-sectoral inequality could also arise from other well-intentioned policies such as those aimed at improving infrastructure. A key insight from this modeling exercise on Myanmar's financial sector reform is that, while such reforms can boost growth and reduce poverty, without changes to the existing institutional setup and appropriate targeting they can also worsen certain aspects of income distribution. Additional analysis shows that an increase in infrastructure investment using the revenue generated from financial liberalization—even if targeted toward rural areas—can lead to increased inequality within the rural sector despite the likely improvement in income distribution between rural and urban areas.

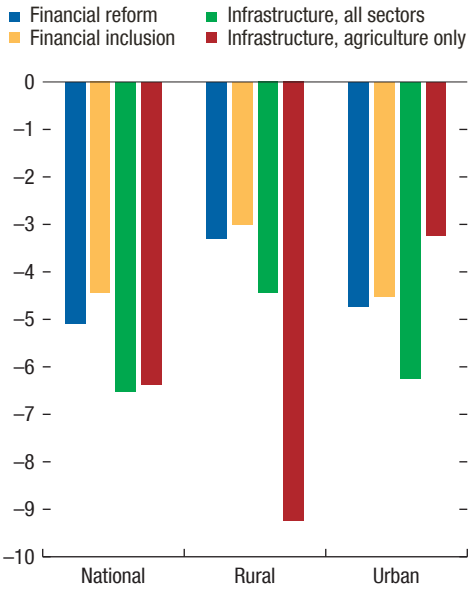
This case study highlights the importance of complementary policies in pursuing economic liberalization. Where equality is an important policy objective, reforms such as financial liberalization need to be supported by policy measures that target disadvantaged groups. This may require fiscal measures or sound financial policies that directly help such groups.

Figure 1.5.2. Myanmar: Gini Coefficient
(Total change)



Source: IMF staff estimates.

Figure 1.5.3. Myanmar: Poverty Rate
(Total change, percentage points)



Source: IMF staff estimates.

Table 1.1. Asia: Real GDP
(Year-over-year percent change)

	Actual Data and Latest Projections					Difference from October 2016 *World Economic Outlook*		
	2014	2015	2016	2017	2018	2016	2017	2018
Asia	**5.6**	**5.6**	**5.3**	**5.5**	**5.4**	**−0.1**	**0.1**	**0.0**
Emerging Asia[1]	**6.8**	**6.8**	**6.4**	**6.4**	**6.4**	**−0.1**	**0.1**	**0.1**
Industrial Asia	**0.8**	**1.5**	**1.3**	**1.6**	**1.1**	**0.3**	**0.6**	**0.1**
Australia	2.8	2.4	2.5	3.1	3.0	−0.4	0.5	0.1
Japan	0.3	1.2	1.0	1.2	0.6	0.5	0.7	0.1
New Zealand	2.8	3.1	4.0	3.1	2.9	1.2	0.4	0.3
East Asia	**6.7**	**6.2**	**6.1**	**6.0**	**5.7**	**0.1**	**0.3**	**0.1**
China	7.3	6.9	6.7	6.6	6.2	0.1	0.4	0.1
Hong Kong SAR	2.8	2.4	1.9	2.4	2.5	0.5	0.5	−0.3
Korea	3.3	2.8	2.8	2.7	2.8	0.1	−0.4	−0.2
Taiwan Province of China	4.0	0.7	1.4	1.7	1.9	0.4	0.1	−0.1
South Asia	**7.0**	**7.7**	**6.7**	**7.1**	**7.5**	**−0.7**	**−0.4**	**0.0**
Bangladesh	6.3	6.8	6.9	6.9	7.0	0.0	0.0	0.0
India[2]	7.2	7.9	6.8	7.2	7.7	−0.8	−0.4	0.0
Sri Lanka	4.9	4.8	4.3	4.5	4.8	−0.7	−0.5	−0.2
Nepal	6.0	2.7	0.6	5.5	4.5	0.0	1.5	0.8
ASEAN	**4.7**	**4.7**	**4.8**	**4.9**	**5.1**	**0.0**	**−0.1**	**−0.1**
Brunei Darussalam	−2.5	−0.4	−3.2	−1.3	0.7	−3.5	−5.2	−1.1
Cambodia	7.1	7.0	7.0	6.9	6.8	0.0	0.0	0.0
Indonesia	5.0	4.9	5.0	5.1	5.3	0.1	−0.2	−0.2
Lao P.D.R.	8.0	7.5	6.9	6.8	6.7	−0.5	−0.5	−0.6
Malaysia	6.0	5.0	4.2	4.5	4.7	−0.1	−0.1	0.0
Myanmar	8.0	7.3	6.3	7.5	7.6	−1.8	−0.2	−0.1
Philippines	6.2	5.9	6.8	6.8	6.9	0.4	0.1	0.1
Singapore	3.6	1.9	2.0	2.2	2.6	0.3	0.0	−0.1
Thailand	0.9	2.9	3.2	3.0	3.3	0.0	−0.3	0.2
Vietnam	6.0	6.7	6.2	6.5	6.3	0.1	0.3	0.1
Pacific island countries and other small states[3]	**3.2**	**3.6**	**3.4**	**3.4**	**3.8**	**0.4**	**0.1**	**0.1**
Bhutan	4.0	6.1	6.2	5.9	11.2	0.2	−0.5	−0.1
Fiji	5.6	3.6	2.0	3.7	3.7	−0.5	−0.2	−0.2
Kiribati	2.4	3.5	3.2	2.8	2.0	0.1	0.3	0.0
Maldives	6.0	2.8	3.9	4.1	4.7	0.9	0.0	0.0
Marshall Islands	0.6	1.4	1.8	1.8	1.6	0.0	0.0	0.0
Micronesia	−2.4	3.7	2.0	2.0	1.5	0.9	1.3	0.7
Palau	4.4	9.3	0.1	5.0	5.0	0.1	0.0	0.0
Papua New Guinea	7.4	6.6	2.5	3.0	3.2	0.0	0.0	0.7
Samoa	1.2	1.6	6.6	2.1	0.9	3.5	0.6	−1.1
Solomon Islands	2.0	1.8	3.2	3.0	3.0	0.2	−0.3	0.0
Timor-Leste	5.9	4.3	5.0	4.0	6.0	0.0	−1.5	0.0
Tonga	2.9	3.6	3.5	3.9	3.6	0.8	1.4	0.9
Tuvalu	2.2	2.6	4.0	2.3	2.3	0.0	0.0	0.0
Vanuatu	2.3	−0.8	4.0	4.5	4.0	0.0	0.0	0.0
Mongolia	7.9	2.4	1.0	−0.2	1.8	0.9	−1.2	−1.6

Sources: IMF, World Economic Outlook database; and IMF staff estimates and projections.
[1]Emerging Asia includes China, India, Indonesia, Malaysia, the Philippines, Thailand, and Vietnam. India's data are reported on a fiscal year basis.
[2]India's data are reported on a fiscal year basis. Its fiscal year starts from April 1 and ends on March 31.
[3]Simple average of Pacific island countries and other small states which include Bhutan, Fiji, Kiribati, Maldives, the Marshall Islands, Micronesia, Palau, Papua New Guinea, Samoa, Solomon Islands, Timor-Leste, Tonga, Tuvalu, and Vanuatu.

Table 1.2. Asia: General Government Balances
(Percent of fiscal year GDP)

	Actual Data and Latest Projections					Difference from October 2016 *World Economic Outlook*		
	2014	2015	2016	2017	2018	2016	2017	2018
Asia	**−2.3**	**−2.9**	**−3.4**	**−3.4**	**−3.0**	**−0.1**	**0.1**	**0.0**
Emerging Asia[1]	**−2.6**	**−3.7**	**−4.1**	**−4.1**	**−4.0**	**−0.4**	**−0.2**	**−0.2**
Industrial Asia	**−4.8**	**−3.3**	**−3.8**	**−3.5**	**−2.8**	**0.8**	**1.0**	**1.0**
Australia	−2.9	−2.7	−2.7	−2.2	−1.3	0.2	0.3	0.4
Japan	−5.4	−3.5	−4.2	−4.0	−3.3	1.0	1.2	1.2
New Zealand	−0.3	0.6	0.6	0.6	1.5	1.0	0.9	1.4
East Asia	**−0.8**	**−2.4**	**−3.2**	**−3.2**	**−2.9**	**−0.6**	**−0.4**	**−0.4**
China	−0.9	−2.8	−3.7	−3.7	−3.4	−0.7	−0.4	−0.4
Hong Kong SAR	3.2	0.6	4.8	1.6	1.4	3.3	0.0	0.5
Korea	0.4	0.3	0.3	0.7	1.1	−0.5	−0.4	−0.5
Taiwan Province of China	−2.7	−1.8	−1.6	−1.3	−1.1	0.0	0.0	0.0
South Asia	**−6.8**	**−6.8**	**−6.3**	**−6.2**	**−6.0**	**0.2**	**0.2**	**−0.1**
Bangladesh	−3.1	−3.9	−3.4	−4.7	−4.2	0.9	0.0	0.0
India[2]	−7.2	−7.1	−6.6	−6.4	−6.3	0.1	0.2	−0.1
Sri Lanka	−6.2	−7.0	−5.7	−5.2	−4.6	−0.2	−0.5	−0.7
Nepal	1.5	0.7	1.4	−1.1	−1.2	−0.2	0.7	0.3
ASEAN	**−1.4**	**−1.8**	**−2.0**	**−2.3**	**−2.4**	**0.2**	**−0.1**	**−0.1**
Brunei Darussalam	3.6	−14.5	−21.9	−10.9	−9.2	4.3	2.7	0.1
Cambodia	−1.3	−1.6	−2.9	−3.2	−3.6	−0.3	−0.3	−0.3
Indonesia	−2.1	−2.5	−2.5	−2.4	−2.5	0.0	0.2	0.4
Lao P.D.R.	−4.5	−2.7	−5.9	−5.3	−5.2	−2.9	−1.4	−1.1
Malaysia	−2.7	−2.9	−3.0	−3.0	−2.7	0.3	−0.1	0.0
Myanmar	−0.9	−4.4	−4.6	−4.5	−4.5	0.0	0.1	0.1
Philippines	0.9	0.6	−0.4	−1.0	−1.2	0.0	0.5	0.5
Singapore	5.5	3.7	3.3	1.7	1.5	0.9	−0.7	−1.0
Thailand	−0.8	0.1	0.5	−1.6	−1.8	0.8	−1.2	−1.4
Vietnam	−6.3	−6.2	−6.6	−5.7	−5.7	−0.1	0.3	−0.1
Pacific island countries and other small states[3]	**5.7**	**4.2**	**−3.5**	**−2.8**	**−4.5**	**1.6**	**3.2**	**0.8**
Bhutan	2.9	−0.2	−2.1	−4.4	−6.1	−1.4	−1.9	−5.6
Fiji	−4.3	−3.4	−5.7	−5.1	−3.6	0.0	−0.1	−0.1
Kiribati	23.4	43.7	−11.6	−3.3	−12.2	1.3	9.7	0.8
Maldives	−9.0	−9.5	−8.4	−10.1	−10.4	5.3	8.3	8.7
Marshall Islands	3.2	2.8	2.2	1.6	0.5	−0.1	−0.1	−0.2
Micronesia	11.2	10.5	9.7	8.9	8.3	6.7	6.6	6.1
Palau	3.5	5.1	−2.1	−0.9	1.3	0.0	0.0	0.1
Papua New Guinea	−6.5	−5.1	−4.4	−2.7	−2.4	0.6	2.4	2.5
Samoa	−5.3	−3.9	−0.4	−1.9	−1.7	3.0	0.2	1.8
Solomon Islands	1.7	−0.3	−1.4	−2.5	−2.0	0.0	−1.9	−3.6
Timor-Leste	22.2	3.9	−14.3	2.0	−16.5	3.3	20.1	1.7
Tonga	−0.4	0.0	0.4	−1.3	−1.1	1.6	−1.3	−1.5
Tuvalu	36.3	7.2	−2.7	−4.2	−5.3	0.0	0.0	0.0
Vanuatu	0.8	7.2	−8.5	−14.6	−12.5	2.2	2.6	0.7
Mongolia	−11.3	−8.5	−17.0	−10.5	−8.2	2.5	1.6	1.9

Sources: IMF, World Economic Outlook database; and IMF staff estimates and projections.
[1]Emerging Asia includes China, India, Indonesia, Malaysia, the Philippines, Thailand, and Vietnam. India's data are reported on a fiscal year basis.
[2]India's data are reported on a fiscal year basis. Its fiscal year starts from April 1 and ends on March 31.
[3]Simple average of Pacific island countries and other small states which include Bhutan, Fiji, Kiribati, Maldives, the Marshall Islands, Micronesia, Palau, Papua New Guinea, Samoa, Solomon Islands, Timor-Leste, Tonga, Tuvalu, and Vanuatu.

Table 1.3. Asia: Current Account Balance
(Percent of GDP)

	Actual Data and Latest Projections					Difference from October 2016 *World Economic Outlook*		
	2014	2015	2016	2017	2018	2016	2017	2018
Asia	**1.9**	**2.7**	**2.5**	**2.1**	**2.0**	**0.0**	**0.2**	**0.4**
Emerging Asia[1]	**1.6**	**2.0**	**1.4**	**0.9**	**0.8**	**−0.3**	**−0.1**	**0.1**
Industrial Asia	**−0.2**	**1.2**	**2.4**	**2.5**	**2.5**	**0.3**	**0.8**	**0.9**
Australia	−2.9	−4.7	−2.6	−2.8	−2.9	0.9	1.2	1.2
Japan	0.8	3.1	3.9	4.2	4.3	0.1	0.8	0.9
New Zealand	−3.2	−3.4	−2.7	−2.5	−3.1	0.3	1.0	0.7
East Asia	**3.0**	**3.7**	**2.9**	**2.4**	**2.3**	**−0.5**	**−0.2**	**0.0**
China	2.2	2.7	1.8	1.3	1.2	−0.6	−0.4	−0.1
Hong Kong SAR	1.4	3.3	5.1	3.0	3.1	2.3	0.0	0.0
Korea	6.0	7.7	7.0	6.2	6.1	−0.2	0.3	0.5
Taiwan Province of China	12.0	14.5	14.2	14.8	15.0	−0.8	0.4	0.9
South Asia	**−1.1**	**−0.8**	**−0.8**	**−1.4**	**−1.5**	**0.5**	**0.5**	**0.6**
Bangladesh	1.3	1.9	0.9	−0.5	−1.0	0.9	0.3	0.1
India[2]	−1.3	−1.1	−0.9	−1.5	−1.5	0.5	0.5	0.6
Sri Lanka	−2.5	−2.5	−2.3	−2.8	−2.3	−0.8	0.0	0.8
Nepal	4.5	5.0	6.3	−0.3	−1.3	2.4	0.5	1.9
ASEAN	**3.3**	**3.3**	**3.7**	**3.2**	**2.5**	**0.8**	**0.8**	**0.6**
Brunei Darussalam	30.7	16.0	9.5	8.3	4.3	5.2	12.4	4.5
Cambodia	−12.1	−10.6	−8.7	−8.5	−8.5	1.5	0.9	0.4
Indonesia	−3.1	−2.0	−1.8	−1.9	−2.0	0.5	0.4	0.4
Lao P.D.R.	−20.7	−16.8	−17.0	−18.8	−19.2	0.9	−1.2	−3.8
Malaysia	4.4	3.0	2.0	1.8	1.8	0.8	0.3	0.3
Myanmar	−3.3	−5.2	−6.5	−6.6	−6.7	1.8	1.5	0.5
Philippines	3.8	2.5	0.2	−0.1	−0.3	−1.6	−1.5	−1.4
Singapore	19.7	18.1	19.0	20.1	19.2	−0.3	0.8	0.8
Thailand	3.7	8.1	11.4	9.7	7.8	1.8	2.0	1.9
Vietnam	5.1	0.5	4.7	4.1	3.4	4.3	4.0	3.3
Pacific island countries and other small states[3]	**−0.1**	**2.8**	**−3.2**	**−4.1**	**−5.4**	**4.3**	**5.0**	**3.1**
Bhutan	−26.4	−28.3	−29.1	−29.4	−16.6	−1.4	2.1	4.1
Fiji	−7.6	−1.5	−3.0	−5.8	−6.2	4.2	1.3	0.6
Kiribati	24.0	43.2	5.0	−5.7	−9.7	12.2	−3.2	−8.1
Maldives	−3.8	−10.2	−17.9	−16.7	−14.8	−6.1	−2.6	2.0
Marshall Islands	0.0	17.9	13.6	10.8	9.4	21.2	20.2	18.8
Micronesia	1.2	8.6	8.2	6.7	5.6	8.3	7.4	6.9
Palau	−14.6	−3.4	−6.3	−7.8	−8.8	−1.0	−0.7	−0.5
Papua New Guinea	3.0	19.6	15.3	15.9	14.2	7.8	9.8	9.3
Samoa	−8.1	−3.0	−6.1	−6.1	−5.9	−2.8	−3.1	−3.1
Solomon Islands	−4.3	−2.7	−1.7	−4.0	−5.2	2.8	3.7	1.8
Timor-Leste	26.2	8.3	−4.7	13.0	−9.6	5.2	24.6	2.8
Tonga	−9.3	−7.2	−2.1	−7.8	−11.5	5.4	3.7	1.1
Tuvalu	19.3	7.6	−4.4	−5.4	−3.9	−0.5	0.2	1.6
Vanuatu	−0.3	−9.2	−12.1	−14.9	−12.6	4.6	6.2	6.4
Mongolia	−11.5	−4.0	−4.1	−4.4	−9.5	7.0	14.7	12.9

Sources: IMF, World Economic Outlook database; and IMF staff estimates and projections.
[1]Emerging Asia includes China, India, Indonesia, Malaysia, the Philippines, Thailand, and Vietnam. India's data are reported on a fiscal year basis.
[2]India's data are reported on a fiscal year basis. Its fiscal year starts from April 1 and ends on March 31.
[3]Simple average of Pacific island countries and other small states which include Bhutan, Fiji, Kiribati, Maldives, the Marshall Islands, Micronesia, Palau, Papua New Guinea, Samoa, Solomon Islands, Timor-Leste, Tonga, Tuvalu, and Vanuatu.

Table 1.4. Asia: Consumer Prices
(Year-over-year percent change)

	Actual Data and Latest Projections					Difference from October 2016 *World Economic Outlook*		
	2014	2015	2016	2017	2018	2016	2017	2018
Asia	**3.2**	**2.3**	**2.3**	**2.9**	**2.9**	**−0.2**	**0.0**	**−0.1**
Emerging Asia[1]	**3.4**	**2.6**	**2.8**	**3.2**	**3.2**	**−0.2**	**0.0**	**−0.1**
Industrial Asia	**2.7**	**0.9**	**0.2**	**1.2**	**1.0**	**0.0**	**0.4**	**0.0**
Australia	2.5	1.5	1.3	2.0	2.4	0.0	−0.1	0.0
Japan	2.8	0.8	−0.1	1.0	0.6	0.0	0.5	0.0
New Zealand	1.2	0.3	0.6	1.5	2.0	0.0	0.0	0.0
East Asia	**1.9**	**1.3**	**1.9**	**2.3**	**2.2**	**−0.1**	**0.1**	**−0.1**
China	2.0	1.4	2.0	2.4	2.3	−0.1	0.1	−0.1
Hong Kong SAR	4.4	3.0	2.6	2.6	2.7	0.1	0.0	0.0
Korea	1.3	0.7	1.0	1.8	1.9	0.0	0.0	−0.1
Taiwan Province of China	1.2	−0.3	1.4	1.4	1.3	0.3	0.3	0.0
South Asia	**5.9**	**4.9**	**5.0**	**4.9**	**5.1**	**−0.6**	**−0.4**	**−0.2**
Bangladesh	7.0	6.2	6.4	6.4	5.8	−0.4	−0.5	−0.8
India[2]	5.9	4.9	4.9	4.8	5.1	−0.6	−0.4	−0.2
Sri Lanka	3.3	0.9	3.7	5.8	5.0	−0.4	0.5	−0.1
Nepal	9.0	7.2	9.9	6.7	7.6	−0.1	−3.2	−0.4
ASEAN	**4.4**	**3.3**	**2.4**	**3.6**	**3.7**	**−0.2**	**0.1**	**0.0**
Brunei Darussalam	−0.2	−0.4	−0.7	−0.1	0.0	−0.5	−0.1	−0.1
Cambodia	3.9	1.2	3.0	3.2	3.1	−0.1	0.5	0.0
Indonesia	6.4	6.4	3.5	4.5	4.5	−0.1	0.4	0.1
Lao P.D.R.	4.1	1.3	2.0	2.3	2.7	5.3	0.0	0.0
Malaysia	3.1	2.1	2.1	2.7	2.9	0.0	−0.3	0.0
Myanmar	5.1	10.0	7.0	6.9	6.7	−2.8	−2.1	−1.0
Philippines	4.2	1.4	1.8	3.6	3.3	−0.2	0.2	−0.2
Singapore	1.0	−0.5	−0.5	1.1	1.8	−0.2	−0.1	0.0
Thailand	1.9	−0.9	0.2	1.4	1.5	−0.1	−0.3	−0.3
Vietnam	4.1	0.6	2.7	4.9	5.0	0.6	1.2	1.1
Pacific island countries and other small states[3]	**2.4**	**1.5**	**1.8**	**2.9**	**3.0**	**−0.4**	**0.2**	**−0.1**
Bhutan	9.9	6.3	4.2	4.1	4.6	−0.2	−0.5	−0.5
Fiji	0.5	1.4	3.9	4.0	3.5	0.6	1.2	0.7
Kiribati	2.1	0.6	1.9	2.2	2.5	0.4	0.2	0.0
Maldives	2.5	1.4	0.9	2.5	1.9	−1.3	−0.1	−1.6
Marshall Islands	1.1	−2.2	0.9	1.1	1.8	0.3	0.0	0.0
Micronesia	0.7	−0.2	1.3	2.6	2.4	−0.7	1.2	0.5
Palau	4.1	0.9	−1.0	2.0	2.0	−3.0	0.0	0.0
Papua New Guinea	5.2	6.0	6.9	7.5	6.5	0.0	0.0	0.0
Samoa	−1.2	1.9	0.1	1.8	1.9	−0.2	0.8	0.0
Solomon Islands	5.2	−0.6	0.4	2.5	2.6	−1.9	−1.5	0.0
Timor-Leste	0.7	0.6	−1.3	1.0	2.7	−0.7	−0.3	−1.1
Tonga	1.2	−0.3	1.4	3.7	3.4	1.3	2.2	0.7
Tuvalu	1.1	3.2	3.5	2.9	2.8	0.0	0.0	0.0
Vanuatu	0.8	2.5	2.2	2.6	2.8	0.0	0.0	0.0
Mongolia	12.9	5.9	0.5	4.0	5.1	−1.9	−2.7	−0.2

Sources: IMF, World Economic Outlook database; and IMF staff estimates and projections.
[1]Emerging Asia includes China, India, Indonesia, Malaysia, the Philippines, Thailand, and Vietnam. India's data are reported on a fiscal year basis.
[2]India's data are reported on a fiscal year basis. Its fiscal year starts from April 1 and ends on March 31.
[3]Simple average of Pacific island countries and other small states which include Bhutan, Fiji, Kiribati, Maldives, the Marshall Islands, Micronesia, Palau, Papua New Guinea, Samoa, Solomon Islands, Timor-Leste, Tonga, Tuvalu, and Vanuatu.

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2. Asia: At Risk of Growing Old before Becoming Rich?

Introduction and Main Findings

In past decades, Asia has benefited significantly from demographic trends, along with strong policies. Many parts of Asia, particularly East Asia, reaped a "demographic dividend" as the number of workers grew faster than the number of dependents, providing a strong tailwind for growth. This dividend is about to end for many Asian economies. This can have important implications for labor markets, investment and saving decisions, and public budgets.

Against this backdrop, this chapter examines the implications of projected demographic changes in major Asian economies over the coming decades under three broad headings: implications for growth, external balance, and financial markets in the region.[1] Separately, the chapter briefly discusses Japan's experience with adverse demographic trends in recent decades (Box 2.1) and fiscal implications of aging for Asia (Box 2.2). The chapter concludes by presenting policy options to address some of the unique challenges arising from Asia's demographic transition.

The main findings of this chapter are:

- ***Trends.*** Asia is aging fast. The speed of aging is especially remarkable compared to the historical experience in Europe and the United States. As such, parts of Asia risk becoming old before becoming rich. The region's per capita income relative to the United States stands at much lower levels than those reached by mature advanced economies in the past. In a global context, Asia is shifting from being the biggest contributor to the global working-age population to subtracting hundreds of millions of people from it.[2]
- ***Growth.*** Asia has enjoyed a substantial demographic dividend in past decades, but rapid aging is now set to create a demographic tax on growth. Demographic trends could subtract ½ to 1 percentage point from annual GDP growth over the next three decades in post-dividend countries such as China and Japan. In contrast, they could add 1 percentage point to annual GDP growth in early-dividend countries, such as India and Indonesia, if the transition is well managed. Overall, however, demographics are likely to be slightly negative for Asian growth and could subtract 0.1 of a percentage point from annual global growth over the next three decades (or 0.2 of a percentage point if early-dividend countries are unable to reap the demographic dividend). In several Asian economies, immigration—if past trends continue—could play an important role in softening the impact of aging or prolonging the demographic dividend (Australia, Hong Kong SAR, New Zealand, and Singapore).
- ***Inflation.*** In cases in which structural excess savings and low investment due to demographics lead to such a low real neutral interest rate that monetary policy may no longer stimulate the economy, the economy may operate below potential, keeping inflation under the central bank's target (see Box 2.1 for the case of Japan). This raises the risk of Asia falling into a period of "secular stagnation" at a lower income level compared

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[1]The chapter analyzes developments in the 13 largest Asian economies: Australia, China, Hong Kong SAR, India, Indonesia, Japan, Korea, Malaysia, New Zealand, the Philippines, Singapore, Thailand, and Vietnam.

[2]Throughout this chapter, unless otherwise noted, the working-age population is defined as persons 15 to 64 years old (international definition). Youth dependency ratio refers to persons aged 14 and below as a share of the working-age population, and old-age dependency ratio to persons aged 65 and above as a share of the working-age population.

to advanced economies and smaller policy buffers.

- ***External flow balance.*** The diversity of demographic trends in the region creates opportunities for capital flows and cross-border risk sharing—that is, savings from surplus countries can be used to fulfill capital needs in younger economies. Projections based on the IMF's External Balance Approach (EBA) model suggest that, over the next decade, surpluses of some Asian economies are projected to increase due to demographics. However, the impact is material only for a small set of countries, and the overall effect on global imbalances is likely to be limited (about 0.1 of a percentage point of global GDP over the next decade).
- ***Financial markets***. Finally, demographic trends are likely to put downward pressure on real interest rates and asset returns for most major countries in Asia. These domestic effects are likely to be less important for countries that are financially open. For those, changes in the world interest rate—which may in turn be driven by global aging trends—will likely matter more.

The main policy implications of this chapter are:

- Adapting to aging could be especially challenging for Asia, as populations living at relatively low per capita income levels in many parts of the region are rapidly becoming old. In light of this, policies aimed at protecting the vulnerable elderly and prolonging strong growth take on a particular urgency in Asia.
- Given these low income levels, it is important to adapt macroeconomic policies early on before aging sets in. This may include securing debt sustainability and monitoring potential changes in monetary transmission owing to aging.
- Specific structural reforms—which fiscal space can support—can also help address these challenges. These may include labor market reforms (promoting labor force participation of women and the elderly, guest worker programs, and active labor market policies); pension reforms (automatic adjustment mechanisms and minimum pension guarantees); and retirement system reforms (new financial products to reduce precautionary savings and increase the availability of "safe assets"). These policies could be further supplemented by specific productivity-enhancing reforms (for example, through research and development and education), as discussed in Chapter 3.

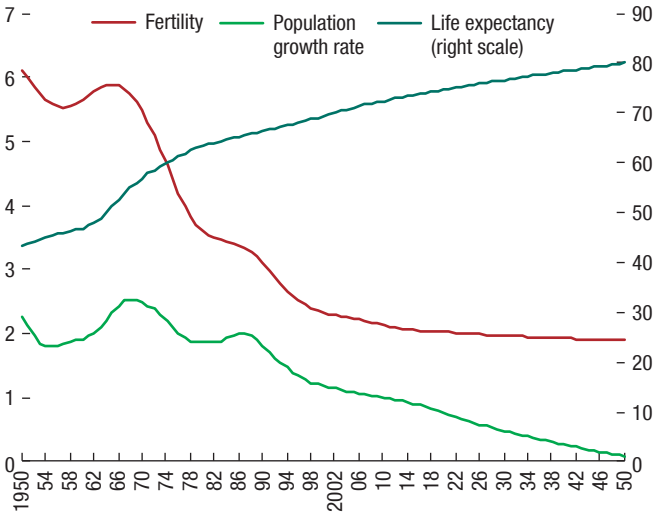
Demographic Trends in Asia

Asia is undergoing a demographic transition marked by slowing population growth and aging. This mainly reflects declining fertility rates since the late 1960s and to a lesser extent rising life expectancy (Figure 2.1). The population growth rate, already negative in Japan, is projected to fall to zero for Asia by 2050. The working-age population share is at its peak now and projected to decline over coming decades. The share of the population age 65 and older (old-age population) will increase rapidly and reach close to 2½ times the current level by 2050. East Asia, in particular, is projected to be the world's fastest-aging region in the coming decades, with its old-age dependency ratio roughly tripling by 2050.[3]

The demographic outlook varies across Asia. Broadly following the findings of World Bank (2015), three broad groups of countries can be distinguished: (1) post-dividend economies, where the working-age population is shrinking in terms of its share in the total population as well as in absolute numbers; (2) late-dividend economies, where the working-age population is declining as a share of total population, but is still growing

[3]Population projections in this chapter are based on United Nations, *World Population Prospects: 2015 Revision* (medium-fertility scenario with unchanged net migration flows). Projections do not differ much until 2030, but uncertainty increases with the projection horizon primarily due to different assumptions about future fertility rates (World Bank 2015).

Figure 2.1. Asia: Fertility, Life Expectancy, and Population Growth
(Percent on left scale; year on right scale)



Source: IMF staff estimates based on United Nations 2015 (medium-fertility scenario).

Table 2.1. Asia: Demographic Classification

	Demographic Characteristics in 2015	Projected Demographic Characteristics in 2030
Australia	Late dividend	Late dividend
China	Post dividend	Post dividend
Hong Kong SAR	Post dividend	Post dividend
India	Early dividend	Early dividend
Indonesia	Early dividend	Late dividend
Japan	Post dividend	Post dividend
Korea	Post dividend	Post dividend
Malaysia	Late dividend	Late dividend
New Zealand	Late dividend	Late dividend
Philippines	Early dividend	Early dividend
Singapore	Late dividend	Post dividend
Thailand	Post dividend	Post dividend
Vietnam	Late dividend	Late dividend

Source: IMF staff estimates based on Amaglobeli and Shi 2016 and United Nations 2015 (medium-fertility variant).
Note: Post dividend is defined as a total fertility rate 30 years earlier below 2.1 and a shrinking working-age population share over the subsequent 15 years or a shrinking absolute working-age population. Late dividend is defined as a total fertility rate 30 years earlier above 2.1 and a shrinking working-age population share over the subsequent 15 years. Early dividend is defined as an increasing working-age population share over the subsequent 15 years.

in absolute numbers; and (3) early-dividend economies, where the share of the working-age population will rise both as a share of the total population and in absolute terms over the next 15 years. The major Asian economies classified by these demographic groups in 2015 and 2030 are as follows (Table 2.1):

- **Post dividend:** This group includes China, Hong Kong SAR, Japan, Korea, and Thailand. These economies are projected to age rapidly and reach some of the highest old-age dependency ratios globally by 2050.[4] Japan is the most aged country globally, with an old-age dependency ratio of 43 percent at the end of 2015, which will rise to 71 percent by the end of 2050. Singapore is projected to transition to post-dividend status by 2030 (Table 2.2).
- **Late dividend:** This group includes Malaysia and Vietnam—two moderately aging emerging markets—as well as Australia and New Zealand, advanced economies that experienced a demographic transition earlier than other countries in the region, but maintain higher fertility rates than most East Asian economies and receive substantial immigration. Immigration has also kept Singapore in this category, despite one of the lowest fertility rates in the region.
- **Early dividend**: This group includes India, Indonesia, and the Philippines. These countries have some of the youngest populations in the region and will see their working-age populations increase substantially in coming decades. Fertility rates are projected to remain above the replacement rate of 2.1 children per woman for India and Indonesia until 2030 and beyond that for the Philippines. Indonesia is projected to transition to late-dividend status by 2030.

An important factor for the demographic evolution of some Asian economies is migration. As migrants tend to be of working age, migrant flows can slow the demographic transition in recipient countries. In Asia, immigration has

[4]China began relaxing its one-child policy in 2013 and, starting in 2016, allowed all couples to have two children. Demographers expect a positive but limited impact of the policy change on fertility (Basten and Jiang 2015). The 2015 UN population projections see the fertility rate gradually rising from 1.5 children per woman in 2010 to 1.7 by 2030 (United Nations 2015).

Table 2.2. Asia: Old-Age Dependency Ratios
(Percent)

Country	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Japan	25.2	29.9	36.0	43.3	48.3	50.6	53.1	57.0	63.8	68.1	70.9
Hong Kong SAR	15.3	16.5	17.2	20.6	26.5	35.1	43.7	50.1	55.6	60.4	64.6
Korea	10.2	12.7	15.0	18.0	22.2	29.4	37.6	46.1	54.4	60.7	65.8
Singapore	10.3	11.3	12.2	16.1	21.4	28.6	36.5	43.7	51.1	57.2	61.6
Thailand	9.5	11.0	12.4	14.6	18.4	23.4	29.2	35.8	42.3	48.2	52.5
New Zealand	18.0	18.1	19.6	22.9	26.3	30.2	34.9	38.0	40.6	40.5	40.7
China	9.7	10.4	11.1	13.1	17.1	20.4	25.3	32.7	39.6	43.0	46.7
Australia	18.5	19.2	20.0	22.7	25.3	28.3	31.3	32.8	34.8	35.3	37.3
Vietnam	10.4	9.9	9.4	9.6	11.7	14.8	18.3	21.8	25.6	29.5	34.1
Malaysia	6.1	6.7	7.2	8.4	10.0	12.2	14.5	16.7	18.7	21.0	25.3
Indonesia	7.3	7.4	7.5	7.7	8.6	10.4	12.4	14.7	17.0	19.2	21.3
India	7.2	7.7	8.0	8.6	9.8	11.1	12.5	14.0	15.8	17.8	20.5
Philippines	5.5	5.8	6.7	7.2	8.0	9.1	10.3	11.5	12.5	13.5	14.5

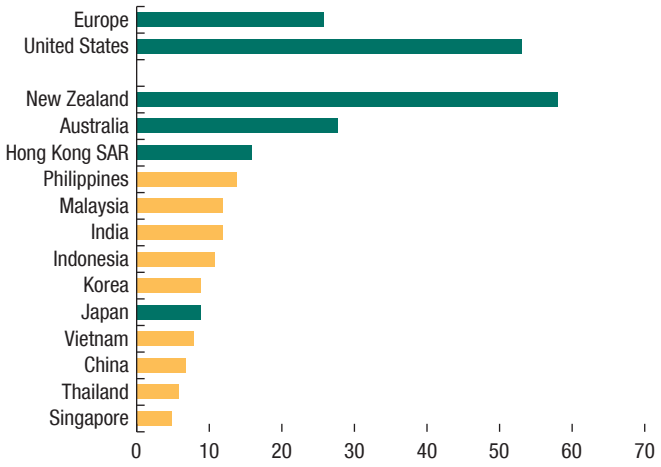
Source: IMF staff calculations and projections based on United Nations 2015 (medium-fertility scenario).
Note: The old-age dependency ratio indicates the size of the population 65 years of age and older as a share of the working-age population (15–64 years old).

been sizable in Australia, New Zealand, Hong Kong SAR, and Singapore. In these economies, continued immigration is projected to substantially slow the decline of working-age populations. The flipside of this is emigration of working-age people. This is of particular relevance for the Philippines, but even here the overall impact on the working-age population is small relative to the population size. For China, Japan, Korea and the remaining member countries of the Association of Southeast Asian Nations, net migration is relatively small.

While Asia is not the most aged region—Europe holds that distinction—the speed of aging in Asia is remarkable. Figure 2.2 shows the number of years it takes for the old-age dependency ratio to increase from 15 to 20 percent. The figure shows that this transition took 26 years in Europe and more than 50 years in the United States. In Asia, however, only Australia and New Zealand aged at similar speeds. For others, such as China, Japan, Korea, Thailand, Singapore, and Vietnam, the same transition has taken (or will take) less than 10 years.

The rapid speed of aging has two implications. First, countries in Asia will have less time to adapt policies to a more aged society than many advanced economies had. Second, some countries in Asia are getting old before becoming rich, or, to put it differently, they are likely to face the challenges of high fiscal costs of aging and

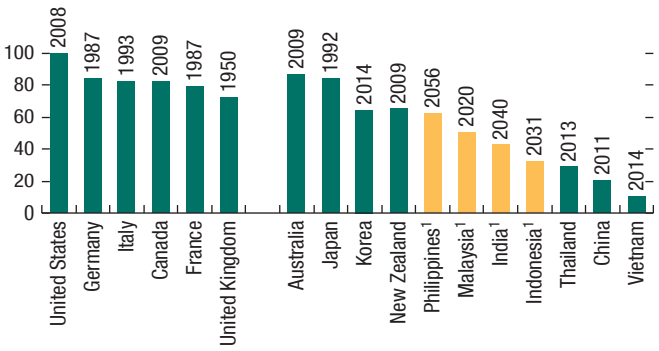
Figure 2.2. Number of Years for the Old-Age Dependency Ratio to Increase from 15 Percent to 20 Percent



Source: IMF staff calculations based on United Nations 2015 (medium-fertility scenario).
Note: The old-age dependency ratio indicates the population 65 years and older as a share of the working-age population (15–64 years). Countries in green reflect historical data, while countries in yellow reflect projections.

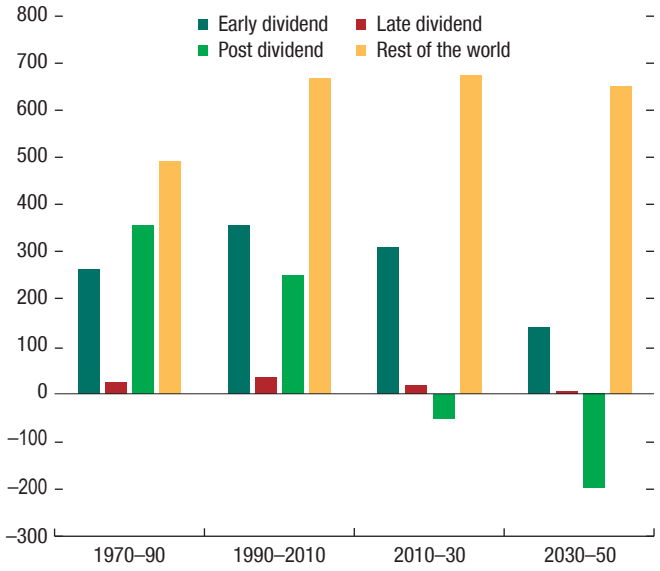
demographic headwinds to growth at relatively low per capita income levels. Figure 2.3 shows per capita income at purchasing power parity relative to the United States at the historical or projected peak of the share of the working-age population in each country. Except for Japan and Australia, per capita income in major Asian countries stands at significantly lower levels than those reached by mature advanced economies at the same stage of

Figure 2.3. Per Capita Income Level at the Peak of Working-Age Population Share
(Purchasing power parity based; in percent of U.S. per capita income at each country's peak year)



Sources: IMF World Economic Outlook (WEO) database; and IMF staff calculations based on United Nations World Population Prospects: 2015 Revision (medium-fertility scenario).
Note: For the countries shown above, the working-age population (15–64 years) share of the total population has peaked, or is projected to reach the peak, in the following years: United States (2008), Germany (1987), Italy (1993), Canada (2009), France (1987), United Kingdom (1950 or earlier), Australia (2009), Japan (1992), Korea (2014), New Zealand (2009), the Philippines (2056), Malaysia (2020), India (2040), Indonesia (2031), Thailand (2013), China (2011), Vietnam (2014).
[1]Based on IMF staff projection. For Malaysia, the income level relative to the United States is calculated from the April 2017 WEO projection for 2020. For India, Indonesia, and the Philippines, the income levels are calculated by applying the projected purchasing power parity per capita income growth rate in 2022, starting from 2023 and up to the year in which the working-age population share is projected to peak, respectively.

Figure 2.4. Asia and the Rest of the World: Change in Working-Age Population
(Millions)



Source: IMF staff calculations and projections based on United Nations 2015 (medium-fertility scenario).
Note: The working-age population is defined as those aged 15 to 64. Early-dividend economies comprise India, Indonesia, and the Philippines. Late-dividend economies comprise Australia, Malaysia, New Zealand, Singapore, and Vietnam. Post-dividend economies comprise China, Hong Kong SAR, Japan, Korea, and Thailand.

the aging cycle. This trend underscores the need to sustain high growth rates in these economies.

Asia's demographic evolution has important global implications through the region's contribution to global growth, current account balances, and capital flows, as well as relative wage levels and competitiveness. Figure 2.4 presents absolute changes in the working-age population for different demographic country groups in Asia and for the rest of the world. Between 1970 and 2010, Asia contributed more to the growth of the global working-age population than the rest of the world combined. This, however, is changing. Over the coming decades, rapidly aging East Asian economies are projected to see their working-age populations drop substantially. The decline is largest in absolute terms for China (a decline of 170 million in the working-age population over the next 35 years), but there are also substantial absolute declines projected for Japan, Korea, and Thailand. In contrast, the April 2015 *Regional Economic Outlook: Sub-Saharan Africa* projected that Africa will account for most of the growth in the global working-age population.

Growth Implications of Demographic Trends

Asia has enjoyed a substantial demographic dividend in past decades, but rapid aging is now set to create a demographic "tax" on growth in several countries. To quantify this effect, this section employs a new template devised by Amaglobeli and Shi (2016) to assess the impact of demographic trends on growth.

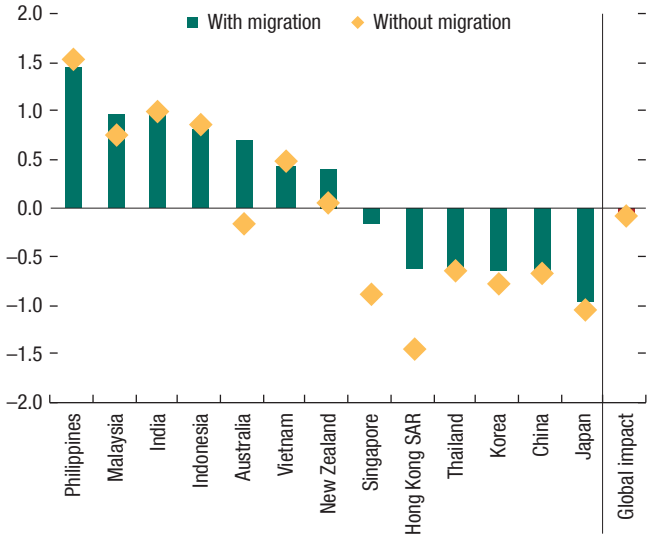
Impact of the Labor Force on Economic Growth

Demographic developments affect growth through various channels, including the size of the

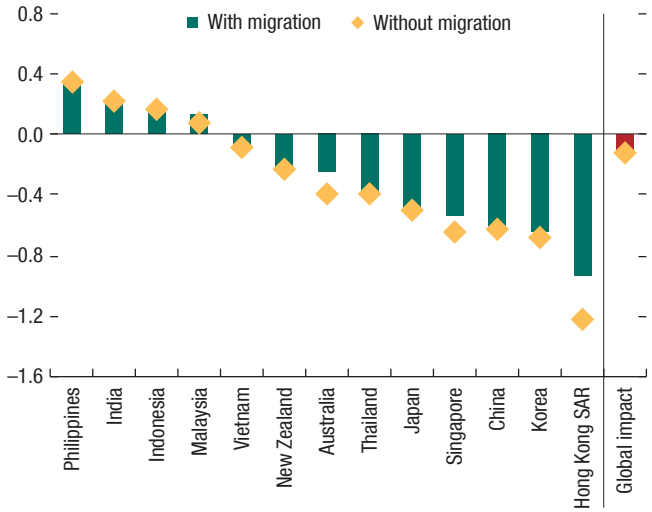
Figure 2.5. Asia: Baseline Growth Impact of Demographic Trends

(Percentage point impact on real GDP growth; average, 2020–50)

1. Impact on Real GDP Growth



2. Impact on Real GDP Per Capita Growth



Sources: IMF staff projections based on Amaglobeli and Shi 2016, United Nations 2015 (medium-fertility scenario), and Penn World Tables 9.0.
Note: The baseline estimates assume unchanged labor force participation by age-gender cohort, constant capital-to-labor ratio, and total factor productivity growth unchanged from historical average. Migration projections follow historical trends. Global impact indicates the purchasing-power-parity-weighted average as a percent of global GDP.

labor force, productivity, and capital formation. The analysis begins by establishing the direct impact on growth of demographic-induced changes in labor force size in a growth accounting framework. This baseline impact rests on several assumptions that are discussed later in this section:

- Unchanged total factor productivity (TFP) growth (based on the historical average)
- Unchanged age- and gender-specific labor force participation rates (and employment rates)
- Constant capital-to-effective-labor ratio[5]

With these assumptions, we estimate long-term output using a production function approach with capital and labor as inputs. Aggregate employment is decomposed into population by age-gender groups, and by group-specific labor force participation and employment rates. Population projections affect output in this framework through aggregate labor and capital. To establish the baseline impact of demographic change, we compare estimated output based on the UN's medium-fertility scenario (which includes migration) to a hypothetical status quo scenario that assumes constant population size and age structure. Separately, we also consider the UN zero-migration scenario to assess the impact of migration.

Figure 2.5, panel 1 shows the average annual growth impact from 2020 to 2050 relative to the status quo. The figure shows that:

- Demographic trends will turn into strong headwinds for post-dividend countries. In Japan, the impact of aging could reduce the average annual growth rate by almost 1 percentage point. The growth impact for

[5]This means that investment adjusts over time to the labor force, where labor is expressed in efficiency units (that is, incorporating TFP). For example, if the capital stock is 300 percent of GDP and the effective labor force growth declines by 1 percentage point, the investment ratio would fall by 3 percentage points of GDP. Since some substitution between capital and labor is likely, this assumption creates an upper bound for the growth impact.

China, Hong Kong SAR, Korea, and Thailand could be between one-half and three-quarters of a percentage point.[6] For Singapore, which transitions from late- to post-dividend status by 2030, the estimated overall impact is close to zero.

- Early- and late-dividend countries could still enjoy a substantial demographic dividend ranging from close to 1½ percent per year for the Philippines to ½ percent for New Zealand. It is important to note, however, that reaping the demographic dividend is not automatic, but depends instead on good policies to raise productivity and create a sufficient number of quality jobs for the growing working-age population, as discussed in Bloom, Canning, and Fink (2010).[7]
- Inward migration can prolong the demographic dividend or soften the impact of rapid aging. In the cases of Australia, Hong Kong SAR, New Zealand, and Singapore, the impact of continued immigration on the workforce could add between ½ and 1 percentage point to annual average growth.[8] The impact of net emigration from Indonesia, the Philippines, and Vietnam is small due to the small relative size of emigration as a share of population in these countries.
- Migration can reduce but cannot reverse the negative impact of aging on growth. For example, Australia would need to receive immigration equal to approximately 23 percent of the actual workforce to maintain the same dependency ratio by 2030. The same immigration figure for Singapore would be 51 percent.

Figure 2.5, panel 2 shows the growth impact on a per capita basis. The country ordering changes slightly on a per capita basis. Notably, the drag from demographics is smaller for Japan, but larger for Hong Kong SAR and Singapore, because the positive impact of immigration is partially eliminated in the per capita perspective.

We next relax several assumptions in this stylized exercise—in particular the assumptions of unchanged TFP growth and labor force participation rates—and then discuss why we keep the capital-to-effective-labor ratio assumption.

Aging and Total Factor Productivity—An Additional Drag on Growth?

The first assumption in the baseline estimates is unchanged TFP growth. Studies, however, show that aging has implications for productivity growth. For example, different age groups differ in their productivity. This could be due to factors such as accumulation of experience over time, depreciation of knowledge, or age-related trends in physical and mental capabilities. Several studies find evidence of a decline in worker productivity and innovation starting between ages 50 and 60 (Aiyar, Ebeke, and Shao 2016; Börsch-Supan and Weiss 2016; and Feyrer 2007). In contrast, Acemoglu and Restrepo (2017) find no robust negative impact of aging on productivity.[9] Figure 2.6 shows that in most Asian countries the share of older workers (ages 55 to 65) in the

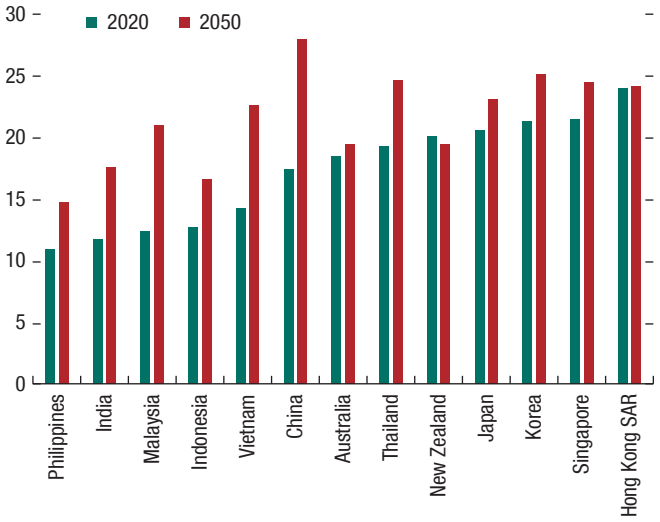
[6]The drag on growth is broadly stable for Japan over the next three decades, near 1.0 percentage point in each decade. In contrast, the drag for China rises over time, from 0.4 in the first decade to about 1.1 percentage points in the last decade.

[7]Long-term demographic projections are surrounded by uncertainties. A sensitivity analysis shows that compared to the UN's medium-fertility scenario, the average annual growth rate is about 0.2 percentage point higher in the UN's high-fertility scenario and about 0.2 percentage point lower in the low-fertility scenario.

[8]This effect is driven only by an enlargement of the workforce. In addition, Jaumotte, Koloskova, and Saxena (2016) estimate that a 1 percentage point increase in the share of migrants in the working-age population can raise GDP per capita over the long term by up to 2 percent by increasing labor productivity and, to a lesser extent, boosting investment. This second-round effect is not shown in Figure 2.5. The long-term UN assumptions on net migration rates for these countries range from 2.5 percent in New Zealand to 6 percent in Australia.

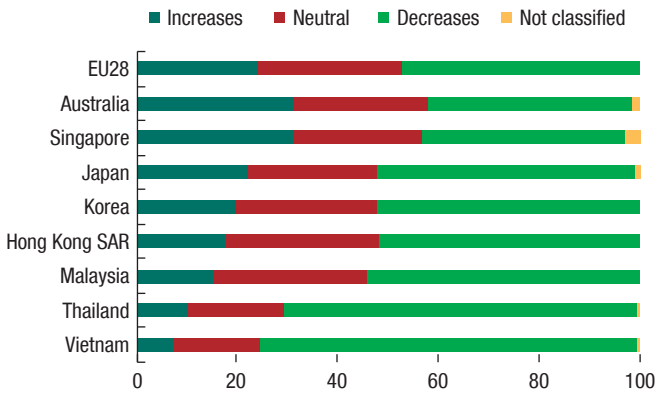
[9]Acemoglu and Restrepo (2017) run cross-country regressions linking aging to GDP per capita growth and conclude that there is no robust negative impact of aging. They argue that this might reflect the more rapid adoption of automation technologies in countries that are aging faster. The empirical approach in Adler and others (forthcoming) differs in that it (1) focuses on TFP rather than GDP per capita; (2) uses a tighter definition of aging based on the employed workforce's age, as opposed to the population's age; and (3) properly instruments for the employed workforce's age with past demographic characteristics of the population.

Figure 2.6. Asia: Share of Older Workers in Working-Age Population
(Population aged 55–64 in percent of working-age population)



Source: IMF staff estimates based on United Nations 2015 (medium-fertility scenario) and Penn World Tables 9.0.
Note: The working-age population is defined as those aged 15 to 64.

Figure 2.7. Share of Workforce Whose Productivity Rises or Falls with Aging
(Percent of total workforce, latest available)



Sources: International Labour Organization; Veen 2008; and IMF staff calculations.
Note: Category productivity "increases" with age comprises managers and professionals; category "neutral" comprises clerical support workers and services and sales workers; category "decreases" comprises technicians, skilled agricultural workers, forestry and fishery workers, craft and related trades workers, plant and machine operators and assemblers, elementary occupations, and armed forces occupations.

workforce is projected to increase substantially by 2050, with the largest increases in China, Malaysia, and Vietnam.

The impact of aging may also differ across professions. Veen (2008) argues that productivity of workers in physically demanding professions (factory workers, construction) declines at older ages, while productivity may increase with age in other professions such as lawyers, managers, and doctors. Figure 2.7 applies Veen's taxonomy to selected Asian economies. Countries with lower per capita income levels such as Thailand and Vietnam tend to have a larger share of their workforce in professions where productivity tends to decline with age. This underscores the importance of structural transformation to prepare for an aging workforce.

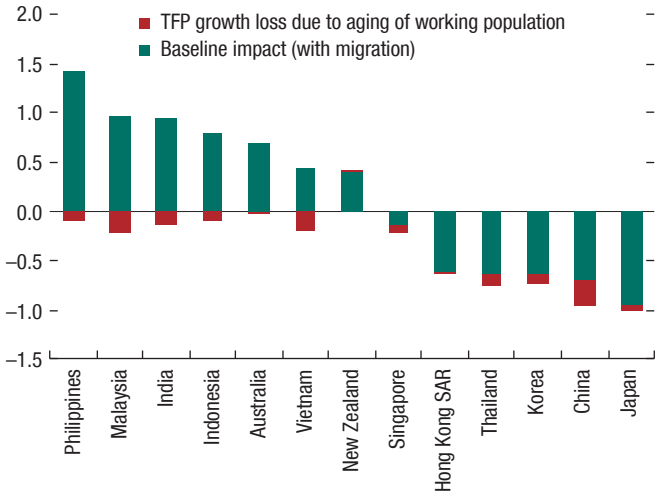
We estimate the effect of workforce aging (measured by the share of workers 55–65 years old in the total workforce) on productivity following the approach in Aiyar, Ebeke, and Shao (2016) and Adler and others (forthcoming).[10]

For a sample of Asian and European countries, we find that an increase in the share of older workers is associated with a significant reduction in labor productivity growth. We decompose the slowdown in labor productivity into factor accumulation and TFP, and find that most of the slowdown is through weaker TFP growth—that is, workforce aging is associated with lower annual TFP growth by 0.1 to 0.3 of a percentage point on average for Asia (see Annex 2.1). The results are quantitatively and qualitatively in line with the findings in Aiyar, Ebeke, and Shao (2016) for Europe and Adler and others (forthcoming) for the global sample.

Figure 2.8 shows the estimated impact of projected workforce aging on growth for different Asian economies. On average, an older workforce is estimated to reduce growth by 0.2 percent per year, with the biggest impact for China (0.3 percent per year). The impact is higher for countries that are projected to experience

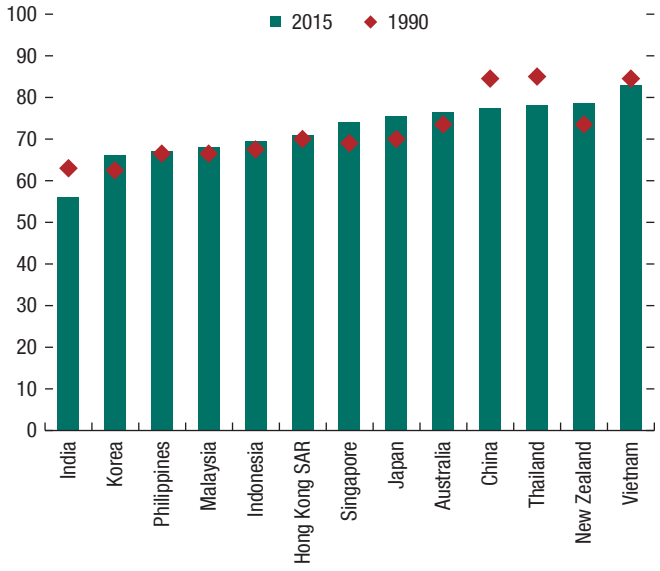
[10]These two studies broadly use the same approach, regressing either the TFP level or TFP growth on demographic variables, and testing whether workforce aging is associated with a permanent loss in productivity or a slowdown in productivity growth due to less innovation.

Figure 2.8. Baseline Growth Impact of Demographic Trends and Impact of Aging on Total Factor Productivity
(Percentage point impact on real GDP growth; average, 2020–50)



Source: IMF staff estimates based on United Nations 2015 (medium-fertility scenario) and Penn World Tables 9.0.
Note: Estimated impact of workforce aging on total factor productivity (TFP) growth follows Aiyar and others 2016 based on a sample of Asian and European countries.

Figure 2.9. Labor Force Participation Rates by Ages 15–64 in 1990 and 2015
(Percent of population between ages 15 and 64 years)



Source: IMF staff calculations based on International Labour Organization figures.

workforce aging faster (the countries were shown in Figure 2.6). This may be a substantial drag on future TFP growth for some countries, but is likely to be of second-order magnitude compared to the baseline growth impact of changes in the size of the labor force.

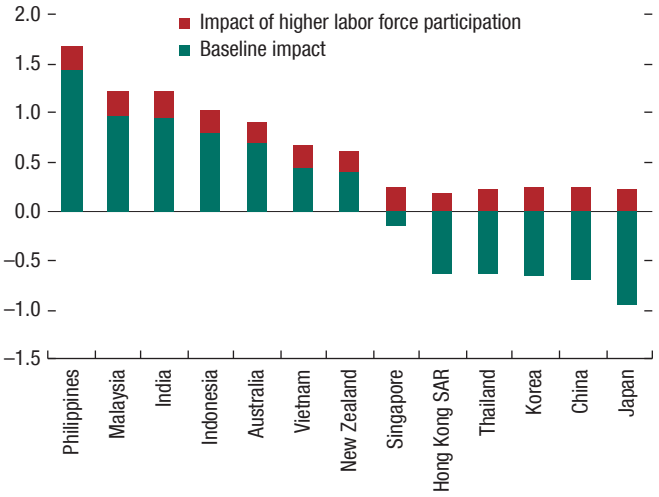
Higher Labor Force Participation Rates to the Rescue?

The second assumption in the baseline estimates are constant age-gender-specific labor force participation rates (LFPRs). However, LFPRs change over time and can be affected by policies. For example, increases in life expectancy could encourage the elderly to stay in the workforce. Indeed, in most Organisation for Economic Co-operation and Development (OECD) countries, the effective retirement age has increased, even though these increases have been modest compared to the larger increases in life expectancy (Bloom, Canning, and Fink 2010). Alternatively, the decline in fertility rates could encourage women to participate more in the labor force (Bloom and others 2007). In most Asian economies, there is indeed scope for greater female labor force participation, although unleashing the full potential of female employment requires a comprehensive set of policies (Steinberg and Nakane 2012; Elborgh-Woytek and others 2013; Kinoshita and Guo 2015). In contrast, LFPRs tend to decline for younger workers as countries develop and average years of schooling increase.

Figure 2.9 shows the changes in LFPRs for working-age populations in Asian economies between 1990 and 2015. The first thing to note is that, overall, LFPRs have remained remarkably stable over this period, despite notable shifts for age-gender subgroups.[11] The second thing to note is that in Japan, the most aged country globally, LFPRs have increased the most in the region—by close to 6 percentage points since 1990 (Box 2.1).

[11]In particular, (1) female LFPRs have increased in the region's advanced economies, but declined in China, India, Thailand, and Vietnam, while male LFPRs have declined in most countries; (2) LFPRs for young workers ages 15–24 have dropped in all countries by up to a third, reflecting longer schooling; and (3) LFPRs for older workers ages 55–64 have increased in most countries, most notably Australia, New Zealand, and Singapore.

Figure 2.10. Baseline Growth Impact of Demographic Trends and Higher Labor Force Participation
(Percentage point impact on real GDP growth; average, 2020–50)



Source: IMF staff estimates based on Amaglobeli and Shi 2016, United Nations 2015 (medium-fertility scenario), and Penn World Tables 9.0.
Note: The rising labor force participation rates scenario is based on the experience of Japan from 1990 to 2015 (Box 2.1).

What if other Asian economies were to achieve a rise in LFPRs similar to that of Japan? Figure 2.10 shows the impact of such a scenario on growth, where we allowed for a gradual increase in LFPR for all age and gender groups by 6 percentage points. Such a scenario could certainly boost growth—the impact on annual GDP growth for this scenario is 0.2 to 0.3 of a percentage point—and offset the lower TFP growth due to workforce aging, as discussed previously. However, such changes in the LFPR are unlikely to counter the baseline growth effects induced by changes in the overall labor force.[12]

Aging and Investment

The third assumption in our baseline impact estimates is a constant capital-to-effective-labor ratio. We examined this question in the analytical framework introduced to analyze the impact of workforce aging on TFP. In that analysis, we find that workforce aging is associated with higher capital per worker (accounting for TFP), but economically the effect is small. Similarly, we do not find a statistically significant relationship between the old-age dependency ratio and capital per worker. Taken together, this suggests that a constant capital-to-labor-ratio assumption is a reasonable approximation, especially for thinking about the next three decades, when countries would presumably be on a balanced growth path.

Overall, demographic trends could reduce growth by ½ to 1 percentage point per year in absolute and per capita terms over the next three decades in post-dividend countries. Over the long term, these sustained reductions in growth rates have important welfare implications: a 0.5 percentage point reduction in growth per year would reduce the level of GDP by 2050 by about 15 percent.

External Balance Implications of Demographic Trends

The impact of demographics on savings, investment, and hence the current account is examined using the EBA model (Phillips and others 2013; IMF 2016). The impact is captured using three variables (see Annex 2.1 for details): population growth, old-age dependency ratio,[13] and aging speed (defined as the expected change in old-age dependency in 20 years).[14] In particular:

[12]Note that the impact on growth for small changes in LFPRs is close to linear. A more ambitious scenario in which the employment gender gap is eliminated could add ¼ of a percentage point to annual GDP growth for Japan and up to 1 percentage point for India by 2050 (Cuberes and Teignier 2016; Elborgh-Woytek and others, 2013; Khera 2016). Moreover, Gonzales and others (2015) show that reducing a broader measure of gender inequality in education, political empowerment, LFPR, and health could lower income inequality and boost growth (that is, a 10 percentage point reduction in the gender inequality index is associated with almost 1 percentage point higher per capita GDP growth).

[13]Following the EBA model, the working-age population is defined as persons ages 30 to 64, which in effect captures the prime-age population. Since 15 year-olds are not routinely in the employed population, the prime-age population is considered a better choice for examining savings-investment relationships. Accordingly, the old-age dependency ratio indicates those ages 65 and over as a share of the prime-age population.

[14]In the EBA model, population growth is a proxy for the fertility rate or youth dependency ratio. Aging speed is a measure of the "probability of survival" or longevity, reflecting the future prospects

Table 2.3. Expected Impact of Demographic Variables on Current Account

	Savings	Investment	Current Account
Population Growth	↓	↑	↓
Old-Age Dependency	↓	↓	Ambiguous
Aging Speed	↑	↓	↑

Source: Authors.

- **Savings**. In principle, countries with higher shares of dependent populations generally have lower savings.[15] Therefore, both higher population growth (a proxy for higher youth dependency) and higher old-age dependency are linked with lower savings (Table 2.3). In contrast, higher aging speed implies a higher probability of survival and therefore a greater need for life-cycle savings.[16]
- **Investment**. As population growth increases, the capital-to-labor ratio falls (therefore raising the return on capital and boosting investment).[17] Rising old-age dependency works in the opposite direction, as it leads to a higher capital-to-labor ratio. Aging speed, to the extent it reflects expectations of a larger future elderly population and lower future aggregate demand, would also result in lower investment.
- **Current account balance**. In summary, population growth, aging speed, and rising old-age dependency are expected to have a negative, positive, and ambiguous impact on the current account, respectively.

Empirical results based on the EBA model support our priors on the effect of population growth and aging speed. Furthermore, higher old-age dependency is found to be positively associated with the current account balance when aging speed is higher than the world average.

What does the EBA model suggest for regional current account norms in the coming decade?[18] By 2020, Australia, Japan, and New Zealand will have higher old-age dependency ratios compared to the (GDP-weighted) world average. By 2030, Hong Kong SAR, Korea, and Singapore will also have higher old-age dependency ratios than the world average.[19] Moreover, several countries in the region—most notably Hong Kong SAR, Japan, Korea, and Singapore (advanced economies) and China, Thailand, and Vietnam (emerging markets)—will have very high speeds of aging until 2030 (see Annex 2.1). In contrast, some advanced economies (Australia and New Zealand), will have lower speeds of aging than the world average.

Over 2020–30, the EBA model suggests that all else being equal, demographic trends are likely to exert upward pressure on current account balances in surplus countries, such as Japan, Korea and Thailand, given the rise in their aging speeds from 2020 to 2030 (Figure 2.11). Among deficit countries, demographic trends are likely to exert downward pressure, particular in New Zealand, given its falling aging speed. Overall, demographics are projected to materially increase current account norms only for a select few countries in Asia, and the total impact of

of population aging, while old-age dependency captures the outcome of population aging so far (see Annex 2.1).

[15]Grigoli, Herman, and Schmidt-Hebbel (2014) provide a comprehensive survey of saving determinants and find that both youth and old-age dependency lower savings in theoretical as well as empirical literature.

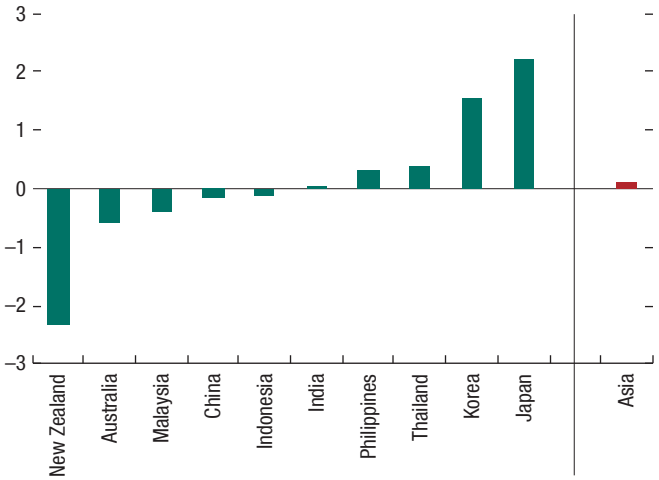
[16]In particular, as people expect to live longer, they are induced to save more, counterbalancing the effects of higher old-age dependency (Li, Zhang, and Zhang 2007). Therefore, in the literature the impact of aging on saving behavior is subject to model uncertainty, depending on whether this forward-looking element is accounted for.

[17]The impact of population growth (or youth dependency) on investment is less certain than on savings. While some studies find a positive effect (Higgins 1998), others find a negative effect (Williamson 2001; Bosworth and Chodorow-Reich 2007).

[18]The rest of this section focuses on old-age dependency and aging speed as the main drivers of the current account norm because changes in population growth from 2020–30 are expected to be relatively small—in particular, the contribution of population growth to changes in current account norms is less than 0.1 percent of GDP for our sample period. See Annex 2.1 for details on the EBA methodology and an estimation of current account norms.

[19]Demographic variables are expressed relative to the (GDP-weighted) world average, reflecting the fact that countries need to be at different stages of the demographic transition in order for it to have an impact on their external positions.

Figure 2.11. Demographic Impact on Current Account Norms
(Percent of GDP, change from 2020 to 2030)



Sources: IMF *World Economic Outlook*; United Nations 2015 (medium-fertility scenario); and IMF staff estimates.
Note: Current account norms (based on demographic variables only) are adjusted for multilateral consistency. Asia impact indicates the sum of projected changes in Asia's current accounts as a percent of world GDP. Hong Kong SAR, Singapore, and Vietnam are not shown as they are not included in the sample for the External Balance Approach model.

Figure 2.12. Changes in Current Account Norms Induced by Demographics and Current Account Balances in 2015
(Percent of GDP)

Sources: IMF *World Economic Outlook*; United Nations 2015 (medium-fertility scenario); and IMF staff estimates.
Note: Current account norms (based on demographic variables only) are adjusted for multilateral consistency.

demographics on global imbalances is limited (Figure 2.11).

What will be the effect on capital flows? All else being equal, demographic factors are likely to strengthen the current dynamics of capital flows. In particular, Figure 2.12 shows that, over 2020–30, changes in current account norms due to demographic trends are likely to be positively correlated with current account balances in 2015. That is, countries with current account surpluses are expected to remain capital exporters, while those in deficit are expected to remain capital importers.

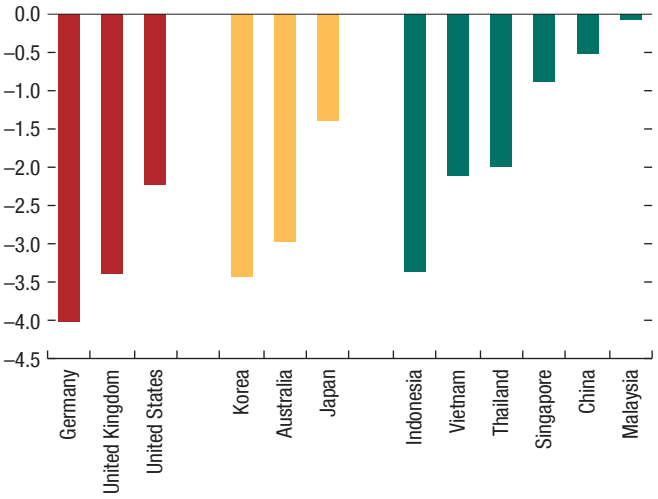
The results above are based on a partial equilibrium analysis, which takes the values of other macroeconomic variables in the EBA model as fixed—for instance, the future expected growth rate, the level of relative productivity, relative output gap, and relative fiscal balance. The broader impact of demographics may be smaller or larger than the estimated partial effect depending on how aging interacts with these variables.[20]

Financial Market Implications of Demographic Trends

The changes in savings and investment associated with aging can also have implications for domestic financial markets. To investigate these effects, a panel regression was conducted to examine the potential impact of demographic trends on domestic interest rates, equity returns, and real estate prices in the region (see Annex 2.1). Overall, the results suggest that rising old-age dependency in post-dividend countries and falling youth dependency in early-dividend countries are both likely to put downward pressure on domestic real interest rates. The impact of these factors diminishes for countries that are financially more open.

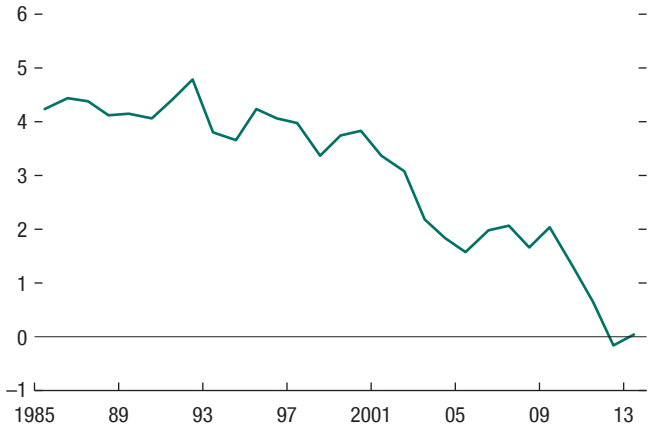
[20]For example, aging may affect fiscal balance through higher pension and health care spending. Since public health spending is included as a control variable in EBA, the estimates (Figure 2.17) account for this channel based on health spending projections (Amaglobeli and Shi 2016). However, the estimates do not account for the role of generosity of pension systems, which could be an important factor behind the private savings behavior.

Figure 2.13. Selected Asia: Change in 10-Year Government Bond Yield
(Percentage points; end-2016 compared with 2000–07 average)



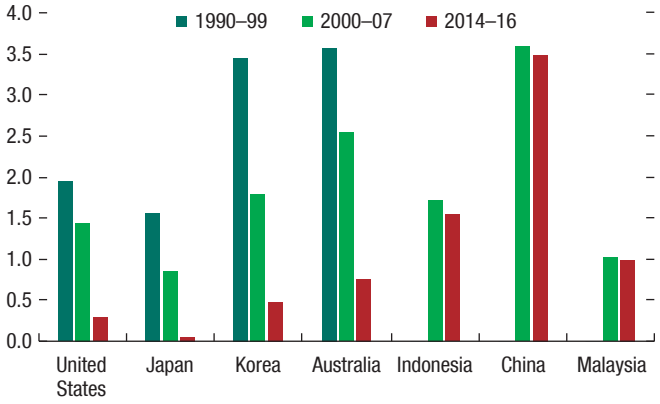
Sources: Bloomberg L.P.; CEIC Asia database; Haver Analytics; and IMF staff calculations.

Figure 2.14. World Real Interest Rates
(Percent)



Source: King and Low 2014.

Figure 2.15. Selected Asia: Real Neutral Interest Rates
(Percentage points)



Sources: Haver Analytics; IMF, *International Financial Statistics*; and IMF staff estimates.

Interest Rates

The decline in long-term interest rates is a global phenomenon, with Asia being no exception. Long-term bond yields have declined significantly in Europe and the United States. A similar trend is observed in Asia, particularly in Australia and Korea, where the decline has been nearly as large (Figure 2.13). Besides reflecting better-anchored inflation expectations, this has also reflected a significant decline in world real interest rates, which have drifted down from around 4 percent in the late 1990s to about zero recently (Figure 2.14).

The decline in real interest rates has in turn reflected the decline in the natural rate of interest.[21] Studies have shown that the estimated natural rates of interest in Europe, the United Kingdom, and the United States have declined dramatically since the start of the global financial crisis (Holston, Laubach, and Williams 2016; Lubik and Matthes 2015; Rachel and Smith 2015). In Asia, natural rates have also fallen in advanced economies (Australia, Japan, and Korea), while remaining broadly stable and relatively high in emerging market economies that have yet to come under aging pressures. In China, natural rates have fallen, but remain high relative to advanced Asian economies (Figure 2.15).

Demographics, among other factors, have been hailed as important drivers of the secular decline in interest rates.[22] In a closed economy,

[21]The natural rate is the interest rate that is consistent with full employment and inflation at the central bank's target.

[22]Other drivers of the secular decline in natural interest rates can be a slowdown in trend productivity growth, shifts in saving and investment preferences (that is, rising inequality), precautionary savings in emerging markets, a fall in the relative price of capital goods, and a preference away from public investment (Rachel and Smith 2015). While this section focuses on real interest rates, low

Table 2.4. Expected Impact of Demographic Variables on Interest Rate

	Savings	Investment	Interest Rates
Youth Dependency	↓	↑	↑
Old-Age Dependency	↓	↓	Ambiguous
Aging Speed	↑	↓	↓

Source: Authors.

demographics can impact savings and thereby interest rates, primarily through youth dependency, old-age dependency, and aging speed (Table 2.4):[23]

- **Youth dependency.** In principle, as the youth dependency ratio rises, the transition working-age cohort saves less, the capital-to-labor ratio falls, and interest rates rise. Youth dependency is expected to fall drastically in early-dividend countries, such as the Philippines and India (Figure 2.16, panel 1).
- **Old-age dependency.** As old-age dependency rises, savings fall. Moreover, as the labor force shrinks, the capital-to-labor ratio rises, and investment falls. Therefore, the impact of old-age dependency on interest rates is theoretically uncertain. Old-age dependency is expected to rise relatively quickly in Hong Kong SAR, Korea, and Singapore (Figure 2.16, panel 2).
- **Aging speed.** Higher aging speed implies a higher probability of survival, which, if not matched by later retirement, is likely to have a positive impact on life-cycle savings. Higher aging speed also lowers current investment, as mentioned earlier, thereby reducing interest rates. Aging speed is currently high and expected to fall in countries in late stages of the demographic transition (Figure 2.16, panel 3). Japan, where aging speed will continue to increase in the next decade, is an exception.

The empirical estimates support our priors for the effect of youth dependency and aging speed on interest rates. Furthermore, higher old-age dependency is found to reduce interest rates in our sample.

The effects of demographic factors are not wholly channeled domestically in open economies. As one moves to an economy with an open capital account, the savings-investment balance, and hence interest rates, are at least partly determined by global savings and investment. In the extreme case of perfect capital mobility, arbitrage in financial markets should equalize interest rates across borders, and demographic factors of each country should not have an impact on domestic interest rates (unless they are large enough to contribute to global demographic trends).

Indeed, we find that the impact of domestic demographic factors on interest rates tends to diminish as a country becomes more open.[24] In our analysis (see Annex. 2.1), the impact of demographic variables—youth dependency, old-age dependency, and aging speed—all become zero as an economy becomes perfectly open (based on the Chinn-Ito index). Youth dependency, old-age dependency, and aging speed are expressed as ratios. Therefore, a 1 percentage point increase in youth dependency increases the interest rate by 8.26 basis points when the economy is fully closed, while there is no impact in the case of a fully open economy (Table 2.5). Hence, in estimating the demographically induced changes in real interest rates over 2020–30, interest rates in Hong Kong SAR, Japan, New Zealand, and Singapore with full capital mobility

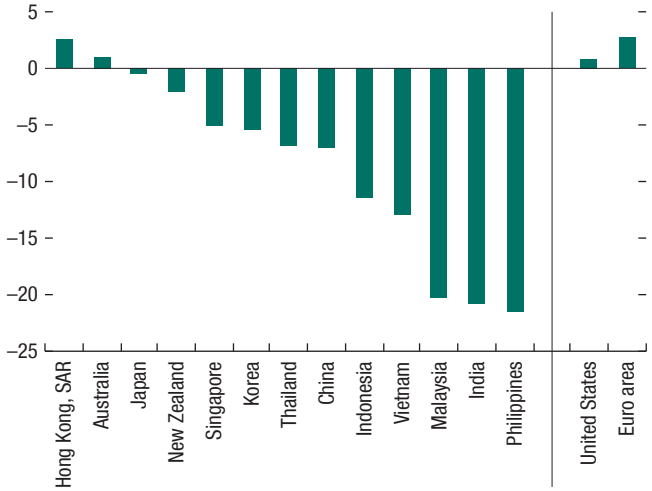
interest rates may also reflect low steady-state inflation due to similar demographic pressures that weaken growth and drive up savings (see Box 2.1 on Japan).

[23]The previous section on external balance was based on the EBA model, which uses population growth as a proxy for youth dependency. Since youth dependency is a more direct measure of population dynamics (and a complement to the old-age dependency ratio), we use that in this section.

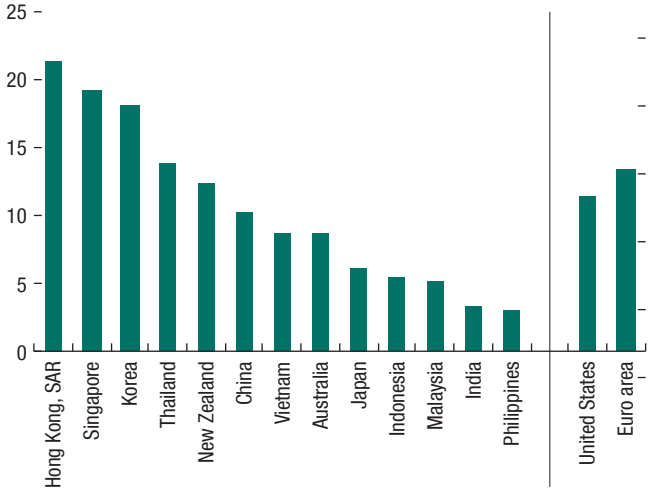
[24]While we find that the impact of domestic demographic factors diminishes as a country becomes more open, we neither test nor find evidence for real interest rate parity (as reflected by non-zero country fixed effects).

Figure 2.16. Selected Asia: Demographic Profile
(Percentage points, change between 2020 and 2030)

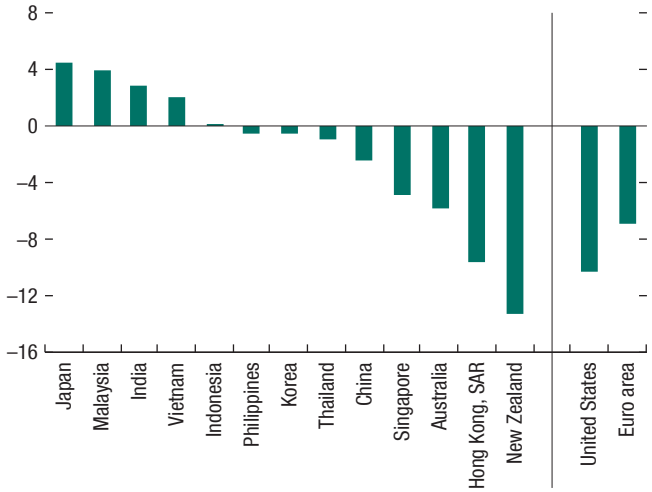
1. Youth Dependency Ratios



2. Old-Age Dependency Ratios



3. Aging Speed



Sources: IMF, *World Economic Outlook*; United Nations 2015 (medium-fertility scenario); and IMF staff estimates.
Note: Aging speed is the projected change in the old-age dependency ratio over the next 20 years. Youth dependency ratio indicates the size of the population 14 years of age and younger as a share of the prime working-age population (30–64 years old). Old-age dependency ratio indicates the size of the population 65 years of age and older as a share of the prime working-age population (30–64 years old).

are decoupled from their domestic demographic trends.

Among countries that are not perfectly open, the old-age dependency effect is important for mature economies, while the youth dependency effect dominates for economies that are relatively young. Increasing old-age dependency is expected to decrease interest rates, with the effect most prominent for post-dividend countries such as China, Korea, and Thailand. Declining youth dependency, especially in early-dividend countries such as India, Indonesia, and the Philippines, whose fertility rates are projected to decline, is expected to decrease interest rates.

A slower pace of aging can be expected to push up interest rates. Interest rates are expected to

Table 2.5. Openness and Estimated Impact of Demographic Variables

Variable/Coefficient Value	Fully Closed	Fully Open
Youth Dependency	8.26 *(1.95)*	0
Old-Age Dependency	−16.16 *(5.51)*	0
Aging Speed	−29.26 *(9.87)*	0

Source: IMF staff calculations.
Note: Standard errors are in parentheses.

increase most markedly in China and Australia as the aging speeds in these countries fall. Given that these economies are already relatively aged, their aging speeds slow and result in a fall in savings and, consequently, an increase in interest rates. On the other hand, aging speed is projected to increase in currently young countries such as India and Malaysia, driving down their interest rates.

Overall, the results suggest that demographic trends could put downward pressure on interest rates by about 1 to 2 percentage points in the next decade, all else being equal (Figures 2.17 and 2.18).[25,26] The impact depends on three factors: the degree of openness, the state of aging, and the speed of aging. For countries that are fully open, demographic factors do not have a direct effect on domestic long-term interest rates. For post-dividend countries (Korea and Thailand), rising old-age dependency is expected to depress interest rates. For early-dividend countries (India and the Philippines), falling youth dependency is projected to reduce interest rates. Finally, as the speed of aging slows in some cases, the aging speed effect will attenuate the decline in interest rates.

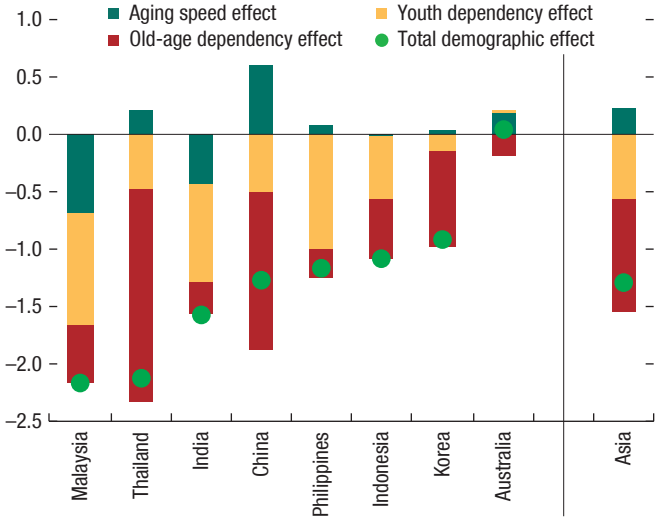
Other Asset Valuations

What about the impact of demographic trends on other asset classes, in particular, stocks and real estate? A popular argument in the literature is the "asset market meltdown" hypothesis, which

[25]Given the low-frequency variation in demographic variables, annual real interest rates may introduce substantial noise to any relationship with demographic structure. To account for this, we have also considered three- and five-year rates for nonoverlapping periods, as explained in Annex 2.1. Such multi-period rates will tend to emphasize the low-frequency variation in real interest rates. The results are broadly similar to the baseline scenario.

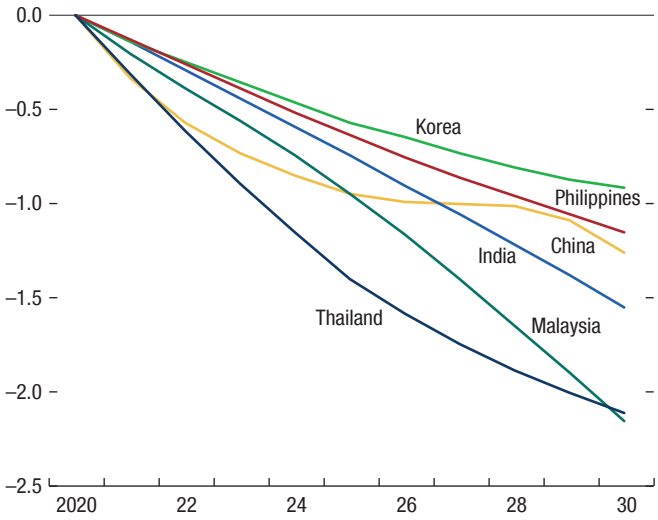
[26]Rachel and Smith (2015) find that demographic factors along with public investment and a global savings glut can explain about 2 percentage points (out of 4.5 percentage points) of the decline in global neutral rates between 1980 and 2015.

Figure 2.17. Selected Asia: Impact of Demographics on 10-Year Real Interest Rates
(Percentage points, cumulative change between 2020 and 2030)



Source: IMF staff estimates.
Note: The figure for Asia reflects the nominal GDP-weighted average.

Figure 2.18. Selected Asia: Impact of Demographics on 10-Year Real Interest Rates
(Percentage points, cumulative change between 2020 and 2030)



Source: IMF staff estimates.

Table 2.6. Expected Impact of Demographic Variables on Asset Returns

	Interest Rate	Risk Appetite	Equity Premium	Stock Returns
Youth Dependency	↑	↑	↓	Ambiguous
Old-Age Dependency	↓	↓	↑	Ambiguous
Aging Speed	↓	↑	↓	↓

Source: Authors.

postulates that as baby boomers retire and draw down their savings, the resulting sell-off pressure in asset markets sharply reduces valuations. Historical experience in the United States and Japan provides some indication of the correlation between demographics and postwar stock market trends. But, generally, recent empirical studies have found mixed evidence of the link between demographics and asset returns (see Annex 2.1). This is also our finding in this chapter.

In principle, demographic trends—through their impact on interest rates and risky premiums—can influence expected stock returns (Table 2.6).[27] In particular, as discussed in the previous section, a decline in youth dependency, or an increase in old-age dependency, are expected to lead to a fall in interest rates. At the same time, these trends would reduce the lifetime investment horizon, lower the preference for risky assets, and thereby raise the equity risk premium.[28] In sum, the expected impact of dependency ratios on stock returns is conceptually ambiguous.

Empirically, we find that lower youth (or higher old-age) dependency is associated with lower stock returns (that is, the interest rate channel dominates), but the results are not statistically strong. Moreover, as with interest rates, we find that the impact of domestic demographic factors is partially offset in more financially open countries.

In the case of real estate, the relationship with demographic variables is even more difficult to identify due to the asset's dual role as a durable good. Conceptually, a fall in interest rates, triggered by a fall in youth dependency (or a rise in old-age dependency), would raise house prices. At the same time, these trends are expected to reduce the demand for housing, as they are associated with declines in household formation.[29] Indeed, empirically, we find weak links between these variables and real estate prices. The degree of openness plays an insignificant role in the case of real estate, likely reflecting the local nature of housing markets.

Policy Implications of Demographic Trends

For early-dividend countries (India, Indonesia, and the Philippines), the main policy challenge is to harness the demographic dividend where possible, as discussed in Bloom, Canning, and Sevilla (2003), and mitigate any adverse spillovers from aging in the rest of Asia.

For Asian countries in the late- or post-dividend stages, adapting to aging could be especially challenging owing to the rapid aging at relatively low per capita income levels. In light of this, policies aimed at protecting the vulnerable elderly and prolonging strong growth take on particular urgency in Asia. These challenges call for adapting macroeconomic policies early on before aging sets in. Specific structural reforms can also help, especially in the areas of labor markets, pension systems, and retirement systems. These policies could be supplemented by productivity-enhancing reforms (for example, research and development and education), as discussed in detail in Chapter 3.

[27]Expected stock returns are, by definition, equal to the sum of the risk-free rate and equity risk premium.

[28]If the correlation between labor income and stock returns is sufficiently low, a labor income stream would act as a substitute for risk-free bond holdings. This implies people should hold a declining share of stocks in their portfolio as they get older (Jagannathan and Kocherlakota 1996).

[29]Furthermore, an initial house price increase due to a positive demand shock may be masked in the data by the subsequent downward price adjustments, as the housing stock supply responds with lags (Lindh and Malmberg 2008; Poterba 1984). Moreover, higher demand for housing could manifest itself more prominently through the rental rate, which may not always move together with house prices (Hamilton 1991).

Macroeconomic Policies

The experience of Japan shows that it is important to adapt macroeconomic policies early on before aging sets in. In terms of fiscal policy, this may include introducing a credible medium-term fiscal framework to secure debt sustainability, shifting the burden of taxes from labor to consumption, and revamping the social safety net.[30] In terms of monetary policy, it may involve studying how monetary transmission may change with aging. For example, if monetary transmission works more through asset prices and household wealth, rather than corporate borrowing costs, the interest rate sensitivity of output and inflation may decline (Miles 2002; Bean 2004). Moreover, to the extent that aging leads to declines in the natural interest rate, regular assessment of the neutral monetary stance by central banks would be needed to avoid a potential tightening bias. Prolonged low interest rates may also call for a strong macro-prudential framework to mitigate related financial stability risks.

Structural Reforms: Labor Market

Labor market reforms aimed at tackling labor shortages and workforce aging can help offset some of the adverse growth effects of aging discussed in the chapter. In particular, reforms could be directed at:

- *Raising labor force participation*, especially for women and the elderly. Expanding the availability of child-care facilities, removing fiscal disincentives to dependents' labor participation, and promoting flexible employment can be especially effective at raising female and elderly labor participation (Elborgh-Woytek and others 2013; Kinoshita and Guo 2015; Olivetti and Petrongolo 2017). Japan's experience in this regard can be particularly instructive (Box 2.1). Furthermore, moving from a seniority-based to a performance-based wage system can incentivize firms to relax retirement age requirements, while reducing labor market duality (Dao and others 2014).
- *Encouraging foreign workers*, including through guest worker programs that target specific skills. This could address labor shortages and have a generally positive impact on receiving countries (Ganelli and Miake 2015; Jaumotte, Koloskova, and Saxena 2016). The cases of Australia, Hong Kong SAR, New Zealand, and Singapore show that immigration can prolong the demographic dividend or soften the negative impact of rapid aging.[31]
- *Promoting active labor market policies.* As discussed in the chapter, workforce aging can exert a further drag on productivity growth. This negative effect could be alleviated by improving affordable health care for mature workers, who are disproportionately affected by health risks, and facilitating human capital upgrading and retraining (Aiyar, Ebeke, and Shao 2016).

Structural Reforms: Pension Systems

Given the rapid aging and related fiscal costs (Box 2.2) in Asia, as well as the region's relatively low pension coverage (World Bank 2016), strengthening pension systems takes a high priority. Policy measures could include:

- *Entitlement reform through automatic adjustment mechanisms that link changes in the retirement age (or benefits) to life expectancy.* This could help de-politicize pension reform and contain pension costs (Arbatli and others 2016). Although such rules have been introduced in many European countries, their use has been limited to date in Asia, except for Japan (Box 2.2).

[30]At the same time, with a credible medium-term fiscal framework, fiscal policy can be used more actively in the short run given its higher potency in a low-interest-rate environment, including to support aging-related structural reforms.

[31]Recent IMF research finds that a key to harnessing the long-term gains of foreign workers is active policies that facilitate the integration of immigrants into the labor market, including language training and job search assistance, better recognition of migrants' skills through the recognition of credentials, and lower barriers to entrepreneurship (IMF 2017).

Fiscal incentives to encourage voluntary savings (for example, tax deductions for long-term retirement savings) can also help relieve long-term fiscal burdens.

- *Raising pension coverage through minimum pension guarantees.* This could provide a safety net for the vulnerable, mitigate the impact of entitlement reforms, and reduce incentives for precautionary savings (Zaidi, Grech, and Fuchs 2006).
- *Reforming the management of public pension funds.* Asia is home to some of the largest public pension funds in the world (OECD 2016). Reducing home bias—along the lines of the recent Government Pension Investment Fund reforms in Japan—could help raise the investment returns of these funds and secure more sustainable resources for aging societies.

Structural Reforms: Retirement Systems

New financial products that help the elderly dissave their post-retirement savings (for example, reverse mortgages) or insure against longevity risks (for example, annuities) could lower the need for precautionary savings. The diverse demographic trends in Asia can also offer rich opportunities for cross-border risk sharing and financial integration.[32] For example, savings in late- or post-dividend countries seeking a higher return could be used to finance the large infrastructure gaps in early-dividend Asian countries (Ding, Lam, and Peiris 2014). Increasing the availability of "safe assets"—such as long-term government bonds or inflation-linked securities—can be especially attractive for pension funds and insurance companies (Groome, Blancher, and Ramlogan 2006).

[32]Financial integration in Asia remains low, especially given its high degree of trade integration—about 60 percent of Asia's exports and imports go to, or originate from, elsewhere within the region, while only 20 to 30 percent of cross-border portfolio investment and bank claims are intraregional, according to the April 2015 *Regional Economic Outlook: Asia and Pacific.*

Box 2.1. Japan: At the Forefront of the Demographic Transition

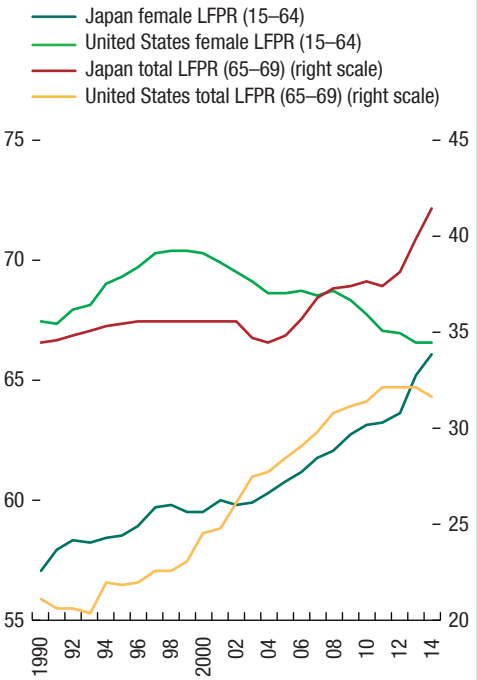
Understanding the challenges Japan faces due to demographic trends is likely to be useful for other Asian countries going through their own demographic transitions. Japan's experience highlights how demographic headwinds can adversely impact growth, inflation dynamics, and the effectiveness of monetary policy.

Growth

Japan faces an unprecedented challenge from an aging and shrinking population. While the overall population started to shrink only after 2010, Japan's working-age population has been declining since 1997.

- **Working-age population**. The falling working-age population, together with the change in the overall labor force participation rate, reduced the Japanese labor force by over 7 percent between 1997 and 2016. A simple growth decomposition suggests that the negative impact on annual average growth has been about 0.3 of a percentage point.

Figure 2.1.1. Labor Force Participation Rates for Female and Older Workers in Japan and the United States
(Percent)



Sources: National authorities; and IMF staff estimates.
Note: LFPR = labor force participation rate.

- **Aging and productivity**. While older workers may enjoy higher productivity due to the accumulation of work experience, younger workers benefit from better health, higher processing speed, and the ability to adjust to rapid technological changes. Indeed, estimates by Liu and Westelius (2016) indicate that a 1 percentage point shift from the 30-year-old age group to the 40-year-old age group in Japan *increased* the level of total factor productivity by about 4.4 percent, while a similar shift from the 40-year-old to the 50-year-old age group *decreased* productivity by 1.3 percent.[1]

- **Labor force participation rate**. To counter these dynamics, the government has emphasized the need to raise the labor force participation rate of both female and older workers. Indeed, some progress has been made on this front. The labor force participation rate for women rose from 63 to 65 percent between 2011 and 2016, and the rate for workers ages 65 to 69 increased from 37 to 39 percent during the same time period. This compares favorably to other G7 countries, including the United States (Figure 2.1.1).

Inflation

Japan's persistent struggles with episodes of deflation and consequent efforts to reflate the economy have also raised concerns that inflation dynamics may be linked to demographics. Shirakawa (2012) argues that as Japanese consumers and corporations gradually realize that demographic headwinds lower future growth—and thus expected permanent income—they cut back on current consumption and investment, triggering deflationary pressures. In contrast, Juselius and Takáts (2015) suggest

This box was prepared by Niklas Westelius.

[1]In addition to the direct impact on productivity, aging may also increase the relative demand for services (for example, health care) and thus cause a sectoral shift toward the less-productive services sector, leading to overall lower productivity in the economy.

Box 2.1 *(continued)*

that aging may actually increase inflation as it constrains the labor supply—and thus production—while dissaving by retirees keeps demand relatively stable. However, in Japan such effects could be more than offset through a currency appreciation as retirees repatriate foreign savings (Anderson, Botman, and Hunt 2014). While empirical studies on the subject are relatively few (Yoon, Kim, and Lee 2014), some recent work on Japan shows that a 1 percentage point increase in the old-age dependency ratio reduces the inflation rate by about 0.1 of a percentage point (Liu and Westelius 2016).

Effectiveness of Monetary Policy

Finally, the secular stagnation hypothesis provides an additional channel through which adverse demographics can lead to both low inflation and low growth (Summers 2013). In particular, structural excess savings due to sluggish investment and high savings may lead to such a low neutral rate of interest that monetary policy can no longer stimulate the economy—causing the economy to operate below potential and thus keeping inflation below the central bank's inflation target. To the extent that Japan's demographic headwinds have changed the propensity to invest and save, they may have played an important role in the country's now over two-decade struggle with stagnant growth and low inflation.

Need for Macro-Structural Reforms

Japan's experience over the past two decades highlights the importance of addressing demographic headwinds in a proactive manner. While it is encouraging that the growth strategy under the "Abenomics" policy is to a large extent centered on overcoming demographic challenges, accelerated efforts are needed to enhance the labor supply (including by boosting female and older worker labor force participation and allowing for more foreign labor), reduce labor market duality, and increase private investment to boost growth prospects, increase monetary policy effectiveness, and support fiscal sustainability.

Box 2.2. Fiscal Implications of Demographic Trends in Asia

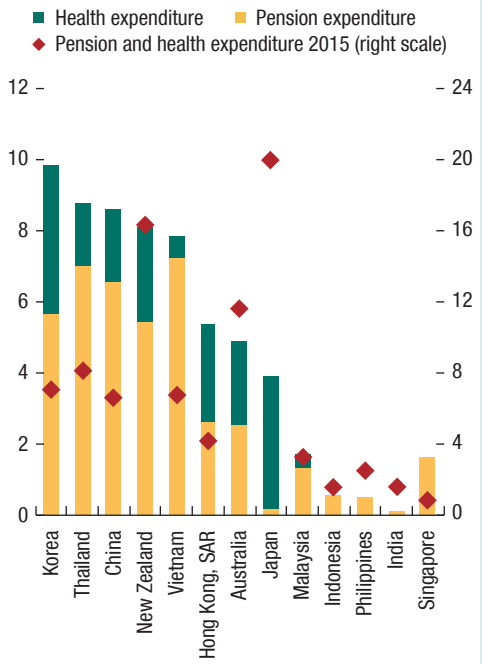
Over the coming decades, Asia will experience significant demographic shifts with material fiscal implications that could limit fiscal space and raise vulnerabilities, absent policy measures.

Under current policies, age-related public expenditures (pensions and health care) are projected to increase in many Asian countries, eroding public finances by up to 10 percentage points of GDP by 2050. In most cases, the increases would be driven by pensions (Figure 2.2.1).[1]

Public Pensions

The projected increase in public pensions depends largely on each country's position in the demographic transition and the specific characteristics of its pension systems. In particular, the increase is likely to be higher in post- or late-dividend countries with a defined benefit system and lower in early-dividend countries or those with a defined contribution system (Table 2.2.1). In particular, for several countries in the late- or post-dividend stage (China, Korea, New Zealand, Thailand, and Vietnam), public pension expenditures could rise by more than 5 percentage points of GDP by 2050, absent policy measures. In contrast, for early-dividend countries (India, Indonesia, and the Philippines), these expenditures (as a percent of GDP) are expected to remain broadly unchanged.[2]

Figure 2.2.1. Projected Age-Related Spending Increases
(Percent of GDP; change from 2015 to 2050)



Sources: IMF staff estimates and projections based on United Nations, *World Population Prospects: 2015 Revision* (medium-fertility scenario); and Amaglobeli and Shi 2016.
Note: For Singapore, health expenditure projections are not available.

Health Care

The increase in public health care expenditures depends largely on the rise in old-age dependency ratios and the generosity of the health care system. Absent reforms, health care expenditures in post-dividend countries with relatively generous health care systems (Korea and Japan) are projected to increase by more than 3 percentage points of GDP by 2050.[3] In Japan, Nozaki, Kashiwase, and Saito (2014) show that health care reforms could generate fiscal savings of 2 percent of GDP by 2030.

Policies

Regarding *pensions,* the introduction of automatic adjustment mechanisms (AAMs) linking retirement ages (or retirement benefits) to life expectancy would be an attractive policy option, provided there is an adequate safety net for the elderly poor, whose life expectancy may be shorter than that of the average population. Although such rules have been introduced in many European countries, the use of AAMs in Asia to date remains limited, except for the case of Japan (Arbatli and others 2016). Regarding *health care*, policy options can be

This box was prepared by Jacqueline Pia Rothfels

[1]The calculations are based on the methodology outlined in Amaglobeli and Shi (2016). Additional age-related fiscal risks not covered in this analysis are potentially lower government revenues.

[2]Pension expenditures are projected as the product of four elements following Clements, Eich, and Gupta (2014): (1) the replacement rate (average pension over average output per worker); (2) the coverage ratio (share of pensioners in the population over 65); (3) the old-age dependency ratio; and (4) the inverse of the labor force participation rate.

Box 2.2 *(continued)*

Table 2.2.1. Characteristics of Asian Public Pension Systems, End of 2015

	Position in Demographic Transition in 2015			
		Early Dividend	Late Dividend	Post Dividend
Risk Sharing	Defined Benefit	Philippines	New Zealand, Vietnam	Japan, Korea, Thailand
	Defined Contribution	Indonesia	Malaysia, Singapore	Hong Kong SAR
	Mixed	India	Australia	China

Sources: Arbatli and others 2016; and IMF staff estimates.
Note: The table describes the main pension system (covering the majority of workers) in each economy. In some economies with defined-benefit contribution systems, there may be smaller pension systems that operate on a pay-as-you-go basis, in the form of civil service pensions, social pensions, or minimum pension guarantees.

classified into three broad categories following Clements, Coady, and Gupta (2012): macro-level controls to cap spending (that is, regulating the price and quantity of health services); micro-level reforms to improve the spending efficiency of the health system (that is, promoting the use of generic drugs and preventative care); and demand-side reforms to curb health care demand (that is, higher patient copayments and premium contributions).

Annex 2.1. Data and Methodology: Estimating the Impact of Demographic Trends on Growth and Financial Markets

Demographics and Growth

Demographics and Labor Supply

Based on United Nations World Population Prospects (the 2015 Revision, median-variant scenario), the aggregate labor force is projected as follows:

$$L_t = \Sigma_{j=1}^{J} N_t^j \, LFP_t^j \, E_t^j \, w_t^j$$

where j indicates the age-gender cohort, t indicates the year, N is the number of individuals in each cohort, LFP and E denote cohort-specific labor force participation and employment rates, respectively, and w is the weight factor to adjust for the difference between number of employees and the effective units of labor supplied.

Demographics and Labor Productivity

Methodology: The methodology follows the approach of Aiyar, Ebeke, and Shao (2017), building on the work by Feyrer (2007). The baseline model fits the growth in real output per worker on the share of workers aged 55+ years and the combined youth and old dependency ratios, with decade (10 years) and country fixed effects. Specifically, the model takes the following form:

$$\Delta logYW_{it} = \theta_1 w55_{it} + \theta_2 DR_{it} + u_i + \eta_t + \varepsilon_{it}$$

where i indicates the country and t indicates the decade. YW denotes real output per worker, $w55$ is the share of the total workforce aged 55–64 years, and DR is the dependency ratio. u_i is the country fixed effect, η_t is the decade fixed effect, and ε_{it} is the error term. Correcting for various econometric pitfalls—such as reverse causality—the approach measures the impact of workforce aging on output per worker. To address the endogeneity issue, the model also instruments the workforce share variable and the dependency ratio with lagged birth rates 10, 20, 30, and 40 years ago, similar to Jaimovich and Siu (2009).

Data: The data sample spans the period from 1950 to 2014 and includes 12 Asian economies (Australia, China, Hong Kong SAR, India, Indonesia, Japan, Korea, Malaysia, New Zealand, the Philippines, Singapore, and Thailand) and more than 20 EU economies. The workforce and population data come from the United Nations (UN) and Organisation for Economic Co-operation and Development, while the output per worker data are from the Penn World Table 9.0.

Results: Running the approach for the combined Asian and European sample, we find that a 1 percentage point increase in the 55–64 age cohort of the labor force is associated with a reduction in total factor productivity of 0.74 of a percentage point (Annex Table 2.1.1).

Demographics and Capital Flows

Methodology:[1] The EBA current account norm is estimated over period 1986–2013 using the general equation (Phillips and others, 2013; IMF, 2016):

$$CA = CA(X_S, X_I, X_{CA}, X_{CF}, Z, \Delta R)$$

where X_S denotes the consumption/saving shifters, which include income per capita, demographics, expected income (shifts in permanent income), social insurance, the budget balance, financial policies, the institutional environment, and net exports of exhaustible resources; X_I denotes the investment shifters, which include income per capita, expected income/output, governance, and financial policies; X_{CA} denotes the export/import shifters, which include the world commodity-price-based terms of trade; X_{CF} are capital account shifters, which

The main authors of this Annex are Umang Rawat and Qianqian Zhang.

[1]Our EBA model is the same as introduced in the IMF Working Paper "The External Balance Assessment (EBA) Methodology" by Phillips and others (2013). Please see https://www.imf.org/external/pubs/ft/wp/2013/wp13272.pdf for more information.

Annex Table 2.1.1. Panel Regression: Demographics and Labor Productivity[1]

Dependent Variables	Change in Real Output per Worker	Change in Real Capital Stock per Worker	Change in Human Capital per Worker	Change in TFP (model based) per Worker[2]	Change in TFP (from PWT 9.0) per Worker
Workforce Share	−0.612***	0.187***	−0.0589***	−0.740***	−0.502***
Aged 55–64	(−5.309)	−4.144	(−2.896)	(−4.714)	(−5.643)
Dependency Ratio	−0.122	−0.105	0.0382	−0.0549	0.279**
	(−0.695)	(−1.532)	−1.232	(−0.229)	−2.057
Observations	571	571	571	571	571
Number of Countries	33	33	33	33	33

Source: IMF staff estimates.

Note: *t*-statistics in parentheses. TFP = total factor productivity.

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

[1]Results are qualitatively similar with country and year fixed effects panel regressions.

[2]Following a Cobb-Douglas function, the model takes the form of $\log(\textit{real output}) = \frac{a}{1-a}\log\left(\frac{\textit{real capital stock per worker}}{\textit{real output per worker}}\right) + \log(\textit{human capital per worker}) + \log(\textit{TFP per worker})$.

include indicators of global risk aversion, the "exorbitant privilege" that comes with reserve currency status, financial home bias, and capital controls; and Z is the output gap and ΔR is the change in foreign exchange reserves.

Current Account Norms. The estimated current account equation includes a number of variables that are under policy control (fully or partially) in the near term: fiscal balances, capital controls, social spending, reserve accumulation, and financial policies (proxied by private credit). The observed values of these policies, along with other variables, contribute to the regression-predicted values of the current account. The fitted current account regression can be written as:

$$\widehat{CA} = \alpha + X'\beta + P'\gamma$$

where $\boldsymbol{X}$ is the vector of non-policy "structural" variables and $\boldsymbol{P}$ is the vector comprising the above policy variables measured by their actual values. Let $\boldsymbol{P}^*$ be the desirable values for those policy variables. The fitted equation can therefore be written as:

$$\widehat{CA} = \alpha + X'\beta + P^{*\prime}\gamma + (P - P^*)'\gamma$$

that is, the fitted CA values from the regression can be decomposed into two parts:

- The first part, $(\boldsymbol{\alpha + X^{\text{“}}\beta + P^{*\text{“}}\gamma})$, is the **EBA CA norm**, that is, the CA value implied by the regression if all policies were at desirable P* levels (and all other regressors were at their actually observed levels).
- The second term represents the *contributions of policy gaps* to explain deviations of the actual current account balance from the EBA norm. These policy gap contributions are measured as the product of each of the estimated coefficients on the respective policy variables by the policy gap $(\boldsymbol{P - P^*})$.

We rely on current account norms for projections in this section.

Demographic variables: The demographic variables included in the regression include population growth, old-age dependency ratio, and two interaction terms between old-age dependency and aging speed, where old-age dependency ratio is defined as the ratio of population aged over 64 divided by population between 30 and 64 years old. Aging speed is the projected change in the old-age dependency ratio, 20 years out. Rel. old-age dependency ratio is the old-age dependency ratio divided by its GDP-weighted country sample average, in each year (same for Rel. aging speed). Coefficients on these variables are listed in Annex Table 2.1.2.

Projections: Projected changes in current account norm due to demographic transition are based on UN World Population Prospects (the 2015 Revision, medium-variant scenario).

Annex Table 2.1.2. EBA: Demographic Variables

Variable Name	Coefficient	1986–2015
Population Growth #	−0.565	−0.659*
Old-Age Dependency Ratio #	−0.057	−0.091*
Rel. Old-Age Dependency Ratio × Aging Speed #	0.130***	0.103***
Rel. Aging Speed × Old-Age Dependency Ratio #	0.088**	0.106**

Source: IMF staff estimates.

Annex Figure 2.1.1. Old-Age Dependency Relative to World Average

(Percentage point difference)

Sources: United Nations, *World Population Prospects: 2015 Revision* (medium-fertility scenario); IMF *World Economic Outlook*; and IMF staff projections.
Note: Old-age dependency is defined as the ratio of the population ages 65 and over divided by the population between 30 and 64 years old, in line with the External Balance Approach model. The world average is calculated on a GDP-weighted basis.

Demographics and Financial Markets

Financial Markets

Methodology: Three variables—youth dependency ratio, old-age dependency ratio, and aging speed—are used to capture different aspects of demographic transition and the effects on long-term interest rates, stock returns, and property prices. The baseline approach involves a panel regression on each dependent variable with country fixed effect. Specifically, the model takes the following form:

$$r_{it}/sr_{it}/pp_{it} = \beta_0 + \beta_1 YD_{it} + \beta_2 (YD_{it} \times COit) + \beta_3 OD_{it} + \beta_4 (OD_{it} \times CO_{it}) + \beta_5 AS_{it} + \beta_6 (AS_{it} \times CO_{it}) + \beta_7 RW_t + \gamma Controls_{it} + \varepsilon_{it} \quad (3)$$

where i indicates the country and t indicates the year. The three dependent variables are each denoted as r—10-year real interest rates, sr—year-over-year percent change in real stock returns, and pp—year-over-year percent change in real property prices.

Among the explanatory variables, YD and OD denote the youth dependency ratio (the ratio of population aged under 30 divided by population between 30 and 64 years old) and the old-age dependency ratio (the ratio of population aged over 64 divided by population between 30 and 64 years old), respectively, to account for the effects of changes in fertility and aging population on interest rates. AS denotes the aging speed (as defined earlier). These variables are also separately interacted with the capital openness index CO to analyze how openness of the economy affects the impact of demographic variables on interest rates. Another explanatory variable is RW, which denotes the world interest rate. The control variables ($Controls$) for the 10-year real interest rates model include the ratio of a country's GDP per capita to that of the United States, growth in labor productivity, and the cyclically adjusted primary balance. The control variable for both the real stock returns and real property price models includes the growth in labor productivity only. Lastly, ε_{it} is the error term.

Data: The data sample spans the period from 1985 to 2013. Based on different data availability, the interest rates model captures 42 economies in the world,[2] the stock returns model captures

[2]The countries include Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, China, Colombia, Czech Republic, Denmark, Finland, France, Germany, Greece, Hong Kong SAR, Iceland, India, Indonesia, Ireland, Israel, Italy, Japan, Korea, Malaysia, Mexico,

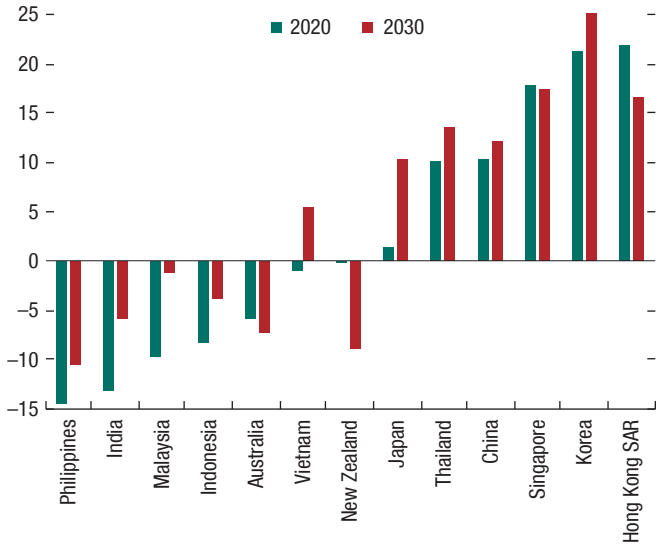
14 economies,[3] and the property price model captures 56 economies.[4] The 10-year real interest rates and world interest rate data come from IMF (2014), King and Low (2014), and the IMF *World Economic Outlook*. The stock returns data come from *Global Financial Data*, and the property prices data come from the Bank for International Settlements. The demographics data come from United Nations, the labor productivity data come from Penn World Table 9.0, and the GDP and fiscal data come from the IMF *World Economic Outlook*. The capital openness index is based on the Chinn-Ito Index (2006).

Results: Running the three regressions gives the following result (Annex Table 2.1.3). On long-term interest rates and stock returns, the impacts of domestic demographic factors tend to diminish as the country becomes more open. On property prices, the effect of capital openness is small and insignificant, reflecting the local nature of the market.

Further, on long-term interest rates, we extend the approach by restricting $\beta_1 = -\beta_2$, $\beta_3 = -\beta_4$, and $\beta_5 = -\beta_6$. After the F tests show that we cannot reject these null hypotheses (Annex Table 2.1.4), we run an alternative specification, which takes the following form where denotations are the same as above:

$$r_{it} = \alpha_0 + \alpha_1 YD_{it} \times (1 - CO_{it}) + \alpha_2 OD_{it} \times (1 - CO_{it}) + \alpha_3 AS_{it} \times (1 - CO_{it}) + \alpha_4 RW_t + \mu Controls_{it} + \varepsilon_{it} \quad (4)$$

Annex Figure 2.1.2. Aging Speed Relative to World Average
(Percentage point difference)



Sources: United Nations, *World Population Prospects: 2015 Revision* (medium-fertility scenario); IMF World Economic Outlook; and IMF staff projections.
Note: Aging speed is the projected change in the old-age dependency ratio over the next 20 years. World average is calculated on a GDP-weighted basis.

Combining with the results from (3) we find that the impacts of all youth and old-age dependency ratios and aging speed become almost zero as an economy becomes perfectly open. (Annex Table 2.1.5).

Robustness. Econometric analyses in Annex Tables 2.1.3 and 2.1.4 should be viewed with caution, because the explanatory demographic variables evolve slowly. We test for the presence of a unit root (with constant and trend) in demographics related variables and can reject the null of unit root in only one case.

When the explanatory variables have unit roots, there is a risk of a spurious regression problem resulting in incorrect statistical inferences. To evaluate the potential importance of this problem, the residuals from the baseline equation are tested for the presence of a unit root test. If the null hypothesis of a unit root in the residuals cannot be rejected, then the underlying regression model maybe misspecified. Annex Table 2.1.6 reports test statistics for the residuals based on the Fisher as well as the Im, Pesaran and Shin test, which reject the null hypothesis of unit root.

Netherlands, New Zealand, Norway, Peru, the Philippines, Portugal, Romania, Singapore, South Africa, Spain, Sweden, Switzerland, Thailand, Ukraine, United Kingdom, and United States.

[3]The countries include Australia, Canada, France, Germany, Italy, Japan, Korea, Malaysia, Netherlands, the Philippines, Sweden, Thailand, United Kingdom, and United States.

[4]The countries include Australia, Austria, Belgium, Brazil, Bulgaria, Canada, Chile, China, Colombia, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong SAR, Hungary, Iceland, India, Indonesia, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Macedonia, Malaysia, Malta, Mexico, Morocco, Netherlands, New Zealand, Norway, Peru, the Philippines, Poland, Portugal, Romania, Russia, Singapore, Slovak Republic, Slovenia, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, United Arab Emirates, United Kingdom, and United States.

Annex Table 2.1.3. Panel Regression: Demographics and Long-Term Interest Rates, Stock Returns, and Property Prices

Dependent Variables	10-Year Real Interest Rate	Percent Growth in Stock Return	Percent Growth in Real Property Price
Youth Dependency Ratio	9.41***	67.28***	−11.32***
	(2.46)	(23.66)	(3.96)
Youth Dependency Ratio × Capital Openness	−7.96***	−31.01**	0.67
	(1.96)	(14.22)	(4.00)
Old-age Dependency Ratio	−18.3***	−32.69	−53.18*
	(6.28)	(82.26)	(31.77)
Old-age Dependency Ratio × Capital Openness	17.04***	138.26*	−5.37
	(5.77)	(75.02)	(26.99)
Aging Speed	−29.7***	315.31*	−100.95***
	(11.06)	(163.18)	(34.05)
Aging Speed × Capital Openness	25.89**	−317.04**	60.79*
	(10.09)	(142.92)	(31.86)
World Interest Rate	0.65***	−1.18	−1.48***
	(0.16)	(2.17)	(0.53)
Growth in Labor Productivity	0.07	4.75***	0.30
	(0.06)	(0.98)	(0.20)
Ratio of GDP per Capita to that of the US	2.38*		
	(1.43)		
Cyclically Adjusted Primary Balance	−0.00		
	(0.04)		
Constant	2.660***	10.15***	1.759***
	(0.214)	(0.967)	(0.405)
Observations	740	406	716
Number of Groups	42	14	56

Source: IMF staff estimates.
Note: Standard errors in parentheses. P denotes the *p*-value as the probability of obtaining a result equal to or more extreme than observed.
***$p<0.01$, **$p<0.05$, *$p<0.1$.

Finally, given the low-frequency variation in demographic variables, annual real interest rates may introduce substantial noise to any relationship with demographic structure. Therefore, three and five-year returns for non-overlapping periods are constructed. Such multi-period returns are expected to emphasize the low-frequency variation in interest rates. The results (Annex Table 2.1.7) from these non-overlapping panels are similar to the baseline specification (Annex Table 2.1.3).

Natural Interest Rate

Methodology. The natural rate is estimated using a time varying parameter VAR, which captures the co-movement between interest rates and trend growth in a flexible manner. We estimate a TVP-VAR for three variables—the growth rate of real gross domestic product, the inflation rate, and a measure of real interest rate. The natural interest rate is then extracted from the data using Wicksell's original definition of natural interest rate as the rate at which an economy is in a stable price equilibrium. Therefore, a long-horizon

Annex Table 2.1.4. F Tests: Demographics and Interaction Variables

F tests
(1) Youth Dependency Ratio + Youth Dependency Ratio × Capital Openness Index = 0
F (1, 688) = 0.65
Prob > F = 0.4221
(2) Old Dependency Ratio + Old Dependency Ratio × Capital Openness Index = 0
F (1, 688) = 0.12
Prob > F = 0.7276
(3) Aging Speed + Aging Speed × Capital Openness Index = 0
F (1, 688) = 1.69
Prob > F = 0.1935

Source: IMF staff estimates.

Annex Table 2.1.5. Panel Regression: Demographics and Long-Term Interest Rates

Dependent variables	10-year real interest rate
Youth Dependency Ratio × (1 − Capital Openness)	8.26***
	(1.95)
Old-Age Dependency Ratio × (1 − Capital Openness)	−16.16***
	(5.51)
Aging Speed × Capital Openness	−29.26***
	(9.87)
World Interest Rate	0.84***
	(0.11)
Ratio of GDP per Capita to that of the US	2.43*
	(1.39)
Cyclically Adjusted Primary Balance	0.00
	(0.04)
Growth in Labor Productivity	0.07
	(0.06)
Constant	−0.63
	(1.57)
Observations	740
Number of Groups	42

Source: IMF staff estimates.
Note: Standard errors in parentheses. P denotes the *p*-value as the probability of obtaining a result equal to or more extreme than observed.
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Annex Table 2.1.6. Null: Non-Stationarity (of order 1)

		Fisher (modified inverse chi square test)		Im, Pesaran,	
Variable	Deterministic	Dickey Fuller	Phillips Perron	Shin (t-value)	Result
Real Interest Rate	Constant	3.23	4.77	−1.34	**I(0)**
		(0.00)	*(0.00)*	*(0.09)*	
	Trend	12.44	26.46	−6.03	**I(0)**
		(0.00)	*(0.00)*	*(0.00)*	
Youth Dependency	Constant	15.27	64.74	4.32	**I(0)**
		(0.00)	*(0.00)*	*(0.00)*	
	Trend	8.25	10.00	0.26	**Inconclusive**
		(0.00)	*(0.00)*	*(0.60)*	
Old Dependency	Constant	5.90	−4.54	4.32	**I(1)**
		(0.00)	*(1.00)*	*(1.00)*	
	Trend	11.56	−2.30	0.01	**I(1)**
		(0.00)	*(0.99)*	*(0.50)*	
Aging Speed	Constant	16.58	−2.99	−1.87	**I(1)**
		(0.00)	*(0.99)*	*(0.03)*	
	Trend	6.58	−1.04	1.11	**I(1)**
		(0.00)	*(0.85)*	*(0.87)*	
World Interest Rate	Constant	−6.00	−5.95	10.61	**I(1)**
		(1.00)	*(1.00)*	*(1.00)*	
	Trend	−2.66	−2.46	0.92	**I(1)**
		(0.99)	*(0.99)*	*−0.82*	
Residuals		17.80	14.82	−7.14	**I(0)**
		(0.00)	*(0.00)*	*(0.00)*	

Source: IMF staff calculations.
Note: Figures in parentheses are *p*-values for the test under the null hypothesis of nonstationarity. One lagged difference included.

Annex Table 2.1.7. Long-Horizon Evidence on Demographic Structure and Real Rates

Dependent Variables	Annual Model	3-Year Averages	5-Year Averages
Youth Dependency Ratio	9.41***	9.68***	9.33**
	(2.46)	(3.62)	(3.98)
Youth Dependency Ratio × Capital Openness	−7.96***	−8.14***	−7.20**
	(1.96)	(2.78)	(2.78)
Old-Age Dependency Ratio	−18.30***	−21.10**	−17.00
	(6.28)	(9.60)	(13.03)
Old-Age Dependency Ratio × Capital Openness	17.04***	19.21**	18.53*
	(5.77)	(8.56)	(9.47)
Aging Speed	−29.69***	−25.56	−35.48*
	(11.06)	(17.40)	(20.57)
Aging Speed × Capital Openness	25.89**	20.69	28.46*
	(10.09)	(15.67)	(17.07)
World Interest Rate	0.65***	0.61**	0.46
	(0.16)	(0.24)	(0.52)
Growth in Labor Productivity	0.07	0.06	0.02
	(0.06)	(0.15)	(0.17)
Ratio of GDP per Capita to that of the US	2.38*	1.97	1.6
	(1.43)	(1.48)	(3.01)
Cyclically Adjusted Primary Balance	−0.00	−0.05	0.05
	(0.04)	(0.10)	(0.08)
Observations	740	271	166
Number of Groups	42	42	42

Source: IMF staff estimates.
Note: Robust standard errors in parentheses. P denotes the *p*-value as the probability of obtaining a result equal to or more extreme that observed.
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

forecast (5-year forecast) of the observed real rate is used as a measure of the natural rate of interest.

Data. The data sample spans from 1970:Q1 – 2016:Q4 and varies across countries based on availability. Real GDP, CPI inflation, and policy rates are sourced from Haver Analytics.

Results. Real natural interest rates have fallen significantly in the United States and some other advanced Asian economies, such as Japan, Korea, and Australia. Natural rates in emerging market economies, such as China, Malaysia, and Indonesia, are relatively stable.

Literature Review on Demographics and Asset Returns

Existing studies seem to offer mixed findings on the empirical link between demographics and asset returns, depending on the specific sample and demographic variables used. In a series of prominent studies, Poterba (2001, 2004), for example, find evidence that U.S. households' asset holdings held outside defined-benefit pensions decline only gradually during retirement, and there is no significant relationship between aging and stock returns in the postwar U.S. data. On the other hand, Geanakoplos, Magill, and Quinzi (2004) and Davis and Li (2003) find that the middle-age-to-young ratio and the population share of prime saver group have significant positive relationships with real stock prices, respectively, in a group of advanced economies. On house prices, Engelhardt and Poterba (1991) show that the empirical relationship between real house prices and demographic variables in Mankiw and Weil (1989) from the U.S. data does not hold in the Canadian data. Meanwhile, Takats (2010) finds that in a group of 22 advanced economies, an increase in the change of old-age dependency significantly lowers real house price growth by about 66 basis points.

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3. The "New Mediocre" and the Outlook for Productivity in Asia

Introduction and Main Findings

Nearly 10 years after the global financial crisis, the prospect of mediocre future growth is still a concern. In part, the cause for this concern is the recent slowdown in productivity growth in many advanced economies—a slowdown that is widely expected to continue. Another related reason is the weakness in business investment, which is one channel through which new technology and innovation—the fundamental underpinnings of productivity growth—influence economies.

Asia is no exception. Indeed, in some countries lower productivity growth since the global financial crisis already is a reality, especially in the advanced economies in the region. They face some of the same challenges as other advanced economies across the world, including coping with the sectoral move toward services, where high productivity growth is more difficult to achieve, and population aging, which tends to lower productivity (Chapter 2).[1] For its part, China faces its own productivity challenges with the rebalancing of the economy. In other economies in the region, productivity spillovers are more pertinent: productivity developments at home tend to be influenced by those elsewhere.

The prospect of low productivity growth is worrisome for policymakers in Asia. Sustained improvements in welfare and living standards ultimately require productivity growth. "Extensive growth" driven by capital accumulation is possible for a while. But over long periods of time, only productivity growth—or "intensive growth"—can overcome decreasing returns to capital and lower investment. Intensive growth is especially important for economies already close to the technological frontier, as extensive growth can lead to the accumulation of too much capital. And for middle-income economies seeking to converge toward high-income-economy income levels, productivity growth can help offset the slowdown in investment.

Against this backdrop, this chapter reviews recent productivity developments in Asia and evaluates the implications of a more adverse external environment for productivity growth. Specifically, the chapter will explore the following questions:

- Has there been a productivity slowdown in Asia similar to that in advanced economies? If so, how large and extensive has it been? What have been the implications for convergence? What is the outlook for productivity?
- How much of the slowdown can plausibly be attributed to external factors? How does it compare to the extent to which the slowdown can be attributed to domestic factors?
- Is there an investment malaise in Asia and can it be related to that in advanced economies elsewhere? How important is foreign direct investment (FDI) as a driver of business investment?

To answer these questions, the chapter presents stylized facts on productivity developments since the global financial crisis, putting them in context with experiences prior to the crisis, as well as stylized facts on developments in underlying drivers, including research and development (R&D) spending. The chapter will also present empirical analyses on the role of external and domestic factors in productivity growth.

The analysis confirms that Asia has also experienced a productivity growth slowdown since the global financial crisis. The productivity slowdown has been most severe in the advanced

This chapter was prepared by Dirk Muir (lead author), Sergei Dodzin, Xinhao Han, Dongyeol Lee, and Ryota Nakatani, under the guidance of Thomas Helbling.

[1]See, for example, Dabla-Norris and others (2015) on advanced economies, and Adler and others (2017), section on "Driving Forces – Long Term Forces" on emerging economies, plus demographics in general.

economies of the region and in China, and the drivers seem similar to those in other advanced economies, including less favorable demographics and a smaller impetus from trade integration. On the other hand, in other emerging market economies and some developing economies of the region, the decline in productivity growth since the global financial crisis has been small.

While the magnitude and nature of the slowdown differ across economies in the region, a common theme emerges: reforms to strengthen domestic sources of productivity growth should be high on the policy agenda in Asia for at least three reasons. First, looking forward, external factors seem less likely to contribute as much to productivity growth as they have in the past, when, as the chapter highlights, they were a major driving force. Second, as was discussed in Chapter 2, demographics will increasingly weigh on productivity growth in a number of economies. Third, Asian countries face the challenge to maintain high productivity growth in parallel with the sectoral change toward services, where productivity growth has been substantially lower than in manufacturing (Baumol, Blackman, and Wolff 1985).

There are positive features upon which policies can build. R&D activity in the advanced economies of the region remains strong, and one policy challenge is to strengthen the effectiveness of R&D spending in boosting productivity. In many of the emerging market and developing economies, the issue is how to strengthen productivity by capitalizing on recent achievements and favorable external factors such as increased FDI, as well as improve on their (sometimes mixed) records for educational achievements, infrastructure spending, and private domestic investment. Finally, building new momentum in trade liberalization and integration would also benefit productivity.

The Productivity Picture in Asia and the Pacific

Productivity measures how effectively production inputs are used. This chapter considers two concepts of productivity: total factor (or multi-factor) productivity, typically referred to as total factor productivity (TFP), and labor productivity.

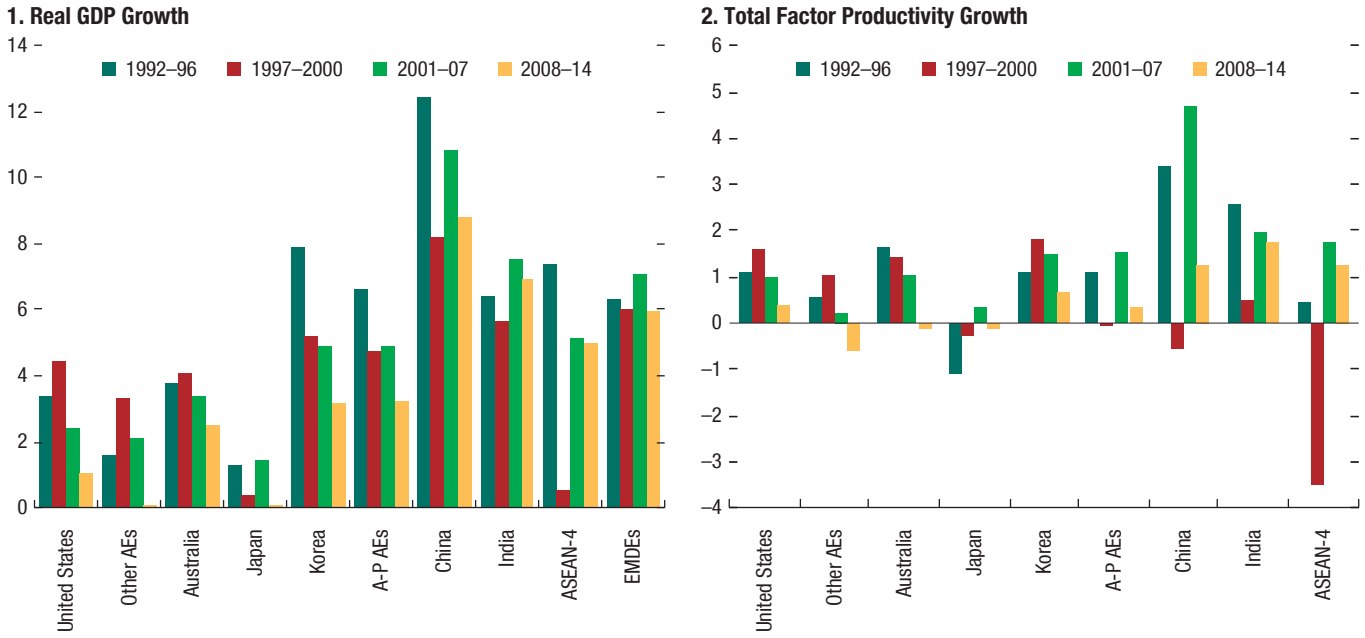
Increasing TFP implies that a given set of factors of production—capital and labor—can produce more output over time. The key role of TFP in economic growth has long been highlighted in the literature on economic growth.[2] Labor productivity measures the output per worker or per hour worked. It increases with TFP, but can also increase with capital deepening—an increase in the amount of capital per worker or per hour worked. Hence, one would expect TFP and labor productivity growth to be positively, but not necessarily strongly correlated.

There are two ways to assess productivity growth on a country by country basis—either against past performance, or relative to the technological frontier. The rationale for the latter is that there should be a tendency toward convergence or catching up, that is, for output in countries further away from the frontier to grow faster than those on the frontier. Countries on the frontier, including the United States, lead in the development of new technologies and have the highest productivity levels. If there is convergence, countries over time should close productivity gaps with the frontier as technology and knowledge diffusion should, over time, enable countries to catch up.[3] This chapter presents measures of productivity gaps relative to the United States. While there are other countries on or close to the frontier, depending on the sector, a single point of comparison has the merit of simplicity.

[2]For example, Solow (1956), Jorgenson and Griliches (1967), Lucas (1988), and Cooley and Prescott (1995).

[3]See, among others, Wolff (2014).

Figure 3.1. Real GDP Growth and Total Factor Productivity Growth
(Percent)



Sources: IMF, World Economic Outlook database; Penn World Tables 9.0; and IMF staff calculations.
Note: GDP growth rates are weighted by purchasing power parity GDP. Other advanced economies (AEs) are Canada and the European Union. Asia-Pacific advanced economies (A-P AEs) are Hong Kong SAR, New Zealand, Singapore, and Taiwan Province of China; the ASEAN-4 are Indonesia, Malaysia, the Philippines, and Thailand; emerging market and developing economies (EMDEs) are Bangladesh, Bhutan, Cambodia, Fiji, Lao P.D.R., Myanmar, Nepal, Sri Lanka, and Vietnam.

Aggregate Total Factor Productivity

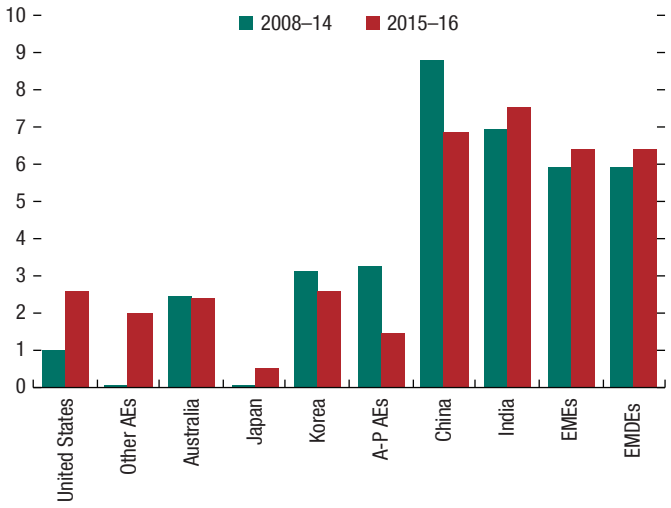
Figure 3.1 juxtaposes a regional overview of real GDP growth and aggregate TFP growth in four groups within the Asia region and compares them to developments in the United States. Both charts show average rates of growth over four periods in order to highlight trends and abstract from cyclical fluctuations.

The broad picture that emerges is that economic growth has generally held up well in Asia since the global financial crisis, both when compared to the precrisis period (2001–07) and to other advanced economies. The difference between real GDP and TFP growth could suggest that growth after the crisis has been relatively more extensive, that is, driven more by factor accumulation than by TFP improvements.

Within this broad picture, however, there is considerable variation across the major country groups.

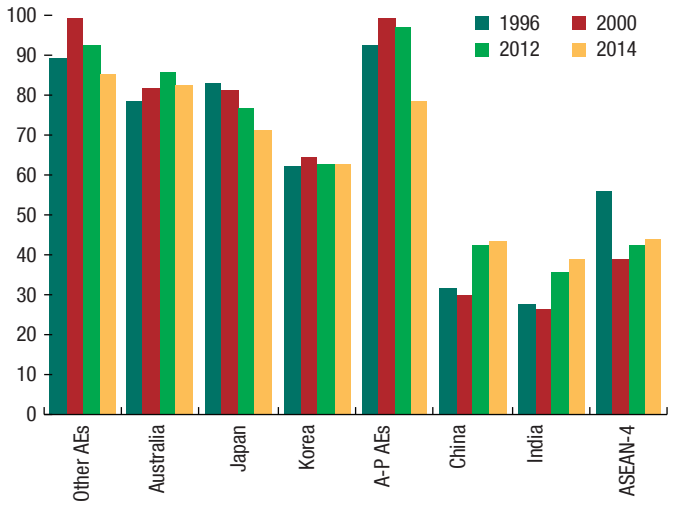
- In the *Asia-Pacific advanced economies* (Australia, Japan, Korea, Hong Kong SAR, New Zealand, and Singapore) growth was about 1 percentage point lower on average after the global financial crisis, roughly comparable to the outcome in the United States but better in comparison with other advanced economies as a group. The decline in TFP growth after the global financial crisis, however, is broadly comparable to that in other advanced economies.
- In the two large emerging economies in Asia—*China and India*—the decline in average growth has been smaller since the global financial crisis. Average growth is close to 8 percent, although it has declined more recently in China. This is also reflected in TFP growth in India, although the decline in China's TFP growth is more substantial than that of its real GDP.

Figure 3.2. Real GDP Growth after the Global Financial Crisis
(Percent)



Sources: IMF, World Economic Outlook database; and IMF staff calculations.
Note: All GDP growth rates are weighted by purchasing power parity GDP.
Other advanced economies (AEs) are Canada and the European Union; Asia-Pacific advanced economies (A-P AEs) are Hong Kong SAR, New Zealand, Singapore, and Taiwan Province of China; the ASEAN-4 are Indonesia, Malaysia, the Philippines, and Thailand; emerging market and developing economies (EMDEs) are Bangladesh, Bhutan, Cambodia, Fiji, Lao P.D.R., Myanmar, Nepal, Sri Lanka, and Vietnam.

Figure 3.3. Total Factor Productivity Gaps
(Current purchasing power parity, United States = 100)



Sources: Penn World Tables 9.0; and IMF staff calculations.
Note: All total factor productivity is weighted by purchasing power parity GDP.
Other advanced economies (AEs) are Canada and the European Union; Asia-Pacific advanced economies (A-P AEs) are Hong Kong SAR, New Zealand, Singapore, and Taiwan Province of China; the ASEAN-4 are Indonesia, Malaysia, the Philippines, and Thailand; emerging market and developing economies (EMDEs) are Bangladesh, Bhutan, Cambodia, Fiji, Lao P.D.R., Myanmar, Nepal, Sri Lanka, and Vietnam.

- In the *ASEAN-4* economies (Indonesia, Malaysia, the Philippines, and Thailand), real GDP and TFP growth after the global financial crisis remained relatively close to precrisis growth, with only a minor decline in both.
- Growth in other *Asia-Pacific emerging market and developing economies* remained high and stable, with only a minor reduction in growth after the global financial crisis.[4] TFP data are not available for all countries in the group, but some have TFP patterns similar to real GDP growth.

The data presented so far end in 2014. What has happened to productivity since? Over longer periods, TFP growth tends to be strongly procyclical. Since real GDP growth broadly held up in 2015–16 compared to 2008–14 (Figure 3.2), one would expect that TFP trends in 2008–14 would still be broadly representative for the more recent period.

Productivity growth has not been high enough everywhere for a strong convergence in TFP levels. Figure 3.3 uses TFP data from the Penn World Tables to construct relative indices for selected Asia-Pacific countries and regions against the United States as the frontier country.[5] It suggests relatively weak TFP convergence in China and India and in the ASEAN-4. Furthermore, the Asia-Pacific advanced economies have lost some ground against the United States, like other advanced economies.

Productivity Developments by Sector

Aggregate productivity reflects developments at the sectoral and, ultimately, firm level. Data at the sectoral level should thus be more informative

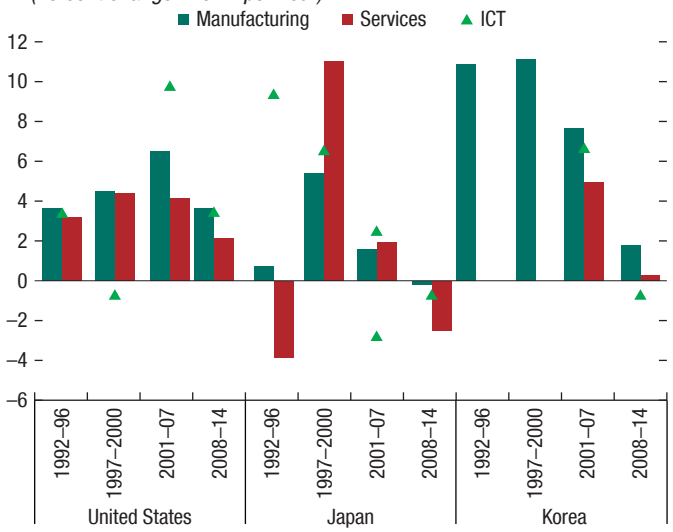
[4]The Asia-Pacific emerging market and developing economies include Bangladesh, Bhutan, Brunei Darussalam, Cambodia, Fiji, Lao P.D.R., Maldives, Myanmar, Nepal, Solomon Islands, Timor Leste, Vanuatu, Vietnam and the other small Pacific island nations.

[5]This is the level of TFP at current PPP prices, indexed to the United States equal to 100. See Inklaar and Timmer (2013) on the construction of the TFP measures.

Figure 3.4. Sector-Level Labor Productivity Growth

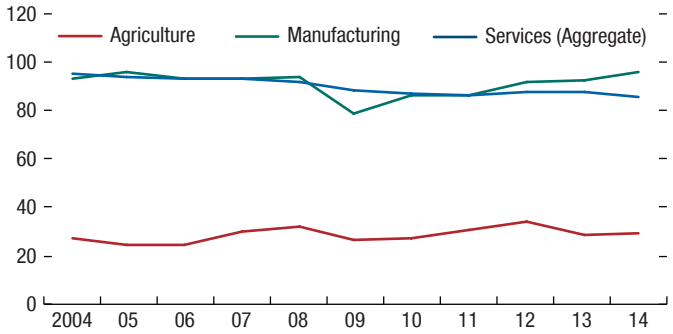
1. Period Averages for Selected Industries in the United States, Japan, and Korea

(Percent change in GDP per hour)



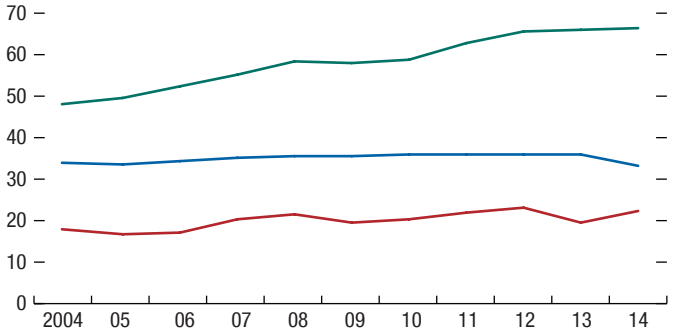
2. Selected Industries in Japan

(Percent of U.S. value added per employed)



3. Selected Industries in Korea

(Percent of U.S. value added per employed)



Sources: CEIC database; Haver Analytics; Organisation for Economic Co-operation and Development, Productivity and ULC by Main Economic Activity (ISIC Rev.4) database; and IMF staff calculations.
Note: The growth rates in the top chart are geometric averages over the periods. For the 1992–96 period, only 1994–96 is available for Japan. Data for Korea cover 2001–14 only for services and information and communication technology (ICT). Services also include ICT.

about the underlying dynamics in productivity, showing, for example, the sectors that are the engines of productivity growth (typically manufacturing sectors) as well as sectors where growth is below average (typically services sectors).

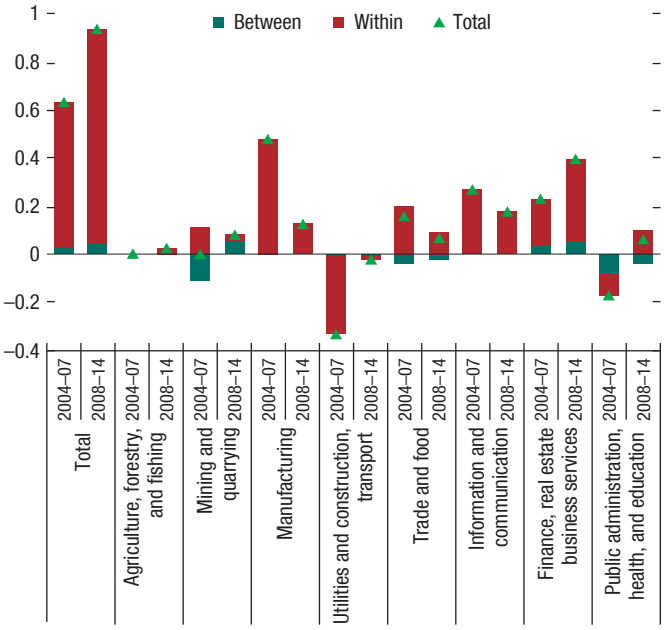
Given data availability issues, sectoral level analysis relies on measurements of labor productivity rather than TFP. In practice, looking at labor productivity is complementary to looking at TFP, given their positive correlation. That said, one caveat to keep in mind is that magnitudes of labor productivity growth are not directly comparable to those of TFP.

Figure 3.4 highlights the considerable difference in labor productivity growth in the manufacturing sectors relative to the services sectors for Japan, Korea, and the United States. Four developments stand out. First, labor productivity growth in the services sectors has been much lower than in the manufacturing sectors. While labor productivity growth in the services sectors has improved in Korea since the global financial crisis, it has remained weak in Japan. Second, in Korea, labor productivity growth in manufacturing has been broadly similar to or stronger than in the United States. In both countries, labor productivity growth in manufacturing declined after the global financial crisis. Third, in information and communication technology (ICT) sectors, labor productivity growth in both Korea and Japan has been relatively weak compared to the United States. To the extent that the ICT sectors are likely to remain important drivers of economy-wide labor productivity gains, this lagging performance could be a concern. Fourth, reflecting relatively low growth compared to the United States, productivity convergence in services broadly stalled in Korea, while some earlier gains started to be reversed in Japan.

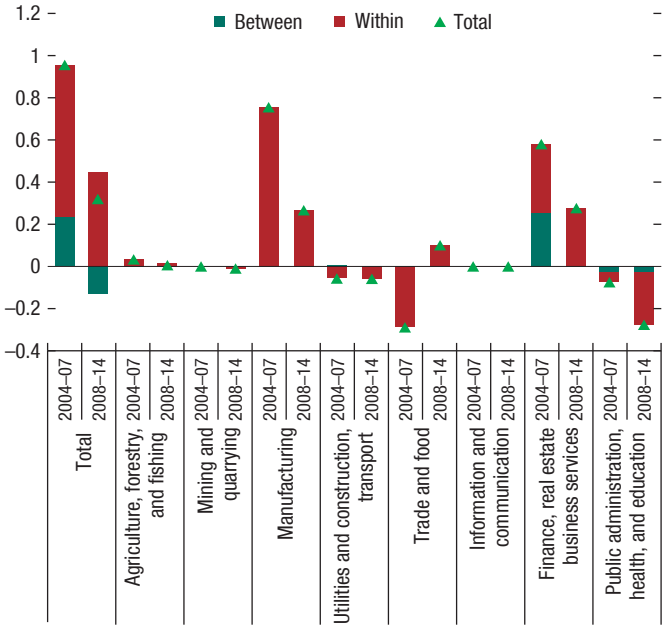
What sectors have been the engines of labor productivity growth in Asia? To answer this question, Figure 3.5 provides details on sector-level labor productivity growth in China, India, Japan, and Korea, plus a comparison with the United States. The panels in the figure incorporate

Figure 3.5. Contribution of "Within" and "Structural Change" Effects on Sectoral Labor Productivity Growth
(In constant prices)

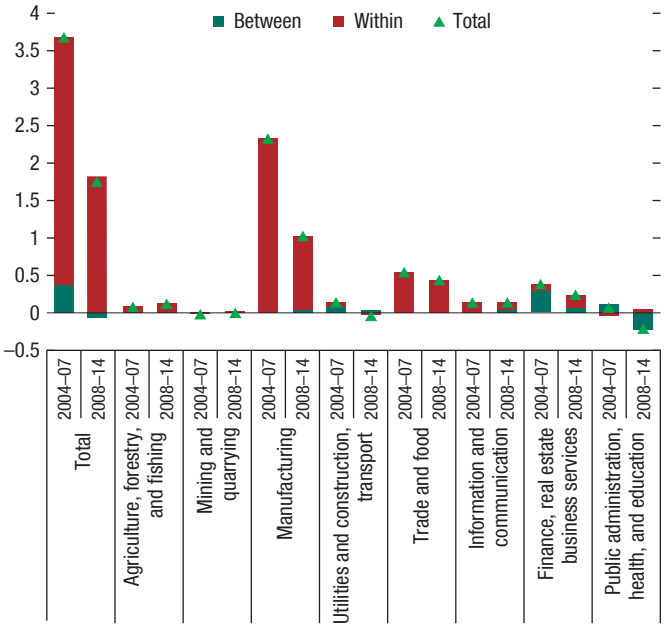
1. United States
(Percent)



2. Japan
(Percent)



3. Korea
(Percent)



4. China
(Percent)

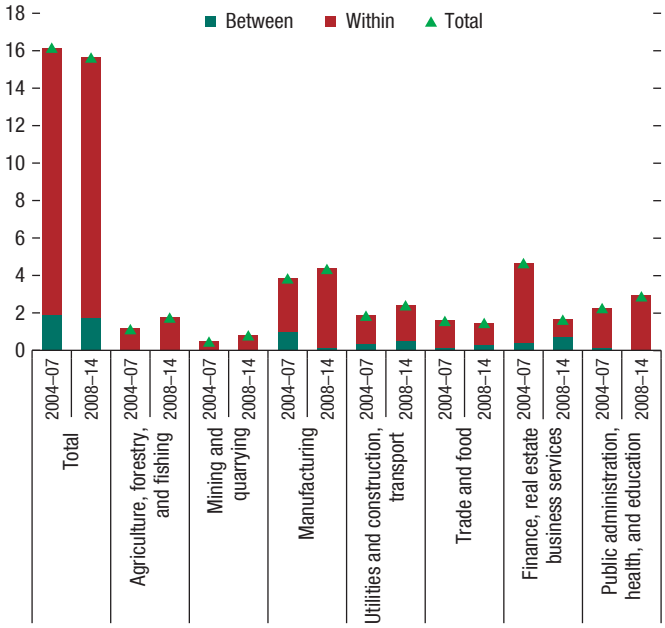
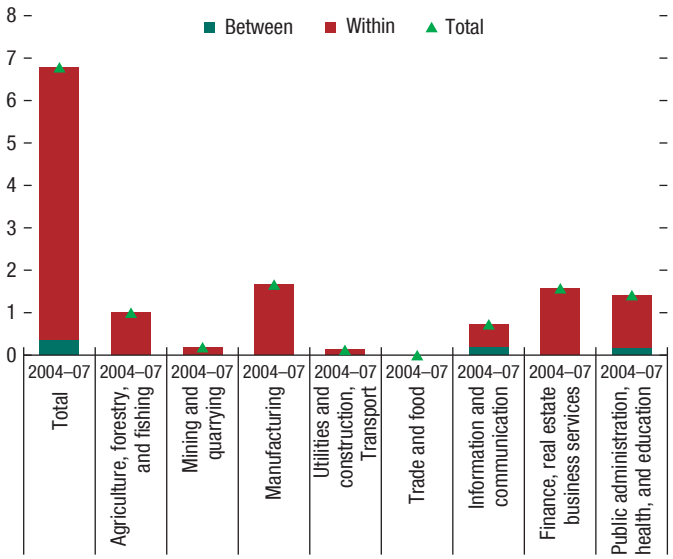


Figure 3.5. *(continued)*

5. India
(Percent)



Sources: Groningen Growth and Development Centre 10-Sector database; Organisation for Economic Co-operation and Development national accounts statistics; national authorities; and IMF staff calculations.
Note: No data available for India after 2007.

the results from a shift-share analysis, where real labor productivity growth (or its contribution), in aggregate or a sector, is decomposed into "within" and "structural change" effects, for the period prior to the global financial crisis (2004–07) and the period following the crisis (2008–14).[6] The within effects are changes in productivity growth generated in the sector itself, while structural change effects arise from the changing share of a sector in the economy over time, presumably from reforms or shifts in preferences. The highlights are as follows:

- The sectoral labor productivity growth rates generally confirm that productivity growth in Asia slowed after the global financial crisis.
- The manufacturing sectors accounted for about half of aggregate labor productivity growth (less in China, with a broader spread across sectors). A slowdown in these sectors was an important reason for the overall productivity slowdown following the global financial crisis, although labor productivity has also slowed in other sectors, including financial services.
- While labor productivity growth in the services sectors generally is lower than in manufacturing, finance, real estate, and business services sectors also contributed substantially to aggregate labor productivity growth, accounting for between one-fifth and one-third of that growth.[7] Still, labor productivity growth in these services sectors slowed compared to the period prior to the global financial crisis. These sectors also accounted for most of the structural change

[6]"Structural change effects" are measured by comparing labor productivity in industries with expanding employment relative to average labor productivity in shrinking industries. Thus, structural change effects would be more positive for those industries with relatively higher labor productivity than for shrinking industries, and more negative for those expanding industries with lower labor productivity. Timmer and de Vries (2009) provide details on the methodology.

[7]This is affirmed by a much broader sample of emerging market economies (including Asian economies) before the global financial crisis, in McMillan and Rodrik (2011).

effects in aggregate labor productivity growth. The growing share of these sectors in the economy generally has, in fact, lifted aggregate labor productivity growth, all else being equal.

- In China and India, the labor productivity gains were in part generated by continuing reallocation from agriculture to other sectors—a phenomenon that is common for many developing economies.

Domestic and External Factors in Productivity Growth

To understand the factors behind the slowdown in productivity established in the previous section, this section turns to the drivers and determinants of productivity and provides empirical evidence on the role of external and internal factors in productivity growth.

Drivers of Productivity Growth

Fundamentally, productivity improvements are driven by new technologies—technological progress—or new ways of organizing production processes. There is broad agreement that both drivers depend on economic incentives and on preconditions that create an enabling environment.

There is also broad agreement that economic integration and openness can boost productivity through a number of channels (Grossman and Helpman 1991), ranging from technology and knowledge diffusion through information-sharing to increased competition from foreign firms that can force domestic firms to adapt and raise their productivity.[8] In addition, trade creates larger markets that enable greater specialization and higher productivity or facilitate more productive supply chain arrangements.

Assessing the state of the drivers of productivity is notoriously difficult. Economic incentives and enabling factors are concepts that are difficult to measure in practice because they involve many dimensions. This chapter focuses on three primary concepts to assess the current environment for productivity in Asia. One relates to a domestic factor (measures of R&D investment) and two are related to international factors (international trade and FDI).[9] These factors seem particularly relevant, given the focus on spillovers.

Other factors influencing productivity relate to the enabling environment. This includes an economy's absorptive capacity, along with other features that facilitate productivity growth. Absorptive capacity can be defined as the ability of one factor to enrich the ability of another factor to stimulate productivity growth. For example, high-quality R&D or high-quality infrastructure (often a result of public capital investment) may interact with FDI to further increase productivity. Other contributing factors to absorptive capacity, such as human capital, as well as financial depth and the role of institutions, can also be considered.[10]

[8]Imports of intermediate goods can provide technology from exporting countries (forward spillovers), for example in the form of capital goods. Conversely, exports of intermediate goods to more technologically advanced importers can encourage the importers to transfer technology to the exporters (backward spillovers). At the same time, opportunities from greater openness can also encourage exporters to adapt and compete with exporters elsewhere, leading to greater sophistication and productivity. Greater import penetration can increase competition for local firms in domestic markets (horizontal spillovers), which should lead to greater efforts to improve their productivity, or enable access to new or better intermediate goods, thereby increasing productivity (vertical spillovers). Havránek and Iršová (2011) find evidence for vertical spillovers. Estimates for horizontal spillovers range from none (Iršová and Havránek 2013) to positive (usually in low-income countries where foreign firms operate in markets separate from domestic firms and do not crowd out domestic firms) (Meyer and Sinani 2009).

[9]Studies on the roles of the three concepts for emerging market economies can be found in Ciruelos and Wang (2005), Crispolti and Marconi (2005), and Krammer (2010). Blomström and Kokko (1998) and Keller (2004) provide surveys of the sector-level literature.

[10]See Aghion and others (2010), Aghion, Hemous, and Kharroubi (2014), Delgado and McCloud (2016), Farla, De Crombrugghe, and Verspagen (2016), Filippetti, Frenz, and Ietto-Gillies (2017), and Krammer (2015).

Domestic and External Drivers of Productivity Growth

This section presents empirical evidence based on the role of R&D, trade openness, and FDI inflows in productivity growth, building on the approach by Griffith and others (2004). The approach uses sectoral data and, as above, is based on labor productivity growth. The sectoral data are only available for a cross-section of advanced economies, including three Asian advanced economies (Japan, Korea, and Taiwan Province of China) for the sample period 1995–2007. While this data sample does not cover the period after the global financial crisis, it should nevertheless provide representative evidence on the role of domestic and external factors in driving productivity growth.

The analysis is based on a panel regression that relates labor productivity growth in 24 sectors to the productivity gap and other determinants in 19 advanced economies (see Annex 3.1 for details of the specification, results, and data set). The productivity gap captures the idea of convergence. This productivity gap is interacted with other explanatory variables to see whether these variables influence the speed of convergence. Since the dependent variable is labor productivity growth, the regression also controls for the changes in the capital-labor ratio.

The five explanatory variables of interest are (1) R&D expenditure, (2) exports, (3) imports, (4) inward FDI, and (5) outward FDI. All variables are scaled by the value added or gross output in the sector. As such, the assumption is that, within the variation encountered in the sample, the relationship between labor productivity growth and these variables is broadly proportional.

The results are broadly in line with the conceptual framework discussed previously. Labor productivity grows faster in the industries with larger labor productivity gaps, indicating more catch-up growth, or a transfer of productivity from abroad. This relationship is statistically significant.

Higher R&D spending raises labor productivity. It is noteworthy, however, that the impact of R&D spending is greater in sectors where labor productivity levels are already close to U.S. levels. Interestingly, the analysis does not find substantial differences between manufacturing and services sectors as far as the magnitude of the productivity impact of R&D. This is consistent with the view that technological progress (for example, the provision of business services reliant on new telecommunications systems) has also become important for services. That said, in the sample used in the analysis, R&D spending has been small in the services sectors compared to that in manufacturing sectors.

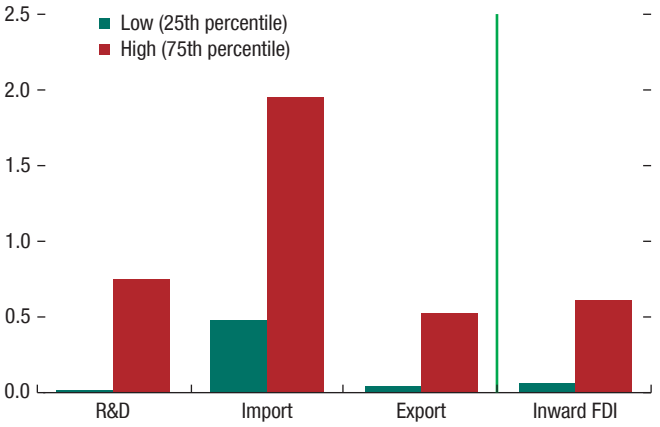
Higher trade openness also has a positive and significant impact on labor productivity growth, as expected. The results suggest that there is a larger positive impact if import openness increases by 1 percentage point than if export openness increases by the same amount. They also confirm the finding of other studies that imports of intermediate inputs are an important channel through which imports can raise labor productivity.[11]

The impact of FDI on labor productivity growth also matters at the sectoral level. Inward FDI shows a statistically significant positive impact. In contrast, outward FDI has a negative impact. It may be that firms invest abroad in more productive markets, crowding out some domestic investment, leading to weaker-than-otherwise domestic labor productivity growth.

What do the results imply for the relative role of external versus internal factors in productivity growth? To answer this question, consider a thought experiment that asks what would happen to labor productivity growth if the main productivity drivers (R&D, imports, exports, and FDI) increased from the low end (25th

[11]Ahn and others (2016) document that imports can promote productivity by increasing competitive pressure on domestic firms (competition channel) and by enhancing the quality of their intermediate goods (input channel), while exports can increase productivity via learning from foreign markets and through increased competition abroad.

Figure 3.6. Estimated Impact on Sectoral Labor Productivity Growth
(Percent)



Source: IMF staff calculations.
Note: The 25th and 75th percentiles are calculated based on research and development (R&D) expenditure, imports and exports from the United States, and inward foreign direct investment (FDI) for all industries and countries in the sample.

percentile) to the high end (75th percentile) of the sample, that is, an economy or industry shifting from being a "low" to a "high performer."[12] The differences between the blue and red bars in Figure 3.6 show the marginal benefit of this shift and suggest that policies aimed at increased trade integration or greater import competition and inward FDI would generate substantial productivity increases.[13]

The thought experiment highlights the potentially strong impact of greater openness and trade integration on productivity growth. Higher productivity growth can also enable firms to compete better in international markets, increasing openness. The flip side is that productivity growth with stagnating global trade and cross-country investment flows becomes more difficult to achieve. As a caveat, it should be noted, however, that the relationship between external factors and labor productivity growth is a complex one and that the analysis does not establish causality definitively. There is a possibility of reverse causality and omitted variable bias. Moreover, the experiment does not capture the effects of all domestic factors, many of which are captured by country-industry fixed effects in the regressions that cannot be recovered for an economic interpretation.

Broader Evidence of Domestic and External Drivers of Productivity Growth

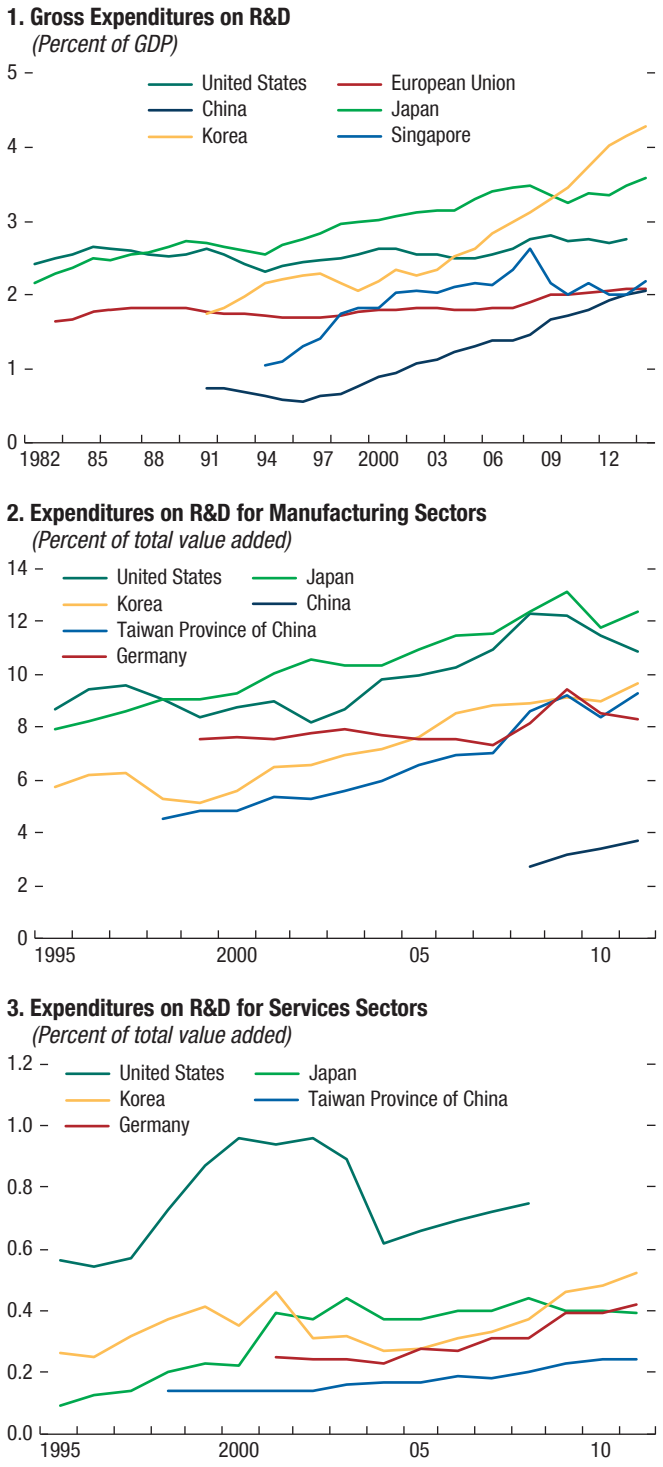
As a cross-check, we now complement the sectoral analysis in the previous section with country evidence on aggregate TFP growth for a more recent sample period 1980–2014 and for a broader set of Asia-Pacific countries, including the Asian advanced economies, China, India, the ASEAN-4, and some Asia-Pacific emerging market and developing economies. The analysis is based on three different panel regressions that relate country-level TFP levels to a broadly similar set of explanatory variables (see Annex 3.2 for details of the specifications, results, robustness checks, and the data set).

The country-level evidence also suggests that, in general, domestic factors (such as R&D) have less of an impact than external factors (such as FDI). That said, there is some evidence that the sources of TFP growth have shifted in favor of domestic factors (also including financial development and absorptive capacity) since the global financial crisis. This will be key if advanced economies continue to slow and provide a weaker impetus to Asia-Pacific productivity. By looking at the recent trends in the factors used in this analysis, the next section will further elucidate the possibilities for productivity growth going forward.

[12]The estimated impacts are calculated as the product of the estimated coefficients on explanatory variables (see Annex 3.1 for the estimation results) and the 25th and 75th percentiles of the variables, which show the implied difference in average labor productivity growth between low and high explanatory variables (for example, R&D expenditure, import/export openness, and inward FDI).

[13]It should be noted that the results of inward FDI are based on a regression with a smaller sample of countries because of data availability issues. See Annex 3.1 for more details.

Figure 3.7. Expenditures on Research and Development



Sources: National Science Foundation; National Center for Science and Engineering Statistics, National Patterns of R&D Resource (Annual Series); Organisation for Economic Co-operation and Development, Main Science and Technology Indicators (2015/1); UNESCO Institute for Statistics Data Centre.

Understanding Productivity Developments and Prospects in Asia: A Narrative Approach

This section drills down deeper and reviews recent developments in the main productivity drivers (R&D, investment, trade, and FDI) before and after the global financial crisis and discusses their likely impact, drawing on the analysis from the previous section.

Research & Development Investment

R&D is the means through which firms and countries more broadly innovate and develop new technologies. R&D can also be a means to promote technology transfer, or adaptation and imitation.[14]

Overall R&D spending has increased notably among Asian countries since the global financial crisis, converging toward United States and other advanced economy levels. Korea has even become a leader in R&D spending (Figure 3.7). As of 2014, after more than a decade of sustained increases, China was at par with the average R&D spending in the European Union and with spending in Singapore.

Data on the number of patent applications filed by residents in their own country, in absolute numbers and per unit of GDP (Figure 3.8), corroborate the picture provided by R&D spending.[15] The strong increases in the number of patents in China and Korea stand out.

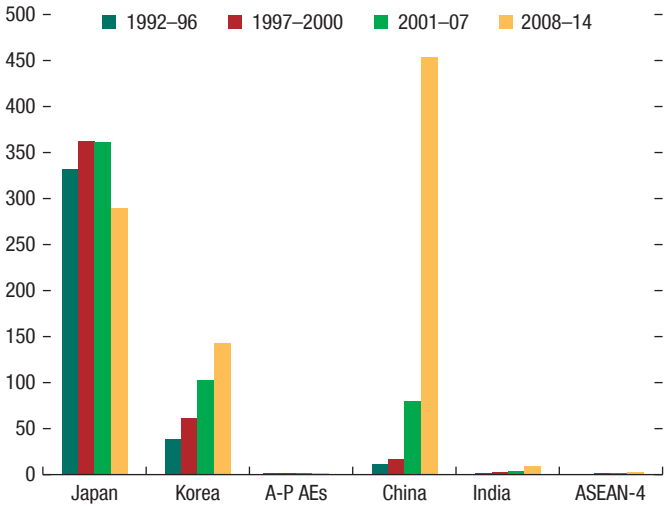
The increase in R&D spending since the global financial crisis in some Asian economies would, all else being equal, imply that productivity growth in these economies should have increased noticeably, based on the benchmarks provided by the previous empirical analysis. The fact that it did not suggests either that other factors more than offset the beneficial impact, or that the

[14]See Griffith, Redding, and van Reenen (2004), Acemoglu, Aghion and Zilibotti (2006), and Madsen and Timol (2011).

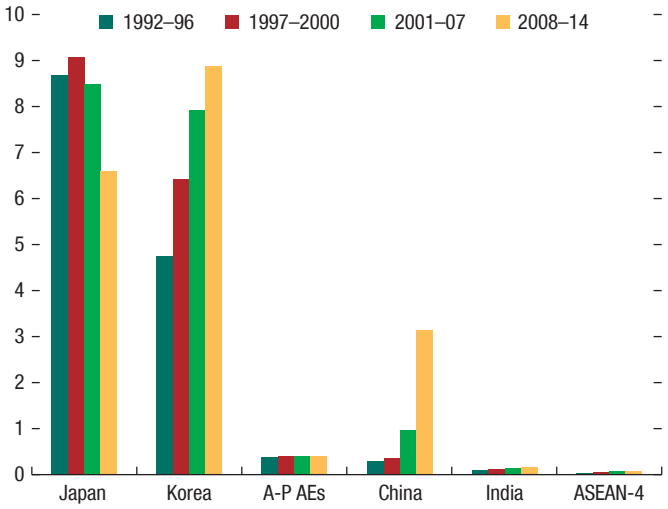
[15]See Kao, Chiang, and Chen (1999) and Lee (2006) at the country level, and Branstetter and Nakamura (2003) at the sectoral level.

Figure 3.8. Average Annual Registration of Patents

1. Average Number of Annual Patent Registrations
(Thousands)



2. Average Annual Patent Registration Relative to Purchasing Power Parity GDP
(Indexed by PPP GDP)

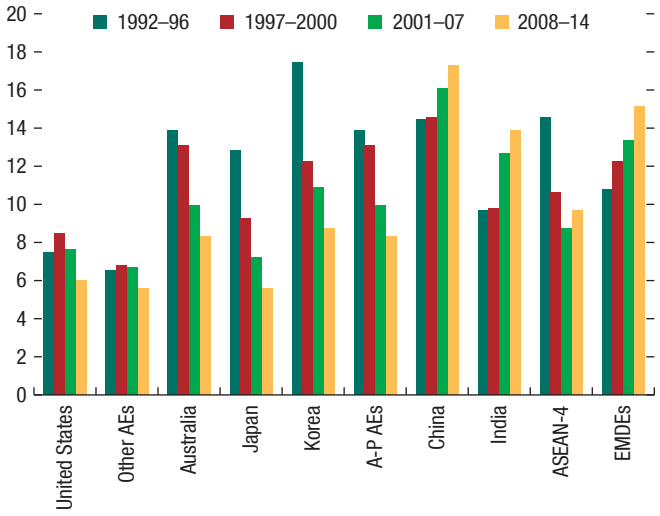


Sources: World Intellectual Property Organization; and IMF staff calculations.
Note: Asia-Pacific advanced economies (A-P AEs) are Hong Kong SAR, New Zealand, and Singapore. The ASEAN-4 are Indonesia, Malaysia, the Philippines, and Thailand. PPP = purchasing power parity.

increased spending has not yet translated fully into marketable innovation and productivity gains because of problems of effectiveness. For some sectors, there is indeed some evidence that there have been such problems (Branstetter and Nakamura 2003). Another reason could be that the diffusion from R&D-related spending by leading firms, which likely accounts for much of the increase in R&D spending, might have slowed. There is indeed evidence that much of the R&D spending in Asia is undertaken by large companies, especially multinational ones.

The closing of the gap with or even surpassing the United States in R&D spending in a growing number of Asian economies primarily reflects developments in manufacturing sectors, rather than services (Figure 3.7, second and third panels). In the services sectors, R&D spending in the same economies is still lagging, which could plausibly be one of the factors explaining relatively lower productivity growth in these sectors.

Figure 3.9. Gross Fixed Capital Formation
(Percent of previous year's capital stock)



Sources: IMF, World Economic Outlook database; Penn World Tables 9.0; and IMF staff calculations.
Note: Regional aggregates for gross fixed capital formation are weighted by purchasing power parity GDP. Other advanced economies (AEs) are Canada and the European Union; Asia-Pacific advanced economies (A-P AEs) are Hong Kong SAR, New Zealand, Singapore, and Taiwan Province of China; the ASEAN-4 are Indonesia, Malaysia, the Philippines, and Thailand; emerging market and developing economies (EMDEs) are Bangladesh, Bhutan, Cambodia, Fiji, Lao P.D.R., Myanmar, Nepal, Sri Lanka, and Vietnam.

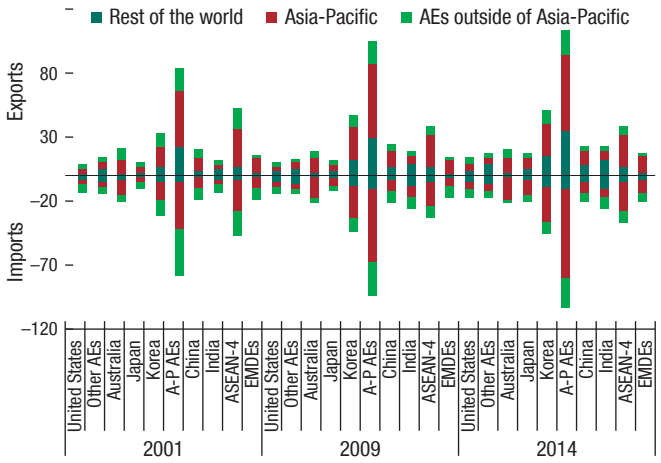
Fixed Investment

Fixed investment can also contribute to productivity growth. The traditional channel is through increased capital intensity, which lifts labor productivity for a given amount of labor. Another channel operates through the new technologies embodied in new capital. There is also a case to be made that there is a bias toward capital affecting the measurement of productivity, so this channel may be more important than often thought (Box 3.1). This would imply that a downshift in the investment path—say, relative to pre-global-financial-crisis trends—would lower TFP.

Figure 3.9 shows that the rate of fixed investment, as a percent of the stock of physical capital, slowed in Asia-Pacific advanced economies to rates that are broadly at par with those in other advanced economies after the global financial crisis. This slowdown is perhaps the clearest reflection that elements of the new mediocre have also been present in the advanced economies in the region. Estimates by Adler and others (2017) would suggest that such declines in investment rates could explain a sizable reduction in TFP growth, on the order of ¼ to ½ of a percentage point. In the ASEAN-4 countries, in contrast, investment rates were broadly unchanged before and after the global financial crisis. In a number of countries in the region, however, investment rates increased and have supported productivity, including in China, India, and other emerging market and developing economies in the region.

Prospects are that fixed investment will remain relatively weak for some time and is unlikely to contribute to productivity in the economies where investment rates slowed after the global financial crisis. Furthermore, in China, with the economic rebalancing toward consumption, investment rates are likely to slow, which, in the absence of offsetting measures, could weigh on productivity.

Figure 3.10. Developments in Trade Openness
(Percent of GDP)



Sources: IMF, *Direction of Trade Statistics*; IMF, World Economic Outlook database; and IMF staff calculations.
Note: Values for trade are approximations because of incompatibilities between different data sources. Measures of GDP for the regional aggregates include intraregional trade; the corresponding measures of trade exclude it. Other advanced economies (AEs) are Canada and the European Union; Asia-Pacific advanced economies (A-P AEs) are Hong Kong SAR, New Zealand, Singapore, and Taiwan Province of China; the ASEAN-4 are Indonesia, Malaysia, the Philippines, and Thailand; emerging market and developing economies (EMDEs) are Bangladesh, Bhutan, Cambodia, Fiji, Lao P.D.R., Myanmar, Nepal, Sri Lanka, and Vietnam.

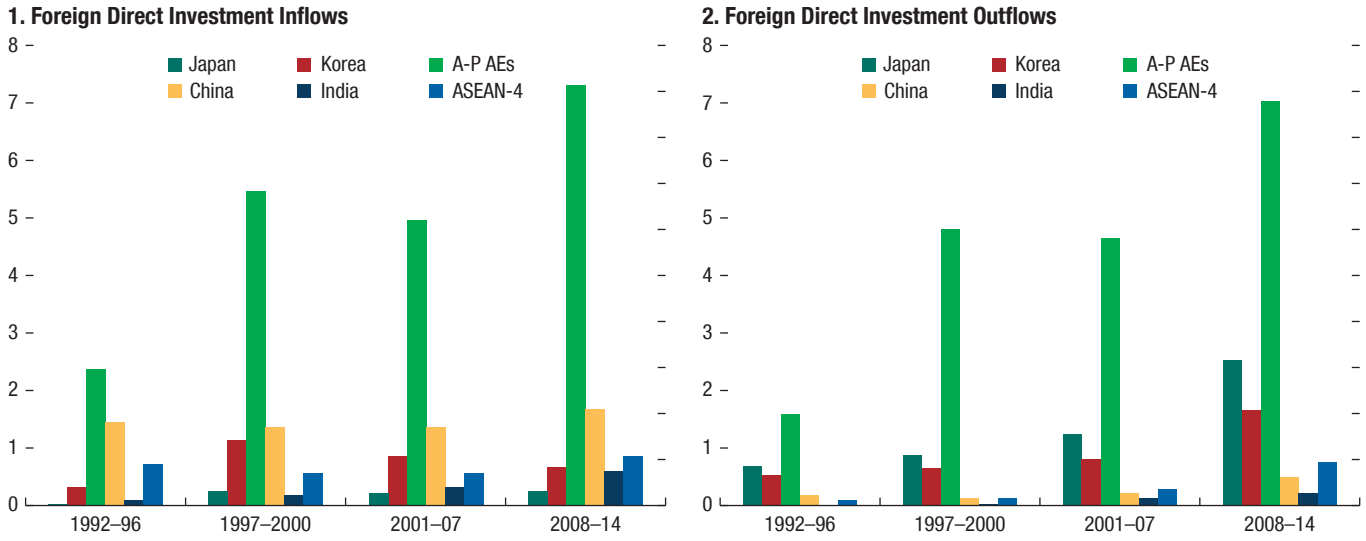
International Trade

International trade is an important channel of technology transfer, as discussed above.[16] Figure 3.10 shows that, overall, trade openness involving both exports and imports has generally moved sideways or declined since the global financial crisis. Trade, therefore, is unlikely to have supported productivity. Going forward, prospects are for continued moderate trade growth, with little change in export or import ratios. A trade-related boost to productivity overall thus seems unlikely (Constantinescu, Mattoo, and Ruta 2016).

There have been exceptions to these broad trends, however. Trade openness increased after the global financial crisis in Asia-Pacific advanced economies and in other emerging market and developing economies in the region. The increase is particularly prominent in intra-Asia-Pacific

[16]See, for example, Ahn and others (2016), Frankel and Romer (1999), and IMF (2016).

Figure 3.11. Foreign Direct Investment
(Percent of GDP)



Sources: Financial Flows Analytics Database; and IMF staff calculations.
Note: Foreign direct investment inflows and outflows are the average during the period. Asia-Pacific advanced economies (A-P AEs) are Hong Kong SAR, New Zealand, Singapore, and Taiwan Province of China; the ASEAN-4 are Indonesia, Malaysia, the Philippines, and Thailand.

trade and partly reflects further outsourcing of manufacturing activity from advanced economies to emerging market and developing economies in the region and the continued building of supply chains between these economies. This lengthening of supply chains is consistent with developments seen in Europe. There is evidence of such a lengthening in the chains between Germany and central European countries (Aiyar and others 2013). While patterns in trade openness since the global financial crisis do not suggest that the lengthening of cross-border supply chains involved China or India, there is a possibility that supply chains could have intensified within these two countries, generating their own productivity improvements. If so, however, other factors would have offset these gains.

Foreign Direct Investment

FDI can also be an engine of productivity growth, with effects depending in part on whether it is inward FDI[17] or outward FDI.[18] Figure 3.11 shows that, as a percent of GDP, FDI inflows increased in China, India, and the ASEAN-4 after the global financial crisis. In Japan and Korea, FDI inflows remained broadly stable, although the two countries registered a noticeable increase in FDI outflows. China also saw some increase in FDI. The implication is that FDI likely contributed to productivity increases only in emerging and developing Asia-Pacific economies after the global financial crisis. FDI inflows into many emerging market and developing economies in the region are expected to remain strong, which should support further productivity increases. That said, there are risks from increased protectionism, which could slow or reverse the building of supply chains and offshoring.

The empirical analysis associated with the country-level work presented above also suggests that FDI

[17]Inward FDI can be a channel for technology diffusion. Bitzer and Kerekes (2008) offer supporting evidence. Van Pottelsberghe de la Potterie and Lichtenberg (2001) offer an opposing view.

[18]Based on German data, Onaran, Stockhammer, and Zwickl (2013) find that outward FDI to high-wage countries crowds in domestic investment, whereas FDI to low-wage countries crowds out investment.

Table 3.1. Levels of Enrollment in Tertiary Education
(Percent of the official tertiary education cohort population)

	1992[1]	1997[2]	2001	2008	2014[3]
European Union	32.5	44.8	52.3	62.6	67.7
United States	77.1	70.6	69.0	85.0	86.7
Japan	30.0	45.1	49.9	57.6	62.4
Korea	39.5	64.5	82.5	95.3	95.3
Indonesia	9.4	13.4	14.2	20.7	31.1
Malaysia	9.1	21.8	25.0	33.7	38.5
Philippines	25.8	27.5	30.3	29.4	35.8
Thailand	19.3	23.0	39.0	47.9	52.5
China	2.8	5.5	10.0	20.9	39.4
India	6.0	6.6	9.7	15.1	23.9
Bangladesh	—	5.5	6.4	8.6	13.4
Nepal	5.4	4.8	4.5	11.3	15.8

Source: World Bank, World Development Indicators.
[1]For 1992, Bangladesh = not available; India = 1991; Thailand = 1993.
[2]For 1997, Bangladesh = 1999; Japan, Malaysia, the Philippines, and the United States = 1998; Nepal = 1996.
[3]For 2014, India, Japan, Korea, Malaysia = 2013.

supports domestic fixed investment within Asia as a whole, which can be another channel through which increased FDI could raise productivity. In fact, the role of FDI has become increasingly important over time, particularly since the global financial crisis.[19]

Absorptive Capacity

Absorptive capacity refers to factors that enable the domestic economy to absorb the positive influences of other factors such as R&D or technology transfer.[20] Human capital, in particular, has long been identified as an important factor in this regard. The higher it is, the better the workforce can adapt to new technology or contribute to innovation. Absorptive capacity has risen across Asia, albeit with variation across countries.

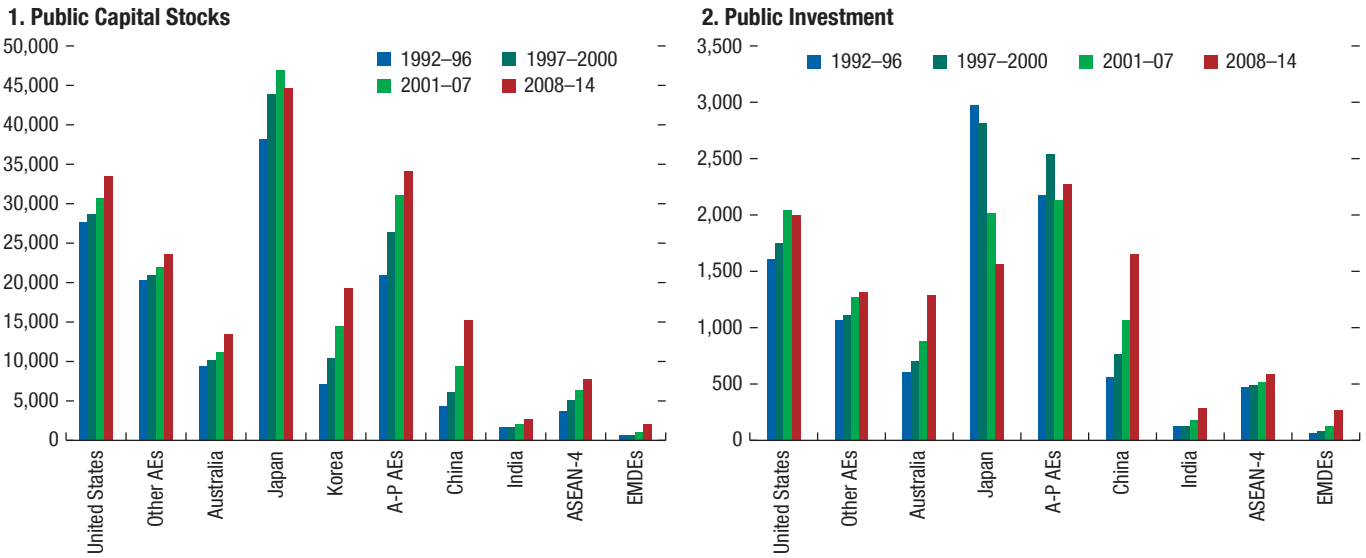
The number of enrollees in tertiary education programs as a share of their age cohort is a standard measure—even if not comprehensive—of human capital. A country's human capital stock would, all else being equal, increase if this share increases. Table 3.1 shows how the tertiary enrollment share has broadly increased across Asian economies over the past few decades. In the advanced economies, where initial levels were already high, the rate of increase has slowed since the global financial crisis, including compared to the precrisis boom period of the early to mid-2000s. This slowdown in the building of human capital is seen as one of the contributing factors to the productivity slowdown in the advanced economies in recent years (Adler and others 2017). In other countries, however, the share of tertiary education increased rapidly after the global financial crisis. In China, for example, the share doubled between 2008 and 2014.

Another dimension of absorptive capacity is public infrastructure. Bom and Ligthart (2014) suggest related investment can substantially increase an economy's output in the short and long term. With higher infrastructure capital, firms can more easily produce goods and ship them to domestic and foreign markets, and they can hire workers who are better educated and healthier (IMF 2014). Figure 3.12 shows that public capital stocks are high in most Asia-Pacific advanced economies and China compared to other advanced economies and the United States. Therefore, initial conditions seem favorable. In China and the ASEAN-4, the public-capital per capita ratio accelerated after the global financial crisis, reflecting increasing investment shares.

[19]See Annex Table 3.2.5. For support in the literature, see Al-Sadig (2013), Farla, Crombrugghe, and Verspagen (2016), and Hejazi and Pauly (2003).

[20]See Crispolti and Marconi (2005) and Filippetti, Frenz, and Ietto-Gillies (2017). At the sectoral level, see Blalock and Gertler (2009) and Blalock and Simon (2009) for Indonesia and Özer and Böke (forthcoming) for Turkey.

Figure 3.12. Public Capital Stocks and Investment
(Constant 2011 dollars, per capita)



Sources: IMF, Investment and Capital Stock Dataset; and IMF staff calculations.
Note: All flows are in real terms, weighted by purchasing power parity real GDP. Other advanced economies (AEs) are Canada and the European Union; Asia-Pacific advanced economies (A-P AEs) are Hong Kong SAR, New Zealand, Singapore, and Taiwan Province of China; the ASEAN-4 are Indonesia, Malaysia, the Philippines, and Thailand; emerging market and developing economies (EMDEs) are Bangladesh, Bhutan, Cambodia, Fiji, Lao P.D.R., Myanmar, Nepal, Sri Lanka, and Vietnam.

In sum, a number of factors can explain the recent slowdown in productivity growth in many economies in the Asia-Pacific region after the global financial crisis, including lower investment rates, less impetus from international trade integration, and slowing growth in human capital. That said, in emerging market and developing economies in the region, many of these forces have continued to contribute to productivity growth.

Conclusions and Policy Implications

The analysis presented in this chapter suggests that Asia experienced a productivity growth slowdown after the global financial crisis. It also suggests that, in terms of productivity, there has been little, if any, convergence to the technological frontier. The likelihood is that productivity growth will remain low for some time, including, increasingly, because of demographics. Raising productivity growth should therefore be a priority on the economic policy agenda in Asia. Within this broad picture, however, the magnitude and nature of the slowdown differ across economies in the region.

In terms of magnitude, the slowdown has been most severe in the advanced Asia-Pacific economies and in China. In terms of the nature of the problem, many of the factors behind the slowdown identified elsewhere apply to the advanced economies of the region, including slowing investment, little impetus from trade (as reflected in broadly unchanged trade openness), slowing human capital formation, reallocation of resources to less productive sectors, and, as discussed in Chapter 2, an aging population. Another common theme is that the performance in some services sectors in the region has been lagging relative to other countries, notably with respect to the United States. On the positive side, however, R&D activity in the advanced economies of the region remains strong or has increased.

In China, a number of underlying drivers of productivity have improved further since the

global financial crisis, including increased R&D spending and rapid progress in educational attainment. On the other hand, trade openness has declined after some increases immediately following China's accession to the World Trade Organization, suggesting that the related gains in productivity levels have largely been absorbed. And resource misallocation (reflected in sectoral overcapacity, for example) and distortions in economic incentives appear to be holding back productivity.

In emerging markets and some low-income economies of the region, including India and the ASEAN-4, the decline in productivity growth since the global financial crisis has been small. That said, there has been little progress in productivity convergence toward the high-productivity countries at the technology frontier.

Looking forward, the main policy issue is how to raise productivity growth when external factors might not be as supportive as they were before the global financial crisis. In particular, further trade liberalization might be more difficult to achieve. While policies can also strengthen domestic sources of productivity growth, the analysis highlights that increases in trade openness come with strong productivity benefits. Efforts toward further trade liberalization should thus continue to be pursued. Turning to domestically oriented policies, priorities differ across countries in Asia. In advanced economies, the focus should be on strengthening the effectiveness of R&D spending and measures to raise productivity in the services sectors (see Box 3.2 for the cases of Australia and Singapore). Increased competition in these sectors would spur innovation and adaption. The empirical analysis has shown that these mechanisms have contributed to higher productivity growth not just in manufacturing but also in services.

In India, improving productivity in the agriculture sector, which is the most labor-intensive sector and employs about half of Indian workers, remains a key challenge. More needs to be done to address long-standing structural bottlenecks and enhance market efficiency, including from liberalizing commodity markets to giving farmers more flexibility in the distribution and marketing of their produce, which will help raise competitiveness, efficiency, and transparency in state agriculture markets. In addition, input subsidies to farmers should be administered through direct cash transfers rather than underpricing of agricultural inputs, as such subsidies to the agriculture sector have had large negative impacts on agricultural output.[21]

In other emerging market and developing economies in the region, the priority should be to capitalize on recent achievements, including the rise in FDI inflows, by increasing the related productivity spillovers through further increases in absorptive capacity and domestic investment. Japan and Korea have proved to be leaders in the field of human capital formation. The ASEAN-4 countries have begun to follow this model and should continue, including by strengthening the quality and flexibility of domestic education systems. In some economies, there is a need to expand public infrastructure, as noticeable gaps remain.

[21]For example, cheap or free water, electricity and fertilizers have had a large negative impact on ground-water levels, soil fertility and production efficiency for both inputs and outputs in agriculture (IMF 2017).

Box 3.1. Biased Technical Change and Productivity

The issue of biased technical change has gained prominence recently as progress in automation in manufacturing and services has led to increased substitution away from labor to automated processes. Understanding technical bias helps with assessing future directions in productivity, factor compensation, and employment (Amtz, Gregory, and Zierahn 2016; Autor 2015). A particularly important question for policymakers is how to combine increased labor savings in sectors undergoing rapid automation with the ability of the economy to employ the labor resources productively elsewhere.

This box investigates whether the issue of technical bias is relevant for China, Japan, and Korea (and the United States, for the sake of comparison) and discusses some implications for productivity. It suggests that there is indeed a bias toward capital equipment and high-skilled labor away from low-skilled labor in a number of industries.

The framework for measuring factor bias is based on the multi-factor cost approach (as in Binswanger 1974), which looks at the change in factor shares used for production, using five input factors (capital goods, high-skilled labor, medium-skilled labor, low-skilled labor, and intermediate goods) across four broadly defined industries (agriculture; food, textiles, and leather; machinery and equipment; and finance).

Following this approach, a bias toward a particular factor, $B_i(t)$, is defined as a change in share $S_i(t)$ of this factor for any given set of relative prices. A positive value for $B_i(t)$ indicates a shift toward an increasing use of the factor, while a negative value means a shift toward the reduced use of the factor. For the capital stock, K, the bias, $B_K(t)$, is measured as:

$$B_K(t) \approx (s_{Kt+1} - s_{Kt})/s_{Kt} \mid \rho_K, w, \rho_I$$

given the cost of capital, p_K, the wage, w, and the price of intermediate goods, p_I.

The biases are computed from 1995 to 2009 over four periods: prior to the Asian crisis (1995–96), during the Asian crisis (1997–2000), after China's accession to the World Trade Organization (2001–07), and during the global financial crisis (2008–09). Figure 3.1.1 suggests several trends and tendencies.

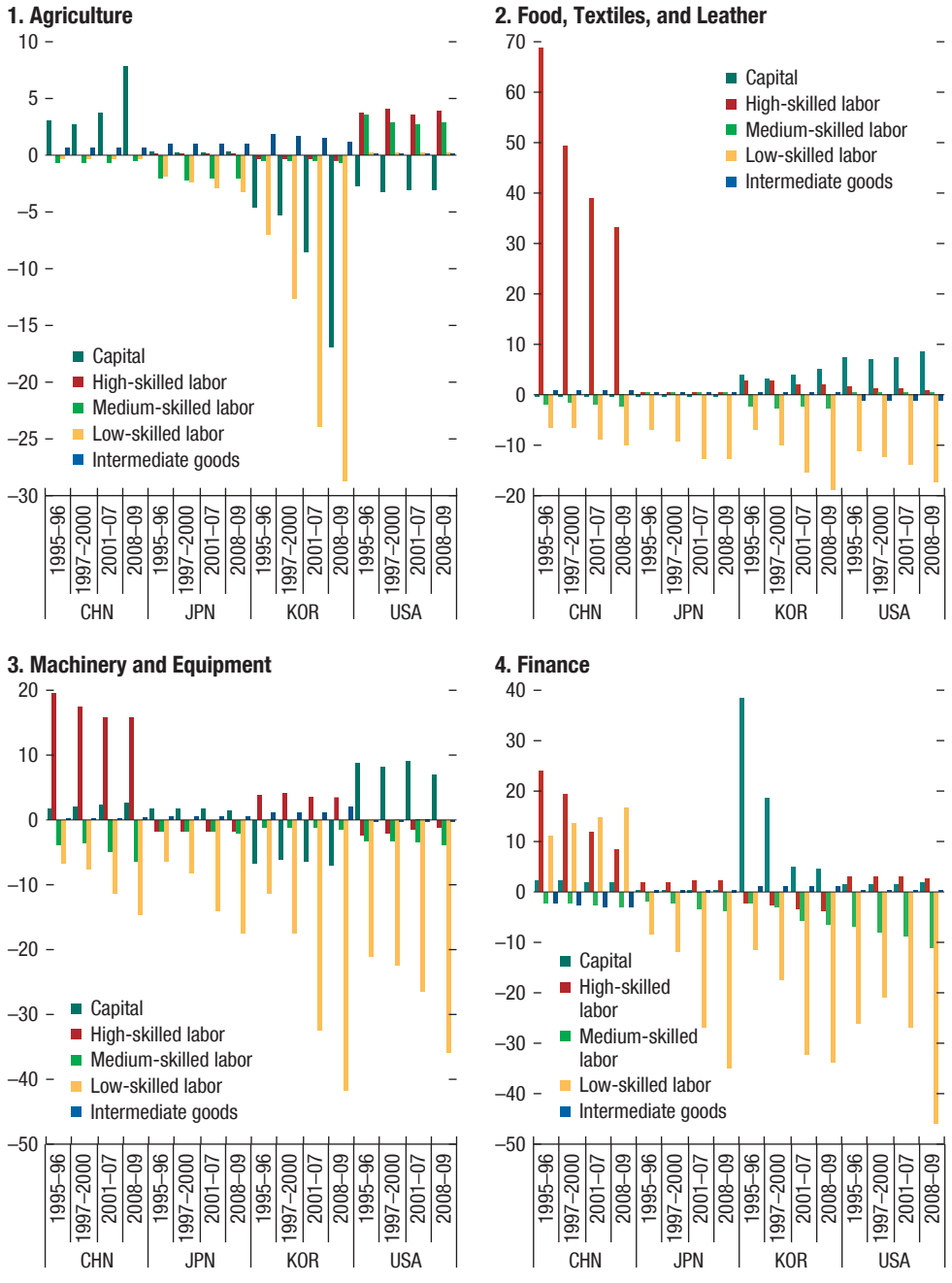
There is a general tendency toward a positive bias in capital goods and a negative bias against low-skilled labor in all countries under consideration. The capital bias is stronger in China, which is consistent with the notion that this country is relatively capital scarce, although the bias is declining over time. There appears to be a mild bias toward high-skilled labor in more research-intensive industries (such as machinery and equipment) and high-knowledge service industries (such as finance). Not surprisingly, those industries exhibit a strong negative bias against low-skilled labor, with the strongest negative bias in the most technically advanced country (the United States) and the least negative bias in China. Furthermore, in China, as an emerging market economy, the bias toward high-skilled labor is also observed in other industries, consistent with its relative scarcity.

These trends suggest that the impact of biased technical change on productivity may be unclear. Industries with a positive bias toward capital goods should generally demonstrate higher labor productivity. The impact on aggregate productivity, however, will depend on the productivity sectors where labor is reallocated and the ability of the economy to redeploy workers without increasing unemployment. Therefore, policymakers should take into account that increasing productivity in separate industries needs to be combined with inclusive growth. In addition, the widespread and often strong negative bias toward low-skilled labor and the positive bias toward high-skilled labor suggest that the benefits from increasing human capital and economic environment could help mitigate the economic effects from the ongoing transition implied by strong technical bias.

This box was prepared by Sergei Dodzin and Xinhao Han.

Box 3.1 *(continued)*

Figure 3.1.1. Technical Biases in Major Sectors
(Percent)



Sources: World Input Output Database; and IMF staff calculations.
Note: Data labels in the figure use International Organization for Standardization (ISO) country codes.

Box 3.2. The Roles of Government in Productivity: Case Studies of Australia and Singapore

In Asia, government could play a greater role in most economies to augment productivity growth. For example, as discussed in the text, government can also play a role by increasing education and health spending. Productivity growth can be stimulated through a variety of channels, often focused on macroeconomic and structural tax and expenditure policy (see IMF 2015). However, here, the focus is more narrow. This is not a call for governments to intervene in industrial policy, but rather to improve their role through engaging with the private sector, using a three-pronged approach:

1. Providing infrastructure through public investment, or by facilitating private efforts;
2. Putting in place a strong regulatory environment and secure legal framework in which to conduct business, have ownership, and engage smoothly with capital and labor; and
3. Establishing public institutions that can serve as public goods for the private sector and provide quality information

This is not to say there is no role for industrial policy, as demonstrated in the past by many of the Asia-Pacific advanced economies. However, to maintain productivity growth, private involvement is also important, and it can be facilitated by governments in their role as a central coordinator in their country for public goods. A good example is a leader in best practices, Australia, an advanced economy with vital links to Asia.

In Australia, several public institutions play the role of public good by sending strong signals to the private sector about the need for improved productivity, providing comprehensive sources of information, and validating private sector initiatives. Initiatives include Infrastructure Australia, which identifies infrastructure needs and evaluates plans to meet those needs from governments and the private sector, and the Productivity Commission, which provides analysis on the state of productivity growth and advice on legislation, but as an arm's-length observer.

The public sector then supplements these activities with its legislative work and direct spending. Through special studies, such as the Competition Policy Review (Harper and others 2015), the government works to strengthen the legal and regulatory environment in order to simplify conducting business. The government also actively engages in trade policy in an innovative fashion, such as through intellectual property protections under the now-defunct Trans-Pacific Partnership agreement.

On the spending side, the public sector leads large-scale infrastructure projects, but also encourages private sector involvement. Some modestly budgeted programs such as the National Innovation and Science Agenda (NISA) have ambitious aims. The NISA incubates industries perceived as future leaders in productivity (for example, information and communication technology), and facilitates research and development and industry collaboration through a three-pronged approach: increasing public spending on many smaller initiatives over five years; addressing perceived gaps in critical science capabilities and access to quality private funding; and simplifying business regulation and interaction with the public sector.

Some segments of Australia's approach are still new, and their effectiveness has yet to be evaluated (especially the new public initiatives and the NISA). However, the hope is that the three-pronged approach is a viable way forward to increase productivity in an economy with slowing productivity, such as Australia.

Australia's approach could be replicated in other Asia-Pacific economies by using limited government funds more efficiently, but avoiding being dependent on the public sector to "mandate" productivity growth. However, some countries, such as Singapore, are adapting Australia's approach to also include a more active

This box was prepared by Dirk Muir.

Box 3.2 *(continued)*

role for government.

In Singapore, the most recent vehicle is the report by the Committee on the Future Economy (2017). It recommends a framework to encourage productivity through economic development using seven strategies focused on five key concepts: consolidating international connections, deepening human capital, encouraging innovation, building a strong modern and digital infrastructure, and supporting industrial transformation. The main thrust of the resulting recommendations is new regulations and public funding that foster or work with the private sector. Some current government programs are consistent with this approach, such as on-the-job training and education (Skills Future) and the science and technology incubator program (Agency for Science Technology and Research, A*Star), which enables small and medium-sized enterprises to commercialize their research and development findings.

Singapore's approach—as seen, for example, in the Committee on the Future Economy and its recommendations—has more elements of a top-down strategy to improve productivity, but using the private sector as a vehicle. In Australia, the government plays more of a support role, providing institutional frameworks and information but little direct government funding. The distinction is not large, but Singapore's approach, at this early juncture, appears to give the government more engagement and control in the process.

Overall, the most useful parts of the push for productivity, as typified by both Australia and Singapore, will mostly likely be those that are also public goods—that is, clear and enforceable regulations and laws, institutions that could serve to evaluate the use of public money, and efforts to incubate commercially viable firms and industries.

Annex 3.1. Methodology and Data for the Sector-Level Productivity Analysis

This annex describes the regression approach underlying the results discussed in the section in this chapter on "Domestic and External Factors in Productivity Growth." It is based on Griffith, Redding, and van Reenen (2004) and Lee (2016). The dependent variable, labor productivity growth, is related to capital deepening, the labor productivity gap vis-à-vis the United States, research and development (R&D) investment, and trade. Using this baseline regression, two further channels—intra- and inter-industry trade, and foreign direct investment (FDI)—are considered individually.

The detailed construction and sources of the data used in the analysis are presented in Annex Table 3.1.1. The sample period is 1995 to 2007, as reported, and covers three Asian advanced economies[1] and 16 other advanced economies[2] for 24 industries (14 in manufacturing, six in services, and four in other sectors, as defined in Annex Table 3.1.2).

The general form of the regression equations (with lagged explanatory variables to mitigate endogeneity concerns) is:

$$\Delta logLP_{ijt} = \alpha_1 \Delta log(K/L)_{ijt} + \alpha_2 GAP_{ijt-1} + \alpha_3 RD_{ijt-1} + \alpha_4 RD_{ijt-1} \cdot GAP_{ijt-1} + \beta_1 Z_{ijt} + \mu_{ij} + \mu_t + \varepsilon_{ijt},$$

where the subscripts i, j, and t represent country, industry, and year, respectively; LP_{ijt} is labor productivity, which is real value added divided by the product of the number of engaged persons and the relevant purchasing-power-parity exchange rate; $(K/L)_{ijt}$ is the capital-labor ratio (real capital stock divided by the number of engaged persons and the relevant purchasing-power-parity exchange rate); GAP_{ijt} is the labor productivity gap via-à-vis the United States, which can be further defined as $(log(LP_{Fjt}) - log(LP_{ijt}))$; RD_{ijt} is R&D intensity (spending scaled by the industry's value added); μ_{ij} and μ_t are country-industry and year fixed effects, respectively; and ε_{ijt} is a stochastic error term.

Note that Z_{ijt} denotes extra channel variables. The first set of regressions in Annex Table 3.1.3—the columns under (1)—uses lagged imports to output (IM_{ijt}), which is the ratio of imports from the United States to country-industry output, and lagged exports to output (EX_{ijt}), the ratio of exports to the United States to country-industry output. Regression (2) further subdivides the measures of exports and imports to intra-industry and inter-industry flows for four extra channel variables. Regression (3) has FDI^{in}_{ijt}, the ratio of inward FDI to country-industry output, and

Annex Table 3.1.1. Variables and Their Data Sources

Variable	Description	Sources
Labor Productivity (*LP*)	Real value added/(number of engaged × PPP exchange rate)	World Input-Output database 2013; Inklaar and Diewert 2016
Capital/Labor Ratio (*K/L*)	Real capital stock/(number of engaged × PPP exchange rate)	World Input-Output database 2013; Inklaar and Diewert 2016
Productivity Gap (*GAP*)	Labor productivity gap from the U.S. ($ln(LP_F)$-$ln(LP_I)$)	World Input-Output database 2013; Inklaar and Diewert 2016
R&D Intensity (*RD*)	R&D expenditure/value added	OECD STAN database
Import Ratio (*IM*)	Imports from the U.S./output	World Input-Output database 2013
Export Ratio (*EX*)	Exports to the U.S./output	World Input-Output database 2013
Inward FDI Ratio (FDI^{in})	Inward FDI position/output	OECD Statistics; World Input-Output database 2013
Outward FDI Ratio (FDI^{out})	Outward FDI position/output	OECD Statistics; World Input-Output database 2013

Note: "FDI position" includes equities and inter-company loans, but excludes investment income flows and financial flows. FDI = foreign direct investment; OECD = Organisation for Economic Co-operation and Development; PPP = purchasing power parity; R&D = research and development.

Annex authored by Dongyeol Lee.

[1]Japan, Korea and Taiwan Province of China.

[2]Australia, Austria, Belgium, Canada, the Czech Republic, Finland, Germany, Hungary, Italy, Mexico, Poland, Portugal, Romania, Slovenia, Spain, and Turkey.

Annex Table 3.1.2. Industries

Sector	Industry Code	Description
Manufacturing (14)	15–16	Food, beverages, and tobacco
	17–18	Textiles and textile products
	19	Leather, leather products, and footwear
	20	Wood and products of wood and cork
	21–22	Pulp, paper, paper products, printing, and publishing
	23	Coke, refined petroleum, and nuclear fuel
	24	Chemicals and chemical products
	25	Rubber and plastics products
	26	Other nonmetallic mineral products
	27–28	Basic metals and fabricated metal products
	29	Machinery and equipment not elsewhere classified
	30–33	Electrical and optical equipment
	34–35	Transport equipment
	36–37	Manufacturing not elsewhere classified and recycling
Services (6)	50–52	Wholesale and retail trade, repair of motor vehicles and motorcycles
	H	Hotels and restaurants
	60–63	Transport and storage
	64	Post and telecommunications
	J	Financial intermediation
	71–74	Renting of machinery and equipment and other business activities
Other (4)	A–B	Agriculture, hunting, forestry, and fishing
	C	Mining and quarrying
	E	Electricity, gas, and water supply
	F	Construction

Source: United Nations International Standard Industry Classification, Revision 3.
Note: Industry codes are from the International Standard Industrial Classification, Revision 3 (ISIC, Rev. 3).

FDI^{out}_{ijt}, the ratio of outward FDI to country-industry output. In this regression, the R&D terms are dropped to avoid potential endogeneity problems between R&D and FDI.

The estimation of the impact of trade and FDI productivity faces identification issues, in particular reverse causality and omitted variables bias. Our econometric specification tried to address the reverse causality issue by using lagged variables as explanatory variables, an approach that has been widely used in the growth literature (for example, Griffith, Redding, and van Reenen 2004; Woo and Kumar 2015; Ahn and others 2016). The omitted variables bias is addressed through country-industry and year fixed effects. While these steps cannot fully resolve the identification issues, other studies found that ordinary least squares (or fixed effects) estimates do not appear to overstate the trade effects on income/productivity compared to instrumental variables (IV) estimates (for example, Frankel and Romer 1999; Ahn and Duval 2017). Moreover, our econometric specification may be less vulnerable to reverse causality issues than some other country-level estimation in the growth literature as we use industry-level productivity growth and bilateral industry-level trade with the United States (technology frontier). In this setup, the external influences are more likely to be transmitted from the technological frontier to non-frontier countries, not vice versa.

Annex Table 3.1.3. Sectoral Productivity Growth: Domestic and External Factors

	(1)					(2)	(3)
	All	Asian AEs	Other AEs	Manufacturing	Services	All	All
Capital/Labor Growth	0.301***	0.205***	0.321***	0.302***	0.235***	0.300***	0.187***
	(0.067)	(0.051)	(0.074)	(0.088)	(0.044)	(0.068)	(0.048)
Lagged LP Gap	0.127***	0.091***	0.126***	0.119***	0.167***	0.125***	0.288***
	(0.020)	(0.031)	(0.021)	(0.026)	(0.016)	(0.020)	(0.052)
Lagged R&D Intensity	0.256	0.310**	0.116	0.216	2.053*	0.252	
	(0.157)	(0.126)	(0.420)	(0.150)	(1.119)	(0.155)	
Interaction of Lagged R&D and LP Gap	−0.277**	0.307	−0.286	−0.191	−0.703	−0.257*	
	(0.132)	(0.327)	(0.200)	(0.142)	(1.412)	(0.140)	
Lagged Imports to Output	1.279***	1.454	1.258***	1.192***	1.793		
	(0.304)	(1.411)	(0.315)	(0.337)	(1.219)		
Lagged Exports to Output	0.347**	0.248	0.373**	0.441***	−0.988		
	(0.141)	(0.329)	(0.159)	(0.158)	(0.675)		
Lagged Imports to Output (intraindustry)						1.336***	
						(0.381)	
Lagged Imports to Output (interindustry)						1.160**	
						(0.486)	
Lagged Exports to Output (intraindustry)						0.403	
						(0.556)	
Lagged Exports to Output (interindustry)						0.337	
						(0.251)	
Lagged FDI to Output (inward)							0.029*
							(0.016)
Lagged FDI to Output (Outward)							−0.023*
							(0.013)
Country-Industry	403	67	336	249	81	401	182
Observations	4,233	672	3,561	2,723	710	4,211	1,434
R^2—within	0.305	0.233	0.321	0.264	0.561	0.296	0.202

Source: IMF staff calculations.

Note: Numbers in parentheses are robust standard errors clustered at the country-industry level. Constants, country-industry fixed effects, are included but not reported. The sample period is 1995–2007. AEs = advanced economies; FDI = foreign direct investment; LP = labor productivity; R&D = research and development.

*$p < .10$; **$p < .05$; ***$p < .01$.

Annex 3.2. Methodology and Data for the Country-Level Productivity Analysis

This annex relies on estimation at the country level, and is built around a main regression focused on productivity or technology spillovers across borders mainly through two channels—foreign direct investment (FDI) and trade—as well as domestic engines of productivity, best represented by investment in research and development (R&D). It builds on the work of Ang and Madsen (2013).

The regression equation to capture the total factor productivity (TFP) spillovers across countries is defined as:

$$logTFP_{it} = \alpha_0 + \alpha_i + \alpha_t + \beta_1 logR\&D_{it} + \beta_2 logFDI_{it} + \beta_3 Import_{it} + \gamma X_{it} + \varepsilon_{it},$$

where the subscripts i and t represent country and year, respectively; TFP_{it} is total factor productivity; a_0 is the constant term; a_i and a_t are the country and year fixed effects, respectively; $R\&D_{it}$ is a domestic R&D stock constructed from patent data; FDI_{it} is the FDI stock; $Import_{it}$ is the ratio of imports to GDP; X_{it} is the control variables, including financial development and absorptive capacity (interaction terms involving human capital and public capital with FDI); and ε_{it} is a stochastic error term. The tertiary education enrollment rate for men is used as a proxy for human capital because men are the primary workforce in many countries. Stock data on R&D, public capital, and FDI are used rather than flow data, because technology spillovers might occur over the medium to long term. Since the latter are largely predetermined, they alleviate concerns about endogeneity problems, although the issue is not fully resolved because of a lack of suitable instruments. Hence, the results only indicate relationships between productivity and external factors, but not necessarily causality. To avoid problems with multicollinearity, some plausible but highly correlated other control variables are excluded from the set of explanatory variables (for example, the public capital stock is excluded since it is highly correlated with the R&D stock). The detailed construction and sources of the data used in the analysis are presented in Annex Table 3.2.1. This regression forms the basis of the regressions reported in Annex Tables 3.2.2, 3.2.3, and 3.2.4.

The analysis of the relationship between domestic investment and inward FDI considers the following empirical specification:

$$GFCF_{it} = \alpha_0 + \alpha_i + \alpha_t + \beta_1 GFCF_{it-1} + \beta_2 Inward\_FDI_{it} + \beta_3 Growth_{it-1} + \beta_4 i_{it} + \varepsilon_{it},$$

where the subscripts i and t represent country and year, respectively; $GFCF_{it}$ is domestic investment (gross fixed capital formation, both public and private); α_0 is the constant term; α_i and α_t are

Annex Table 3.2.1. Variables and Their Data Sources

Variable	Description	Sources
Total Factor Productivity (TFP)	TFP at constant national prices adjusted at 2011 purchasing power parity (USA = 1)	Penn World Tables 9.0 and Feenstra, Inklaar, and Timmer 2015
Gross Fixed Capital Formation (GFCF)	Gross fixed capital formation (percent of GDP)	IMF World Economic Outlook database
Domestic R&D Stock (R&D)[1]	Estimated using the perpetual inventory method for total patent applications by residents with a 20 percent depreciation rate as in Ang and Madsen 2013	World Intellectual Property Organization
Foreign Direct Investment (FDI)	FDI stock (percent of domestic capital stock)	UNCTAD; Penn World Tables 9.0
Inward FDI (Inward_FDI)	FDI inflow (percent of GDP)	UNCTAD
Public Capital Stock (Public_capital)	General government capital stock (percent of real GDP)	IMF Investment and Capital Stock Dataset
Imports	Imports of goods and services (percent of GDP)	World Development Indicators
Financial Development	Domestic credit to private sector (percent of GDP)	World Development Indicators
Human Capital	Tertiary education enrollment rate for men	World Development Indicators
Interest Rate	Lending interest rate (percent)	World Development Indicators
Real GDP Growth (Real_growth)	Real GDP growth rate	IMF World Economic Outlook database

Note: R&D = research and development; UNCTAD = United Nations Conference on Trade and Development.
[1]To avoid the division by zero problem when taking the log of domestic R&D, the formula log(R&D+0.1^5) is used. The results do not change substantially if we change this specification.

Annex authored by Ryota Nakatani.

Annex Table 3.2.2. Baseline Country-Level Total Factor Productivity Results

	Asia-Pacific	Asian AEs	Other A-P	AEs	EMDEs
R&D Stock	0.005***	0.019***	0.005***	0.008***	0.001
	0.001)	(0.006)	(0.001)	(0.003)	(0.001)
FDI Stock	0.089***	0.067***	0.103***	0.014***	0.046***
	(0.007)	(0.024)	(0.009)	(0.005)	(0.006)
Imports	−0.001***	0.001**	−0.003***	0.001***	−0.002***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Financial Development	0.002***	0.001	0.002***	0.000**	0.001
	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)
Countries	14	5	9	36	70
Observations	454	153	301	1052	2074
R-Squared	0.93	0.81	0.90	0.87	0.93

Source: IMF staff calculations.
Note: White's heteroscedasticity robust standard errors are in parentheses. Constants, country fixed effects, and year fixed effects are included but not reported. AEs = advanced economies; A-P = Asia-Pacific; EMDEs = emerging market and developing economies; FDI = foreign direct investment; R&D = research and development.
*p < .10; **p < .05; ***p < .01.

Annex Table 3.2.3. Absorptive Capacity in Asia

	Asia-Pacific	Asia-Pacific	Asia-Pacific
R&D Stock	0.012***	0.005***	0.023***
	(0.004)	(0.001)	(0.005)
FDI Stock	0.118***	0.087***	0.096***
	(0.012)	(0.008)	(0.013)
Imports	−0.001*	−0.001***	−0.002**
	(0.001)	(0.000)	(0.001)
Financial Development	0.001*	0.002***	0.002**
	(0.001)	(0.000)	(0.001)
Interaction of FDI Stock and Human Capital	0.002**		0.002**
	(0.001)		(0.001)
Interaction of FDI Stock and Public Capital		−0.011	−0.099**
		(0.014)	(0.044)
Countries	12	13	11
Observations	203	430	184
R-Squared	0.95	0.93	0.95

Source: IMF staff calculations.
Note: White's heteroscedasticity robust standard errors are in parentheses. Constants, country fixed effects, and year fixed effects are included but not reported. AEs = advanced economies; EMEs = emerging market economies; FDI = foreign direct investment; R&D = research and development.
*p < .10; **p < .05; ***p < .01.

the country and year fixed effects, respectively; $Inward\_FDI_{it}$ is FDI inflows; $Growth_{it}$ is real GDP growth; i_{it} is a nominal interest rate; and ε_{it} is a stochastic error term. $Growth_{it-1}$ is lagged one year to avoid endogeneity problems, whereas contemporaneous $Inward\_FDI_{it}$ is used to estimate the simultaneous relationship between FDI and domestic investment (*GFCF*). The results of this regression are reported in Annex Table 3.2.5.

Panel unit root regression tests were carried out, indicating that most variables are stationary at the 5 percent level of significance, although the financial development, human capital, and public capital variables have unit roots and are stationary in first differences. The sample in this study covers five Asian advanced economies (Asian AEs),[1] nine other Asia-Pacific economies (other A-P),[2] the Asian advanced economies and other Asia-Pacific economies as one group (Asia-Pacific), 36 advanced economies (AEs),[3] and 70 emerging

[1]Japan, Korea, Hong Kong SAR, Macao SAR and Singapore.
[2]China, Fiji, India, Indonesia, Malaysia, Mongolia, the Philippines, Sri Lanka, and Thailand.
[3]Australia, Austria, Belgium, Canada, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, New Zealand, Norway, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, the United Kingdom, and the United States plus the five Asian advanced economies.

Annex Table 3.2.4. Asia before and after the Global Financial Crisis

	1980–2007	2008–14
R&D Stock	0.010***	0.090***
	(0.003)	(0.027)
FDI Stock	0.127***	0.107***
	(0.014)	(0.027)
Imports	−0.001	−0.003***
	(0.001)	(0.001)
Financial Development	0.002**	0.001
	(0.001)	(0.001)
Interaction of FDI Stock and Human Capital	0.001	0.002**
	(0.001)	(0.001)
Countries	12	11
Observations	137	66
R-Squared	0.97	0.98

Source: IMF staff calculations.
Note: White's heteroscedasticity robust standard errors are in parentheses. Constants, country fixed effects, and year fixed effects are included but not reported. Excludes Australia and New Zealand. AEs = advanced economies; A-P = Asia-Pacific; EMEs = emerging market economies; FDI = foreign direct investment; R&D = research and development.
*$p < .10$; **$p < .05$; ***$p < .01$.

Annex Table 3.2.5. Complementarity between Domestic Investment and Foreign Direct Investment in Emerging and Developing Asia and the Pacific

	1978–2015	1992–2015	1997–2015	2001–15	2008–15
Lagged Investment	0.690***	0.664***	0.571***	0.557***	0.325***
	(0.036)	(0.041)	(0.046)	(0.055)	(0.078)
Inward FDI Flows	0.133**	0.126*	0.146**	0.170***	0.566***
	(0.060)	(0.065)	(0.069)	(0.077)	(0.122)
Lagged Real Growth	0.156**	0.107	0.129	0.111	0.144
	(0.072)	(0.084)	(0.089)	(0.104)	(0.195)
Interest Rate	0.038**	0.036**	0.194**	−0.046	−0.507
	(0.016)	(0.017)	(0.088)	(0.182)	(0.361)
Observations	470	382	330	273	147
R-Squared	0.84	0.83	0.82	0.81	0.83

Source: IMF staff calculations.
Note: Standard errors are in parentheses. Constants, country fixed effects, and year fixed effects are included but not reported. Excludes Australia and New Zealand. FDI = foreign direct investment.
*$p < .10$; **$p < .05$; ***$p < .01$.

market and developing economies (EMDEs)[4] for TFP spillover analyses. It also covers 19 emerging and developing Asia and Pacific economies for the analysis examining the complementarity of investment and FDI.[5] The TFP regressions cover the period (or subperiods of) 1980–2014 (Annex Tables 3.2.2 to 3.2.4), while the investment-FDI regressions cover the period (and subperiods of) 1978–2015 (Annex Table 3.2.5).

[4]Argentina, Armenia, Bahrain, Barbados, Bolivia, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Chile, Colombia, Costa Rica, Côte d'Ivoire, Croatia, the Dominican Republic, Ecuador, Egypt, Guatemala, Honduras, Hungary, Iran, Iraq, Jamaica, Jordan, Kazakhstan, Kenya, Kuwait, the Kyrgyz Republic, Lesotho, Mauritius, Mexico, Moldova, Morocco, Mozambique, Namibia, Nicaragua, Nigeria, Panama, Paraguay, Peru, Poland, Qatar, Romania, Russia, Rwanda, Saudi Arabia, Serbia, Sierra Leone, South Africa, Sudan, Swaziland, Tajikistan, Tanzania, Trinidad and Tobago, Tunisia, Turkey, Ukraine, Uruguay, Venezuela, and Zimbabwe plus the nine other Asia-Pacific economies.

[5]Bangladesh, Bhutan, Brunei Darussalam, China, Fiji, India, Indonesia, Malaysia, Maldives, Mongolia, Myanmar, Nepal, the Philippines, Solomon Islands, Sri Lanka, Thailand, Timor-Leste, Vanuatu, and Vietnam.

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