LONG-TERM PROJECTIONS OF
Asian GDP and Trade

Asian Development Bank
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Acknowledgments

This report, a collection of research products, was prepared as part of a research and development technical assistance project, Long-Term Projections of Asian Gross Domestic Product (GDP) and Trade. Under the overall guidance of Jong-Wha Lee, former chief economist, Economics and Research Department, Asian Development Bank (ADB), the project was managed and coordinated by Akiko Terada-Hagiwara, economist, and Lea Sumulong, senior economics officer, both from Economics and Research Department, ADB.

Key contributors to this project are Jong-Wha Lee and Ruth Francisco (Human Capital Accumulation in Emerging Asia); Jinyoung Kim (Past and Future of the Labor Force in Emerging Asian Economies); Jong-Wha Lee and Kiseok Hong (Economic Growth in Asia: Determinants and Prospects); Jungsoo Park (Projections of Long-Term Total Factor Productivity Growth for 12 Asian Economies); Charles Yuji Horioka and Akiko Terada-Hagiwara (The Determinants and Long-Term Projections of Saving Rates in Developing Asia); Etsuro Shioji and Tuan Khai Vu (Physical Capital Accumulation in Asia 12: Past Trends and Future Projections); and Prema-chandra Athukorala (Asian Trade Flows: Trends, Patterns and Prospects).

Earlier versions of these research products were presented at an inception workshop held at the Bank of Korea, Seoul, Republic of Korea, on 1–2 March 2010, and at a finalization workshop held at the Chinese University of Hong Kong, Hong Kong, China, on 8–9 July 2010. Jessie Pang provided administrative and technical support in organizing the finalization workshop. The following experts provided valuable comments during the two workshops: Shin-ichi Fukuda, Joonkyung Ha, Carsten Holz, Hyun Jeong Kim, Yong Jin Kim, Edward Leung, Pak-Wai Liu, Francis Lui, Weh-Sol Moon, Kwanho Shin, Yun-Wing Sung, Dennis Tao Yang, and Hongliang Zhang.

A special seminar was held at ADB headquarters on 30 September 2010, where valuable suggestions were provided by Maria Socorro Bautista, Juzhong Zhuang, and Joseph Ernest Zveglich, as well as by other participants. The technical assistance project team also benefited from discussions at various conferences, including the Emerging Asia 2030 Workshop, Tokyo, Japan, 24–25 January 2011; Asia–Pacific Economic Association Seventh Annual Conference, Busan, Republic of Korea, 24–25 June 2011; and International Economic Association 16th World Congress, Beijing, People’s Republic of China, 4–8 July 2011.

The final versions of the research products will be edited by Charles Yuji Horioka and Akiko Terada-Hagiwara to be published in a special volume in Japan and the World Economy. Kiseok Hong prepared additional materials and significantly contributed to this report, Kimberly Fullerton did the manuscript editing, and Ariel Paelmo was responsible for the layout and design. Technical and research support was provided by Shiela Camingue assisted by Elenita Pura and Maria Susan Torres. The publication would not have been possible without the cooperation of the Department of External Relations and the Office of Administrative Services, ADB.
Executive Summary

In 2011, uncertainty has cast a dark shadow over global economic prospects. Economic setbacks that are holding back recoveries in many developed economies have been expected to spill over to developing Asia. However, as the Asian Development Outlook 2011 Update confirms, the impact to the region’s economies has been less severe. Developing Asia continued to exhibit steady growth, underpinned by ample fiscal space, low debt, and strong domestic demand. To sustain its growth momentum, developing Asia must build on these gains and turn toward its unfinished growth agenda.

Long-term growth in the region depends largely on supply-side factors, augmented by each economy’s productive capacity. Such growth reflects the combined effects of production factors, such as capital and labor, as well as productivity improvements—not on the short-term business cycle. This distinction matters, as policies for sustaining growth are different from policies for minimizing cyclical fluctuations. The former involves structural supply-side strategies that enable individuals, firms, industries, and the entire economy to become more productive on a sustained basis; the latter involves fiscal and monetary actions for influencing the level of aggregate demand only temporarily.

The regional technical assistance project on Long-Term Projections of Asian Gross Domestic Product (GDP) and Trade, provides careful analyses and projections of the supply-side factors of 12 economies in the region, as well as their GDP and trade growth, for the next 2 decades. This report details the following key findings: (i) the vital driver of the region’s robust growth during the past 3 decades was primarily capital accumulation with the contribution of productivity improvements being relatively limited, (ii) GDP growth rates will gradually slow except for in a few economies during the next 2 decades as a convergence phenomenon kicks in, and (iii) the surge in intraregional trade of the past decades will continue but at a decelerated rate.

Central to these findings is the need for and urgency of growth friendly reforms in developing Asia. While the report confirms that poorer economies tend to grow faster, it also verifies that factors other than initial income are at work, generating income differences across economies. As a result, in the next 2 decades, per worker income is not expected to narrow in the region. Three possible areas—human capital, research and development, and institutions—that can enhance economies’ productive capacities and promote the efficiency-driven growth are highlighted. Such reforms are found to be particularly effective in economies where these initial levels are relatively low, that is, where school enrollment is low, research and development support is weak, and property rights protection is poor.

Reforms are necessary not only for low-income economies, but also for those that have achieved substantial growth already, such as in Asia’s newly industrialized economies. Reforms that facilitate a shift from input-driven growth to efficiency-driven growth will be in increasing demand as population aging progresses and the speed of factor accumulation decelerates.

While these reforms already pose substantial challenges to the region, the research products under the technical assistance project go even farther. From the seven papers produced, the report also discusses four crucial developmental issues: (i) impacts of demographic transitions and the labor force, (ii) policy reforms needed to shift to efficiency-driven growth, (iii) the saving and investment gap in developing Asia, and (iv) convergence in income levels and income growth. In sum, the demographic transition of the region—along with the efficiency enhancing reforms—is crucial in affecting growth dynamics of the region.

As demographic dividends that characterized developing Asia’s newly industrialized economies’ rapid growth fade, the report concludes that it is urgent to increase the labor participation of females and the elderly to moderate the decline in the region’s labor force. Yet, the anticipated relatively strong income growth of the region can offset the negative aging effects on the saving rate to a certain extent. The saving and investment gap of developing Asia is projected to remain positive. Trade projects a similar story, and a consistent picture can also be drawn from the projections for exports and imports.
Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ADB</td>
<td>Asian Development Bank</td>
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<tr>
<td>ASEAN</td>
<td>Association of Southeast Asian Nations</td>
</tr>
<tr>
<td>GDP</td>
<td>gross domestic product</td>
</tr>
<tr>
<td>PRC</td>
<td>People’s Republic of China</td>
</tr>
<tr>
<td>TFP</td>
<td>total factor productivity</td>
</tr>
</tbody>
</table>
I. Introduction

The economies of Asia and the Pacific have shown robust, sustained growth during the 3 decades since 1980, with the region’s real gross domestic product (GDP) in purchasing power parity terms increasing more than sevenfold during 1980–2009, as compared to only threefold in the world economy as a whole. The region’s real per capita GDP increased more than fourfold, as compared to less than twofold in the world economy. This growth has raised living standards, lifted millions of persons out of poverty, and expanded the region’s global economic influence.

While the economies of Asia and the Pacific have shown considerable resilience to the global financial crisis of 2008–2009, they continue to be exposed to internal and external shocks that could affect their growth path and progress toward prosperity, equality, and poverty reduction. The export-led growth model followed by several Asian countries is under reconsideration, as the region’s economies are starting to realize the limits of excessive dependency on exports and the need to rebalance growth by increasing internal demand. More balanced growth will help solve the problem of global imbalances and decrease the region’s dependency on final goods demand from the United States and Europe, although intraregional trade is still too concentrated on intermediate products included in supply chains of manufactured goods destined for non-Asian markets.
Against this backdrop, the region’s economic interdependence is expanding both in the real and financial sectors, and business cycles are becoming increasingly synchronized across the region. At the same time, following the recent adoption of its new long-term strategic framework, Strategy 2020, the Asian Development Bank (ADB) is moving toward expanding its role as a knowledge bank, with increasing advisory functions for member countries, especially on critical economic issues and policies. Thus, it has become increasingly important for ADB to have its own model for long-term projections, especially of the region’s GDP and trade. Such models will help the region better understand the long-term trends of its economies and assist policy makers in coming up with strategic decisions that affect a wide range of economic policies.

This report summarizes the findings of a research and development technical assistance project, Long-Term Projections of Asian GDP and Trade, conducted from 2009 to 2011. This technical assistance has two objectives: (i) to analyze the determinants of each component of GDP in 12 developing economies in the region during the past 40 years; and (ii) to project future trends in GDP and trade for the next 20 years (i.e., until 2030), based on the findings of (i).

The 12 developing economies are the People’s Republic of China; Hong Kong, China; India; Indonesia; the Republic of Korea; Malaysia; Pakistan; the Philippines; Singapore; Taipei, China; Thailand; and Viet Nam. These economies comprise 95% of the GDP of Asia and the Pacific. Seven research products were prepared on GDP as a whole, saving rate, physical capital accumulation, total factor productivity, labor force, human capital accumulation, and international trade flows.

This report also discusses selected topics based on the findings of the technical assistance project. Four issues that have important policy implications for the region’s long-term growth were identified and will be discussed in the second half of this report. They are (i) impacts of demographic transitions and the labor force, (ii) policy reforms needed to shift to efficiency-driven growth, (iii) the saving and investment gap in developing Asia, and (iv) convergence in income levels and income growth.

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1Evidence from an ADB study (2008) and other works show that Asia and the Pacific’s economic cooperation and integration has been rising rapidly during the last decade.


3In this report, they are referred to as “developing Asia.”
II. Summaries and Key Findings

A. Summaries

Seven research products were produced to analyze GDP, its components (i.e., saving rate, physical capital accumulation, total factor productivity [TFP], labor force, and human capital accumulation), and international trade flow. In the following subsection, each paper is summarized.

   JONG-WHA LEE AND RUTH FRANCISCO

Developing Asia has made rapid progress in raising the level of its educational capital during the past 40 years, due in large part to higher school enrollment rates, especially at the secondary level. Lee and Francisco (2010) conducted a regression analysis of the determinants of school enrollment and found that better parental education and income, lower income inequality, declining fertility, and higher public educational expenditures contributed to the increase in school enrollment.

The authors then projected future trends in years of schooling based on the results of the regression analysis and found that average years of schooling in developing Asia are projected to increase only from 7.0 years to 7.6 years by 2030, significantly slower than the 4.1-year increase during 1970–2010. That would put the region’s educational capital in 2030 at only the 1970 level of advanced countries such as the United States or Japan, or still 3.5 years behind the level of advanced countries in 2010. To sustain human development, the region needs to invest in improving educational quality and raising school enrollment rates at the secondary and tertiary levels.

2. Past and Future of the Labor Force in Emerging Asian Economies

Jinyoung Kim

Kim (2010) investigated the determinants of past changes in the labor force of the 12 developing Asian economies, and made projections of the labor force in those economies for 2011–2030. Results from the regression analysis indicate that the labor force has grown faster than the population, has an inverted U-shape relationship with per capita GDP, and is smaller in more capital-intensive countries.

Using extrapolation, the author predicted that the labor force will increase in all 12 economies during the first decade of 2011–2030 but will eventually decline in the People’s Republic of China (PRC); Hong Kong, China; Republic of Korea; Singapore; and Taipei, China. The author also projected the unemployment rate and average working hours in those economies.

3. Economic Growth in Asia: Determinants and Prospects

Jong-Wha Lee and Kiseok Hong

Using a growth accounting framework, Lee and Hong (2010) found that developing Asia grew rapidly over the past 3 decades, mainly due to robust growth in capital accumulation. The contributions of education and TFP in the region’s past economic growth were relatively limited in the past decades.

The authors then made long-term growth projections for developing Asia by combining the growth accounting framework with a growth regression approach. Their baseline projections, based on the model of conditional convergence, showed that the growth rates of GDP of the 12 developing economies for the next 3 decades will be consistently lower than their historical performance. However, policy reforms in education, property rights, and research and development can substantially raise GDP growth in the region and partly offset the slowdown in growth caused by the convergence phenomenon. Yet even under the baseline scenario, the region’s share in the world economy will increase from 34% in 2009 to close to 50% in 2030.

4. Projection of Long-Term Total Factor Productivity Growth for 12 Asian Economies

Jungsoo Park

Park (2010) examined past trends and patterns in the growth of TFP in developing Asia during the past 4 decades. Growth accounting exercises, focused on the contribution of TFP growth, were performed for the 12 developing economies. The results support an accumulationist’s view during the pre-2000 period but show evidence of a growing contribution of TFP during the post-2000 period. The author

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estimated an empirical model of TFP growth augmented with human capital and research and development using a country-level panel dataset, and found that the major source of TFP growth of developing Asia in the early years was a catch-up effect driven by its low base.

However, the author also found that the role of human capital in raising TFP growth has been gradually increasing for Hong Kong, China; the Republic of Korea; Singapore; and Taipei, China, but has stagnated or weakened for other developing Asia economies. Strong growth in TFP is projected for the next 2 decades, supporting the idea that developing Asia will increasingly shift to efficiency-driven growth from input-driven growth.

5. The Determinants and Long-Term Projections of Saving Rates in Developing Asia

CHARLES YUJI HORIOKA AND AKIKO TERADA-HAGIWARA

Against the common perception of developing Asia’s high saving rates, Horioka and Terada-Hagiwara (2010) showed that enormous variation exists among the 12 developing economies in their domestic saving rates, with the nominal domestic saving rate ranging from 39.8% in Singapore to 11.2% in Pakistan during 1966–2007 as a whole. In fact, Viet Nam showed negative real domestic saving rates until it transitioned to a market economy in the 1990s.

The authors then conducted an econometric analysis of the determinants of domestic saving rates in the 12 developing economies during 1966–2007, and found that the main determinants of the domestic saving rate in developing Asia during this period appear to be the age structure of the population, especially the aged dependency ratio, income levels, and level of financial sector development. Their projections suggest that the domestic saving rate in developing Asia as a whole will remain elevated in the next 2 decades, mainly driven by rising income levels, which are only partially offset by aging effects.

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The domestic saving rate in developing Asia as a whole will remain elevated in the next 2 decades, mainly driven by rising income levels, which are only partially offset by aging effects.

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6. Physical Capital Accumulation in Asia-12: Past Trends and Future Projections

ETSURO SHIOJI AND TUAN KHAI VU

Shioji and Khai Vu (2011) investigated the sources of rapid capital accumulation in the region and projected future trends. The authors estimated a convergence equation for physical capital per capita, which was derived from an open economy growth model, using a pooled cross-country, across-decade sample for 1977–2007. The authors found that an economy with a low per capita capital stock tends to experience faster subsequent accumulation. Developing Asia certainly benefited from this convergence effect; however, other factors, such as a low rule of law score and high investment goods prices, worked against it.

Projections for the next 2 decades suggest that the pace of capital accumulation will decline relative to its current level if no reforms are made to enhance potential growth rates. The authors asserted that if developing Asia wishes to maintain its current rapid pace of capital accumulation, the keys are to reduce distortions in the domestic market, as reflected in the relative price of investment goods, and to improve the quality of institutions, as reflected in the rule of law index.

7. Asian Trade Flows: Trends, Patterns, and Prospects

PREMA-CHANDRA ATHUKORALA

Over the past 4 decades, the merchandise trade of developing Asia has grown at a much faster rate than growth in world trade, with a distinct intraregional bias. Global production sharing has become a unique feature of the region’s economic landscape, with the PRC playing a pivotal role as the premier assembly center within regional production networks.

Athukorala (2011b) estimated a standard gravity model of trade flows for each of the 12 developing economies, which suggest that the two standard gravity variables, GDP in pairs and geographic distance, as well as the Logistics Performance Index, an indicator of the quality of trade-related logistics, perform remarkably well in explaining both imports and exports. The projections of trade flows based on the estimation results find that the region’s total real nonoil trade will increase at an annual rate of 8.2% during the next 2 decades, with a notable convergence of individual countries’ rates to the regional average.
B. Key Findings: Gross Domestic Product and Trade Projections, 2011–2030

1. Gross Domestic Product

Using a growth accounting framework, the sources of developing Asia’s GDP growth in 1981–2007 were deconstructed into growth in the different factors of production—labor, human capital, and physical capital—as well as in TFP. The result shows that Asia’s rapid economic growth in nearly 3 decades has been mainly due to robust growth in physical capital accumulation. In 10 out of the 12 economies studied, average growth in physical capital stock was more than 5.8% per year between 1981 and 2007, which contributed more than 2.3 percentage points to average GDP growth. The contributions of human capital and TFP growth to GDP growth during the same period were relatively limited (Figure 1).

A system of equations was set up to estimate the parameters of the growth model described above. The results were then used to generate projections of GDP growth for 2011–2030 for each of the 12 developing economies. In generating GDP projections for the technical assistance project, demographic profiles were considered exogenously given. Population projections were sourced from the United Nations and are assumed to grow according to the medium-variant fertility rate assumption of the United Nations. Labor force and human capital are also considered exogenous to the GDP, and their projections for the next 20 years are generated in Kim (2010) and Lee and Francisco (2010) (Table 1).

In general, the resulting baseline forecasts of annual GDP growth are lower than the historical averages in 1981–2007. (5.5% versus 9.3% for the PRC, and 4.5% versus 5.5% for India, for example, Table 2). Only the projections for Pakistan and the Philippines are higher than the historical averages (by 1.4 and 1.3 percentage points, respectively).

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**Figure 1: Sources of Gross Domestic Product Growth in Developing Asia, 1981–2007**

<table>
<thead>
<tr>
<th>Country</th>
<th>Capital</th>
<th>Labor</th>
<th>Education</th>
<th>TFP</th>
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<tbody>
<tr>
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<td>TAP</td>
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<td>0.5</td>
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</tbody>
</table>

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11This section draws heavily from the material prepared for Box 2.1.2 of Asian Development Outlook 2010 Update based on Lee and Hong (2010).

12It is assumed that the share of physical capital is 0.4 and that the labor share is 0.6. Growth in physical capital must thus be multiplied by 0.4 to get its contribution to GDP growth. The contribution of labor and human capital is similarly calculated, multiplying their growth rates by the 0.6 labor share. TFP is calculated by subtracting the contributions of capital, labor, and human capital from GDP growth.

13See Lee and Hong (2010) for details.
These results are largely driven by a slowdown in labor force growth caused by a demographic transition and the cross-country catch-up phenomenon where the lower-income economies of the region are expected to grow faster than the higher-income economies.

In the next 2 decades, labor force growth is expected to decrease in most economies, mainly due to fertility decline and population aging; Pakistan is the only country where labor force growth is expected to increase in the next 20 years.\textsuperscript{14} The contribution of human capital

\textsuperscript{14}See Section III on demographic dividends.
accumulation is also forecast to decline as economies move closer to best practice school enrollment and completion rates.

Growth in capital stock is projected to contribute less to GDP growth in 2011–2030 than it did in 1981–2007. This is because capital was the major source of growth in the past, and as the marginal productivity of capital declines, the contribution of growth in capital stock to GDP growth tends to fall. Pakistan and the Philippines are the exceptions, since they started off with lower growth in capital stock. These results suggest that, while labor and physical capital have been a major source of growth in developing Asia in the past, the same factors will turn into a main cause of growth slowdown in the future. Human capital growth is also expected to decrease in every economy except for Viet Nam. However, due to its small magnitude, the growth rate of human capital makes only a limited contribution to overall GDP growth in growth accounting.

In contrast to these factors, TFP is expected to maintain a relatively stable growth rate on average between the periods of 1981–2007 and 2011–2030. As a result, the relative contribution of TFP growth in growth accounting will become greater. On average, the contribution of TFP growth remains roughly the same magnitude in the next 2 decades; thus, its relative share in GDP growth should be increasing. In fact, it is only in the PRC and Singapore that the relative contribution of TFP growth does not increase between the periods of 1981–2007 and 2011–2030. The PRC may be an exception because many suspect that its historical TFP growth rate is overestimated. For Singapore, the relative contribution of TFP growth remains almost constant in the two periods at about 29%.

These results generally support the conditional convergence theory. Faster rates of factor accumulation and technology diffusion narrow the gap with potential income, leaving little room to grow further. However, convergence does not imply that as Asia becomes more prosperous, it cannot keep growing fast in the future. Institutional and policy variables can expand the potential income of an economy, widening the gap with the initial income level and allowing for the achievement of a higher growth path. The potential impacts of policy reforms on GDP growth will be discussed in Section III.

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For example, Young (2003) argued that, after correcting for measurement errors in deflators and labor inputs, TFP growth in the nonagricultural economy of the PRC during 1978–1998 was only 1.4% per year. Similarly, Woo (1998) reported TFP growth of 1.1%–1.3% per year for 1979–1993.
2. International Trade Flows

Developing Asia has become increasingly open to foreign trade over the past 4 decades. The average applied tariff rate among the 12 developing economies decreased from about 30% in the late 1980s to about 9% in 2005 (Table 3). Also, total trade as a percentage of GDP more than doubled between 1970 and 2005 throughout the region. It is widely recognized that trade liberalization and the rapid trade expansion have played a key role in developing Asia’s economic growth. One of the most prominent patterns in developing Asia is the significance of intraregional trade, which has been growing much faster than total trade in the region. In fact, the rapid growth of total trade is to a large extent due to the growth of intraregional trade.

The fast growth of intraregional trade has been driven by global production sharing or vertical specialization and the increasingly deep integration of developing Asia, particularly the PRC, into the global production networks (Athukorala 2011a; Ng and Yeats 2003). Vertical specialization, that is, the production of goods using imported inputs, has grown rapidly worldwide since 1960s. Yet the significance of this new form of international specialization has been particularly sizable in Asia.

Global production sharing has changed the region’s economic landscape, with the PRC playing a key role as the premier assembly center in the region and other Asian economies specializing in the production of intermediate goods. A notable outcome of this development has been the rapid growth of cross-border trade within the region and the advancement of the PRC as the region’s export hub. As the region’s export hub, the country is importing more from other Asian economies and exporting more to outside of the region. This runs counter to the popular perception that PRC’s global integration crowds out other countries’ opportunities for international specialization.

Another important, related pattern is the sharp increase in the share of parts and components in total trade. The increased trade in parts and components is driven by the need for vertical specialization. In PRC, the share of parts and components in its total manufacturing imports (44.0%) is much larger than the corresponding share in its exports.

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### Table 3: Average Applied Tariff Rates in Developing Asia, 1980–2006 (%)

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<tbody>
<tr>
<td>China, People’s Republic of</td>
<td>49.5</td>
<td>39.3</td>
<td>40.0</td>
<td>18.8</td>
<td>12.8</td>
</tr>
<tr>
<td>India</td>
<td>74.3</td>
<td>93.5</td>
<td>57.0</td>
<td>33.7</td>
<td>16.8</td>
</tr>
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<td>Indonesia</td>
<td>...</td>
<td>13.7</td>
<td>13.4</td>
<td>6.4</td>
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<tr>
<td>Korea, Republic of</td>
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</tr>
<tr>
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</tr>
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<td>13.1</td>
</tr>
<tr>
<td>Philippines</td>
<td>29.3</td>
<td>27.8</td>
<td>23.7</td>
<td>13.3</td>
<td>5.9</td>
</tr>
<tr>
<td>Singapore</td>
<td>...</td>
<td>0.5</td>
<td>0.4</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>Taipei, China</td>
<td>26.5</td>
<td>16.8</td>
<td>12.5</td>
<td>8.4</td>
<td>5.5</td>
</tr>
<tr>
<td>Thailand</td>
<td>41.2</td>
<td>40.3</td>
<td>37.2</td>
<td>19.6</td>
<td>8.9</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>...</td>
<td>...</td>
<td>13.4</td>
<td>13.7</td>
<td>14.4</td>
</tr>
</tbody>
</table>

... = data not available.

Note: Simple averages of most-favored-nation rates.

Source: Athukorala (2011b).
(25.6%). This difference is consistent with the production sharing in the region, where Association of Southeast Asian Nations (ASEAN) countries produce parts and components for final assembly activities in the PRC. Using the parts and components imported from ASEAN countries, the PRC produces final goods that are exported to the rest of the world. In spite of its intrinsic comparative advantage, India still remains a minor player in this new form of international exchange (Krueger 2010).

Using standard gravity models estimated for exports and imports, Athukorala (2011b) extended the historical patterns and trends in the series and produces forecasts. Projections are for total nonoil exports and imports from the region’s developing countries to increase at an annual rate of 8.5% and 7.8%, respectively, during 2011–2020 and 2021–2030, exhibiting a mild slowdown in the rate of growth over time. The growth of intraregional trade will be about 1.2 percentage points faster, resulting in an increase in the intraregional share in total exports and imports (Table 4). As a result, trade openness in developing Asia is project to average 46% and 65%, respectively for 2011–2020 and 2011–2030 (Table 5). Trajectories of the intraregional trade, however, will heavily depend on how the regional production network evolves in tandem with the increasing purchasing power of the region and exchange rate adjustments globally.

### Table 4: Projections for Intraregional Trade–Total Trade Ratio in Developing Asia, 2011–2030

<table>
<thead>
<tr>
<th>Economy</th>
<th>2011–2020</th>
<th>2021–2030</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exports</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>China, People’s Republic of</td>
<td>54.3</td>
<td>58.5</td>
</tr>
<tr>
<td>Hong Kong, China</td>
<td>68.4</td>
<td>70.7</td>
</tr>
<tr>
<td>India</td>
<td>61.0</td>
<td>65.6</td>
</tr>
<tr>
<td>Indonesia</td>
<td>75.7</td>
<td>87.7</td>
</tr>
<tr>
<td>Korea, Republic of</td>
<td>62.7</td>
<td>67.2</td>
</tr>
<tr>
<td>Malaysia</td>
<td>72.9</td>
<td>76.5</td>
</tr>
<tr>
<td>Pakistan</td>
<td>45.8</td>
<td>49.1</td>
</tr>
<tr>
<td>Philippines</td>
<td>71.8</td>
<td>76.8</td>
</tr>
<tr>
<td>Singapore</td>
<td>82.3</td>
<td>85.0</td>
</tr>
<tr>
<td>Taipei, China</td>
<td>60.1</td>
<td>63.4</td>
</tr>
<tr>
<td>Thailand</td>
<td>73.9</td>
<td>77.1</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>67.1</td>
<td>71.3</td>
</tr>
<tr>
<td><strong>Imports</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>China, People’s Republic of</td>
<td>44.6</td>
<td>48.5</td>
</tr>
<tr>
<td>Hong Kong, China</td>
<td>90.7</td>
<td>92.6</td>
</tr>
<tr>
<td>India</td>
<td>42.2</td>
<td>46.2</td>
</tr>
<tr>
<td>Indonesia</td>
<td>58.5</td>
<td>69.2</td>
</tr>
<tr>
<td>Korea, Republic of</td>
<td>52.5</td>
<td>56.9</td>
</tr>
<tr>
<td>Malaysia</td>
<td>62.1</td>
<td>66.4</td>
</tr>
<tr>
<td>Pakistan</td>
<td>57.2</td>
<td>62.0</td>
</tr>
<tr>
<td>Philippines</td>
<td>69.9</td>
<td>73.8</td>
</tr>
<tr>
<td>Singapore</td>
<td>70.5</td>
<td>74.2</td>
</tr>
<tr>
<td>Taipei, China</td>
<td>63.0</td>
<td>68.2</td>
</tr>
<tr>
<td>Thailand</td>
<td>68.7</td>
<td>72.2</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>81.7</td>
<td>84.0</td>
</tr>
</tbody>
</table>

Source: Athukorala (2011b).

Note: Trade openness = (exports + imports)/2 as percentage of gross domestic product.

### Table 5: Projections for Trade Openness in Developing Asia, 2011–2030

<table>
<thead>
<tr>
<th>Economy</th>
<th>2011–2020</th>
<th>2021–2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>China, People’s Republic of</td>
<td>49.6</td>
<td>70.5</td>
</tr>
<tr>
<td>Hong Kong, China</td>
<td>162.8</td>
<td>184.7</td>
</tr>
<tr>
<td>India</td>
<td>8.6</td>
<td>11.1</td>
</tr>
<tr>
<td>Indonesia</td>
<td>44.7</td>
<td>63.8</td>
</tr>
<tr>
<td>Korea, Republic of</td>
<td>50.3</td>
<td>65.3</td>
</tr>
<tr>
<td>Malaysia</td>
<td>129.5</td>
<td>171.5</td>
</tr>
<tr>
<td>Pakistan</td>
<td>18.7</td>
<td>23.0</td>
</tr>
<tr>
<td>Philippines</td>
<td>152.1</td>
<td>231.9</td>
</tr>
<tr>
<td>Singapore</td>
<td>175.9</td>
<td>234.1</td>
</tr>
<tr>
<td>Taipei, China</td>
<td>56.4</td>
<td>75.0</td>
</tr>
<tr>
<td>Thailand</td>
<td>73.8</td>
<td>95.7</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>69.0</td>
<td>91.6</td>
</tr>
<tr>
<td>Developing Asia</td>
<td>46.4</td>
<td>64.6</td>
</tr>
</tbody>
</table>

Note: Trade openness = (exports + imports)/2 as percentage of gross domestic product.

Source: Athukorala (2011b).
III. Selected Issues

A. Demographic Dividends and the Role of the Labor Force in Asia’s Growth

Demographic changes have clear, significant impacts on GDP growth. The growth accounting analysis undertaken by Lee and Hong (2010) shows that changes in the labor force account for a large part of the changes in GDP growth in developing Asia. For example, the average GDP growth rate among developing economies in the region is expected to decrease by 1.3 percentage points from 1981–2007 to 2011–2030, and about 48% of the decline can be attributed to the slowdown in labor growth. Also, per capita GDP growth is expected to decrease by about 1 percentage point, even though per worker GDP growth remains roughly constant, because the ratio of the labor force to the total population decreases. This suggests that, while developing Asia so far has been benefiting from the high growth of its labor force, the demographic dividend will gradually run out in the future.

Across individual economies, however, the pace of the demographic change will be diverse. In economies where the demographic dividend was started earlier, such as Hong Kong, China; the Republic of Korea; Singapore; and Taipei, China, labor force growth is forecast not only to slow down but even to turn negative during the next 2
decades. On the other hand, countries that entered the demographic transition later, such as India, Indonesia, Malaysia, Pakistan, and the Philippines, will be able to enjoy favorable demographic conditions throughout 2011–2030.

The slowdown in labor force growth is caused mainly by mortality and fertility decline as well as population aging. A fall in infant mortality, which typically precedes fertility decline by a few decades in each country, initially increases the labor force when more infants grow to working age. Also, a decline in fertility, which more than offsets the effect of the preceding drop in mortality, leads to a decrease in young dependents and thus an increase in the proportion of working-age people and the labor force in the total population. However, as the working-age cohort grows older, the proportion of the elderly will increase, and the initial increase in the labor force will be reversed.

The self-generated swing in the age structure of the population means that a period of high labor force growth will necessarily be followed by a period of low labor force growth. The labor force projection of Kim (2010) confirms these dynamics. According to his forecasts, the labor force in the People’s Republic of China (PRC); Hong Kong, China; the Republic of Korea; Singapore; and Taipei, China will reach its peak around 2020 and then start to decrease. In contrast, other countries, including India, Indonesia, Pakistan, and the Philippines, are projected to maintain a steady increase in their labor forces until 2030.

The pace of demographic transition in East Asia has been one of the fastest in history. The transition from high fertility and high mortality to low fertility and low mortality took more than a century in Europe but only several decades in East Asia. The rapid pace of transition implies that the age structure of the population and the growth rate of labor force should manifest accordingly as large fluctuations in East Asia.

Changes in the age structure and the labor force may affect economic growth through many channels. First, an increase in labor force growth will directly contribute to GDP growth. Second, an increase in the ratio of the labor force to the total population can have a positive

Figure 2: Demographic Transition in East Asia versus South and Southeast Asia

<table>
<thead>
<tr>
<th>Year</th>
<th>Ratio</th>
<th>East Asia</th>
<th>South and Southeast Asia</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>0.3</td>
<td>0.16</td>
<td>0.08</td>
</tr>
<tr>
<td>1990</td>
<td>0.35</td>
<td>0.21</td>
<td>0.12</td>
</tr>
<tr>
<td>2000</td>
<td>0.4</td>
<td>0.25</td>
<td>0.15</td>
</tr>
<tr>
<td>2010</td>
<td>0.45</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>2020</td>
<td>0.5</td>
<td>0.35</td>
<td>0.25</td>
</tr>
<tr>
<td>2030</td>
<td>0.55</td>
<td>0.4</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Note: Working age refers to ages 15–64 years.
Sources: Kim (2010) and author’s calculations.
When the labor force or working-age population grows faster than the total population, per capita GDP is positively affected.

The above equation shows that, given the growth rate of GDP per worker, an increase in the labor force–population ratio will result in an increase in the growth rate of GDP per capita. When the labor force or working-age population grows faster than the total population, per capita GDP is positively affected. Bloom and Williamson (1998) argued that this demographic dividend has characterized East Asia’s rapid growth since the 1970s.

Demographic factors can also indirectly contribute to growth through changes in saving and investment. An increase in saving and investment leads to an increase in the growth rate of GDP per worker in the above equation, by generating greater capital accumulation. The standard life-cycle hypothesis predicts that the aggregate saving rate will be systematically influenced by the age structure of the population. The analysis by Horioka and Terada-Hagiwara (2010) on the saving rate supports the prediction. They showed that the saving rate is negatively correlated with both the youth dependency ratio and the elderly dependency ratio. According to their results, the demographic transition in Asia has contributed to capital accumulation as well to raising the saving rate. An increase in the working-age population may boost investment demand at the same time by raising the marginal product of capital. Also, low fertility may lead to more educational spending per child and thus greater human capital per worker.

The demographic dividend, however, is only transitional. In time, the working-age cohort will move into an elderly cohort, and the same forces that generated the demographic dividend will now work to slow economic growth. As Figure 2 shows, the labor force as percentages of the total population is expected to start decreasing around 2020 among East Asian economies, while continuing to increase among the other economies. The average of the technical assistance project’s 12 developing economies is expected to peak around 2025 and then to decrease slightly.
The difference between the two groups of economies with respect to the movements of labor force and saving rates translate differently in per capita GDP growth. Driven by the stagnant growth in labor force participation rates, the per capita GDP growth rate will exhibit a substantial fall in East Asian economies but a modest increase in South and Southeast Asian economies during the next 2 decades (Figure 3).

Economies in different stages of demographic transition need different policy responses. In economies with a rapidly aging population, it is urgent to increase the labor participation of females and the elderly to moderate the decline in the labor force. For relatively young economies, it may be more important to try to reap the demographic dividend while it lasts. The demographic dividend is not automatic, and the magnitude of the demographic dividend will depend on the economy’s ability to use the extra labor force. Latin American economies experienced a similarly rapid increase in the working-age population around the same period as East Asian economies, yet their economic performance was not as remarkable. Relatively young economies such as those in South and Southeast Asia should be able to benefit from the experiences of their aging predecessors in East Asia and Latin America.

**B. Reforms for Efficiency-Driven Growth**

One of the most prominent features of the baseline GDP forecasts by Lee and Hong (2010) is the slowdown in GDP growth. In almost all of the 12 economies covered, except for Pakistan and the Philippines, the annual GDP growth rate forecast for 2011–2030 is lower than the historical average over 1981–2007. For example, forecasts for PRC GDP growth are 6.1% for 2011–2020 and 5.0% for 2021–2030, substantially lower than the historical average of 9.4%. Also, in all of the 12 developing economies, the GDP growth rate is projected to decrease between the periods of 2011–2020 and 2021–2030.

The growth-accounting analysis provided in the technical assistance project helps reveal from where the slowdown originates, as discussed in Section II. The decomposition of the sources of growth shows that the GDP growth rate will slow mainly due to a substantial fall in the growth rate of the labor force and that of physical capital stock.

The observation that input-driven growth cannot be sustained signifies the importance of efficiency-driven growth via human capital accumulation and total factor productivity (TFP) growth. In principle, under the Cobb-Douglas representation of the production function assumed in the technical assistance project, human capital is regarded as a factor input that contributes to production in the same way as physical capital and labor. Also, the growth-accounting analyses in Lee and Hong (2010) show that the contribution by human capital is small and decreasing. However, this does not necessarily imply that human capital is irrelevant for efficiency-driven growth. First, the measure of human capital used in the majority of the literature is a function simply of the number of schooling years and thus does not incorporate quality of education. When quality of education is taken into account, the slowdown in human capital growth may be reduced or even reversed.
Second, and more importantly, the level of human capital may positively affect TFP growth by increasing the research and development capacity of the economy as in the endogenous growth theory (Romer 1990; Aghion and Howitt 1998) or by facilitating the adoption and implementation of new technologies (Benhabib and Spiegel 1994). This suggests that human capital may contribute to production in more comprehensive ways than assumed in the standard growth-accounting analysis.

In both the neoclassical and the endogenous growth models, the ultimate source of sustained growth is TFP growth. TFP growth also may exhibit a slowdown as developing economies catch up with developed economies through technology imitation and learning. However, as mentioned above, the average TFP growth rate in the region does not show a substantial change between the periods of 1981–2007 and 2011–2030, suggesting that convergence may not be the dominant force that drives the movement of TFP in the region. Thus, developing Asia can partly offset the slowdown in growth by maintaining high TFP growth.

According to endogenous growth theories, TFP growth may be promoted through various policy measures and institutional changes. For example, in the endogenous growth model of Aghion and Howitt (2005), productive research and development, high education, and protection of innovation rents against imitation all promote innovations and thus increase the productivity growth rate. This suggests that policy reforms for a good educational system, property right protection, and support for research and development investment should be given high priority.

The reform scenario in Lee and Hong (2010) represents this view. In particular, they considered simultaneous changes in the three measures: (i) the growth rate of research and development stock per worker in each economy will increase...
from the historical average by 0.02 * (log per worker research and development level of the United States – log per worker research and development level of each economy) as long as the level difference is positive; (ii) property rights of every economy reach the level of the United States by 2020 and remain constant afterwards; and (iii) school enrollment rates in each economy will grow logistically over time to converge to the best prevailing enrollment rates among the developing economies by 2030. Under this scenario, the GDP growth rate in each economy was shown to increase by about 1 percentage point on average, with greater gains accruing to less developed economies with low initial values of policy variables (Figures 4 and 5). This result suggests that, through the policy reforms, developing Asia can substantially increase its growth performance and partly offset the slowdown caused by demographic changes and the convergence phenomenon.

To be sure, the list of policy variables relevant for sustained growth is not limited to the three measures mentioned above. Openness, governance, entry costs to new firms, and other institutional factors may be equally important for productivity growth. Depending on country-specific conditions, different policy reforms may be needed. Also, a policy measure may interact with the effect of other variables on economic growth. For example, Murphy, Shleifer, and Vishny (1991) reported that countries with more engineering students have higher growth than countries with more law students. Education may not contribute much to growth if countries lack the institutional environment that promotes entrepreneurship against rent-seeking behavior. Due to the interaction effects, simultaneous reforms in various measures may have accelerating impacts on economic growth if undertaken properly.

**Figure 5: Average Gross Domestic Product Growth Rate Projections: Baseline versus Reform Scenario**

To be sure, the list of policy variables relevant for sustained growth is not limited to the three measures mentioned above. Openness, governance, entry costs to new firms, and other institutional factors may be equally important for productivity growth. Depending on country-specific conditions, different policy reforms may be needed. Also, a policy measure may interact with the effect of other variables on economic growth. For example, Murphy, Shleifer, and Vishny (1991) reported that countries with more engineering students have higher growth than countries with more law students. Education may not contribute much to growth if countries lack the institutional environment that promotes entrepreneurship against rent-seeking behavior. Due to the interaction effects, simultaneous reforms in various measures may have accelerating impacts on economic growth if undertaken properly.

C. Developing Asia’s Saving and Investment Gap

Global imbalances, measured as the sum in absolute terms of the current account positions of all economies as a rate of the world GDP, fell by nearly one-half in the aftermath of the global financial crisis after reaching a high of over 5% of world
GDP in 2008. The narrowing was largely due to the decline in oil prices that led to a halving of the current account surplus of Middle Eastern economies and the rise in saving in the United States. Asia’s contributions to the narrowing trend have been limited, however, given its robust growth relative to the rest of the world.

Given the still significant contribution of the region’s current account surplus, or surplus saving over investment, to the global imbalance, trajectories of its saving and investment rates are of great interest. Over the past decades, the saving and investment gap is found to be persistently positive in the PRC; Hong Kong, China; Indonesia; Malaysia; and Singapore, while others such as India, Pakistan, the Philippines, and Viet Nam always borrowed from abroad to finance their domestic investments (Figure 6).

Population aging is projected to occur at a rapid rate in developing Asia as discussed in the previous subsection, which will presumably lead to a sharp decline in saving rates. If so, the large, current account surpluses that exist in some economies will go away by themselves. However, if other factors, such as culture, market imperfections, or a per capita income upsurge, are the dominant determinants of saving rates, it is possible that saving rates will remain high.

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Figure 6: Saving and Investment Gap of the Past 4 Decades in Developing Asia (decade average)

( ) = negative.
Sources: Heston, Summers, and Aten (2009); and Horioka and Terada-Hagiwara (2010).
As discussed in the previous section, 20-year projections based on Horioka and Terada-Hagiwara (2010) suggest that the domestic saving rates in developing Asia will decrease in rapidly aging economies such as Hong Kong, China; the Republic of Korea; Singapore; and Taipei, China. On the other hand, in economies where aging of the population is not as imminent as those in East Asia (i.e., the PRC), Indonesia, India, Malaysia, Pakistan, and the Philippines, the domestic saving rates are projected to increase moderately or to remain at a similar level of the recent past.

Meanwhile, Shioji and Khai Vu (2011) investigated and projected the capital accumulation and investment ratios for the next 20 years for the region. According to the study, capital accumulation is expected to accelerate through improvement in TFP while contributions from a catch-up effect and labor force increase will gradually fade. The study also confirmed the variation across the economies. For example, the PRC and India, where capital accumulation is still low, can expect a catch-up effect, say, relative to Singapore. Meanwhile, factors such as low TFP and higher relative price of investment goods would decelerate capital accumulation.

The study concluded that developing Asia will continue with the per capita capital accumulation over the next 20 years but at a slower speed in some economies such as the PRC, the Republic of Korea, and Viet Nam. It also projected a decrease in the domestic investment rate for the PRC and the Republic of Korea, which together comprise more than 60% of GDP in the region, and a moderate downward trend throughout the region. Given that the saving rate is expected to remain at a similar level of the recent past, it suggested that a positive saving and investment gap or a current account surplus of a similar or larger magnitude will still remain in the next 2 decades (Figure 7). Trade-side projections in Athukorala (2011b) also provided a consistent picture with persistent trade...

---

**Figure 7: Domestic Saving Rate, Investment Rate, and Current Account, Current and Future Trends**

<table>
<thead>
<tr>
<th>Year Range</th>
<th>Percentage Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1986–1990</td>
<td>6 (45)</td>
</tr>
<tr>
<td>1991–1995</td>
<td>3 (30)</td>
</tr>
<tr>
<td>1996–2000</td>
<td>1 (15)</td>
</tr>
<tr>
<td>2001–2007</td>
<td>2 (5)</td>
</tr>
<tr>
<td>2011–2020</td>
<td>-1 (2)</td>
</tr>
<tr>
<td>2021–2030</td>
<td>-3 (15)</td>
</tr>
</tbody>
</table>

( ) = negative.
Sources: Horioka and Terada-Hagiwara (2010); Shioji and Khai Vu (2011).
surpluses projected over the next 2 decades.

The trajectory of the saving and investment gap in developing Asia as a whole appears to be heavily influenced by the trend in the PRC, which will account for more than 50% of regional GDP in the next 2 decades. Any new policy developments, such as increasing expenditures on social services and pensions and a reduced corporate saving rate affecting the domestic saving rate in the PRC, are of great importance to reduce the saving rate in the region as a whole. Also, investment rates will increase rather than decrease if the prices of capital goods fall, TFP improves, and/or a structural formation leads to a larger industry sector.

D. Income Convergence in Developing Asia

Long-term GDP projections portray a promising future for developing Asia. According to the baseline projection, the region’s share in the world economy will grow from 34% in 2009 to about 50% in 2030. Also, per capita GDP in each country is expected to increase by about 75% on average between 2009 and 2030. However, this remarkable growth will not be equally experienced by the 12 economies in the region. An important question regarding the growth differential across economies is the issue of convergence in income levels. Are poorer countries projected to grow faster than wealthier countries, with other things being equal? Will the dispersion of income levels across countries actually diminish over time? If so, what will be the speed of convergence? The results of this project suggest that, while the conventional 2% speed of conditional convergence is embedded in the projection, the cross-sectional dispersion of income levels may remain.

1. $\beta$ Convergence

The most commonly used definition of convergence, $\beta$ convergence, measures the relationship between the initial income level and the subsequent income growth. A negative correlation between the two implies that, with other things being equal, poorer countries will tend to grow faster. A conventional estimate of $\beta$ convergence is 0.02; a doubling up of the initial income level is associated with a 2-percentage point decrease in
the growth rate (Barro and Sala-i-Martin 1995).

Historical performance of the technical assistance project’s 12 developing economies covered for this project seems to be consistent with the convergence hypothesis. First, even without controlling for possible differences in the steady-state income levels across economies, there appears to be a negative relationship between the initial income level and subsequent income growth. For example, the PRC, which had the lowest initial level of GDP per worker, grew the fastest from 1981 to 2007. On the other hand, Singapore and Hong Kong, China, with significantly higher GDP per worker in 1980, registered relatively lower rates of growth. This unconditional convergence is more apparent in capital stock per worker and TFP, as shown in Figure 2 of Lee and Hong (2010).

Second, the multivariate regression results of Lee and Hong (2010) support conditional convergence. While there is no separate equation for GDP growth in Lee and Hong’s model, Table 2 of their paper shows that for each growth of per worker capital stock and TFP growth, the coefficient on the corresponding initial level is statistically significant and close to -0.02. If GDP growth is given by the sum of capital stock growth and TFP growth, the implied speed of convergence for GDP growth is also close to 2%.16

Lee and Hong made GDP projections by explicitly incorporating the convergence results obtained from regression analysis into the standard growth-accounting framework. Thus, their projections can be regarded as representing the conventional view on income convergence. However, the β convergence embedded in Lee and Hong’s projection does not necessarily imply that the cross-country income gap will exhibit a decreasing trend over time in their forecasts, as explained below.

2. σ Convergence

An alternative type of convergence, σ convergence, measures the cross-sectional standard deviation of GDP per capita (or per worker) among countries. If poor countries actually catch up with rich countries, the dispersion of income levels across countries will decrease over time. As is widely noted (Barro and Sala-i-Matin 1995; Young, Higgins, and Levy 2008), β convergence and σ convergence are related but not equal—β convergence is a necessary condition for σ convergence but not vice versa. This can be illustrated by the following example of a stylized growth regression:

\[
\Delta \ln y_{it} = -\beta \ln y_{i,t-1} + \epsilon_{it}
\]

\[
\ln y_{i,t} = (1 - \beta) \ln y_{i,t-1} + \epsilon_{i,t}
\]

\[
\text{var}(\ln y) = (1 - \beta)^2 \text{var}(\ln y_{i,t-1}) + \text{var}(\epsilon_t)
\]

where time subscript i,t denotes the ith observation in period t, and var(\epsilon_t) denotes the cross-sectional variance of x in period t. The last equation shows that the cross-sectional variance of income level can unanimously decrease over time only if β convergence holds, that is, 0 < β < 1. It is also clear that, even with 0 < β < 1, income variance may either decrease, increase, or stay constant as long as var(\epsilon_t) ≠ 0. In other words, even when there is β convergence, σ convergence may well be absent. Cross-sectional income dispersion is likely to decrease over time when β is large and var(\epsilon) is small.17

---

16Suppose that capital stock per labor and TFP each exhibits β convergence of 2% and that GDP is given by a Cobb-Douglas production function:

\[
\Delta \ln A_t = 0.02(\ln(A^*) - \ln(A_{i,t-1})), \Delta \ln k_t = 0.02(\ln(k^*) - \ln(k_{i,t-1})),
\]

\[
\Delta \ln y_t = \Delta \ln A_t + \Delta \ln k_t = 0.02(\ln(A^*) - \ln(A_{i,t-1})), \Delta \ln k_t = 0.02(\ln(k^*) - \ln(k_{i,t-1})),
\]

By combining the above equations, one can obtain the following:

\[
\Delta \ln y_t = \Delta \ln A_t + \Delta \ln k_t = 0.02(\ln(A^*) - \ln(A_{i,t-1})), \Delta \ln k_t = 0.02(\ln(k^*) - \ln(k_{i,t-1})),
\]

\[
= 0.02(\ln(A^*) - \ln(k^*) - \ln(A_{i,t-1})) - \ln(k_{i,t-1})\]

\[
= 0.02(\ln(y^*) - \ln(y_{i,t-1})),
\]

17This can be seen in the following equation. If var(\epsilon_t) is nonzero and constant, the following holds:

\[
\Delta \text{var}(\ln y_{i,t}) > 0 \quad \text{if and only if} \quad \text{var}(\ln y_t) > \frac{\text{var}(\epsilon_t)}{1 - (1 - \beta)^2}
\]
The movement of the historical standard deviation of GDP per worker among the TA project’s 12 developing economies can be understood within this context. The theoretical distinction between $\beta$ convergence and $\sigma$ convergence implies that it is entirely possible for the cross-sectional income dispersion not to exhibit monotonic dynamics.

In the next 2 decades, GDP projections by Lee and Hong provide a mixed picture regarding income dispersion in the region. The income dispersion (GDP per worker) exhibits an increasing trend over time, suggesting that the cross-country income gap may actually increase in the future despite the $\beta$ convergence (Figure 8A). In contrast, the standard deviation of GDP per capita exhibits a decreasing trend over time for most of the projection period (Figure 8B). As described previously, the difference between GDP per worker and GDP per capita is the labor force–population ratio. Since the labor force–population ratio is projected to rapidly converge among economies, GDP per capita may exhibit $\sigma$ convergence while GDP per worker does not.

However, under the reform scenario of Lee and Hong, the cross-country income gap actually decreases over time for both GDP per worker and GDP per capita (Figure 9A and 9B). This result is not entirely surprising because the reform scenario considers cross-country convergence in research and development stock per worker, property rights, and school enrollment rates. To narrow the cross-country income gap or $\sigma$ convergence, developing Asia needs to exert its efforts to catch up with best practices in institutional and human capital development.

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Figure 8: Cross-Country Income Dispersion Under the Baseline Scenario

![Figure 8](image1.png)

Source: Lee and Hong (2010).

Note: Income dispersion is computed as the standard deviation of log (GDP per worker) or log (GDP per capita).

Figure 9: Cross-Country Income Dispersion Under the Reform Scenario

![Figure 9](image2.png)

Source: Lee and Hong (2010).

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10While the residual term is assumed to be zero, thus $\text{var}(c_t) = 0$ in the projection, there are other explanatory variables than initial income that have nonzero cross-sectional variances. Therefore, Figure 8 is not inconsistent with the $\beta$ convergence embodied in the projection.
References


Long-Term Projections of Asian GDP and Trade

Long-Term growth in the region depends largely on supply-side factors, augmented by each economy’s productive capacity. Such growth reflects the combined effects of production factors, such as capital and labor, as well as productivity improvements—not on the short-term business cycle. This distinction matters, as policies for sustaining growth are different from policies for minimizing cyclical fluctuations. This report details the key findings of the Asian Development Bank’s project on Long-Term Projections of Asian Gross Domestic Product (GDP) and Trade.

About the Asian Development Bank

ADB’s vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries reduce poverty and improve the quality of life of their people. Despite the region’s many successes, it remains home to two-thirds of the world’s poor: 1.8 billion people who live on less than $2 a day, with 903 million struggling on less than $2 a day. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

Based in Manila, ADB is owned by 67 members, including 48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.