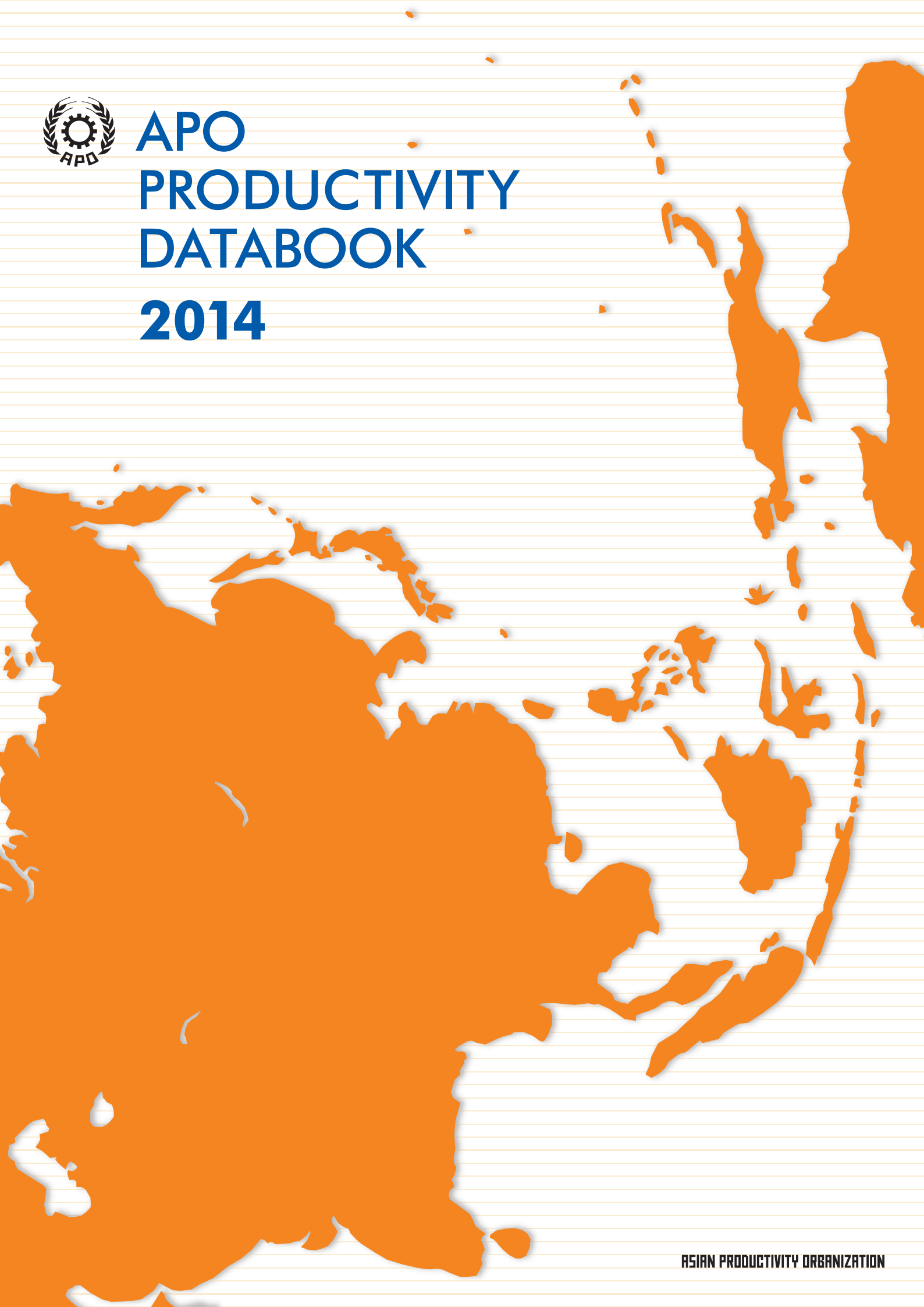
# APO PRODUCTIVITY DATABOOK 2014



ASIAN PRODUCTIVITY ORGANIZATION


# APO PRODUCTIVITY DATABOOK 2014

ASIAN PRODUCTIVITY ORGANIZATION

Designed in Tokyo by
Koh Tsuchiya / Perfect Vacuum

Printed in Japan by
Keio University Press Inc., Tokyo

for
ASIAN PRODUCTIVITY ORGANIZATION
Leaf Square Hongo Building, 2F
1-24-1 Hongo, Bunkyo-ku, Tokyo, 113-0033,
Japan

ISBN 978-92-833-2456-0 (Paperback)
ISBN 978-92-833-2457-7 (PDF)

# Contents

## Box



## Table

## Figure

## Abbreviations

| | |
|---|---|
| **ADB** | Asian Development Bank |
| **APO** | Asian Productivity Organization |
| **APO20** | 20 member economies of the Asian Productivity Organization: Bangladesh, Cambodia, the Republic of China, Fiji, Hong Kong, India, Indonesia, Islamic Republic of Iran, Japan, the Republic of Korea, the Lao PDR, Malaysia, Mongolia, Nepal, Pakistan, the Philippines, Singapore, Sri Lanka, Thailand, and Vietnam |
| **AQGM** | Asian quarterly growth map |
| **ASEAN** | Association of Southeast Asian Nations: Brunei, Cambodia, Indonesia, the Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam |
| **ASEAN6** | Brunei, Indonesia, Malaysia, the Philippines, Singapore, and Thailand |
| **Asia23** | APO20 plus the People's Republic of China, Brunei, and Myanmar |
| **Asia29** | Asia23 plus GCC countries |
| **CLMV** | Cambodia, the Lao PDR, Myanmar, and Vietnam |
| **CPI** | consumer price index |
| **EU** | European Union |
| **EU15** | 15 member economies of the European Union prior to enlargement: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and the United Kingdom |
| **EU27** | European Union: EU15 plus Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovak Republic, and Slovenia |
| **FISIM** | financial intermediation services indirectly measured |
| **GCC** | Gulf Cooperation Council: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the UAE |
| **GDP** | gross domestic product |
| **GFCF** | gross fixed capital formation |
| **GNI** | gross national income |
| **ICP** | International Comparisons Program |
| **IMF** | International Monetary Fund |
| **ISIC** | International Standard Industry Classification |
| **IT** | information technology |
| **KEO** | Keio Economic Observatory, Keio University |
| **Lao PDR** | Lao People's Democratic Republic |
| **NPISHs** | non-profit institutions serving households |
| **OECD** | Organisation for Economic Co-operation and Development |
| **PPP** | purchasing power parity |
| **QNA** | quarterly national accounts |
| **ROC** | Republic of China |
| **SNA** | System of National Accounts |
| **TFP** | total factor productivity |
| **UAE** | United Arab Emirates |
| **UN** | United Nations |
| **UNSD** | United Nations Statistics Division |
| **US** | United States |

# Foreword

Today, we are witnessing ever-vibrant dynamism in the Asian economies. This vitality has been prompted by multiple factors, including globalization, diversified division of labor, and economic integrations. The changes and challenges member economies face in this era demand the APO to devise new productivity drivers. Currently, the APO is working on its Roadmap 2020 to illustrate how we enhance productivity further with specific activities. This will assist the member economies in becoming more productive and competitive, while ensuring equal distribution of productivity gains.

Measuring productivity is one of the core research activities at the APO. The outcome data offers empirical analysis of cross country comparisons of economic growth and productivity levels in the context of the global economy. This guides us to assess economic performance and structural changes. The data also serves as numeric indicators for reviewing our contributions to our mission of enabling the APO economies to be more productive and competitive. Additionally, this is a mechanism for setting new targets for our future productivity movements in the dynamic economic development in the region.

It is with pleasure that I introduce readers to this edition as a vital resource for comprehending the dynamic economic development in the region. This publication is the fruit of research efforts of the APO Productivity Databook Project, implemented by the Research and Planning Department of the APO Secretariat in collaboration with Keio Economic Observatory, Keio University in Tokyo. My profound gratitude goes to Professor Koji Nomura, Professor Fukunari Kimura, Ms. Shinyoung Oh, Mr. Hiroshi Shirane, Mr. Kei Okamoto, and Mr. Naoyuki Akashi. I also wish to thank all of the national experts for providing their respective economic data. The APO does, and will continue to, work with our members and their respective statistical offices to improve the data quality and coverage that underpins the data presented in the APO Productivity Databook series.

I hope that readers will appreciate this publication as a useful reference and find practical use for their own purposes.

*Mari Amano*
*Secretary-General*
*Asian Productivity Organization*
*Tokyo, September 2014*

# 1 Introduction

## 1.1 Databook 2014



This is the seventh edition in the *APO Productivity Databook* series. The publication aims to provide a cross-country comparison of economic growth and productivity levels of Asian economies in relation to global and regional economies. The focus of the Databook is on long-term analysis. This is achieved by examining a country's economic growth and productivity performance, as well as the sources and industry origins of the growth. This complete analysis provides readers with a more comprehensive description and comparison of a given country's economic structure and characteristics.

Baseline indicators on economic growth and labor productivity are calculated for 29 Asian economies, representing the 20 Asian Productivity Organization (APO20) member economies and nine non-member economies in Asia. This edition covers the period 1970–2012. The APO20 include: Bangladesh, Cambodia, the Republic of China (ROC), Fiji, Hong Kong, India, Indonesia, the Islamic Republic of Iran (Iran), Japan, the Republic of Korea (Korea), the Lao People's Democratic Republic (Lao PDR), Malaysia, Mongolia, Nepal, Pakistan, the Philippines, Singapore, Sri Lanka, Thailand, and Vietnam. The nine non-member economies in Asia are: the People's Republic of China (China), Brunei, Myanmar, and the Gulf Cooperation Council (GCC) that consists of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates (UAE). These two groups combine to make the Asia29. In addition, Australia, the European Union (EU), Turkey, and the United States (US) are included as reference economies.

The productivity measures in this report are based on data and estimates collated for the APO Productivity Database project since September 2007, as a joint research effort between the APO and the Keio Economic Observatory (KEO), at Keio University. Estimates are based primarily on the System of National Accounts (SNA) in 1993. In this edition, some significant revisions on the national accounts were incorporated. New developments for the upgrading of statistics systems in APO member economies have resulted in Pakistan and Korea publishing their accounts based on the 2008 SNA in April 2013 and March 2014, respectively. While there are movements toward upgrading the SNA, some countries in Asia, such as Indonesia, have still not fully introduced the 1993 SNA. Because the varying SNA adaptions among the member economies can result in discrepancies between data definitions and coverage, data harmonization is necessary for comparative productivity analyses. This Databook attempts to reconcile the national accounts variations that are based on the different concepts and definitions, and provide harmonized estimates for international comparison.

To analyze the overall productivity improvement as well as partial productivity improvement (labor productivity and capital productivity), the Databook project constructs estimates of capital services appropriate to the concept of capital input introduced in the 2008 SNA. Based on these estimates, the sources of economic growth in each economy are further decomposed to factor inputs of labor and capital and total factor productivity (TFP) for 18 Asian economies – Bangladesh, the ROC, Fiji, Hong Kong, India, Indonesia, Iran, Japan, Korea, Malaysia, Mongolia, Pakistan, the Philippines, Singapore, Sri Lanka, Thailand, Vietnam, and China – along with the US as a reference economy. It is a notable achievement that the TFP estimate for Bangladesh is newly developed in the APO Productivity Database 2014 and is presented in this edition of the Databook. This edition reflects the revisions to the official national accounts and other statistical data published as of May 2014.

The official national accounts and metadata information used for constructing the APO Productivity Database 2014 have been prepared by national experts in APO member economies through questionnaires designed at KEO. The names of these experts are listed in Section 1.2. The submitted data was then examined and processed at KEO where further information was collected on labor, production, prices, trades, and taxes as required. The project was managed by Koji Nomura (Keio University),

under the consultancy of Professors Dale W. Jorgenson (Harvard University) and W. Erwin Diewert (University of British Columbia), and with coordination by Yasuko Asano (APO). The text, tables, and figures in the report were authored by Koji Nomura and Fukunari Kimura (Keio University), with support from research assistants Shinyoung Oh, Hiroshi Shirane, Kei Okamoto, and Naoyuki Akashi.

## 1.2 List of Contributors

### Authors of This Report

*Dr. Koji Nomura*
APO Productivity Database Project Manager, Associate Professor, KEO, Keio University, 2-15-45 Mita, Minato-ku, Tokyo, 108-8345, Japan

*Dr. Fukunari Kimura*
Professor, Department of Economics, Keio University

### Research Assistants at KEO, Keio University

*Ms. Shinyoung Oh*

*Mr. Hiroshi Shirane*

*Mr. Kei Okamoto*

*Mr. Naoyuki Akashi*

### APO Officer

*Ms. Yasuko Asano*
Program Officer, Research and Planning Department, Asian Productivity Organization, 1-24-1 Hongo, Bunkyo-ku, Tokyo, 113-0033, Japan

### National Experts

**Bangladesh**
*Mr. Ziauddin Ahmed*
Joint Director, Bangladesh Bureau of Statistics, Ministry of Planning, Parishankhyan Bhaban, E/27/A, Agargaon, Sher-e-Bangla Nagar, Dhaka, 1207

**Cambodia**
*Mr. Chettra Keo*
Director, National Accounts Department, National Institute of Statistics, Ministry of Planning, #84, St. 130, Don Penh, Phnom Penh

**Republic of China**
*Ms. Wei-jie Huang*
Chief, National Accounts Section, Bureau of Statistics, Directorate-General of Budget, Accounting, and Statistics, Executive Yuan, No. 2, Guangzhou St., Zhongzheng District Taipei, 10065

**Fiji**
*Ms. Navilini Singh*
Senior Statistician, Economics Statistics Division, Fiji Bureau of Statistics, Ratu Sukuna House, Government Buildings, Suva

**India**
*Ms. P. Bhanumati*
Director, National Accounts Division, Central Statistics Office, Ministry of Statistics & Programme Implementation, NAD Hall 1, 4th Floor, Sardar Patel Bhawan, Sansad Marg, New Delhi, 110001

**Indonesia**
*Ms. Wachyu Winarsih*
Leader of Social Analysis, Directorate of Analysis and Development Statistic/Statistic Indonesia, JL. Dr. Sutomo No.6-8, Jakarta, 10710

**Islamic Republic of Iran**
*Mr. Behzad Mahmoodi*
Chief of Statistical Designs Survey Section, Statistical Research and Survey Department, Central Bank of Iran, Mirdamad Blvd., No.144, Tehran

*Mr. Hamid Azarmand*
Deputy, National Iranian Productivity Organization, No. 15, Daneshsara St., Baharestan Sq., Tehran

**Japan**
*Mr. Takashi Watanabe*
Director, National Wealth Division, National Accounts Department, Economic and Social Research Institute, Cabinet Office, Government of Japan, 3-1-1 Kasumigaseki, Chiyoda-ku, Tokyo, 100-8970

**Republic of Korea**
*Dr. Keun Hee Rhee*
Director/Senior Researcher, Productivity Research Institute, Korea Productivity Center, 32, 5ga-gil, Saemunan-ro, Jongno-gu, Seoul, 110-751

**Lao PDR**
*Mr. Phousavanh Chanthasombath*
Deputy Director of National Account, Department of Economic Statistics, Lao Statistics Bureau, Ministry of Planning and Investment, Luang Prabang Road, Vientiane

**Malaysia**
*Ms. Hezlin Suzliana Binti Abdul Halim*
Assistant Director, National Accounts Statistics Division, Department of Statistics, Malaysia, Ting. 3, Unit 01-05, Wisma Minlon, Batu 12 Lebuhraya Sg. Besi, 43300 Seri Kembangan, Selangor

**Mongolia**
*Ms. Bayarmaa Baatarsuren*
Statistician, National Statistical Office of Mongolia, Government Building 3, Ulaanbaatar

**Nepal**
*Mr. Rajesh Dhital*
Director, Central Bureau of Statistics, Thapathali, Kathmandu

**Pakistan**
*Mr. Shahid Mahmood Butt*
Consultant, Duetsche Gesellschaft fur Internationale Zusammenarbeit PK, GmbH, 2nd Floor, Statistics House, Pakistan Bureau of Statistics, Mauve Area, G-9/1, Islamabad

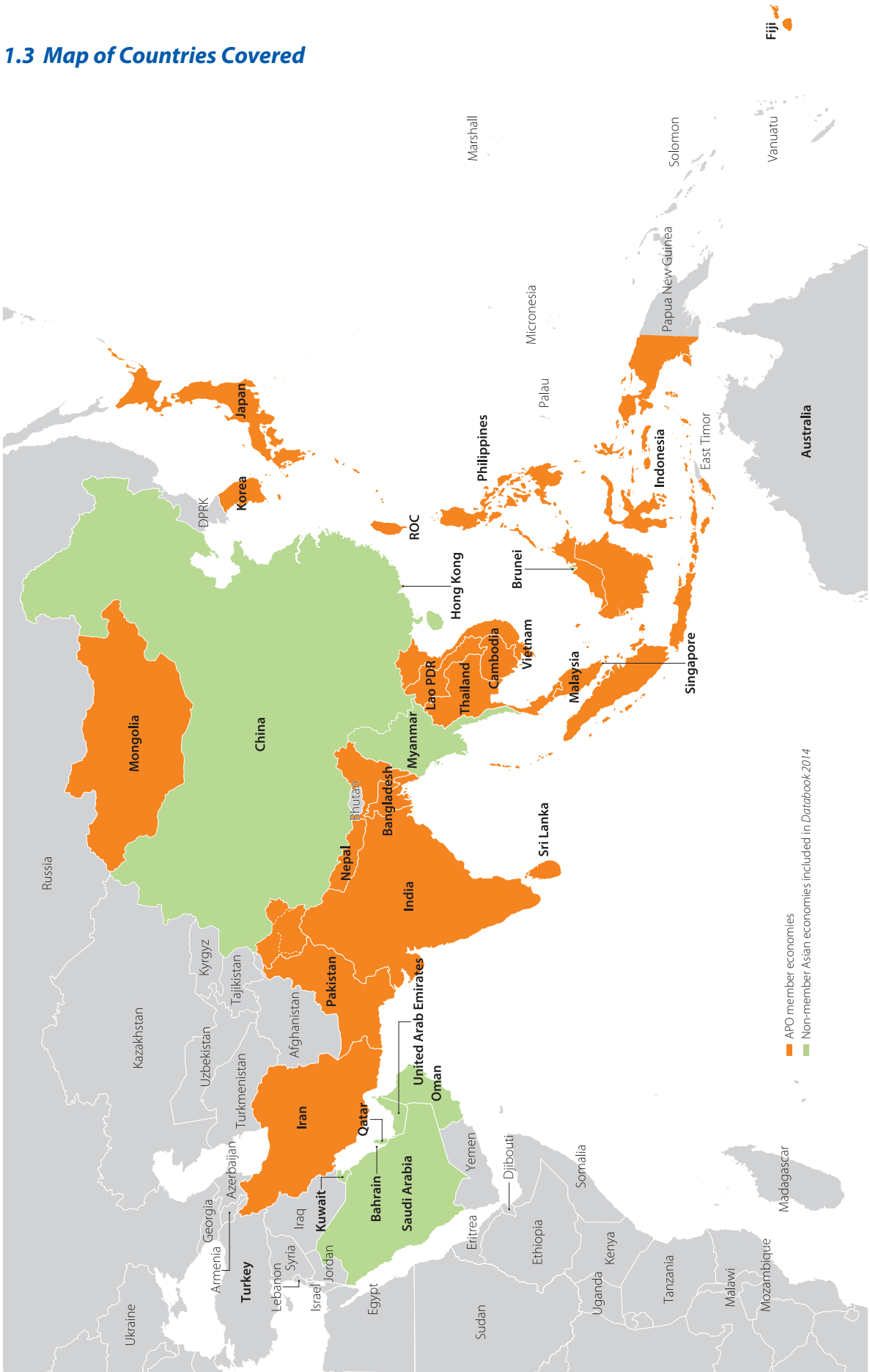
**Philippines**
*Ms. Estela T. de Guzman*
Director, Industry and Trade Statistics Department, National Statistics Office, Solicarel Building, Ramon Magsaysay Blvd., Sta. Mesa, Manila, 1016

**Sri Lanka**
*Mr. Weerasinghe Wasala Mudiyanselage Ananda Sarath Premakumara*
Director Statistics, Sample Surveys Division, Department of Census and Statistics, Ministry of Finance and Planning, Unity Plaza Building, Bambalapitiya, Colombo, 04

**Thailand**
*Ms. Wirot Nararak*
Director, National Accounts Office, National Economic and Social Development Board, 962 Krung Kasem Road, Pomprab, Bangkok, 10100

**Vietnam**
*Ms. Thi Hai Ha Nguyen*
Statistical Officer, Trade and Services Department, General Statistics Office of Vietnam, 6B Hoang Dieu Street, Ba Dinh District, Hanoi

## 1.3 Map of Countries Covered



# 2 Overview



In 2013 most of the Asian economies realized relatively strong economic growth. In most cases, the recovery of developed economies from the global financial crisis and its aftermath was still at a slow pace in the world. However, US economic growth aimed towards a come-back, despite some political turmoil on fiscal deficit and other issues. Japan applied a series of policies called "Abenomics," and its first two arrows out of three, that is., bold monetary easing and flexible fiscal stimulus, seemed to pull the Japanese economy back to the normal situation. Although the EU continued to struggle, they realized enough improvement to put the worst behind them. While the external conditions were far from perfect, most of the Asian economies continued to grow steadily based on the expansion of their own demand.

The Asian economies, particularly those in East Asia including Northeast Asia and Southeast Asia, have recorded impressive economic growth in the past two decades. Average annual growth rates of GDP in Asia29 and East Asia at constant market prices in 1990–2012 reached 5.5% and 5.7%, which significantly exceeded those in the US (2.4%) or EU27 (1.7%), as shown in Table 3. East Asia has been the most advanced region in taking advantage of a new type of international division of labor called international production networks (Ando and Kimura, 2005) or the 2nd unbundling (Baldwin, 2011). A new development strategy has aggressively applied the mechanism of international division of labor in terms of production processes or tasks, rather than industries.

Although global value chains are a subject of current discussion throughout the world (see for example Elms and Low, 2013), one must be mindful that not all global value chains are international production networks or the 2nd unbundling. The latter refers to tightly connected production/distribution/function links with well-coordinated, high-frequency, and synchronized transactions, rather than a simplistic international input-output linkage with slow and low-frequency transactions. Such production networks are typically observed in machinery industries though other industries such as garment, food processing, and services may also utilize the mechanics. Latecomers in the region including Cambodia, the Lao PDR, Myanmar, and Vietnam (CLMV) have started participating in production networks and jump-starting industrialization, particularly since the global financial crisis began.[1] Per capita GDP (using exchange rate) in CLMV increased from $310 in 2000 to $1,410 in 2012 (Table 4). Countries in South Asia have good potential to take advantage of such a division of labor by connecting themselves with East Asian production networks; per capita GDP (using exchange rate) in India and Pakistan was still $1,490 and $1,240, respectively, in 2012 (Table 4).

After hosting a number of production blocks in international production networks, countries began to form industrial agglomerations in which the inter-firm division of labor, including links between multinationals and local firms, was intensively developed. Through these processes of industrialization, a number of the East Asian developing economies have successfully reduced the population below the poverty line and have gradually built up affluent middle-income population. Strong growth in productive sectors has generated benevolent labor movements from informal to formal, from rural to urban, and from agriculture to modern sectors, which are smoother than in other parts of the developing world. Per capita GDP (using exchange rate) in China and ASEAN6 were $6,070 and $4,820, respectively, in 2012 (Table 4). The Asian developing countries other than East Asia have not yet fully achieved such transformation with production networks.

While the long-run growth perspectives of most Asian economies are bright, there are several issues to consider in the short run. In the globalization era, one cannot neglect investors' views in the market;

1: The Databook separates ten countries of the Association of Southeast Asian Nations (ASEAN) into the ASEAN6 consisting of Brunei, Indonesia, Malaysia, the Philippines, Singapore, and Thailand; and the CLMV consisting of Cambodia, the Lao PDR, Myanmar, and Vietnam.

even if the logical background of such concern may not necessarily be fully warranted. The China factor is the first such issue to consider. China's economic growth has been outstanding for the last two decades; average annual growth rate of GDP at constant market prices in 1990–2012 was 9.8% (Table 3). The significance of the Chinese economy, both as a production site and a market, has naturally increased in the Asian economy as well as in the world. Thus, investors in the market are becoming very sensitive to the growth prospect of the Chinese economy. The macroeconomic management by the Chinese government has accomplished remarkable performance and now seems to head for a soft landing on a medium-speed growth path. However, some economists and investors are carefully watching on several issues in the Chinese economy: notably, a possible collapse of excessive real estate growth, possible instability of financial system triggered by shadow banking crisis, and possible economic difficulty due to a huge debt held by local governments. The share of investment with respect to GDP in China is still as high as 48.7% in 2012 (Table 7), which partially reflects the government's effort to keep growth rates high. If the Chinese economy were to make a hard landing, it would affect investors' perception for other parts of the Asian economy, as well.

The second issue to consider is a possible fragility of some newly developed economies against external shocks. As the financial exposure increases, market perception becomes a crucial element to make an economy shift. For example, an announcement by the US Federal Reserve in May 2013 of a gradual removal of financial easing, triggered sudden depreciation of currencies in some newly developed economies. This consequently effected stock prices and market sentiments. An economist at Morgan Stanley listed five currencies that presented notable downturns, namely, Brazil real, Indian rupee, Indonesian rupiah, Turkish lira, and South African rand, dubbing them the "Fragile Five." The markets calmed down eventually, but another shock came in the latter half of 2013, suggesting these types of shocks would hit anytime when the market considers an economy as fragile.

The market in particular tries to detect possible signs of a major collapse of newly developed economies. Such indicators include current account deficit, slowdowns of inward foreign direct investment, short-run external debts, small foreign currency reserves, insufficient ability of manipulating macroeconomic policies, and political instability. In cases of East Asian economies, resiliency against macro shocks has been reinforced notably since the Asian Currency Crisis, with limited current account deficits, careful debt management, and enlarged foreign currency reserves. However, globalization has continued, and the power of speculation has enhanced. By keeping macro figures healthy and preparing quick policy responses for unexpected happenings, the Asian countries can guard against a sudden attack in the market.

The third short-term issue to consider is the possible instability in politics. The Asian countries, including India and Indonesia, are likely to have new governments soon. Whether the transition of the governments would go smoothly with the adoption of good economic policies is an important checkpoint of the market. A political turmoil in Thailand seems to continue, which may slow economic growth to some extent. International conflicts, including territorial disputes in the East and South China Sea, are another concern that may influence economic matters. Political stability and separation of economics and politics have been a basis for extending international production networks and vitalizing economic dynamism, particularly in East Asia. Overcoming domestic and international political difficulties would allow Asia to foster a favorable economic environment for strong economic growth and the betterment of lifestyle.

On the positive front, there is the steady progress of economic integration in Asia. Political leaders acknowledge the importance of their progress and try to keep momentum for deeper economic integration. The ASEAN is committed to finalize the ASEAN Economic Community (AEC) by the end of 2015. Although not all of the commitments under the AEC Blueprint, announced in 2007, can be

achieved, AEC will be a milestone of economic integration in the developing world. This will present a new development strategy of pursuing both deepening economic integration and narrowing development gaps. East Asia and Asia-Pacific are also stepping into the era of mega-FTAs (free trade agreements). Mega-FTAs, particularly Trans-Pacific Strategic Economic Partnership Agreement (TPP), in which some of the East Asian countries participate, are pursuing deep liberalization and international rule making. The liberalization is not limited to tariff removal, but includes the liberalization of services, investment, and government procurement. International rule making covers intellectual property rights protection, competition with state-owned enterprises, environment, dispute settlements, and others. The wide coverage of such policy modes is clearly motivated by a new type of international division of labor or the 2nd unbundling. Though a conclusion for TPP is uncertain, the negotiation itself is already influencing the East Asian economies. Negotiations over competing mega-FTAs, such as Regional Comprehensive Economic Partnership (RCEP) and China-Japan-Korea (CJK) FTA, are likely to be accelerated and upgraded in quality. Regardless of the details of these agreements the general concept is necessary to pursue a more stimulated economic environment in East Asia and Asia-Pacific.

Asia's economic dynamism warrants considerable attention to the rapid and vigorous changes in its economic performance in the short run. To fully understand this economic dynamism, it is essential to grasp its growth performance, structural changes, and the advancement of its economic development within a context of its middle- and long-term performance. Asia, in particular, consists of a variety of countries at different development stages, with diversified resource endowments, and under various political regimes. The *APO Productivity Databook* provides concise information and useful insights into the basis of growth performance and economic structure of Asian countries by presenting such long-term data analysis.

International comparisons of economic performance are never a precise science; instead, they are fraught with measurement and data comparability issues. Despite best efforts in harmonizing data, some data uncertainty remains. Operating within a reality of data issues, some of the adjustments in the Databook are necessarily conjectural, while others are based on assumptions with scientific rigor. In addressing this shortcoming, findings drawn from the research are cross-referenced against other similar studies. Such magnitude of variations in the economic indicators is often subject to a certain degree of data uncertainty.

Bearing in mind these caveats, the main findings from our analysis are as follows:

## Recent economic growth of Asia

- In terms of exchange-rate-based GDP, China overtook Japan in 2010 as the largest economy in Asia and the second largest economy in the world, after the US. On this measure, Asia29 was 45% and 53% larger than the US and EU15 in 2012, respectively (Table 1).

- Based on GDP adjusted for purchasing power parity (PPP),[2] the weight of the world economy is even more tilted toward Asia, with Asia29 being 1.5 times and 2.3 times larger than the US and EU15 in 2012, respectively. China has overtaken Japan as the largest Asian economy since 1999, and its size was 94% relative to the US in 2012. India surpassed Japan, replacing it as the second largest economy in Asia in 2008. In 2012, the total GDP of the three largest Asian economies alone was 61% larger than the US economy (Table 2 and Figure 5).

2: This Databook based on the new PPP estimates of the 2011 International Comparisons Program (ICP) round published in April 2014. This has the significant effect of raising the relative sizes of Asian economies against the base economy, the US.

- During the period 2000–2012, Asia29 grew at 5.9% on average per annum, compared with 1.7% and 1.1% in the US and EU15, respectively. Japan was the slowest growing economy among the Asia29 at 0.7%, compared with 14 of the 29 Asian economies with over 5.0% of annual economic growth (Table 3 and Figure 1).

- For the past two decades (1990–2012), China and India have emerged as the driving force propelling Asia forward, accounting for 45% and 16% of regional growth, respectively (Figure 7).

- The global financial crisis slowed Asia29's growth significantly from a recent peak of 8.2% during 2006–2007, to 4.8% during 2007–2008 and further to 4.0% during 2008–2009, before rebounding strongly to 8.0% during 2009–2010. This is in comparison to the deep recession of –3.1% and –4.7% experienced by the US and EU15, respectively, during 2008–2009 (Figure 1).

- The correlation coefficients between China and other Asian economies strengthened between the two decades. This suggests that China has become more integrated within the Asian economy. For most Asian countries, the correlation with the US and EU15 has also grown stronger (Figures 8 and 9).

### Catching up in per capita GDP

- Our results show the outcome of the dramatic development effort of the four Asian Tigers.[3] Singapore and Hong Kong have managed to close a per capita GDP gap with the US of around 60% in just under four decades. Singapore has even surpassed the US since 1992, and in 2012 its per capita GDP was 49% higher. In contrast, veteran Japan has fallen behind, widening its gap with the US to 29%. In 2012, the ROC's and Korea's per capita GDP was 80% and 60% of the US level, respectively (Table 5 and Figure 14).

- Despite their rapid growth, due to their population size per capita GDP of China and India was 22% and 10% of the US in 2012, respectively. However, this represents a tenfold increase in China's relative per capita GDP over the last four decades. The level achieved by Asia29 was 16% of the US, indicating that there is ample room for catch-up (Table 5).

- Asia's huge per capita GDP gap with the US is predominantly explained by its labor productivity gap. With the exception of the Asian Tigers, Japan, and Iran, all Asian countries have a labor productivity gap of 50% or higher (Figure 18).

- For most countries in Asia, the majority of per capita GDP growth can be explained by improvement in labor productivity. However, the employment rate contribution relative to labor productivity was also highly significant in Nepal, Pakistan, Bangladesh, Cambodia, and Thailand in 2000–2012 (Figure 19).

- There is a significant variation in Asia's employment rates from 25% to over 60% at present. The employment rates have been rising in most countries in Asia and are 10–15 percentage points above the US in Singapore, Cambodia, Thailand, Vietnam, and China (Figure 21).

3: Refers to Hong Kong, Korea, Singapore, and the ROC.

## Changes in demand composition

- With a few exceptions, household consumption is the biggest component of final demand. In recent years, Asia29's consumption ratio has dropped to 49.3% of GDP, largely reflecting the trend in China. This compares to 70.8% in the US, 58.5% in EU15, and 55.6% in Australia (Table 7).

- The share of household consumption in GDP tends to be more volatile, dropping in countries that are undergoing rapid development. As countries get richer, the household consumption share tends to rise. At the other end of the spectrum, countries with low income and a high dependent population (under-15, over-65) sustain a high consumption ratio to GDP (Figures 24 and 25).

- Overall, Asia invests more than the US/EU15 as a share of its GDP. Lately this gap has been widening. Historically, Australia's investment share has been sandwiched between that of Asia and the US/EU15. In 2012, Asia29 invested 35.1% of its GDP, compared with 16.1% for the US, 17.8% for EU15, and 27.5% for Australia (Table 7 and Figure 31).

- China faces huge internal and external imbalances. The investment share of GDP (at 48.7%) as the biggest component in final demand and the household consumption share plummeted to 34.7% in 2012. In contrast, the weight of net exports has been rising in the past decade, although it is declining in recent years due to weak foreign demand (Figure 22).

- GCC economies are unusually skewed toward net exports because of their oil. Net exports accounted for 28.0% of final demand in 2012, compared with Asia29's 2.1% and China's 2.8%. Only the US and South Asia run trade deficits of a more significant nature, which accounted for –3.5% and –7.6% of final demand, respectively, in 2012 (Table 7).

- Basic necessities account for a high proportion of household consumption in lower-income countries, according to the cross-country version of Engel's Law, which says that basic necessities will account for a high proportion of household consumption for a lower per capita income group and vice versa. They spend 30–60% of total consumption for food, which corresponds to Japan's experience in the 1950s and the 1960s (Figures 29 and 30).

- In the 2000s, investment recovered in the Asian economies and drove growth. For Singapore, Hong Kong, and the ROC, however, the strength of net exports was still the dominant force behind their economic growth. The growth slowed in the US and EU15, and the contributions of government consumption to growth nearly tripled as contributions from investment took a plunge (Figures 34 and 38).

## Labor productivity

- For most Asian countries, the per capita GDP gap with the US is largely explained by their labor productivity shortfalls of 80% or more against the US level. Only Singapore and Hong Kong have effectively closed that gap. The relative labor productivity of Asia23 was 18% of the US in 2012 (Table 8 and Figure 39).

- Growth of per-worker GDP in Asia has outstripped that in the US, allowing catch-up. In particular, the low-income countries appeared to experience a labor productivity growth spurt in the 2000s. China achieved the fastest labor productivity growth of 9.5% on average per year in 2005–2012, followed by Mongolia's 7.2% and India's 6.9%; this compares with the US's 1.3%. Singapore's 0.4%

growth over the same period was the weakest performance among the Asian Tigers and Japan (Table 9 and Figure 41).

- The productivity gap based on GDP per hour is generally wider between Asian countries and the US. While the adjustments are negligible for most Asian countries, the productivity gap significantly widened by 14–31 percentage points for the Asian Tigers, suggesting that people work much longer hours than in the US (Figure 42).

- Most Asian countries experience faster growth in GDP per hour than the US. Among them, China's performance is the most outstanding, with average annual productivity growth doubling from 4.3% to 9.0% between 1970–1990 and 1990–2012, compared to the US at 1.5% and 1.8% over the same periods (Figure 44).

- Mapped onto Japan's historical trajectory of GDP per hour, most Asian countries cluster around the level that Japan achieved in the 1950s and early 1970s, with the Asian Tigers being the clear frontrunners, sprinting away from the pack (Figure 46).

### Total factor productivity

- Eleven of the 18 Asian countries compared experienced faster TFP growth than the US over the period 1970–2012, with China in a league of its own. Its TFP growth was at 3.1% on average per year, compared with those of Thailand and Sri Lanka at 1.9% in second place and the US at 0.9%. With TFP growing at 0.5% on average per year, Singapore's productivity performance has been weak relative to its economic counterparts (Figure 48).

- Over the past four decades, economic growth in Asia has been predominantly explained by the contribution of capital input, but the role of TFP growth should not be underestimated. Its contribution accounted for over 20% of economic growth in 11 of the 18 Asian countries compared, with it being most prominent in Sri Lanka (38%), China (36%), Thailand (35%), and Pakistan (31%) (Figure 50).

- The composition of economic growth is shifting over time. In the past two decades, the contribution of capital input (especially of non-IT capital) has been getting progressively smaller in Asia, falling to a share of below 55% on average, while the contribution of TFP is getting progressively more significant, rising to a share of above 35% on average in 2000–2012 (Figure 52).

- The evident rise in the contribution of information technology (IT) capital is noteworthy. By the 2000s, it had risen to above 5% in most Asian countries compared, while accounting for around one-third of economic growth in Japan and the US. The allocation shift towards IT capital started two decades earlier in the US than in any Asian country (Figures 52 and 55).

- Over the past decades, it has been observable that economic growth has decelerated in the early starters (Japan and the Asian Tigers). Their experience lends support to the likelihood of an eventual slowdown in China; the question is more likely "when," than "if." TFP growth slowed from its former peaks achieved in the late 1970s or late 1980s until recent years when countries experienced TFP resurgence (Figure 54).

### Capital deepening and capital productivity

- Capital deepening appears to be an accompanying process of rapid economic development. The early starters (i.e., Japan and the Asian Tigers) underwent more rapid capital deepening in the initial period whereas the reverse is true for the currently emerging Asian economies. For example, the rise in capital–labor ratio decelerated from 10.2% on average per year to 7.1% in Korea between 1970–1990 and 1990–2012, whereas it doubled in China from 5.3% to 10.6% (Figure 58).

- Capital deepening tends to go hand in hand with deterioration in capital productivity. China's performance is particularly impressive as its acceleration in capital deepening over the past two decades did not compromise its capital productivity as much as the early starters in the early period (Figure 59).

- Over a long period stretching four decades, a downward trend in labor productivity growth can be seen among the early starters, but there is a step up in China and India. Singapore's productivity performance, albeit robust compared with other mature economies like the US, has been very modest against its Asian counterparts (Figure 66).

### Industry structure

- Evidence supports the view that a country's industry structure transforms with its economic development. There is a broad negative correlation between the share of agriculture in total GDP and per capita GDP. Finance, real estate, and business activities increase in weight as countries move up income levels, whereas mining is the sector that defines the oil-exporting countries (Figure 67).

- Manufacturing is a significant sector, accounting for over 20% of total value added in most Asian economies. It is particularly prominent in China, Korea, Thailand, the ROC, Malaysia, and Indonesia, in which higher TFP growths are measured in 2000–2012 (Figure 68). Asian manufacturing is dominated by machinery and equipment in the richer Asian economies while their poorer counterparts concentrate on light manufacturing such as textiles and the food industry (Figure 69).

- While Asian countries are diversifying away from agriculture, the sector still dominates employment, accounting for 38% of total employment in 2012 for Asia29, down from 61% in 1980. Its share in total value added decreased more moderately, from 14% to 10% over the same period. Shifting out of agriculture into more efficient sectors will boost economy-wide productivity (Figures 70 and 73).

- Manufacturing is a main absorption sector for workers who have been displaced from the agriculture sector, especially in the initial stages of economic development. In Korea and the ROC, expansions to manufacturing output could account for the increases of employment in the 1970s and the 1980s. Since the 1990s, however, the manufacturing sector has no longer been an absorption sector of employment, regardless of the sound expansion of production in this sector. (Figure 75).

### Industry origins of economic growth

- Our results support the observation that China and India have taken different development paths, with the former relying more on the traditional growth engine of manufacturing and the latter on services. In the past two and a half decades China has been undergoing a slight transition, with its growth shifting away from manufacturing-driven to more services-driven. In the period

2000–2012, the contributions to economic growth by manufacturing and services were 35% and 44%, respectively, compared with 44% and 34% in the 1990s (Figures 77 and 78).

- In contrast, growth in India has always been more driven by services, the contribution of which rose from 51% in the late 1980s to 64% in 2000–2012, while manufacturing usually contributes one-fifth or less (Figures 77 and 78).

- A total of 29% of Asia29's regional growth originated from the expansion of manufacturing in the 2000s, 60% of which was accounted for by China. In other words, China's manufacturing alone contributed 17% to regional growth (Figure 81).

- The importance of manufacturing as a contributor to overall labor productivity growth has never waned in Korea and the ROC. However, manufacturing has never been a major contributor in India in its recent development process, or in Hong Kong and Sri Lanka in 2000–2012 (Table 16 and Figure 85).

### Real income and terms of trade

- Real GDP could systematically underestimate (or overestimate) growth in real income if terms of trade improve (or deteriorate). It is generally observed that the trading gain effect is more significant in the short term than in the long term. Our findings confirm this observation, with the exceptions in some oil-exporting countries such as Kuwait and Brunei, where trading gain has always been positive and significant (Table 17 and Figure 92).

- Positive net primary income from abroad also bolsters a country's real income. In Japan and the Philippines, net primary income from abroad has been rising steadily, albeit at different magnitudes. In Japan, it rose from 0.7% of GDP in 1990 to 3.2% in 2012, compared with 1.4% in 1990 and 31.4% in 2012 in the Philippines. Singapore's historical margin fluctuates within a large range when compared with other rich economies – from +1.9% in 1997 to –7.1% in 2004, but on the whole, it has been more negative than positive (Figure 86).

- Our results show that for most countries studied, the difference between growth of real GDP and real income (reflecting the combined effect of trading gain and net primary income from abroad) was within the margin of ±20% over the long period from 1970–2012; Kuwait and Brunei appear to be the outliers (Figure 87).

- The five countries that have been enjoying a trading gain over 1% per annum in the past four decades are all oil-exporting countries. Among them, only Iran managed to achieve a positive growth in labor productivity. In contrast, export-oriented, high productivity Asian countries have been facing a deteriorating trading gain position as a price of their own success (Figure 93).

Asia is a diverse regional economy in which countries have embarked on their own journey of economic development at different times and different paces. As shown by our analysis, nearly all countries are making concerted efforts to move away from agriculture and accumulate capital in order to improve their growth potential and catch up with the West. Their efforts are yielding results beyond just impressive growth rates. The evidence gained from our research confirms that countries' capital accumulation is accompanied by strong productivity improvements. Through the statistics and data presented in this report, one manages to catch a glimpse of the current unparalleled economic dynamics inherent in the region.

# 3 Growth of Asian Economy

In the past two decades, the story of the world economy belonged to Asia, featuring its steady rise in economic prowess. Before the mid-1980s, the fortune of Asia closely followed that of Japan but 1988 marked the start of their paths decoupling. The Asian economy is no longer defined by Japan alone (Figure 1). Asian growth consistently has been outperforming the West over the past two decades. With the exception of 1997–1999, when the economy was adversely affected by the Asian financial crisis, Asia29 has been growing faster than the US and EU15 by more than 3 to 4 percentage points on average per year. This gap has been widening in recent years. In 2009, at the height of the global financial storm, the growth differentials were 7.1 and 8.6 percentage points with the US and EU15, respectively. In 2010, simultaneous large-scale fiscal stimulus packages helped major economies rebound strongly, before growth slowed again in 2011. The fortunes of economies were mixed in 2012. The slowdown in growth was less pronounced in Asia than in the previous year. Plagued by the euro crisis, EU15 saw their economy shrink by 0.6%, whereas the US and Japanese economies picked up. Despite that, the differences in growth performance have been sustained. It is therefore no surprise that the center of gravity in the global economy is gradually shifting toward Asia. In 2012, the Asian economy contributed 41% (38% for Asia29) of world output, compared with the US and EU27, each accounting for 20% and 19%, respectively (Figure 2). The International Monetary Fund (IMF) (2014) projects the Asian share in world output will continue to rise, reaching 46% (43% for Asia29) by 2019. In contrast, the output shares of the US and EU27 will shrink by a similar extent to 18%, and 17%, respectively.

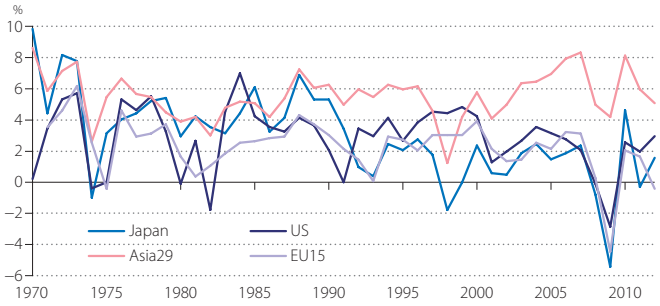



**Figure 1** GDP Growth of Asia, the EU, Japan, and the US, 1970–2012

——Annual growth rate of GDP at constant market prices

Sources: Official national accounts in each country, including author adjustments.

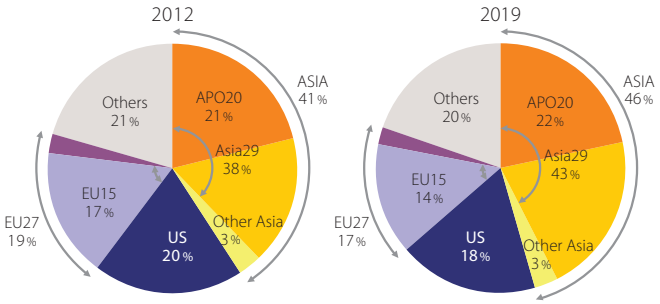



**Figure 2** Share of Asia in World GDP in 2012 and Projection for 2019

——Share of GDP using constant PPP

Source: IMF, *World Economic Outlook Database*, April 2014.

To better understand the dynamics of the long-term economic growth within the region, the remainder of this chapter details countries' diverse development efforts and achievements since the 1970s, through cross-country level comparisons of GDP and other related performance indicators.[4] To facilitate international level comparisons, harmonized GDP for each of the individual countries[5] is expressed in its equivalent in a common currency unit (customarily in the US dollar), using a set of conversion rates between the individual national currencies. The choices for conversion rates are exchange rate and PPP.

**Table 1 GDP using Exchange Rate, 1970, 1990, 2000, 2010, 2011, and 2012**
——GDP at current market prices, using annual average exchange rate

| 1970 | | (%) | 1990 | | (%) | 2000 | | (%) | 2010 | | (%) | 2011 | | (%) | 2012 | | (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Japan | 209 | 100.0 | Japan | 3,097 | 100.0 | Japan | 4,741 | 100.0 | China | 5,931 | 100.0 | China | 7,322 | 100.0 | China | 8,221 | 100.0 |
| China | 92 | 43.9 | China | 390 | 12.6 | China | 1,198 | 25.3 | Japan | 5,507 | 92.9 | Japan | 5,919 | 80.8 | Japan | 5,951 | 72.4 |
| India | 61 | 29.0 | India | 322 | 10.4 | Korea | 533 | 11.3 | India | 1,649 | 27.8 | India | 1,857 | 25.4 | India | 1,823 | 22.2 |
| Pakistan | 12 | 5.8 | Korea | 270 | 8.7 | India | 468 | 9.9 | Korea | 1,015 | 17.1 | Korea | 1,114 | 15.2 | Korea | 1,130 | 13.7 |
| Iran | 11 | 5.4 | ROC | 165 | 5.3 | ROC | 326 | 6.9 | Indonesia | 719 | 12.1 | Indonesia | 858 | 11.7 | Indonesia | 889 | 10.8 |
| Indonesia | 10 | 4.7 | Indonesia | 127 | 4.1 | Saudi Arabia | 190 | 4.0 | Saudi Arabia | 531 | 8.9 | Saudi Arabia | 674 | 9.2 | Saudi Arabia | 739 | 9.0 |
| Bangladesh | 10 | 4.7 | Saudi Arabia | 118 | 3.8 | Hong Kong | 169 | 3.6 | Iran | 467 | 7.9 | Iran | 637 | 8.7 | Iran | 617 | 7.5 |
| Korea | 9 | 4.3 | Iran | 94 | 3.0 | Indonesia | 168 | 3.5 | ROC | 428 | 7.2 | ROC | 465 | 6.4 | ROC | 475 | 5.8 |
| Thailand | 7 | 3.5 | Thailand | 88 | 2.9 | Thailand | 126 | 2.7 | Thailand | 339 | 5.7 | Thailand | 367 | 5.0 | Thailand | 393 | 4.8 |
| Philippines | 7 | 3.2 | Hong Kong | 77 | 2.5 | Iran | 110 | 2.3 | UAE | 294 | 5.0 | UAE | 356 | 4.9 | UAE | 392 | 4.8 |
| ROC | 6 | 2.7 | UAE | 51 | 1.7 | UAE | 105 | 2.2 | Malaysia | 239 | 4.0 | Malaysia | 279 | 3.8 | Malaysia | 293 | 3.6 |
| Saudi Arabia | 5 | 2.6 | Pakistan | 48 | 1.5 | Singapore | 94 | 2.0 | Singapore | 233 | 3.9 | Singapore | 272 | 3.7 | Singapore | 284 | 3.5 |
| Malaysia | 4 | 1.9 | Philippines | 46 | 1.5 | Malaysia | 94 | 2.0 | Hong Kong | 224 | 3.8 | Hong Kong | 244 | 3.3 | Hong Kong | 258 | 3.1 |
| Hong Kong | 4 | 1.8 | Malaysia | 45 | 1.5 | Philippines | 81 | 1.7 | Philippines | 199 | 3.4 | Philippines | 224 | 3.1 | Philippines | 250 | 3.0 |
| Kuwait | 3 | 1.4 | Singapore | 39 | 1.3 | Pakistan | 72 | 1.5 | Pakistan | 176 | 3.0 | Pakistan | 211 | 2.9 | Pakistan | 224 | 2.7 |
| Myanmar | 3 | 1.3 | Bangladesh | 29 | 0.9 | Bangladesh | 46 | 1.0 | Qatar | 127 | 2.1 | Qatar | 174 | 2.4 | Qatar | 195 | 2.4 |
| Sri Lanka | 3 | 1.2 | Kuwait | 19 | 0.6 | Kuwait | 38 | 0.8 | Kuwait | 123 | 2.1 | Kuwait | 164 | 2.2 | Kuwait | 187 | 2.3 |
| Singapore | 2 | 0.9 | Oman | 12 | 0.4 | Vietnam | 33 | 0.7 | Vietnam | 117 | 2.0 | Vietnam | 137 | 1.9 | Vietnam | 157 | 1.9 |
| Vietnam | 1 | 0.6 | Sri Lanka | 8 | 0.3 | Oman | 20 | 0.4 | Bangladesh | 100 | 1.7 | Bangladesh | 108 | 1.5 | Bangladesh | 113 | 1.4 |
| UAE | 1 | 0.5 | Qatar | 7 | 0.2 | Qatar | 18 | 0.4 | Oman | 59 | 1.0 | Oman | 70 | 1.0 | Oman | 79 | 1.0 |
| Nepal | 1 | 0.5 | Vietnam | 7 | 0.2 | Sri Lanka | 17 | 0.4 | Sri Lanka | 50 | 0.8 | Sri Lanka | 59 | 0.8 | Sri Lanka | 60 | 0.7 |
| Cambodia | 1 | 0.4 | Myanmar | 5 | 0.2 | Bahrain | 8 | 0.2 | Myanmar | 42 | 0.7 | Myanmar | 56 | 0.8 | Myanmar | 60 | 0.7 |
| Qatar | 1 | 0.3 | Bahrain | 5 | 0.1 | Myanmar | 7 | 0.2 | Bahrain | 26 | 0.4 | Bahrain | 29 | 0.4 | Bahrain | 30 | 0.4 |
| Bahrain | 0 | 0.2 | Nepal | 4 | 0.1 | Nepal | 6 | 0.1 | Nepal | 19 | 0.3 | Nepal | 21 | 0.3 | Nepal | 20 | 0.2 |
| Oman | 0 | 0.1 | Brunei | 3 | 0.1 | Brunei | 6 | 0.1 | Brunei | 14 | 0.2 | Brunei | 17 | 0.2 | Brunei | 17 | 0.2 |
| Fiji | 0 | 0.1 | Cambodia | 2 | 0.1 | Cambodia | 4 | 0.1 | Cambodia | 11 | 0.2 | Cambodia | 13 | 0.2 | Cambodia | 14 | 0.2 |
| Brunei | 0 | 0.1 | Fiji | 1 | 0.0 | Fiji | 2 | 0.0 | Lao PDR | 7 | 0.1 | Mongolia | 9 | 0.1 | Mongolia | 10 | 0.1 |
| Mongolia | 0 | 0.1 | Mongolia | 1 | 0.0 | Lao PDR | 2 | 0.0 | Mongolia | 6 | 0.1 | Lao PDR | 8 | 0.1 | Lao PDR | 9 | 0.1 |
| | | | Lao PDR | 1 | 0.0 | Mongolia | 1 | 0.0 | Fiji | 3 | 0.1 | Fiji | 4 | 0.1 | Fiji | 4 | 0.0 |
| (regrouped) | | | (regrouped) | | | (regrouped) | | | (regrouped) | | | (regrouped) | | | (regrouped) | | |
| APO20 | 357 | 170.9 | APO20 | 4,473 | 144.4 | APO20 | 7,092 | 149.6 | APO20 | 11,509 | 194.1 | APO20 | 12,806 | 174.9 | APO20 | 12,974 | 157.8 |
| Asia23 | 451 | 216.1 | Asia23 | 4,872 | 157.3 | Asia23 | 8,304 | 175.2 | Asia23 | 17,495 | 295.0 | Asia23 | 20,201 | 275.9 | Asia23 | 21,272 | 258.8 |
| Asia29 | 462 | 221.2 | Asia29 | 5,083 | 164.1 | Asia29 | 8,684 | 183.2 | Asia29 | 18,654 | 314.5 | Asia29 | 21,668 | 295.9 | Asia29 | 22,894 | 278.5 |
| East Asia | 319 | 152.8 | East Asia | 4,001 | 129.2 | East Asia | 6,969 | 147.0 | East Asia | 13,111 | 221.1 | East Asia | 15,073 | 205.9 | East Asia | 16,045 | 195.2 |
| South Asia | 86 | 41.3 | South Asia | 412 | 13.3 | South Asia | 609 | 12.8 | South Asia | 1,993 | 33.6 | South Asia | 2,257 | 30.8 | South Asia | 2,239 | 27.2 |
| ASEAN | 35 | 16.6 | ASEAN | 363 | 11.7 | ASEAN | 614 | 13.0 | ASEAN | 1,920 | 32.4 | ASEAN | 2,230 | 30.5 | ASEAN | 2,367 | 28.8 |
| ASEAN6 | 30 | 14.4 | ASEAN6 | 349 | 11.3 | ASEAN6 | 569 | 12.0 | ASEAN6 | 1,743 | 29.4 | ASEAN6 | 2,017 | 27.5 | ASEAN6 | 2,127 | 25.9 |
| CLMV | 5 | 2.2 | CLMV | 14 | 0.5 | CLMV | 45 | 1.0 | CLMV | 177 | 3.0 | CLMV | 213 | 2.9 | CLMV | 240 | 2.9 |
| GCC | 11 | 5.1 | GCC | 211 | 6.8 | GCC | 380 | 8.0 | GCC | 1,159 | 19.5 | GCC | 1,467 | 20.0 | GCC | 1,622 | 19.7 |
| (reference) | | | (reference) | | | (reference) | | | (reference) | | | (reference) | | | (reference) | | |
| US | 1,038 | 497.6 | US | 5,801 | 187.3 | US | 9,952 | 209.9 | US | 14,499 | 244.5 | US | 15,076 | 205.9 | US | 15,775 | 191.9 |
| EU15 | 1,209 | 579.5 | EU15 | 6,155 | 198.7 | EU15 | 9,571 | 201.9 | EU15 | 14,051 | 236.9 | EU15 | 14,636 | 199.9 | EU15 | 14,925 | 181.5 |
| | | | | | | EU27 | 10,637 | 224.4 | EU27 | 16,124 | 271.9 | EU27 | 16,840 | 230.0 | EU27 | 17,215 | 209.4 |
| Australia | 45 | 21.6 | Australia | 322 | 10.4 | Australia | 406 | 8.6 | Australia | 1,277 | 21.5 | Australia | 1,516 | 20.7 | Australia | 1,558 | 19.0 |
| Turkey | 24 | 11.5 | Turkey | 200 | 6.5 | Turkey | 267 | 5.6 | Turkey | 734 | 12.4 | Turkey | 778 | 10.6 | Turkey | 791 | 9.6 |

Unit: Billions of US dollars.
Sources: Official national accounts in each country, including author adjustments.
Note: See Appendix 1 for the adjustments made to harmonize GDP coverage across countries.

## *3.1 Economic Scale and Growth*

Table 1 provides snapshot-level comparisons of Asian countries, based on GDP at current market prices using exchange rates,[6] for the six separate years of 1970, 1990, 2000, 2010, 2011, and 2012. By this measure, Japan had been the largest economy in Asia until 2010 when China finally overtook Japan's position to become the second-largest economy in the world after the US. Japan clearly surged ahead between the 1970 and 1990 comparisons, dwarfing the relative size of all other Asian economies

and reducing the US lead from five times to less than two times its economy. The turn of Japan's fortune came in 1990, when the country's excessive growth years of the late 1980s ended and its descent began. Thereafter, stagnation in Japan combined with vibrant growth in developing Asia has resulted in the rapid erosion of Japan's prominence in the regional economy. The countries that make up the four largest Asian economies (China, Japan, India and Korea) have been consistent with their positions rather secure in the past two decades, whereas ASEAN as a group has been demonstrating vigor in catching up since 2000. On this measure, Asia29 was 45% and 53% larger than the US and EU15 in 2012, respectively.

Comparisons based on exchange rates however, could appear arbitrary as movements in exchange rates can be volatile and subject to short-term or substantial fluctuations of speculative capital flows and government intervention. Furthermore, comparisons based on exchange rates typically underestimate the size of a developing economy and, in turn, the perceived welfare of its residents. The scale of economy rankings change dramatically when international price differences are properly taken into account.[7]

Figure 3 shows the extent to which the exchange rates have failed to reflect countries' price differentials properly relative to the US, based on the PPP estimates of the 2011 International Comparisons Program (ICP) round published in April 2014. With the exception of Japan and

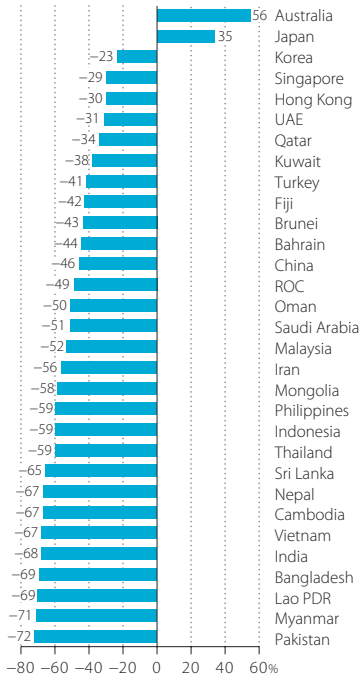



**Figure 3 Price Level Indices of GDP, 2011**

——Ratio of PPP to exchange rate (reference country=US)

Sources: Analysis of Main Aggregate rates by United Nations Statistics Division (UNSD) and PPP by World Bank (2014).

4: The database used in the Databook series includes author adjustments made to better harmonize GDP coverage across countries. GDP reported in this edition includes the final consumption of financial intermediation services indirectly measured (FISIM). Although our database mainly follows the 1993 SNA, the current decision to exclude investment of valuables and to include software investment and final consumption of FISIM is detailed in Appendix 1. At the end of 2011, Thailand officially switched to the 1993 SNA, and its national accounts became compatible with the 1993 framework for the first time. To construct the long time-series data in this report, back data based on the 1968 SNA has been adjusted to be consistent with the new series. For example, government consumption in the new series includes consumption of fixed capital (CFC) owned by the government since 1990. Government capital stock and its CFC for the period 1970–1989 are estimated and the past government consumption and GDP are adjusted accordingly. In the new Vietnamese National Accounts published in 2013, the GDP was upwardly revised by about 9% (mainly due to the introduction of FISIM) and was published after the year of 2005. The backward estimates before 2004 are estimated and GDP are adjusted accordingly. There are also some revisions to the data, largely results of national accounts revisions including backward amendment and/or benchmark revisions. The Databook 2014 reflects some large revisions published by national statistical offices in 2013 and in the first quarter of 2014.

5: Appendix 1 discusses the extent to which countries' GDP data are comparable.

6: The exchange rates used in this Databook are the adjusted rates, which are called the Analysis of Main Aggregate (UNSD database) rates in the UN Statistics Division's National Accounts Main Aggregate Database. The AMA rates coincide with the IMF rates (which are mostly the annual average of market or official exchange rates) except for some periods in countries with official fixed exchange rates and high inflation, when there could be a serious disparity between real GDP growth and growth converted to US dollars based on IMF rates. In such cases, the AMA adjusts the IMF-based rates by multiplying the growth rate of the GDP deflator relative to the US.

7: This is because exchange rates embody the trade sector bias (i.e., is more influenced by the prices of traded than non-traded goods and services) and thus do not necessarily succeed in correcting the price differentials among countries. As developing economies tend to have relatively lower wages and, in turn, lower prices for non-traded goods and services, a unit of local currency has greater purchasing power in the local economy than reflected in its exchange rate.

Australia, exchange rates systematically under-represent the relative purchasing power for all the countries covered in this report. The underestimation is substantial for some, ranging from 23% for Korea to 72% for Pakistan. Thus, the exchange-rate-based GDP considerably underestimates the economic scales in real terms for those countries. By taking into account the international price differentials, PPP rectifies the trade sector bias, and in turn the relative size of economies can be more adequately measured.[8]

**Table 2 GDP using PPP, 1970, 1990, 2000, 2010, 2011, and 2012**
——GDP at constant market prices, using 2011 PPP, reference year 2012

| 1970 | | (%) | 1990 | | (%) | 2000 | | (%) | 2010 | | (%) | 2011 | | (%) | 2012 | | (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Japan | 1,512 | 100.0 | Japan | 3,665 | 100.0 | China | 4,636 | 100.0 | China | 12,561 | 100.0 | China | 13,729 | 100.0 | China | 14,779 | 100.0 |
| India | 662 | 43.7 | China | 1,719 | 46.9 | Japan | 4,163 | 89.8 | India | 5,508 | 43.9 | India | 5,835 | 42.5 | India | 6,119 | 41.4 |
| China | 387 | 25.6 | India | 1,540 | 42.0 | India | 2,644 | 57.0 | Japan | 4,492 | 35.8 | Japan | 4,472 | 32.6 | Japan | 4,537 | 30.7 |
| Iran | 296 | 19.6 | Indonesia | 787 | 21.5 | Indonesia | 1,197 | 25.8 | Indonesia | 1,991 | 15.9 | Indonesia | 2,122 | 15.5 | Indonesia | 2,256 | 15.3 |
| Saudi Arabia | 247 | 16.4 | Saudi Arabia | 615 | 16.8 | Korea | 944 | 20.4 | Iran | 1,439 | 11.5 | Iran | 1,477 | 10.8 | Korea | 1,500 | 10.2 |
| Indonesia | 190 | 12.6 | Iran | 533 | 14.5 | Saudi Arabia | 806 | 17.4 | Korea | 1,418 | 11.3 | Korea | 1,470 | 10.7 | Saudi Arabia | 1,482 | 10.0 |
| Kuwait | 148 | 9.8 | Korea | 501 | 13.7 | Iran | 788 | 17.0 | Saudi Arabia | 1,289 | 10.3 | Saudi Arabia | 1,400 | 10.2 | Iran | 1,394 | 9.4 |
| Pakistan | 110 | 7.3 | Thailand | 376 | 10.3 | ROC | 606 | 13.1 | Thailand | 914 | 7.3 | ROC | 923 | 6.7 | Thailand | 985 | 6.7 |
| Philippines | 110 | 7.3 | ROC | 331 | 9.0 | Thailand | 586 | 12.6 | ROC | 886 | 7.1 | Thailand | 920 | 6.7 | ROC | 936 | 6.3 |
| Thailand | 92 | 6.1 | Pakistan | 321 | 8.8 | Pakistan | 473 | 10.2 | Pakistan | 740 | 5.9 | Pakistan | 762 | 5.6 | Pakistan | 794 | 5.4 |
| Korea | 84 | 5.6 | Philippines | 235 | 6.4 | Malaysia | 356 | 7.7 | Malaysia | 566 | 4.5 | Malaysia | 595 | 4.3 | Malaysia | 626 | 4.2 |
| Bangladesh | 77 | 5.1 | UAE | 206 | 5.6 | UAE | 337 | 7.3 | Philippines | 533 | 4.2 | Philippines | 552 | 4.0 | Philippines | 590 | 4.0 |
| ROC | 63 | 4.2 | Malaysia | 177 | 4.8 | Philippines | 334 | 7.2 | UAE | 502 | 4.0 | UAE | 523 | 3.8 | UAE | 546 | 3.7 |
| Malaysia | 44 | 2.9 | Hong Kong | 154 | 4.2 | Hong Kong | 226 | 4.9 | Vietnam | 400 | 3.2 | Vietnam | 425 | 3.1 | Vietnam | 448 | 3.0 |
| Vietnam | 41 | 2.7 | Bangladesh | 117 | 3.2 | Singapore | 211 | 4.6 | Singapore | 369 | 2.9 | Singapore | 391 | 2.8 | Singapore | 398 | 2.7 |
| Hong Kong | 34 | 2.2 | Singapore | 106 | 2.9 | Vietnam | 196 | 4.2 | Hong Kong | 337 | 2.7 | Hong Kong | 353 | 2.6 | Bangladesh | 374 | 2.5 |
| Sri Lanka | 23 | 1.5 | Kuwait | 91 | 2.5 | Bangladesh | 187 | 4.0 | Bangladesh | 330 | 2.6 | Bangladesh | 352 | 2.6 | Hong Kong | 359 | 2.4 |
| Singapore | 21 | 1.4 | Vietnam | 91 | 2.5 | Kuwait | 160 | 3.5 | Kuwait | 243 | 1.9 | Kuwait | 267 | 1.9 | Kuwait | 289 | 2.0 |
| Qatar | 18 | 1.2 | Oman | 64 | 1.7 | Oman | 102 | 2.2 | Qatar | 235 | 1.9 | Qatar | 266 | 1.9 | Qatar | 282 | 1.9 |
| Myanmar | 17 | 1.1 | Sri Lanka | 58 | 1.6 | Sri Lanka | 96 | 2.1 | Myanmar | 182 | 1.4 | Myanmar | 192 | 1.4 | Myanmar | 205 | 1.4 |
| Brunei | 11 | 0.7 | Qatar | 36 | 1.0 | Qatar | 69 | 1.5 | Sri Lanka | 160 | 1.3 | Sri Lanka | 173 | 1.3 | Sri Lanka | 184 | 1.2 |
| UAE | 10 | 0.7 | Myanmar | 29 | 0.8 | Myanmar | 58 | 1.3 | Oman | 142 | 1.1 | Oman | 144 | 1.0 | Oman | 152 | 1.0 |
| Oman | 10 | 0.7 | Nepal | 26 | 0.7 | Nepal | 42 | 0.9 | Nepal | 61 | 0.5 | Nepal | 64 | 0.5 | Nepal | 67 | 0.5 |
| Bahrain | 8 | 0.5 | Brunei | 20 | 0.6 | Bahrain | 29 | 0.6 | Bahrain | 52 | 0.4 | Bahrain | 53 | 0.4 | Bahrain | 55 | 0.4 |
| Mongolia | 3 | 0.2 | Bahrain | 18 | 0.5 | Brunei | 25 | 0.5 | Cambodia | 37 | 0.3 | Cambodia | 40 | 0.3 | Cambodia | 43 | 0.3 |
| Fiji | 2 | 0.1 | Mongolia | 9 | 0.2 | Cambodia | 17 | 0.4 | Brunei | 29 | 0.2 | Brunei | 30 | 0.2 | Brunei | 31 | 0.2 |
| | | | Cambodia | 9 | 0.2 | Lao PDR | 12 | 0.3 | Lao PDR | 25 | 0.2 | Lao PDR | 27 | 0.2 | Lao PDR | 29 | 0.2 |
| | | | Lao PDR | 7 | 0.2 | Mongolia | 10 | 0.2 | Mongolia | 18 | 0.1 | Mongolia | 21 | 0.2 | Mongolia | 24 | 0.2 |
| | | | Fiji | 4 | 0.1 | Fiji | 5 | 0.1 | Fiji | 6 | 0.0 | Fiji | 6 | 0.0 | Fiji | 7 | 0.0 |
| (regrouped) | | | (regrouped) | | | (regrouped) | | | (regrouped) | | | (regrouped) | | | (regrouped) | | |
| APO20 | 3,538 | 234.0 | APO20 | 9,229 | 251.8 | APO20 | 13,249 | 285.8 | APO20 | 20,254 | 161.2 | APO20 | 20,992 | 152.9 | APO20 | 21,670 | 146.6 |
| Asia23 | 4,045 | 267.4 | Asia23 | 11,203 | 305.6 | Asia23 | 18,212 | 392.8 | Asia23 | 33,092 | 263.5 | Asia23 | 34,973 | 254.7 | Asia23 | 36,684 | 248.2 |
| Asia29 | 4,504 | 297.8 | Asia29 | 12,257 | 334.4 | Asia29 | 19,741 | 425.8 | Asia29 | 35,564 | 283.1 | Asia29 | 37,630 | 274.1 | Asia29 | 39,490 | 267.2 |
| East Asia | 2,233 | 147.6 | East Asia | 6,614 | 180.5 | East Asia | 10,832 | 233.7 | East Asia | 19,775 | 157.4 | East Asia | 20,998 | 152.9 | East Asia | 22,135 | 149.8 |
| South Asia | 944 | 62.4 | South Asia | 2,146 | 58.5 | South Asia | 3,535 | 76.3 | South Asia | 6,817 | 54.3 | South Asia | 7,194 | 52.4 | South Asia | 7,539 | 51.0 |
| ASEAN | 575 | 38.0 | ASEAN | 1,908 | 52.1 | ASEAN | 3,045 | 65.7 | ASEAN | 5,059 | 40.3 | ASEAN | 5,303 | 38.6 | ASEAN | 5,610 | 38.0 |
| ASEAN6 | 508 | 33.6 | ASEAN6 | 1,766 | 48.2 | ASEAN6 | 2,751 | 59.3 | ASEAN6 | 4,414 | 35.1 | ASEAN6 | 4,618 | 33.6 | ASEAN6 | 4,885 | 33.1 |
| CLMV | 71 | 4.7 | CLMV | 144 | 3.9 | CLMV | 294 | 6.4 | CLMV | 645 | 5.1 | CLMV | 685 | 5.0 | CLMV | 724 | 4.9 |
| GCC | 475 | 31.4 | GCC | 1,059 | 28.9 | GCC | 1,532 | 33.1 | GCC | 2,473 | 19.7 | GCC | 2,657 | 19.4 | GCC | 2,806 | 19.0 |
| (reference) | | | (reference) | | | (reference) | | | (reference) | | | (reference) | | | (reference) | | |
| US | 4,920 | 325.3 | US | 9,256 | 252.5 | US | 12,934 | 279.0 | US | 15,064 | 119.9 | US | 15,336 | 111.7 | US | 15,775 | 106.7 |
| EU15 | 5,940 | 392.8 | EU15 | 10,315 | 281.4 | EU15 | 12,974 | 279.9 | EU15 | 14,673 | 116.8 | EU15 | 14,888 | 108.4 | EU15 | 14,806 | 100.2 |
| | | | | | | EU27 | 14,707 | 317.2 | EU27 | 16,852 | 134.2 | EU27 | 17,131 | 124.8 | EU27 | 17,064 | 115.5 |
| Australia | 278 | 18.4 | Australia | 502 | 13.7 | Australia | 709 | 15.3 | Australia | 955 | 7.6 | Australia | 989 | 7.2 | Australia | 1,015 | 6.9 |
| Turkey | 237 | 15.7 | Turkey | 587 | 16.0 | Turkey | 843 | 18.2 | Turkey | 1,234 | 9.8 | Turkey | 1,343 | 9.8 | Turkey | 1,372 | 9.3 |

Unit: Billions of US dollars (as of 2012).
Sources: Official national accounts in each country, including author adjustments.
Note: See Appendix 1 for the adjustments made to harmonize GDP coverage across countries.

Table 2 repeats the same snapshot level comparisons of Asian countries as in Table 1, but based on GDP at constant market prices using constant PPP for Asian countries. By correcting for international price differentials, Asia29 has been expanding rapidly. It was 150%, instead of 45%, larger than the US economy in 2012, having overtaken it in 1975 (Figure 4).[9] East Asia (China, the ROC, Hong Kong, Japan, Korea, and Mongolia) caught up with the US in 2006 from a low base of 45% in 1970. In contrast, EU15 has been experiencing a gradual relative decline in economic size, from 121% of the US economy in 1970 to a low of 94% in 2012. Based on GDP using constant PPP, the weight of the world economy is even more tilted toward Asia than portrayed by GDP using exchange rates. This reflects the fact that nearly all Asian countries increase in relative size after international price differentials have been properly taken into account.

The relative size of China's economy in 2012 was 326% or more than three times that of Japan, compared with 138% when exchange rates are used in Table 1. Considering that the Chinese economy was only 26% that of Japan and 59% that of India in 1970, represents remarkable growth. On this measure, China overtook Japan after 1999 to become the leading economy in Asia (Figure 5).[10] Similarly, its size in 2012 increased from 52% to 94% relative to the US economy after adjusting for their price differences. Assuming that China and the US also grow at the usual pace as they have displayed since 2000, China is projected to overtake the US economy in 2014.

Given that PPP for India have been revised by –24% in the 2011 ICP round (see Box 1), the effects have been to raise the relative size of India. Relative to Japan, the Indian economy has been increasing from

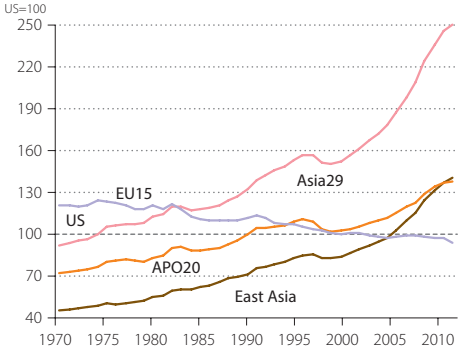



**Figure 4 Regional GDP of Asia and the EU, Relative to the US, 1970–2012**
——Indices of GDP at constant market prices, using 2011 PPP

Sources: Official national accounts in each country, including author adjustments.

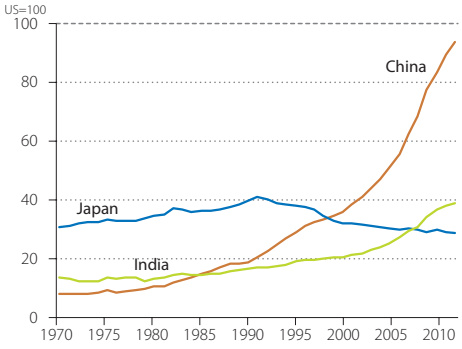



**Figure 5 GDP of China, India, and Japan, Relative to the US, 1970–2012**
——Indices of GDP at constant market prices, using 2011 PPP

Sources: Official national accounts in each country, including author adjustments.

8: It is therefore important to note that any international GDP comparisons are sensitive not only to revisions in national accounts but also to revisions in multilateral PPPs, which are currently benchmarked every six years. PPPs for most Asian countries have been revised downward, compared with what they would have been by extrapolating the 2005 benchmark PPP (see Box 1). This has the effect of raising the relative sizes of these economies against the base economy. Consequently, the level comparisons in Databook 2013, which were based on the 2005 benchmark PPP, are not comparable with the results presented in this Databook.

9: This compares with the finding in Databook 2013 that the economic size of Asia29 overtook the US in 1988.

10: The shift of the benchmark year PPP estimates from 2005 to 2011 has the effect of bringing forward the year when China overtook Japan in relative GDP to 1999, from 2002 in Databook 2013.

44% in 1970 to 135% in 2012, surpassing Japan and replacing it as the second largest economy in Asia in 2008. In 2012, the total GDP of the three largest Asian economies alone was 61% larger than the US economy.

Figure 6 shows the rapid expansion of the relative size of the South Asian economy (consisting of Bangladesh, India, Nepal, Pakistan, and Sri Lanka), 81% of which was accounted for by India in 2012. ASEAN also showed vigor in their catch-up effort. They were on a par with the South Asian economy in 1996–1997 before the setback caused by the Asian financial crisis of 1997–1998 took hold, set them on a lower growth path, opening up a divergence once again. In contrast, the progress of GCC[11] countries flagged for two decades. Only in the past decade has it picked up and brought the relative size of the country group back to its previous peak of the early 1980s.[12]

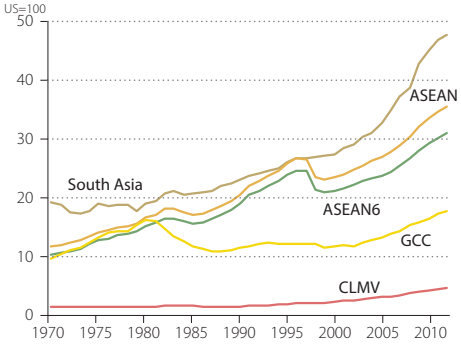



**Figure 6 Regional GDP of South Asia, ASEAN, and GCC, Relative to the US, 1970–2012**
——Indices of GDP at constant market prices, using 2011 PPP

Sources: Official national accounts in each country, including author adjustments.

Countries' relative performance is also transformed when economic growth is used as the yardstick. Table 3 presents cross-country comparisons of real GDP growth in Asia, covering the 1990s and 2000s.[13] The rankings vary from period to period and are no longer dominated by the economic giants. In fact, small developing Asian countries, like Qatar, Myanmar, Cambodia, Vietnam, the Lao PDR, and Mongolia, are equally capable of exhibiting exuberant growth. As labor costs are edging up in China, the workshop of the world has started shifting its location to the neighboring countries such as Cambodia, the Lao PDR, Myanmar, and Vietnam. To capture the dynamism, a new country group, called CLMV, is formed for the Databook to track from this edition onward. They are clearly the faster growing group among the ASEAN countries, at 7.6% on average per year compared with 4.8% managed by ASEAN6 in the period 1990–2012.

At the other end of the table, Japan consistently has been struggling at the bottom over the past two decades (1990–2012), with an average growth of 1.0% per year, compared with Asia29's 5.5% and the fastest growth of 9.8% achieved by China. During this period, only three Asian countries – Brunei, Fiji, and Japan – grew slower than the US (2.4%), and only Japan grew slower than EU15 (1.6%). The divergence of growth performance between the Asian countries on the one hand and the US and EU15 on the other was even more pronounced if focusing on the most recent years,

11: GCC consists of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the UAE. These GCC countries display economic characteristics very different from those of other Asian economies due to their preponderant reliance on the oil and energy sector. Together, these countries account for about 45% of the world's proven oil reserves and 25% of crude oil exports, and possess at least 17% of the proven global natural gas reserves.

12: In interpreting the results in this report, one must bear in mind that conventional GDP tends to overstate the income of these oil-exporting countries since it does not account for the depletion of natural resource stock, and in turn a large part of their GDP may not be sustainable. Besides, GDP growth can underestimate the growth of real income available to the country brought about by a favorable change in terms of trade, and vice versa. For an oil-exporting country, the growth wedge of the two measures could be significant in the face of volatile oil prices. See Chapter 7.

13: Annual data maximize the use of available information and data, and are normally published two to three years in arrears. For more timely analysis, quarterly economic data are used as they are normally published within a month of the reference period and are subsequently revised as more data become available. A trade-off always exists between data timeliness and precision. See Box 8 (p. 122) for more details.

**Table 3 GDP Growth, 1990–1995, 1995–2000, 2000–2005, and 2005–2012**
——Average annual growth rate of GDP at constant market prices

| 1990–1995 | | 1995–2000 | | 2000–2005 | | 2005–2012 | | 1990–2012 | | 2000–2012 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| China | 11.6 | Qatar | 10.6 | Myanmar | 12.1 | Qatar | 14.5 | China | 9.8 | Qatar | 11.8 |
| Malaysia | 9.2 | China | 8.3 | China | 9.3 | China | 9.9 | Qatar | 9.4 | Myanmar | 10.5 |
| Kuwait | 9.2 | Myanmar | 8.2 | Cambodia | 9.0 | Myanmar | 9.3 | Myanmar | 8.9 | China | 9.7 |
| Singapore | 8.2 | Vietnam | 7.3 | Vietnam | 8.0 | Mongolia | 8.5 | Vietnam | 7.3 | Cambodia | 7.6 |
| Thailand | 8.1 | Cambodia | 7.0 | Qatar | 7.9 | Lao PDR | 7.8 | Cambodia | 7.2 | Mongolia | 7.6 |
| Vietnam | 8.1 | UAE | 6.3 | Kuwait | 7.2 | India | 7.3 | Lao PDR | 6.7 | Lao PDR | 7.1 |
| Korea | 7.6 | Lao PDR | 6.0 | Iran | 6.8 | Cambodia | 6.7 | India | 6.3 | India | 7.0 |
| Indonesia | 7.6 | India | 5.7 | India | 6.6 | Sri Lanka | 6.5 | Singapore | 6.0 | Vietnam | 6.9 |
| ROC | 7.0 | Singapore | 5.6 | Mongolia | 6.3 | Bangladesh | 6.1 | Malaysia | 5.7 | Bangladesh | 5.8 |
| Cambodia | 6.5 | ROC | 5.1 | Lao PDR | 6.2 | Vietnam | 6.0 | Sri Lanka | 5.3 | Sri Lanka | 5.4 |
| Lao PDR | 6.2 | Bangladesh | 5.1 | Bahrain | 5.9 | Saudi Arabia | 6.0 | Bangladesh | 5.3 | Singapore | 5.3 |
| Oman | 5.7 | Korea | 5.1 | UAE | 5.4 | Indonesia | 5.8 | Kuwait | 5.3 | Indonesia | 5.3 |
| Myanmar | 5.7 | Sri Lanka | 4.9 | Thailand | 5.3 | Singapore | 5.7 | Bahrain | 5.0 | Bahrain | 5.2 |
| Bahrain | 5.3 | Nepal | 4.8 | Bangladesh | 5.3 | Oman | 5.0 | Korea | 5.0 | Saudi Arabia | 5.1 |
| Sri Lanka | 5.3 | Malaysia | 4.8 | Pakistan | 4.9 | Philippines | 4.9 | Indonesia | 4.8 | Kuwait | 4.9 |
| India | 5.1 | Philippines | 4.5 | Singapore | 4.7 | Malaysia | 4.7 | ROC | 4.7 | Iran | 4.8 |
| Hong Kong | 5.1 | Bahrain | 4.2 | Malaysia | 4.6 | Bahrain | 4.7 | Mongolia | 4.5 | Philippines | 4.7 |
| Nepal | 4.9 | Iran | 4.1 | Indonesia | 4.6 | Nepal | 4.3 | UAE | 4.4 | Malaysia | 4.7 |
| Pakistan | 4.6 | Oman | 3.7 | Philippines | 4.5 | Pakistan | 3.9 | Thailand | 4.4 | Thailand | 4.3 |
| Bangladesh | 4.3 | Mongolia | 3.6 | Korea | 4.4 | ROC | 3.7 | Iran | 4.4 | Pakistan | 4.3 |
| Iran | 3.7 | Pakistan | 3.2 | Hong Kong | 4.1 | Hong Kong | 3.7 | Nepal | 4.3 | UAE | 4.0 |
| UAE | 3.6 | Hong Kong | 2.6 | Sri Lanka | 4.0 | Thailand | 3.6 | Philippines | 4.2 | Korea | 3.9 |
| Brunei | 3.1 | Saudi Arabia | 2.6 | Saudi Arabia | 3.7 | Korea | 3.5 | Pakistan | 4.1 | Hong Kong | 3.8 |
| Saudi Arabia | 2.8 | Kuwait | 2.1 | ROC | 3.5 | Kuwait | 3.3 | Saudi Arabia | 4.0 | Nepal | 3.8 |
| Fiji | 2.7 | Fiji | 2.0 | Nepal | 3.1 | Iran | 3.3 | Oman | 4.0 | ROC | 3.6 |
| Philippines | 2.5 | Brunei | 1.4 | Brunei | 2.1 | UAE | 3.1 | Hong Kong | 3.8 | Oman | 3.3 |
| Qatar | 2.3 | Japan | 0.8 | Fiji | 2.0 | Fiji | 1.2 | Fiji | 1.9 | Brunei | 1.5 |
| Japan | 1.7 | Indonesia | 0.8 | Japan | 1.2 | Brunei | 1.1 | Brunei | 1.9 | Fiji | 1.5 |
| Mongolia | −1.8 | Thailand | 0.7 | Oman | 1.0 | Japan | 0.4 | Japan | 1.0 | Japan | 0.7 |
| (regrouped) | | (regrouped) | | (regrouped) | | (regrouped) | | (regrouped) | | (regrouped) | |
| APO20 | 4.4 | APO20 | 3.0 | APO20 | 4.2 | APO20 | 4.2 | APO20 | 4.0 | APO20 | 4.2 |
| Asia23 | 5.7 | Asia23 | 4.3 | Asia23 | 5.7 | Asia23 | 6.3 | Asia23 | 5.6 | Asia23 | 6.0 |
| Asia29 | 5.6 | Asia29 | 4.2 | Asia29 | 5.6 | Asia29 | 6.2 | Asia29 | 5.5 | Asia29 | 6.0 |
| East Asia | 5.7 | East Asia | 4.5 | East Asia | 5.6 | East Asia | 6.6 | East Asia | 5.7 | East Asia | 6.1 |
| South Asia | 5.0 | South Asia | 5.3 | South Asia | 6.2 | South Asia | 6.8 | South Asia | 5.9 | South Asia | 6.5 |
| ASEAN | 7.3 | ASEAN | 2.5 | ASEAN | 5.2 | ASEAN | 5.3 | ASEAN | 5.1 | ASEAN | 5.2 |
| AESEAN6 | 7.3 | AESEAN6 | 2.0 | AESEAN6 | 4.7 | AESEAN6 | 5.0 | AESEAN6 | 4.8 | AESEAN6 | 4.9 |
| CLMV | 7.4 | CLMV | 7.4 | CLMV | 8.9 | CLMV | 7.0 | CLMV | 7.6 | CLMV | 7.8 |
| GCC | 3.8 | GCC | 3.7 | GCC | 4.6 | GCC | 5.6 | GCC | 4.6 | GCC | 5.2 |
| (reference) | | (reference) | | (reference) | | (reference) | | (reference) | | (reference) | |
| US | 2.5 | US | 4.2 | US | 2.4 | US | 1.1 | US | 2.4 | US | 1.7 |
| EU15 | 1.7 | EU15 | 2.9 | EU15 | 1.8 | EU15 | 0.6 | EU15 | 1.6 | EU15 | 1.1 |
| | | EU27 | 2.9 | EU27 | 1.9 | EU27 | 0.8 | EU27 | 1.7 | EU27 | 1.2 |
| Australia | 3.1 | Australia | 3.8 | Australia | 3.3 | Australia | 2.7 | Australia | 3.2 | Australia | 3.0 |
| Turkey | 3.2 | Turkey | 4.1 | Turkey | 4.5 | Turkey | 3.8 | Turkey | 3.9 | Turkey | 4.1 |

Unit: Percentage.
Sources: Official national accounts in each country, including author adjustments.
Note: See Appendix 1 for the adjustments made to harmonize GDP coverage across countries.

with Asia29 growing at 6.2% on average per annum, compared with 1.1% in the US and 0.6% in EU15 in the period 2005–2012.

The change of guards in Asia is clearly illustrated in Figure 7. While Japan was the standard-bearer in yesteryears, China and India have emerged as the driving force propelling Asia forward over the past two decades (1990–2012) and accounting for 45% and 16% of regional growth, respectively. Despite

being the slowest growing economy in Asia, Japan has remained the fifth largest contributor to regional growth in 1990–2012, due to its size.

Looking at the four sub-periods in Table 3, growth in the reference countries, namely the US, EU15, and Australia, revived in the latter half of the 1990s, before it deteriorated in the subsequent two periods in the 2000s. Both the US and EU15 went through deep recessions in 2009, following the global financial storm. Consequently, the US managed a growth of only 1.1% on average per year in the period 2005–2012. EU15 fared worse as they dipped into recession again in 2012 on the stress of the euro crisis. They managed an average annual growth of 0.6% over the same period. Growth in Australia has been faster than that in the US and EU15, and sustained by, among other things, China's surging demand for commodities even through the turbulent years of global financial crisis. Growth in Asia has gone from strength to strength, with a blip in the second half of the 1990s due to the Asian financial crisis. Fastest acceleration has been achieved by South Asia, from an annual average growth rate of 5.0% in 1990–1995 to 6.8% in 2005–2012, compared with 5.7% and 6.6% for East Asia, respectively. Among all country groups, ASEAN6 was most impacted by the Asian financial crisis of 1997, which slowed its average annual growth drastically from 7.3% to 2.0% in 1990–1995 and 1995–2000, respectively (see Figure 6). More than one decade later, it has not yet fully recovered its pre-crisis growth vitality, with the 2005–2012 average annual growth rate 2.3 percentage points lower than in the first half of the 1990s. CLMV on the other hand has been the fastest growing country group in Asia.

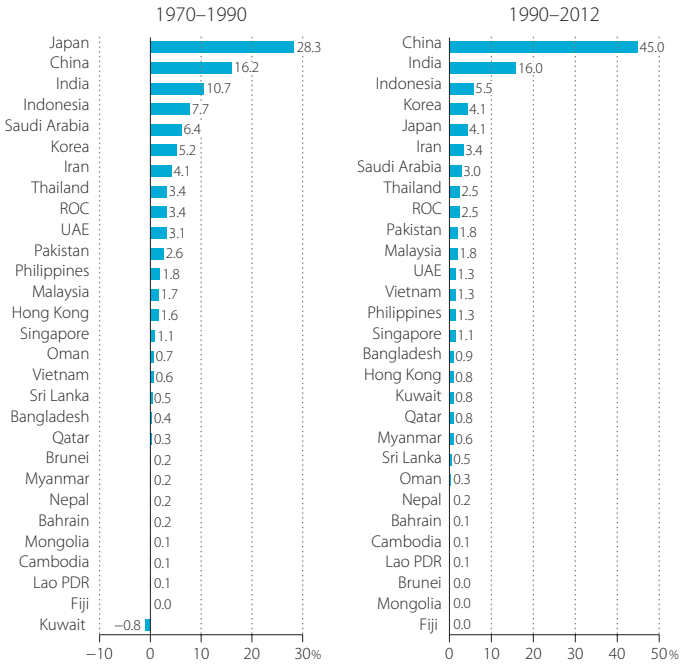



**Figure 7 Country Contributions to Regional GDP Growth, 1970–1990 and 1990–2012**

——Contribution share to the growth of gross regional products (growth rate of Asia29=100)

Sources: Official national accounts in each country, including author adjustments.
Note: The starting periods for the Lao PDR and Cambodia are 1984 and 1987, respectively.

Based on Table 3, it is easy to assume that Asia has not been even slightly affected by the global financial crisis, as Asia29's growth rate accelerated from 5.6% to 6.2% between 2000–2005 and 2005–2012. But, in fact, Asia29's growth slowed significantly from a recent peak of 8.2% in 2007, to 4.9% in 2008 and further to 4.0% in 2009, before rebounding strongly to 8.0% in 2010. Growth moderated again in 2011 to 5.8% and further to 5.0% in 2012, partly reflecting the retreating impact of the crisis response in the form of fiscal stimulation. Out of the 29 countries, 11 Asian economies experienced negative growth in 2009. Japan went through the deepest contraction of 5.7%. Of the Asian Tigers, only Korea managed a narrow escape from recession with 0.3% growth in 2009.

It has been a subject of much debate whether the Asian economy has decoupled from the US and EU15. If it has, the world economy will be substantially less volatile. Park and Shin (2009) show that East Asia has seen a marked increase in intra-regional trade, and, at the same time, diversified its

## Box 1 PPP Revisions by 2011 ICP Round

Purchasing power parities (PPPs) are indispensable inputs into economic research and policy analysis involving cross-country comparisons of macroeconomic aggregates. They affect a double conversion of macroeconomic measures, estimated in national currencies and price levels, into comparable cross-country volume measures. These are expressed in a common currency and at a uniform price level.

PPPs are price relatives that show the ratio of the prices in national currencies of a comparable basket of goods and services in different countries. They are compiled within the International Comparisons Program (ICP) for GDP and its main aggregates. Comparisons are made from the expenditure side of GDP. To this end, the ICP compiles PPPs by holding worldwide surveys at regular intervals (currently, every six years) to collect comparable price and expenditure data for the whole range of final goods and services that make up the final expenditure on GDP. In April 2014, the new benchmark PPP estimates were published by the ICP 2011 round. For a number of methodological improvements, see Eurostat-OECD (2012) and World Bank (2014).

Chapter 3 mainly provides the cross-country comparison of economic volumes. To obtain comparable volume measures, the Databook uses the constant PPP approach. This creates national series for volumes at the prices of a common reference year (2012), and deflates these by the PPP for a fixed year (one of the ICP benchmark years). This Databook uses the new ICP 2011 estimates. It is inevitable that they will be compared with the results of the previous round in 2005, which has provided the benchmark estimate for the past Databook series in 2009–2013.

Figure B1 shows the revisions of PPPs in Asian countries at the 2011 ICP round, in comparison with the 2005 ICP round. The 2011 benchmark PPP for most of the Asian countries are lower than suggested by their extrapolated equivalents from the 2005 benchmark, with a difference ranging from +3% for Korea to –47 % for Myanmar. With the exception of Singapore, it is observed that revisions for the more mature economies are much smaller (ranging within ±4%) than those for the rapidly developing economies (with downward revisions larger than 10%). Therefore, the impact of the PPP revisions is to raise the relative size of Asian economies, moving them closer to the level of the more mature economies. More specifically, the PPP revisions for India and China are –24% and –16% respectively. As a result, the relative position of India has improved considerably in cross-country level comparisons after PPP revisions.

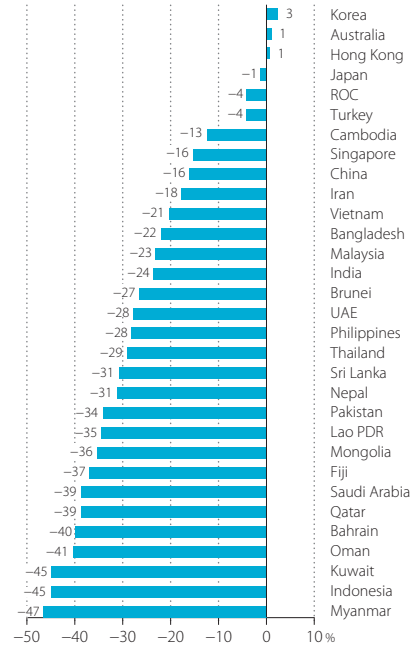



**Figure B1 Revisions of PPP for GDP by 2011 ICP Round**
—Ratio of the 2011 ICP PPP to the 2005 ICP PPP (extrapolated for 2011)

Source: World Bank, *World Development Indicators 2014*.

export markets to other parts of the world resulting in an output movement that is more idiosyncratic than before. In turn, East Asia is less dependent on the US. Such increased self-subsistence is a necessary adaptation. In recent years the US has become less and less reliable as an outlet of China's final goods export. In contrast, the impact of Asia's extra-regional integration with the global financial markets on business cycle synchronicity is less clear-cut. While deep financial markets allow more risk diversification, and the smoothing out of consumption, closer integration also provides the conduit for financial contagion. East Asia still suffers from the flight for quality when a crisis strikes. As the impact of the global financial crisis was filtering through, Asia seemed immune to the adverse impacts

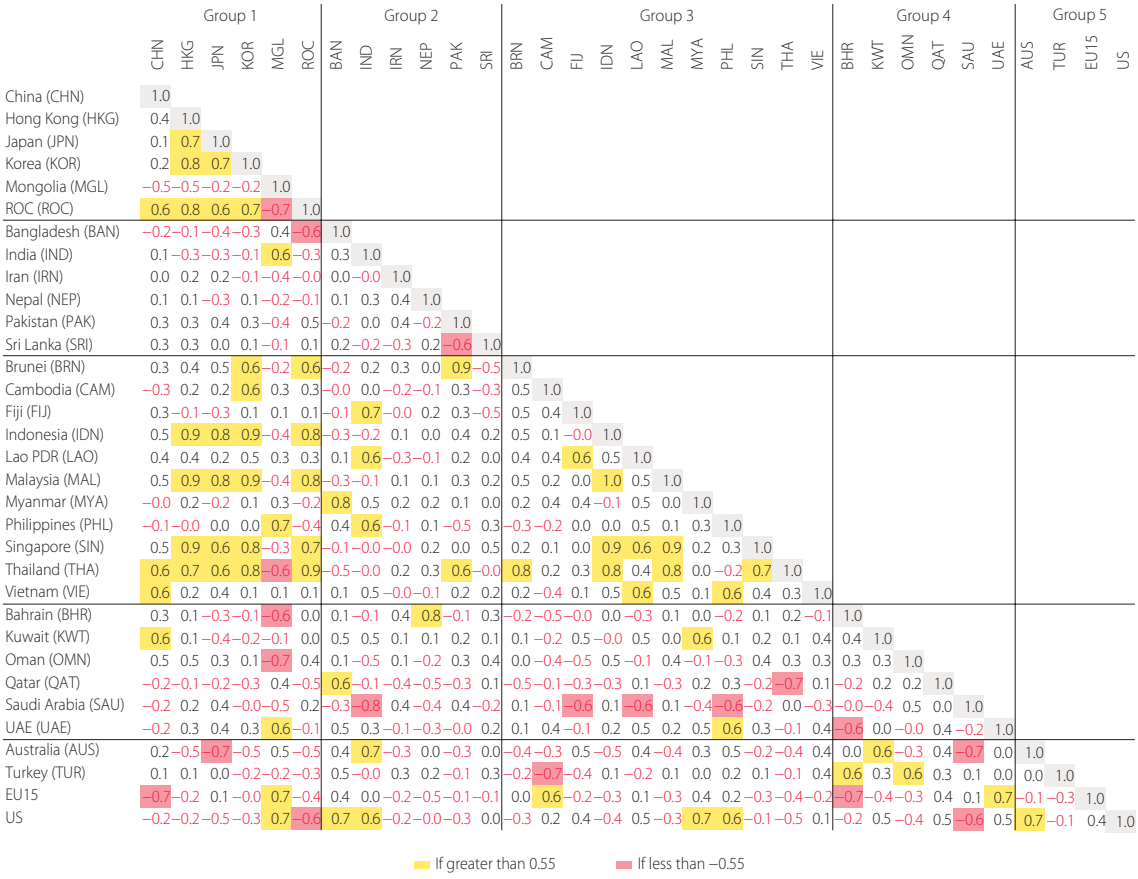



**Figure 8 Correlation of GDP Growth, 1990–2000**
——Correlation of GDP growth at constant market prices

Sources: Official national accounts in each country, including author adjustments.

initially. However, once global investors began to retreat from the region and the financial menace began to inexorably spread through the real economy, Asia, too, started to slow.

Figures 8 and 9 compare the correlation coefficients of growth rates among countries in the 1990s and the 2000s, respectively. Countries are grouped by region. Overall, the fortunes of the reference countries have become increasingly tied to Asia in a pro-cyclical manner. It is interesting to note that China's correlation with the US and EU15 has moved from negative to moderately positive. Correlation among the East Asian countries has strengthened over time. With the exception of China, their correlation with the US and EU15 has strengthened as well. The correlation among countries in Group 3 and their correlation with the US and EU15, has also grown much stronger. Therefore, comparisons of the correlation coefficients of growth between the two periods lend support to an increase, not a decrease, in business cycle synchronicity.

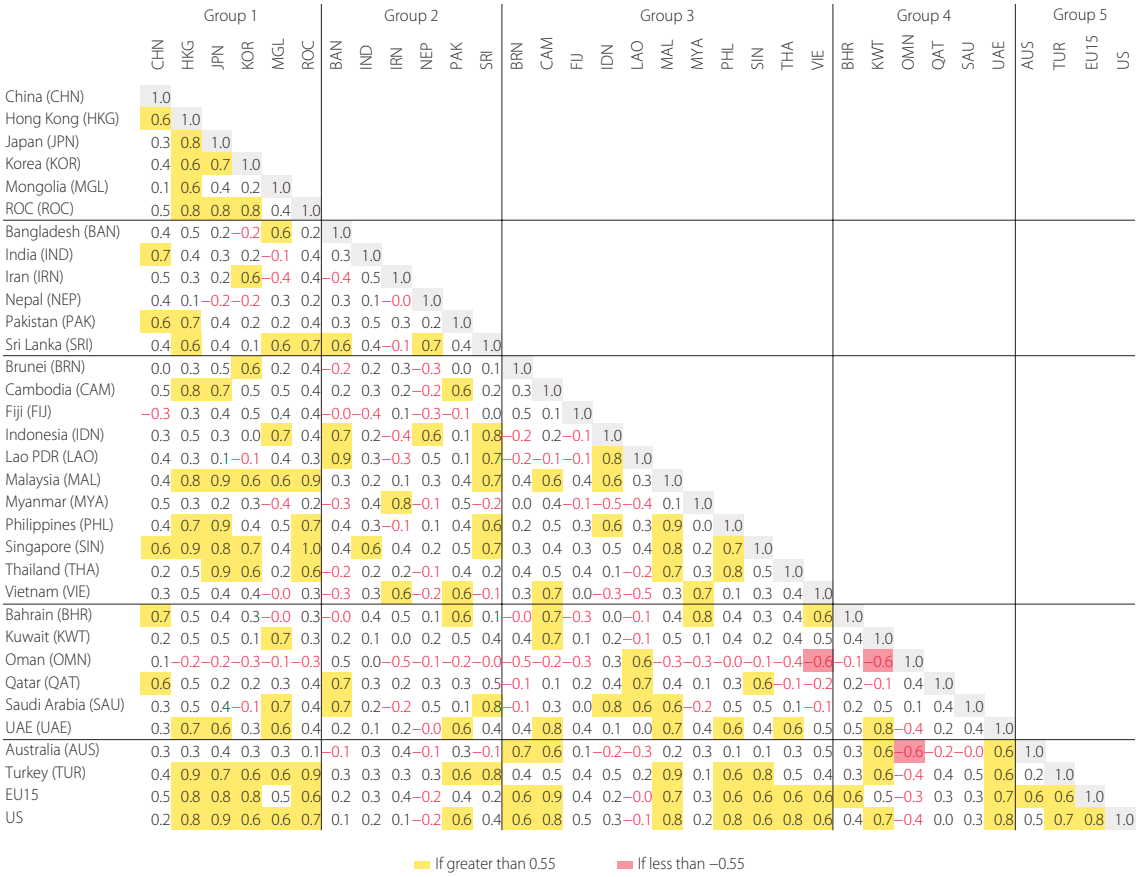



**Figure 9 Correlation of GDP Growth, 2000–2012**
——Correlation of GDP growth at constant market prices

Sources: Official national accounts in each country, including author adjustments.

## 3.2 Catching Up in Per Capita GDP

Performance comparisons based on whole-economy GDP do not take into account the population size and can in turn exaggerate the wellbeing of countries with large populations. Asia is the world's most populous region. In 2012, it accounted for 60% of the world's population (56% for Asia29), with China and India alone accounting for more than one-third (Figure 10). Based on per capita GDP, which adjusts for the differences in population size (but not income distribution), Asia's rising economic giants (China and India) are still substantially less well-off when compared with the US standard. Conversely, the Asian Tigers fare exceptionally well.

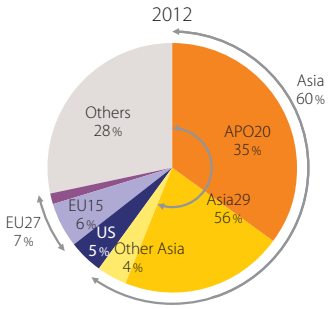



**Figure 10 Share of Asian Population in the World in 2012**

Source: IMF, *World Economic Outlook Database*, April 2014.

## Table 4 Per Capita GDP using Exchange Rate, 1970, 1990, 2000, 2010, 2011, and 2012

——GDP at current market prices per person, using annual average exchange rate

| 1970 | | (%) | 1990 | | (%) | 2000 | | (%) | 2010 | | (%) | 2011 | | (%) | 2012 | | (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Japan | 1.99 | 100.0 | Japan | 25.06 | 100.0 | Japan | 37.35 | 100.0 | Singapore | 45.95 | 100.0 | Singapore | 52.53 | 100.0 | Singapore | 53.52 | 100.0 |
| Hong Kong | 0.96 | 48.3 | Hong Kong | 13.48 | 53.8 | Hong Kong | 25.38 | 67.9 | Japan | 43.01 | 93.6 | Japan | 46.32 | 88.2 | Japan | 46.67 | 87.2 |
| Singapore | 0.93 | 46.4 | Singapore | 12.75 | 50.9 | Singapore | 23.41 | 62.7 | Hong Kong | 31.91 | 69.4 | Hong Kong | 34.46 | 65.6 | Hong Kong | 35.99 | 67.3 |
| Fiji | 0.43 | 21.4 | ROC | 8.08 | 32.2 | ROC | 14.64 | 39.2 | Korea | 20.54 | 44.7 | Korea | 22.39 | 42.6 | Korea | 22.59 | 42.2 |
| Iran | 0.39 | 19.8 | Korea | 6.31 | 25.2 | Korea | 11.35 | 30.4 | ROC | 18.49 | 40.2 | ROC | 20.03 | 38.1 | ROC | 20.38 | 38.1 |
| ROC | 0.39 | 19.5 | Malaysia | 2.49 | 10.0 | Malaysia | 4.00 | 10.7 | Malaysia | 8.35 | 18.2 | Malaysia | 9.60 | 18.3 | Malaysia | 9.92 | 18.5 |
| Malaysia | 0.36 | 17.9 | Fiji | 1.85 | 7.4 | Fiji | 2.10 | 5.6 | Iran | 6.28 | 13.7 | Iran | 8.48 | 16.1 | Iran | 8.10 | 15.1 |
| Korea | 0.28 | 13.9 | Iran | 1.71 | 6.8 | Thailand | 2.09 | 5.6 | Thailand | 5.14 | 11.2 | Thailand | 5.55 | 10.6 | China | 6.07 | 11.3 |
| Thailand | 0.21 | 10.6 | Thailand | 1.62 | 6.5 | Iran | 1.71 | 4.6 | China | 4.42 | 9.6 | China | 5.43 | 10.3 | Thailand | 5.93 | 11.1 |
| Sri Lanka | 0.21 | 10.5 | Philippines | 0.76 | 3.0 | Philippines | 1.06 | 2.8 | Fiji | 3.70 | 8.0 | Fiji | 4.28 | 8.1 | Fiji | 4.48 | 8.4 |
| Pakistan | 0.20 | 10.1 | Indonesia | 0.71 | 2.8 | China | 0.95 | 2.5 | Indonesia | 3.03 | 6.6 | Indonesia | 3.56 | 6.8 | Indonesia | 3.65 | 6.8 |
| Philippines | 0.18 | 9.3 | Mongolia | 0.58 | 2.3 | Sri Lanka | 0.89 | 2.4 | Sri Lanka | 2.41 | 5.2 | Mongolia | 3.13 | 6.0 | Mongolia | 3.63 | 6.8 |
| Bangladesh | 0.14 | 6.9 | Sri Lanka | 0.49 | 1.9 | Indonesia | 0.81 | 2.2 | Mongolia | 2.25 | 4.9 | Sri Lanka | 2.85 | 5.4 | Sri Lanka | 2.94 | 5.5 |
| Cambodia | 0.12 | 5.9 | Pakistan | 0.43 | 1.7 | Pakistan | 0.52 | 1.4 | Philippines | 2.16 | 4.7 | Philippines | 2.38 | 4.5 | Philippines | 2.61 | 4.9 |
| India | 0.11 | 5.6 | India | 0.39 | 1.5 | Mongolia | 0.47 | 1.3 | India | 1.40 | 3.0 | Vietnam | 1.56 | 3.0 | Vietnam | 1.77 | 3.3 |
| China | 0.11 | 5.5 | China | 0.34 | 1.4 | India | 0.46 | 1.2 | Vietnam | 1.34 | 2.9 | India | 1.53 | 2.9 | India | 1.49 | 2.8 |
| Myanmar | 0.10 | 5.0 | Bangladesh | 0.27 | 1.1 | Vietnam | 0.42 | 1.1 | Lao PDR | 1.11 | 2.4 | Lao PDR | 1.28 | 2.4 | Lao PDR | 1.42 | 2.7 |
| Mongolia | 0.09 | 4.7 | Nepal | 0.25 | 1.0 | Bangladesh | 0.37 | 1.0 | Pakistan | 1.01 | 2.2 | Pakistan | 1.19 | 2.3 | Pakistan | 1.24 | 2.3 |
| Nepal | 0.09 | 4.4 | Lao PDR | 0.21 | 0.8 | Lao PDR | 0.32 | 0.9 | Cambodia | 0.82 | 1.8 | Cambodia | 0.92 | 1.8 | Cambodia | 0.99 | 1.9 |
| Indonesia | 0.09 | 4.3 | Cambodia | 0.20 | 0.8 | Cambodia | 0.31 | 0.8 | Nepal | 0.72 | 1.6 | Myanmar | 0.92 | 1.8 | Myanmar | 0.98 | 1.8 |
| Vietnam | 0.03 | 1.4 | Myanmar | 0.13 | 0.5 | Nepal | 0.28 | 0.7 | Myanmar | 0.70 | 1.5 | Nepal | 0.79 | 1.5 | Nepal | 0.76 | 1.4 |
| | | | Vietnam | 0.10 | 0.4 | Myanmar | 0.15 | 0.4 | Bangladesh | 0.68 | 1.5 | Bangladesh | 0.72 | 1.4 | Bangladesh | 0.74 | 1.4 |
| | | | | | | | | | | | | | | | | | |
| Bahrain | 1.88 | 94.4 | Bahrain | 9.27 | 37.0 | Bahrain | 13.17 | 35.3 | Bahrain | 20.83 | 45.3 | Bahrain | 24.30 | 46.3 | Bahrain | 24.92 | 46.6 |
| Kuwait | 3.95 | 198.3 | Kuwait | 8.96 | 35.7 | Kuwait | 17.94 | 48.0 | Kuwait | 41.20 | 89.6 | Kuwait | 53.40 | 101.6 | Kuwait | 58.55 | 109.4 |
| Oman | 0.39 | 19.8 | Oman | 7.20 | 28.7 | Oman | 8.21 | 22.0 | Oman | 21.43 | 46.6 | Oman | 21.39 | 40.7 | Oman | 21.69 | 40.5 |
| Qatar | 4.95 | 248.4 | Qatar | 17.66 | 70.5 | Qatar | 29.20 | 78.2 | Qatar | 74.63 | 162.4 | Qatar | 93.57 | 178.1 | Qatar | 97.84 | 182.8 |
| Saudi Arabia | 0.93 | 46.5 | Saudi Arabia | 7.26 | 29.0 | Saudi Arabia | 9.44 | 25.3 | Saudi Arabia | 19.47 | 42.4 | Saudi Arabia | 24.29 | 46.2 | Saudi Arabia | 26.13 | 48.8 |
| UAE | 4.27 | 214.3 | UAE | 28.86 | 115.2 | UAE | 35.20 | 94.2 | UAE | 35.55 | 77.4 | UAE | 40.74 | 77.6 | UAE | 43.47 | 81.2 |
| Brunei | 1.49 | 74.6 | Brunei | 12.92 | 51.5 | Brunei | 17.81 | 47.7 | Brunei | 35.66 | 77.6 | Brunei | 43.24 | 82.3 | Brunei | 43.58 | 81.4 |
| (regrouped) | | | (regrouped) | | | (regrouped) | | | (regrouped) | | | (regrouped) | | | (regrouped) | | |
| APO20 | 0.31 | 15.8 | APO20 | 2.58 | 10.3 | APO20 | 3.45 | 9.2 | APO20 | 4.86 | 10.6 | APO20 | 5.30 | 10.1 | APO20 | 5.31 | 9.9 |
| Asia23 | 0.23 | 11.4 | Asia23 | 1.67 | 6.7 | Asia23 | 2.46 | 6.6 | Asia23 | 4.64 | 10.1 | Asia23 | 5.28 | 10.1 | Asia23 | 5.51 | 10.3 |
| Asia29 | 0.23 | 11.6 | Asia29 | 1.73 | 6.9 | Asia29 | 2.55 | 6.8 | Asia29 | 4.89 | 10.6 | Asia29 | 5.60 | 10.7 | Asia29 | 5.86 | 11.0 |
| East Asia | 0.32 | 16.2 | East Asia | 2.99 | 11.9 | East Asia | 4.73 | 12.7 | East Asia | 8.45 | 18.4 | East Asia | 9.67 | 18.4 | East Asia | 10.25 | 19.2 |
| South Asia | 0.12 | 6.2 | South Asia | 0.38 | 1.5 | South Asia | 0.46 | 1.2 | South Asia | 1.29 | 2.8 | South Asia | 1.42 | 2.7 | South Asia | 1.40 | 2.6 |
| ASEAN | 0.12 | 6.2 | ASEAN | 0.83 | 3.3 | ASEAN | 1.19 | 3.2 | ASEAN | 3.22 | 7.0 | ASEAN | 3.69 | 7.0 | ASEAN | 3.87 | 7.2 |
| ASEAN6 | 0.15 | 7.5 | ASEAN6 | 1.10 | 4.4 | ASEAN6 | 1.53 | 4.1 | ASEAN6 | 4.05 | 8.8 | ASEAN6 | 4.63 | 8.8 | ASEAN6 | 4.82 | 9.0 |
| CLVM | 0.06 | 3.0 | CLVM | 0.12 | 0.5 | CLVM | 0.31 | 0.8 | CLVM | 1.06 | 2.3 | CLVM | 1.27 | 2.4 | CLVM | 1.41 | 2.6 |
| GCC | 1.36 | 68.2 | GCC | 9.34 | 37.3 | GCC | 13.13 | 35.2 | GCC | 26.22 | 57.1 | GCC | 31.96 | 60.8 | GCC | 34.27 | 64.0 |
| (reference) | | | (reference) | | | (reference) | | | (reference) | | | (reference) | | | (reference) | | |
| US | 5.06 | 254.0 | US | 23.24 | 92.7 | US | 35.27 | 94.4 | US | 46.87 | 102.0 | US | 48.38 | 92.1 | US | 50.25 | 93.9 |
| EU15 | 3.54 | 177.4 | EU15 | 16.82 | 67.1 | EU15 | 25.32 | 67.8 | EU15 | 35.26 | 76.7 | EU15 | 36.59 | 69.7 | EU15 | 37.14 | 69.4 |
| | | | | | | EU27 | 22.02 | 59.0 | EU27 | 32.31 | 70.3 | EU27 | 33.63 | 64.0 | EU27 | 34.31 | 64.1 |
| Australia | 3.57 | 178.9 | Australia | 18.88 | 75.4 | Australia | 21.36 | 57.2 | Australia | 57.95 | 126.1 | Australia | 67.84 | 129.1 | Australia | 68.57 | 128.1 |
| Turkey | 0.67 | 33.7 | Turkey | 3.54 | 14.1 | Turkey | 3.94 | 10.5 | Turkey | 9.95 | 21.7 | Turkey | 10.41 | 19.8 | Turkey | 10.46 | 19.6 |

Unit: Thousands of US dollars.
Sources: Official national accounts in each country, including author adjustments.
Note: See Appendix 1 for the adjustments made to harmonize GDP coverage across countries.

Table 4 presents cross-country comparisons of per capita current-price GDP, using exchange rates as conversion rates. However, given the volatile nature of exchange rates, snapshot comparisons like those presented in Table 4 can appear arbitrary. Rather, long-term trends of nominal per capita GDP provide a better guide of relative movements. Based on this measure, Japan closed up on the US level in the late 1980s and peaked in 1995, reflecting the strong yen (Figure 11). Figure 12 shows comparisons among the Asian Tigers. Singapore and Hong Kong have been moving closely with one another for

three and a half decades until the mid-2000s, when Singapore sprinted ahead of Hong Kong. Hong Kong's per capita GDP peaked in 1997, the year when Hong Kong was returned to China, and subsequently plummeted until 2004. Singapore followed a similar path: peaking in 1996, and falling to an all-time low in 2002 before the surge of recent years. The ROC and Korea moved together but at a lower level than Singapore and Hong Kong. Similarly, Korea's income level peaked in 1996; but with lows short lived compared to Hong Kong or Singapore. In Asia, Japan and Singapore are the two countries that have income levels almost equivalent to the US. However, this view is considerably revised if focusing on production or real income per capita, using PPP as the conversion rates (Table 5).

In terms of per capita GDP at constant prices using PPP, Japan was the first country in Asia to start catching up with the US. By 1970, its per capita GDP was 60% of the US, quite a distance ahead of other Asian countries. Japan had been closing the gap with the US steadily until 1991 (84%), but the gap widened again when the impact of the long recession of the 1990s started to manifest itself.[14] In recent years, Japan's level has stabilized to around 70–73% of the US (Figure 13).

Japan's per capita GDP was the highest among Asian countries until it was overtaken by Singapore[15] in 1980.[16] The result highlights the outcome of the dramatic development effort made by the Asian Tigers, as shown in Figure 14. Not only were they inching to the top, they were constantly closing the gap with the US. Starting from a level of 42% the US in 1970, Singapore surpassed the US in 1992.[17] In 2012, Singapore

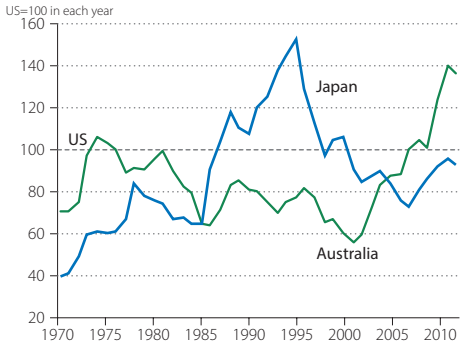



**Figure 11 Per Capita GDP using Exchange Rate of Japan and Australia, Relative to the US, 1970–2012**

——GDP at current market prices per person, using annual average exchange rate, relative to the US

Sources: Official national accounts in each country, including author adjustments.

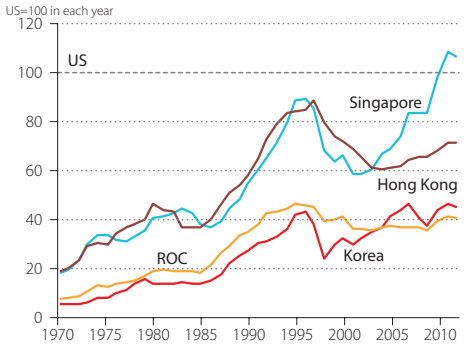



**Figure 12 Per Capita GDP using Exchange Rate of the Asian Tigers, Relative to the US, 1970–2012**

——GDP at current market prices per person, using annual average exchange rate, relative to the US

Sources: Official national accounts in each country, including author adjustments.

14: Jorgenson and Nomura (2007) indicated that the manufacturing sector was the main contributor to the catching-up process of the Japanese economy in the 1960s, and that, by 1990, the US–Japan TFP gap for the manufacturing sector had almost disappeared.

15: Singapore's population comprises not only Singaporean citizens but also non-citizens who have been granted permanent residence in Singapore as well as non-permanent residents such as employment pass holders, work permit holders, and student pass holders. It is known that many workers and students commute to Singapore from outside the country every day. According to the most recent census, the share of Singaporean citizens with respect to total population was 74% in 2000, the share of permanent residents who are not Singaporean citizens was 7%, and the share of non-permanent residents was 19%.

16: Among the mature economies in Asia, Singapore is a unique country, in which the PPP was downwardly revised from the 2005 ICP to the 2011 ICP (Box 1). This shift has the significant effect of bringing forward the year when Singapore overtook Japan (or US) in relative per capita GDP to 1980 (1992 for the US), from 1993 (2004 for the US) as estimated in the Databook 2013. Although this Databook follows the 2011 ICP results, it may require a further examination if this can provide an appropriate picture, especially for Singapore.

## Table 5 Per Capita GDP, 1970, 1990, 2000, 2010, 2011, and 2012

——GDP at constant market prices per person, using 2011 PPP, reference year 2012

| 1970 | | (%) | 1990 | | (%) | 2000 | | (%) | 2010 | | (%) | 2011 | | (%) | 2012 | | (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Japan | 14.4 | 100.0 | Singapore | 34.8 | 100.0 | Singapore | 52.4 | 100.0 | Singapore | 72.6 | 100.0 | Singapore | 75.4 | 100.0 | Singapore | 75.0 | 100.0 |
| Iran | 10.4 | 72.0 | Japan | 29.7 | 85.3 | Hong Kong | 34.0 | 64.8 | Hong Kong | 47.9 | 66.0 | Hong Kong | 50.0 | 66.3 | Hong Kong | 50.1 | 66.9 |
| Singapore | 10.2 | 70.5 | Hong Kong | 27.0 | 77.8 | Japan | 32.8 | 62.6 | ROC | 38.2 | 52.6 | ROC | 39.7 | 52.7 | ROC | 40.2 | 53.6 |
| Hong Kong | 8.6 | 59.4 | ROC | 16.2 | 46.7 | ROC | 27.2 | 51.9 | Japan | 35.1 | 48.3 | Japan | 35.0 | 46.4 | Japan | 35.6 | 47.5 |
| ROC | 4.3 | 29.5 | Korea | 11.7 | 33.7 | Korea | 20.1 | 38.3 | Korea | 28.7 | 39.5 | Korea | 29.5 | 39.2 | Korea | 30.0 | 40.0 |
| Fiji | 4.2 | 28.8 | Malaysia | 9.8 | 28.1 | Malaysia | 15.1 | 28.9 | Malaysia | 19.8 | 27.2 | Malaysia | 20.5 | 27.2 | Malaysia | 21.2 | 28.3 |
| Malaysia | 4.0 | 27.8 | Iran | 9.7 | 27.9 | Iran | 12.3 | 23.4 | Iran | 19.4 | 26.7 | Iran | 19.7 | 26.1 | Iran | 18.3 | 24.4 |
| Philippines | 3.0 | 20.7 | Thailand | 6.9 | 19.8 | Thailand | 9.7 | 18.4 | Thailand | 13.9 | 19.1 | Thailand | 13.9 | 18.5 | Thailand | 14.9 | 19.8 |
| Thailand | 2.7 | 18.6 | Fiji | 5.9 | 16.8 | Fiji | 6.8 | 13.0 | China | 9.4 | 12.9 | China | 10.2 | 13.5 | China | 10.9 | 14.6 |
| Korea | 2.6 | 18.0 | Indonesia | 4.4 | 12.6 | Indonesia | 5.8 | 11.1 | Indonesia | 8.4 | 11.5 | Indonesia | 8.8 | 11.7 | Indonesia | 9.3 | 12.3 |
| Mongolia | 2.3 | 15.9 | Mongolia | 4.2 | 12.1 | Sri Lanka | 5.0 | 9.6 | Sri Lanka | 7.7 | 10.7 | Sri Lanka | 8.3 | 11.0 | Sri Lanka | 9.1 | 12.1 |
| Sri Lanka | 1.9 | 12.9 | Philippines | 3.9 | 11.1 | Philippines | 4.4 | 8.3 | Fiji | 7.3 | 10.1 | Mongolia | 7.5 | 9.9 | Mongolia | 8.3 | 11.1 |
| Pakistan | 1.8 | 12.6 | Sri Lanka | 3.4 | 9.7 | Mongolia | 4.0 | 7.6 | Mongolia | 6.5 | 8.9 | Fiji | 7.5 | 9.9 | Fiji | 7.6 | 10.1 |
| Indonesia | 1.6 | 11.3 | Pakistan | 2.9 | 8.2 | China | 3.7 | 7.0 | Philippines | 5.8 | 7.9 | Philippines | 5.9 | 7.8 | Philippines | 6.2 | 8.2 |
| India | 1.2 | 8.5 | India | 1.8 | 5.3 | Pakistan | 3.4 | 6.5 | India | 4.7 | 6.4 | Vietnam | 4.8 | 6.4 | Vietnam | 5.0 | 6.7 |
| Bangladesh | 1.1 | 7.4 | Lao PDR | 1.6 | 4.7 | India | 2.6 | 5.0 | Vietnam | 4.6 | 6.3 | India | 4.8 | 6.4 | India | 5.0 | 6.7 |
| Vietnam | 1.0 | 6.6 | China | 1.5 | 4.3 | Vietnam | 2.5 | 4.8 | Pakistan | 4.3 | 5.9 | Pakistan | 4.3 | 5.7 | Lao PDR | 4.5 | 6.0 |
| Myanmar | 0.6 | 4.4 | Nepal | 1.4 | 4.1 | Lao PDR | 2.4 | 4.5 | Lao PDR | 4.0 | 5.5 | Lao PDR | 4.3 | 5.6 | Pakistan | 4.4 | 5.9 |
| China | 0.5 | 3.2 | Vietnam | 1.4 | 4.0 | Nepal | 1.9 | 3.5 | Myanmar | 3.0 | 4.2 | Myanmar | 3.2 | 4.2 | Myanmar | 3.4 | 4.5 |
| | | | Bangladesh | 1.1 | 3.1 | Bangladesh | 1.5 | 2.9 | Cambodia | 2.7 | 3.7 | Cambodia | 2.8 | 3.8 | Cambodia | 3.0 | 4.0 |
| | | | Cambodia | 1.0 | 2.8 | Cambodia | 1.4 | 2.7 | Nepal | 2.3 | 3.2 | Nepal | 2.4 | 3.2 | Nepal | 2.5 | 3.3 |
| | | | Myanmar | 0.7 | 2.1 | Myanmar | 1.2 | 2.2 | Bangladesh | 2.2 | 3.1 | Bangladesh | 2.4 | 3.1 | Bangladesh | 2.5 | 3.3 |
| Bahrain | 36.3 | 251.4 | Bahrain | 37.0 | 106.6 | Bahrain | 45.9 | 87.5 | Bahrain | 41.8 | 57.6 | Bahrain | 44.1 | 58.5 | Bahrain | 44.7 | 59.7 |
| Kuwait | 198.1 | 1371.0 | Kuwait | 42.8 | 123.1 | Kuwait | 74.9 | 142.9 | Kuwait | 81.5 | 112.2 | Kuwait | 87.2 | 115.6 | Kuwait | 90.7 | 121.0 |
| Oman | 15.0 | 103.8 | Oman | 39.2 | 112.7 | Oman | 42.5 | 81.0 | Oman | 51.3 | 70.7 | Oman | 43.7 | 57.9 | Oman | 42.0 | 56.1 |
| Qatar | 164.4 | 1137.8 | Qatar | 85.8 | 246.8 | Qatar | 112.2 | 213.9 | Qatar | 138.4 | 190.5 | Qatar | 143.2 | 190.0 | Qatar | 141.8 | 189.2 |
| Saudi Arabia | 42.6 | 295.0 | Saudi Arabia | 37.9 | 109.2 | Saudi Arabia | 40.0 | 76.3 | Saudi Arabia | 47.3 | 65.1 | Saudi Arabia | 50.4 | 66.9 | Saudi Arabia | 52.4 | 69.9 |
| UAE | 42.0 | 290.8 | UAE | 115.9 | 333.6 | UAE | 112.6 | 214.7 | UAE | 60.7 | 83.6 | UAE | 59.8 | 79.3 | UAE | 60.6 | 80.8 |
| Brunei | 84.6 | 585.5 | Brunei | 80.4 | 231.5 | Brunei | 78.3 | 149.4 | Brunei | 75.8 | 104.4 | Brunei | 77.1 | 102.3 | Brunei | 76.6 | 102.2 |
| (regrouped) | | | (regrouped) | | | (regrouped) | | | (regrouped) | | | (regrouped) | | | (regrouped) | | |
| APO20 | 3.1 | 21.6 | APO20 | 5.3 | 15.3 | APO20 | 6.5 | 12.3 | APO20 | 8.6 | 11.8 | APO20 | 8.7 | 11.5 | APO20 | 8.9 | 11.8 |
| Asia23 | 2.0 | 14.1 | Asia23 | 3.8 | 11.0 | Asia23 | 5.4 | 10.3 | Asia23 | 8.8 | 12.1 | Asia23 | 9.1 | 12.1 | Asia23 | 9.5 | 12.7 |
| Asia29 | 2.3 | 15.6 | Asia29 | 4.2 | 12.0 | Asia29 | 5.8 | 11.1 | Asia29 | 9.3 | 12.8 | Asia29 | 9.7 | 12.9 | Asia29 | 10.1 | 13.5 |
| East Asia | 2.3 | 15.7 | East Asia | 4.9 | 14.2 | East Asia | 7.4 | 14.0 | East Asia | 12.7 | 17.6 | East Asia | 13.5 | 17.9 | East Asia | 14.1 | 18.9 |
| South Asia | 1.4 | 9.4 | South Asia | 2.0 | 5.7 | South Asia | 2.7 | 5.1 | South Asia | 4.4 | 6.1 | South Asia | 4.5 | 6.0 | South Asia | 4.7 | 6.3 |
| ASEAN | 2.1 | 14.2 | ASEAN | 4.4 | 12.6 | ASEAN | 5.9 | 11.3 | ASEAN | 8.5 | 11.7 | ASEAN | 8.8 | 11.6 | ASEAN | 9.2 | 12.2 |
| ASEAN6 | 2.5 | 17.5 | ASEAN6 | 5.6 | 16.1 | ASEAN6 | 7.4 | 14.1 | ASEAN6 | 10.3 | 14.1 | ASEAN6 | 10.6 | 14.1 | ASEAN6 | 11.1 | 14.8 |
| CLVM | 0.9 | 6.2 | CLVM | 1.2 | 3.5 | CLVM | 2.0 | 3.9 | CLVM | 3.9 | 5.3 | CLVM | 4.1 | 5.4 | CLVM | 4.2 | 5.7 |
| GCC | 60.9 | 421.6 | GCC | 46.8 | 134.6 | GCC | 53.0 | 101.0 | GCC | 55.9 | 77.0 | GCC | 57.9 | 76.7 | GCC | 59.3 | 79.1 |
| (reference) | | | (reference) | | | (reference) | | | (reference) | | | (reference) | | | (reference) | | |
| US | 24.0 | 166.0 | US | 37.1 | 106.7 | US | 45.8 | 87.4 | US | 48.7 | 67.1 | US | 49.2 | 65.3 | US | 50.3 | 67.0 |
| EU15 | 17.4 | 120.3 | EU15 | 28.2 | 81.1 | EU15 | 34.3 | 65.5 | EU15 | 36.8 | 50.7 | EU15 | 37.2 | 49.4 | EU15 | 36.8 | 49.1 |
| | | | | | | EU27 | 30.4 | 58.1 | EU27 | 33.8 | 46.5 | EU27 | 34.2 | 45.4 | EU27 | 34.0 | 45.4 |
| Australia | 22.0 | 152.2 | Australia | 29.4 | 84.6 | Australia | 37.3 | 71.1 | Australia | 43.4 | 59.7 | Australia | 44.3 | 58.7 | Australia | 44.7 | 59.6 |
| Turkey | 6.7 | 46.1 | Turkey | 10.4 | 29.9 | Turkey | 12.4 | 23.7 | Turkey | 16.7 | 23.1 | Turkey | 18.0 | 23.8 | Turkey | 18.1 | 24.2 |

Unit: Thousands of US dollars (as of 2012)
Sources: Official national accounts in each country, including author adjustments.
Note: See Appendix 1 for the adjustments made to harmonize GDP coverage across countries.

had a per capita GDP which was 49% above the US. It became the richest economy in Asia, representing a remarkable achievement. Hong Kong holds second place, with a per capita GDP similar to the US. Japan's per capita GDP, at 71% of the US, or around 47% of the group leader (Singapore), is simi-

17: Generally, Singapore's GNI is lower than its GDP, and over the past four decades, the divergence was the largest in 2004 with GNI equivalent to 92.9% of GDP. As the US GNI never goes outside +1.7% of GDP, Singapore would not have overtaken the US in 2004 if GNI was used for comparisons instead of GDP. However, Singapore's lead of 26% over the US in 2011 was large enough that their relative positions would be independent of whether GNI or GDP was used.

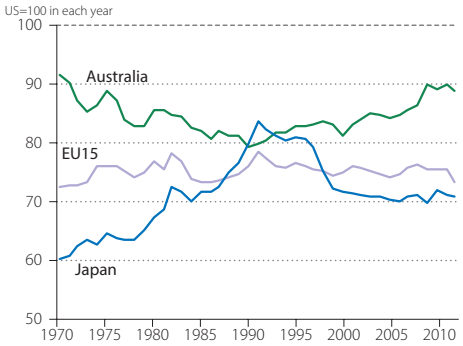



**Figure 13 Per Capita GDP of Japan, the EU, and Australia, Relative to the US, 1970–2012**
——GDP at current market prices per person, using 2011 PPP, relative to the US

Sources: Official national accounts in each country, including author adjustments.

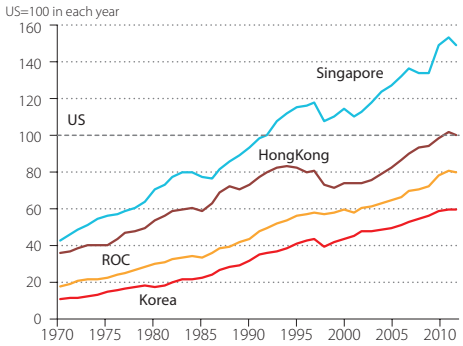



**Figure 14 Per Capita GDP of the Asian Tigers, Relative to the US, 1970–2012**
——Ratio of per capita GDP at constant market prices, using 2011 PPP, relative to the US

Sources: Official national accounts in each country, including author adjustments.

lar to the EU15. The ROC and Korea trail behind the other two Asian Tigers at 80% and 60% of the US, respectively.

The relative performance of China and India, the two most populous countries in the world, is diminished in this measure due to their population, with their per capita GDP at 21.7% and 9.9% of the US in 2012, respectively (Figure 15). However, this should not taint the remarkable progress made over the past decades, especially of China, with a per capita GDP was less than 2% of the US in 1970. China's relative per capita GDP has increased tenfold in four decades. The income gap between the US and the majority of Asian countries is still sizable,[18] indicating significant opportunity for catch up.

Table 5 presents individual figures for seven oil-rich economies (Brunei and the six GCC countries). At first glance, figures in 1970, and to a lesser extent in 1990, suggest these economies enjoyed an income many times that of Japan and the US. For example, in 1970, Kuwait, Qatar, and Brunei had a per capita GDP 13.7 times, 11.4 times, and 5.9 times that of Japan, respectively. However, the measurement of GDP as an indicator of production is misleading for these countries, as it erroneously includes proceeds from the liquidation of a natural resource stock as part of the income flow. In other words, GDP overestimates income from the oil-exporting economies, because it does not account for

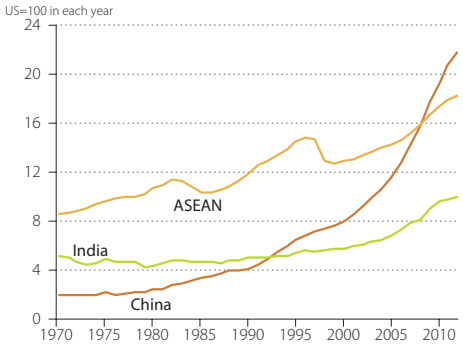



**Figure 15 Per Capita GDP of China, India, and ASEAN, Relative to the US, 1970–2012**
——Ratio of per capita GDP at constant market prices, using 2011 PPP, relative to the US

Sources: Official national accounts in each country, including author adjustments.

18: Per capita GDP may have underestimated the welfare of people in some countries. In the ROC, Hong Kong, and Japan, for example, GNI is consistently higher than GDP although the fluctuations are within +5%. The Philippines is the exception where the divergence between GNI and GDP has been increasing and has become significant for the past two decades, and GNI was more than 30% higher than GDP in the 2010s (Figure 86 in Chapter 7).

depletion of their natural resource assets. To give a rough indication of the extent of distortion, Figure 16 provides comparisons of per capita GDP excluding production of the mining sector (i.e., crude oil, natural gas, and so on). The non-mining GDP per person in Brunei and GCC economies, such as the UAE, Bahrain, and Kuwait, is almost similar to Japan's level, although total GDP per capita is much larger.

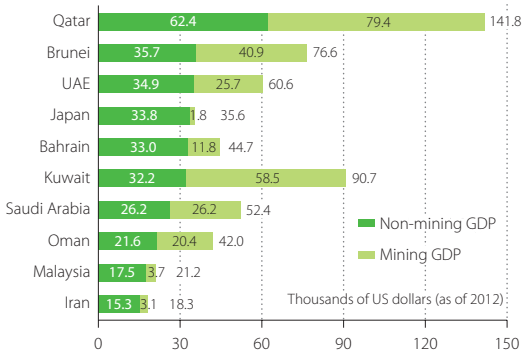



**Figure 16 Per Capita Non-Mining GDP in Oil-Rich Countries and Japan, 2012**
——GDP at constant market prices per person, using 2011 PPP, reference year 2012

Sources: Official national accounts in each country, including author adjustments.

Catching up with the per capita GDP level of advanced economies is a long-term process that could take several decades to accomplish. Empirical evidence suggests there may be a negative correlation between per capita GDP level and the speed of catching up, although with exceptions. With the possibility of adopting successful practices and technologies from the more advanced economies, less advanced economies are poised to experience faster growth in per capita GDP, enabling them to catch up to average income level. However, as income levels approach those of the more advanced countries, their economic growth rates are expected to gradually decline over time.[19]

Figure 17 plots countries' initial per capita GDP levels against their respective average growth rates per year between 1970 (or the initial year data first became available for the country in question) and 2012. If the two variables have a correlation coefficient of –0.5 (i.e., a negative relationship of medium strength), the higher the initial income level, the slower the average growth rate per year is expected. However, this is not always true. Low-income countries like Nepal, Bangladesh, the Philippines, and Fiji have failed to catch up, while Thailand and Malaysia could be expected to have grown even faster given their initial income levels. The Asian Tigers have enjoyed robust growth in the past four decades, but Korea and the ROC, with their lower initial per capita GDP, have sustained higher growth rates than Singapore and Hong Kong. Relative to the Asian Tigers, China appears to be at the start of the catch-up process. Mature economies like the US, EU15, and Japan shared similar growth experiences (around 2% on average per year, in the past four decades).

Table 6 summarizes Figure 17 by country groups. Four levels of per-capita income groups are defined: Group-L1, with per capita GDP at or above 60% of the US; Group-L2, from 20% to under 60%; Group-L3, from 5% to under 20%; and Group-L4, below 5%. Likewise, countries are also grouped according to the speed of their catch-up with the US: Group-C1, at 3% per annum or above; Group-C2, from 1% to under 3%; Group-C3, from 0% to under 1%; and Group-C4, under 0%. The speed of catch-up with the US is defined as the difference in the average annual growth rate of per capita real GDP between each country and the US. Table 6 shows that many Asian countries (not belonging to Group-C4) have managed to close the gap in per capita real GDP with the US over the last four decades, although some are more successful than others.

19: The OECD (2013) observes that GDP per capita has broadly converged in the OECD countries since the 1970s. However, more advanced economies that started with high income levels in the 1970s have had lower rates of catch-up, stagnated or recently diverged *vis-à-vis* the US.

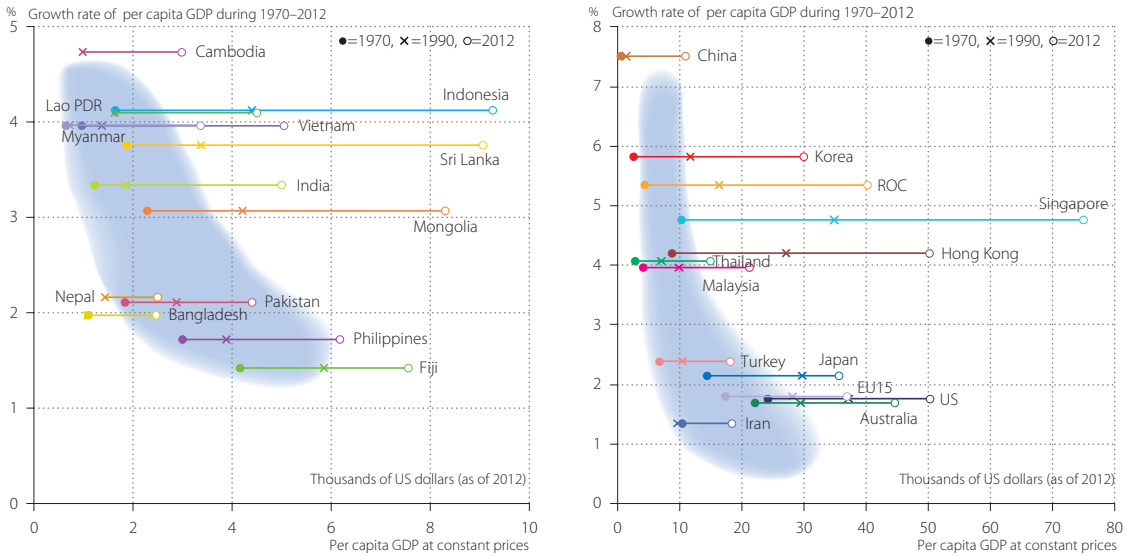



**Figure 17 Initial Level and Growth of Per Capita GDP, 1970–2012**
——Level and average annual growth rate of GDP at constant market prices, using 2011 PPP, reference year 2012

Sources: Official national accounts in each country, including author adjustments.
Note: The starting periods for Nepal, the Lao PDR, and Cambodia are 1974, 1984, and 1987, respectively.

From Table 6 one can see the initial economic level does not fully explain the catch-up process. If it did, the table would have been populated diagonally from the bottom left corner to top right corner. Of the Asia29 countries, five achieved a very fast catch-up (over 3% per year on average) between the respective starting years of their data series and 2012. Their initial per capita GDP level classifies them into the three group: Singapore from Group-L2, the ROC and Korea from Group-L3, and Cambodia and China from Group-L4. Eleven countries in Group-C4 experienced deterioration in their relative income level against the US with low-income countries like Fiji and the Philippines failing to take off. The seven high-income countries in Group-C4 are all GCC countries except Australia. It is worth noting that GCC countries had an exceptionally high GDP (a distortion, as aforementioned) at the beginning of the period. Japan was the only Asian non-oil-exporting country with a high-income level in 1970. But, like EU15, it has since failed to achieve further parity with the US.

**Table 6 Country Groups Based on the Initial Economic Level and the Pace of Catching Up**
——Level and average annual growth rate of GDP at constant market prices, using 2011 PPP

| Initial GDP level to the US | Annual rate of catch-up to the US | | | |
|---|---|---|---|---|
| | (C1) > 3% | (C2) 1% <–< 3% | (C3) 0% <–< 1% | (C4) < 0% |
| (L1) 60% < | | | Japan, EU15, Oman | Brunei, Bahrain, Kuwait, Qatar, Saudi Arabia, UAE, Australia |
| (L2) 20% <–< 60% | Singapore | Hong Kong | Turkey | Iran |
| (L3) 8% <–< 20% | ROC, Korea | Malaysia, Mongolia, Thailand | | Fiji, Philippines |
| (L4) < 8% | Cambodia, China | India, Indonesia, Lao PDR, Myanmar, Sri Lanka,Vietnam | Bangladesh, Nepal, Pakistan | |

Sources: Official national accounts in each country, including author adjustments.
Note: The annual catch-up rates are based on the difference in the growths of per capita GDP at constant prices between each country and the US during 1970–2012. The starting years for some countries are different due to data availability: Cambodia (1987–), the Lao PDR (1984–), and Nepal (1974–).

## 3.3 Sources of Per Capita GDP Gap

To further understand the diverse performance in the Asian group, per capita GDP can be broken into two components: labor productivity (defined here as real GDP per worker) and the corresponding labor utilization rate (number of workers to population ratio, or employment rate used in this report).[20] Figure 18 shows the percentage point differences in per capita GDP decomposed into the contributions by the labor productivity gap and the employment rate gap, relative to the US in 1990 and 2012.[21] Most of the Asian countries display a huge per capita GDP gap with the US, predominantly explained by their relative labor productivity performance. With the exception of the Asian Tigers, Japan, and Iran, all the other Asian countries had labor productivity gaps of more than 50% against the US in 2012. At the top end of performance, estimates show Singapore was 16% above while Hong Kong was 7% below the US labor productivity level. The labor productivity gaps of the other two Asian Tigers are still sizable against the US, at 19% and 44% for the ROC and Korea, respectively. In most countries, the effect of the employment rate is to widen the per capita GDP gap. However, in recent years more Asian countries have employment rate higher than the US, with the effect of narrowing the gap.

Figure 19 focuses on explaining a country's per capita GDP growth by its components: namely labor productivity growth and the change in the employment rate for the periods 1990–2000 and 2000–2012, respectively.[22] For most countries in Asia, the per capita GDP growth can be explained by improvement in labor productivity. However, this should not lead us to underestimate the role of changes in the

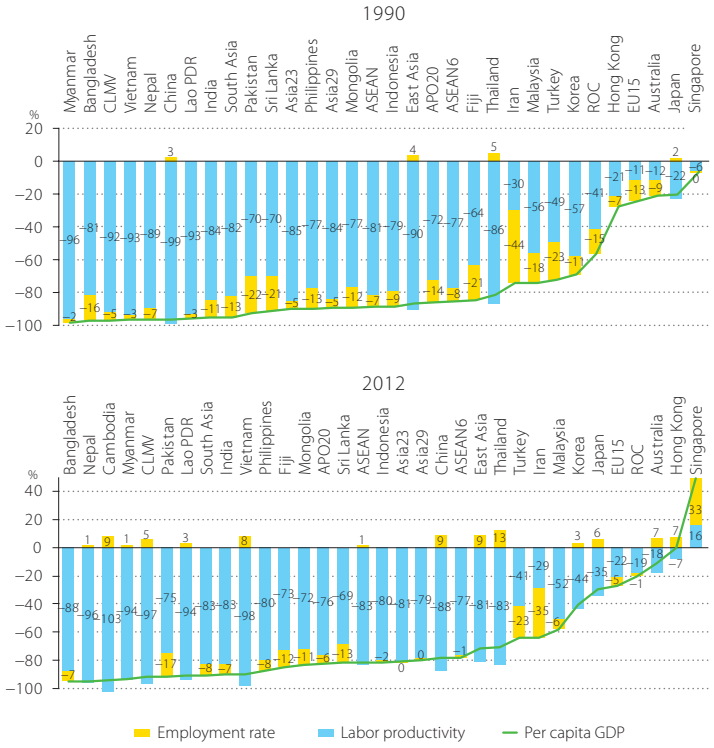



**Figure 18 Labor Productivity and Employment Rate Gap Relative to the US, 1990 and 2012**
——Decomposition of per capita GDP gap at constant market prices, using 2011 PPP

Sources: Official national accounts in each country, including author adjustments.

20: Due to data constraints, labor utilization is measured as the number of workers relative to the population (termed the employment rate in this report), to ensure consistency with the definition of labor productivity (i.e., GDP per worker) that is measured in all APO member economies, although it is frequently defined as hours worked per capita. In Section 5.2, labor productivity measures are provided based on hours worked for some selected countries. Also, in the computation of TFP in Section 5.3, hours worked data are used.

21: The gap of country $x$'s per capita GDP relative to the US is decomposed into the sum of the gap of labor productivity and employment rate with respect to the US, as in:

$$\underbrace{\ln\left(GDP_x^t / POP_x^t\right) - \ln\left(GDP_{US}^t / POP_{US}^t\right)}_{\text{Gap of per capita GDP}} = \underbrace{\ln\left(GDP_x^t / EMP_x^t\right) - \ln\left(GDP_{US}^t / EMP_{US}^t\right)}_{\text{Gap of labor productivity}} + \underbrace{\ln\left(EMP_x^t / POP_x^t\right) - \ln\left(EMP_{US}^t / POP_{US}^t\right)}_{\text{Gap of employment rate}}$$

where $POP_x^t$ is population of country $x$ in period $t$ and $EMP_x^t$ is the number of employment of country $x$ in period $t$.

employment rate. On average, Asia29's per capita GDP grew by 3.4% per year between 1990 and 2000, and accelerated to 4.6% per year between 2000 and 2012. The earlier period captured the dampening effect of the Asian financial crisis of the late 1990s. Emerging from the crisis, both labor productivity growth and employment growth strengthened. For most countries, labor productivity explains a larger share of per capita GDP growth than employment. Additionally, the employment rate contribution relative to labor productivity was also highly significant in countries such as, Nepal (over 50%), Pakistan (45%), Bangladesh (40%), and Cambodia and Thailand (around 30%).

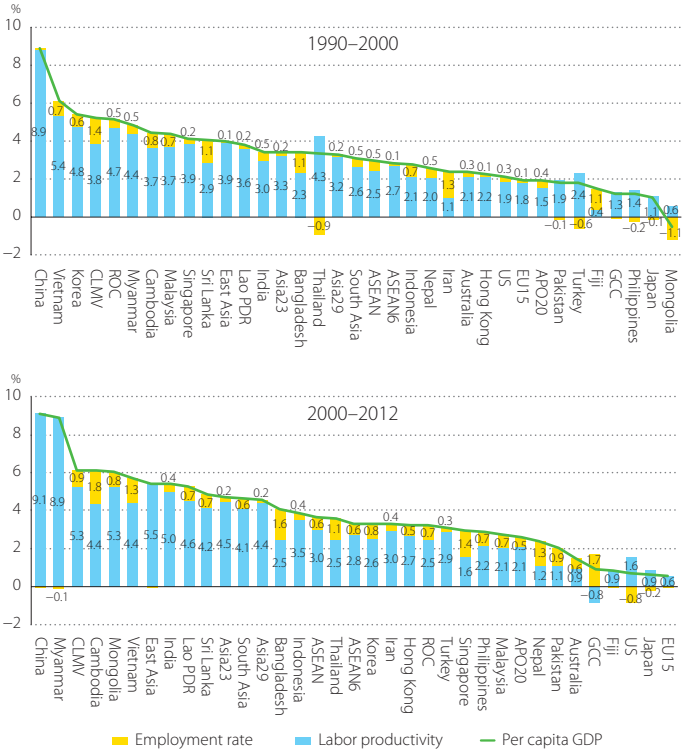



**Figure 19 Sources of Per Capita GDP Growth, 1990–2000 and 2000–2012**

——Decomposition of average annual growth rate of per capita GDP at constant market prices, using 2011 PPP

Sources: Official national accounts in each country, including author adjustments.
Note: The starting period for Cambodia are 1993.

China's improvement was the most impressive, achieving per capita GDP growth of 8.9% and 9.1% per year on average in the two periods, respectively. Improvement in labor productivity explains almost all of that growth. According to official statistics,[23] Myanmar achieved a similar performance to China in growth terms, with per capita GDP growth of 4.9% and 8.8% per year on average in the two periods. However, this growth was from a very low base; even in 2012, Myanmar's per capita GDP was only 30% of China's (see Table 5). Like China, Myanmar's per capita GDP growth has been predominantly explained by labor productivity. In both periods Japan had a deteriorating employment rate. With an aging population (see Box 2), this pattern may well continue. To sustain per capita GDP growth, China's labor productivity growth will have to accelerate to counteract the negative effect of its employment rate. The US also experienced deteriorating employment rate in the recent period, which was a drag on per capita GDP growth. In contrast, falling labor productivity was the drag in GCC countries.

22: Country $x$'s per capita GDP is decomposed into the product of its labor productivity and employment rate, as in:
$\underbrace{\ln\left(GDP_x^t / POP_x^t\right)}_{\text{Per capita GDP}} = \underbrace{\ln\left(GDP_x^t / EMP_x^t\right)}_{\text{Labor productivity}} + \underbrace{\ln\left(EMP_x^t / POP_x^t\right)}_{\text{Employment rate}}$ where $POP_x^t$ is population of country $x$ in period $t$ and $EMP_x^t$ is the number of employment of country $x$ in period $t$.

23: The author would caution readers as to the reliability and quality of Myanmar's official statistics (especially a decade from the late 1990s, based on our observations), which have been questioned. Researchers have suggested that this is not consistent with other variables closely correlated with GDP, such as energy use. Non-official estimates put GDP growth at less than half of the official estimates. See Economist Intelligence Unit (2010). Nonetheless, official statistics from Myanmar are presented in this report, as there is no comprehensive and transparent alternative data source.

Most countries also have an employment rate short of the US level. In the case of Iran, Turkey, and Pakistan, the employment rate is significantly less than the US, further reinforcing the poor productivity performances of these countries (Figure 18). It is no coincidence they are among the countries with the lowest shares of female workers in employment, at 17%, 29% and 20%, respectively (Figure 20). In contrast, a handful of countries such as Cambodia, China, and Thailand, had higher employment rates than the US, counteracting the negative impact of their productivity performances. In Singapore, the positive gap in employment rate further reinforced the already impressive relative labor productivity performance, pulling ahead of the US in per capita GDP. More specifically, Singapore's labor productivity was 16 percentage points higher than the US level, but its employment rate was 33 percentage points higher, giving an overall per capita GDP which was 49% higher than the US.

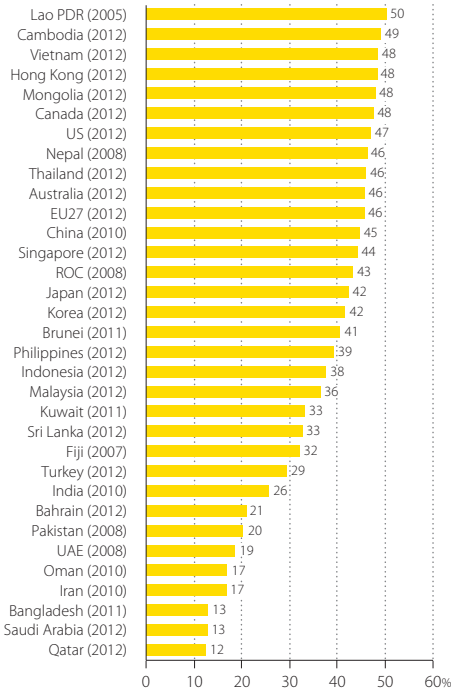



**Figure 20 Share of Female Employment**
——Ratio of female to total employment

Sources: Population census or labor survey in each country.

All other things being equal, increasing employment and improving labor productivity could present a policy trade-off in the short term, as they cannot be achieved simultaneously. If the policy target is to increase employment, productivity may suffer in the short term as marginal and less-productive workers are recruited, bringing down the average productivity performance. The huge labor productivity gap between Asia and the US discussed in Chapter 5 should therefore be considered in the context of the generally high employment rate in Asia.

Figure 21 shows cross-country comparisons of employment rates in 2012, based on the labor statistics of each country. Employment consists of employees, own-account workers, and contributing family workers. Singapore and Cambodia lead the Asian group with employment rates of over 60%, around 14 and 17 percentage points

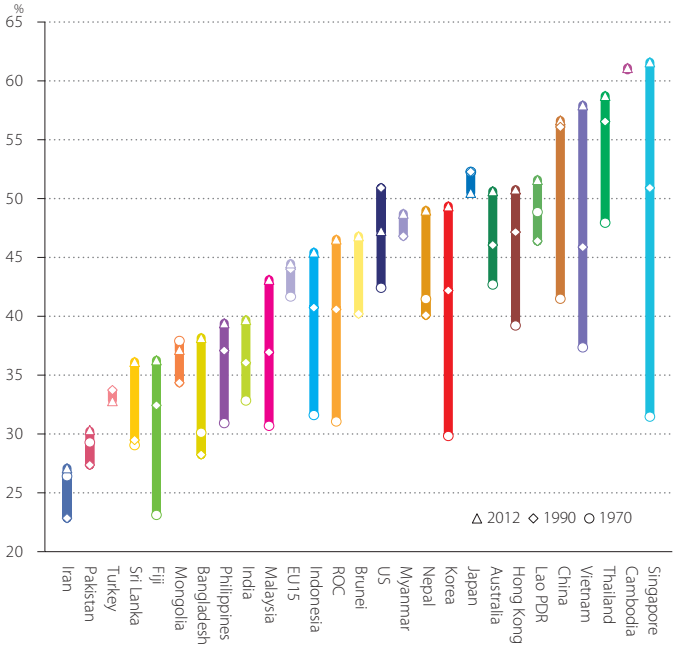



**Figure 21 Employment Rates, 1970, 1990, and 2012**
——Ratio of employment to total population

Sources: Employment and population data by national statistical office in each country.

higher than the US and EU15, respectively, in 2012. It is clear that employment rates have been rising in Asia.[24] The fastest catch-up countries (i.e., those in Group C1) are also countries with the largest surge in employment rates over the past four decades: China, Korea, Cambodia and the ROC. However, China seems to have exhausted its capacity for further improvement as its employment rate changed little between 1990 and 2012 at 57%. Some of the countries in Group C2 also experienced significant improvements in employment rates (for example, Indonesia and Vietnam). While there are exceptions, generally countries that have failed to catch up also tend to make less vigorous improvements over the period, and in turn continue to have lower employment rates.

24: Japan is the only exception where the employment rate in 2012 was lower than that in 1970. This reflects, among other things, its aging population. US employment rates also shows weakening in the recent period, with levels in 2012 lower than that in 1990 (i.e., 47% compared with 51%).

## Box 2 Population and Demographic Dividend

According to the United Nations (UN) (2013), the world's population is estimated to reach 7.1 billion in 2012, of which Asian countries account for 60.1%. The region is by far the most populous in the world. China and India account for 19.4% and 17.5% of the world's population, respectively. It has been observed that falling fertility rates and rising living standards go hand in hand, although the direction of causality is less certain. The evolution of the demographic structure implies dynamics in a society that are not captured by the overall population size or growth. As people's economic behavior, aspirations, and needs vary at different stages of life, changes in a country's age structure can have a significant impact on its economic growth via supply-side and demand-side impacts.

The world's fertility rate is converging to the replacement level (the level at which a country's population stabilizes). According to the UN, the number of children a woman is expected to have in her reproductive years has dropped by more than half, from about 5.0 to 2.5 in the last 60 years, compared to the replacement level of 2.1 children, one of them a girl. There is regional divergence in this trend. In the last 60 years, the total fertility rate dropped from about 6.7 children to 2.6 in Central America, and from about 6.0 children to 1.6 (below the replacement level), in East Asia. In comparison, some parts of Africa have seen only a modest drop in total fertility, which today remains at more than five children per woman. What is even more staggering is the pace of change. For example, it took Britain over 130 years (1800–1930) to halve its fertility rate, while it took Korea only 20 years to achieve it. This is echoed around the world. This widespread social revolution has been heralded by a complex mix of economic and social development. Economic growth, greater access for women to education, income-earning opportunities, and sexual and reproductive health services, have all been contributing factors to this trend. Coupled with changes in the mortality rate, such a trend can dramatically alter the age profile of a country's population, bringing with it economic implications.

The growth rate of the world's population has slowed from its peak of around 2.00% in the 1970s to today's 1.20% per year. With falling fertility rates, the UN projects the world's population growth rate will decelerate to 0.49% per year by 2050 and further to 0.09% by 2100. Even so, the world population will still increase by one-third in the next 40 years, from 6.9 billion to 9.5 billion and a further 13% to 10.8 billion by 2100. These estimates are based on the medium-fertility variant, but with only a small variation in fertility, particularly in the more populous countries, the total could be higher (10.9 billion by 2050 and 16.6 billion in 2100) or lower (8.3 billion in 2050 and 6.8 billion in 2100).

Much of this increase is expected to come from high-fertility countries, which comprise 39 out of the 55 countries in Africa, nine in Asia, six in Oceania, and four in Latin America. In contrast, low-fertility countries include all countries in Europe except Iceland and Ireland, 19 out of the 51 in Asia, 14 out of the 39 in the Americas, two in Africa (Mauritius and Tunisia), and one in Oceania (Australia). Figure B2.1 depicts this shift in the distribution of the world population with the share from the more developed regions gradually

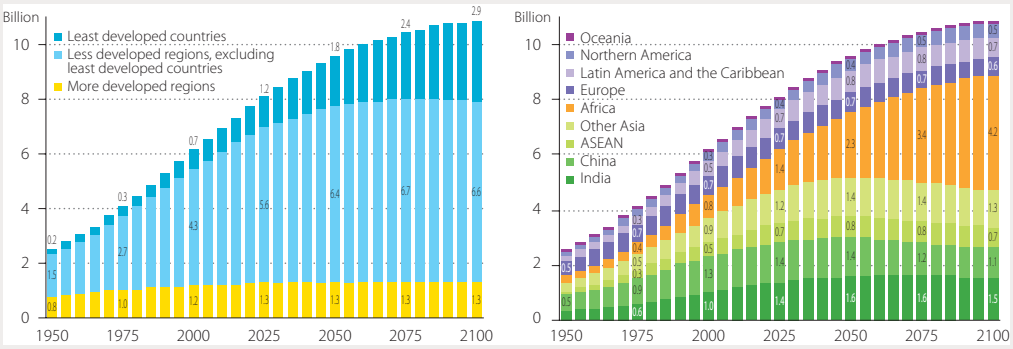



**Figure B2.1 Distribution of the World's Population in Different Regions, 1950–2100**

Source: UN (Department of Economic and Social Affairs), *World Population Prospects: The 2012 Revision*.

continued on next page >

> continued from previous page

declining from 17.9% to 13.6% in 2050 and 11.8% in 2100, compared with 32.2% in 1950. Conversely, the share of the least developed countries is depicted as rising from today's 12.1% to a projected 19.0% in 2050 and 27.0% in 2100, up from 7.7% in 1950.

According to the projection, Asia's share will decline from its 60.2% today to 54.1% in 2050 and 43.4% in 2100, while Africa's share will rise from today's 14.9% to 25.1% and 38.6%, respectively. Figure B2.2 shows the current population size of individual Asian countries compared with the 1970 level and its 2050 projection. As can be seen from the chart, China's population is expected to more or less stabilize around the current level. China has socially engineered the change with its one-child policy, which has made its current population 300–400 million lower than it would have been otherwise. In less than two decades, India is projected to overtake China as the most populous country in the world.

Figure B2.3 shows the demographic make-up of countries in 2012 (the population proportions of the under-15 and over-65 age groups, which together make up the dependent population). Ranking the countries by the share of old-age population, filters the rich economies to the top end. These economies also have a relatively low share of the young age group compared to less developed countries. This suggests that demographic transition tends to run parallel with economic progress, although the direction of causation is not certain. As countries move from high to low mortality and fertility rates, the demographic transition produces a "boom" generation that is larger than those immediately before and after it.

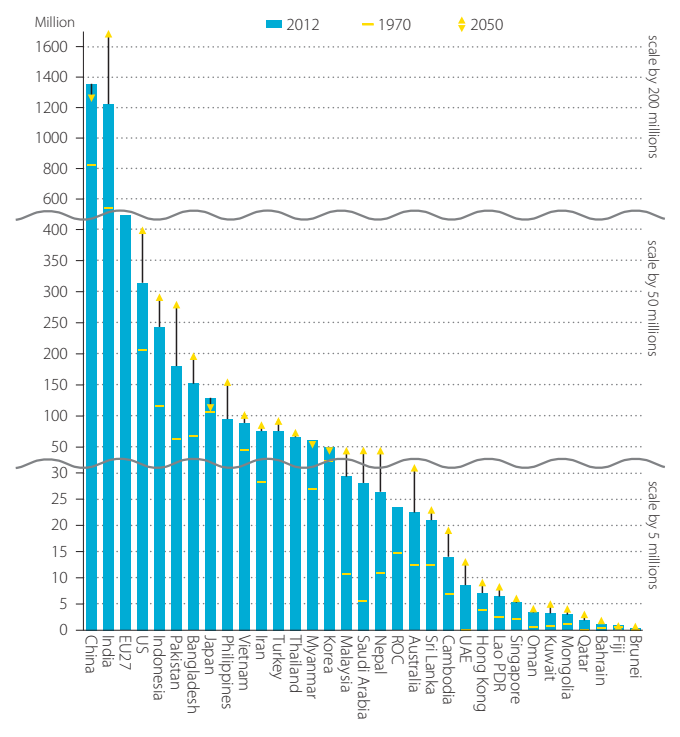



**Figure B2.2 Asian Countries' Population Size and Projection, 1970, 2012, and 2050**

Source: World Bank, *World Development Indicators* 2013.

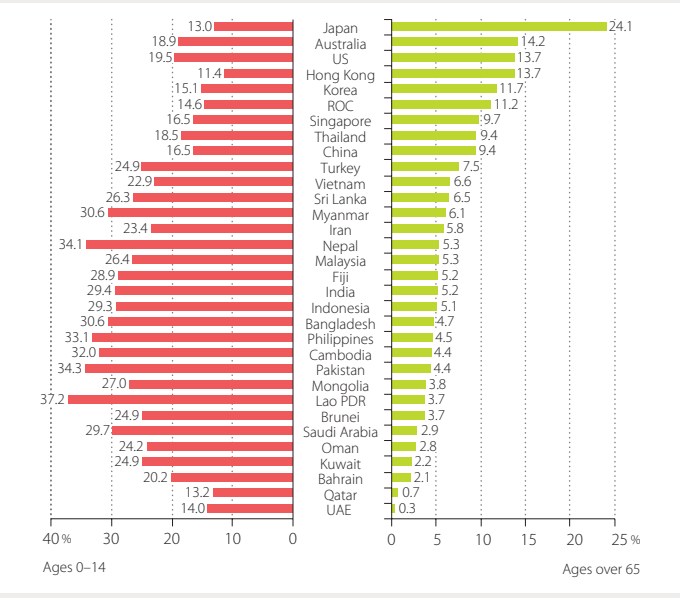



**Figure B2.3 Proportion of the Dependent Population, 2012**

Sources: Population census and official national accounts in each country.

continued on next page >

> continued from previous page

As this boom generation gradually works through a nation's age structure, it produces a demographic dividend of economic growth as people reach their prime.

Using demographic data since 1950 and UN projections up to 2100, Figure B2.4 tracks changes in the ratio of the working population (aged 15-64) to dependent population (aged under 14 and over 65) over time. The higher the ratio, the more favorable its demography for economic growth. Japan could have capitalized the demographic dividend in the 1960s, when its GDP growth was over 10% on average per year for ten years. Similarly, China, Hong Kong, Korea, Singapore, and Thailand are poised for the prospect of such demographic dividend in the 2000s and 2010s, whereas, based on projections, Indonesia will have to wait for such opportunity until the 2020s and 2030s, and India until the 2040s. The reaping of this dividend, however, is far from automatic. A favorable demography can work wonders to produce a virtuous cycle of wealth creation only if it is combined with appropriate health, labor, financial, human capital, and growth-enhancing economic policies. The presence of these complementary factors cannot be taken for granted, but needs to be cultivated in order to earn the demographic dividend. As the analysis of the Databook show, the contribution of labor to economic growth has been smaller than those of capital and TFP for most countries (Figure 52, p.71). This means that countries should not be afraid of aging too much as long as fairly high growth rates of capital and TFP are maintained. Nevertheless, understanding the demographic shift and its implications is highly relevant for economic projections, providing valuable foresight for economic policy making.

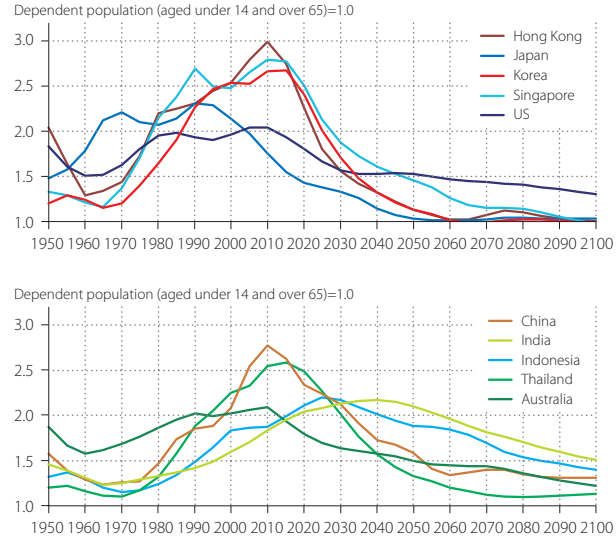



**Figure B2.4 Demographic Dividend, 1950–2100**

Source: UN (Department of Economic and Social Affairs), *World Population Prospects: The 2012 Revision*.

# 4 Expenditure

In national accounts, GDP is measured by three approaches: production by industry; expenditure on final demand; and income to factor inputs. In theory, these three approaches are accounting identities, and should yield the same result, but in reality, they differ by statistical discrepancies. Decompositions of GDP are valuable in understanding the structure, and in turn the behavior, of an economy. In this chapter, the economic insights are drawn from analyzing the composition of countries' expenditure (the demand side). The decomposition of output growth into input growth and the TFP growth (the supply side) is analyzed in Chapter 5, while countries' industry structure are presented and analyzed in Chapter 6.



## *4.1 Composition of Final Demand*

From Table 7, one can see that country groups display distinctive features in their final demand composition, reflecting their development stage and economic makeup. With the differences in emphasis and vulnerabilities, their behavior and reaction to economic shocks are obviously quite diverse. Table 7 presents comparisons of final demand shares of nominal GDP, covering: (1) household consumption, including consumption of non-profit institutions serving households (NPISHs); (2) government consumption; (3) investment or, in national accounts terminology, gross fixed capital formation (GFCF) plus changes in inventories; and (4) net exports (exports minus imports).

For most countries, household consumption is by far the biggest component of GDP.[25] The GCC countries, Brunei, and China are the exceptions. Over the past four decades, the share of household

**Table 7 Final Demand Shares in GDP, 1970, 1990, 2000, 2011, and 2012**
——Share of final demands with respect to GDP at current market prices

| | Household consumption | | | | | Government consumption | | | | | Investment | | | | | Net exports | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1970 | 1990 | 2000 | 2011 | 2012 | 1970 | 1990 | 2000 | 2011 | 2012 | 1970 | 1990 | 2000 | 2011 | 2012 | 1970 | 1990 | 2000 | 2011 | 2012 |
| APO20 | 60.5 | 57.6 | 59.7 | 60.2 | 61.6 | 11.1 | 12.0 | 12.9 | 13.0 | 13.2 | 28.9 | 31.2 | 24.5 | 27.3 | 27.1 | −0.5 | −0.7 | 2.9 | −0.6 | −1.9 |
| Asia23 | 60.1 | 55.9 | 56.3 | 50.6 | 50.7 | 11.1 | 12.3 | 13.7 | 13.1 | 13.4 | 29.2 | 31.9 | 27.2 | 35.5 | 35.9 | −0.5 | −0.1 | 2.8 | 0.7 | 0.1 |
| Asia29 | 57.5 | 55.3 | 55.2 | 49.2 | 49.3 | 11.5 | 13.5 | 14.2 | 13.3 | 13.5 | 28.1 | 30.5 | 26.5 | 34.8 | 35.1 | 2.9 | 0.7 | 4.1 | 2.7 | 2.1 |
| East Asia | 51.9 | 51.3 | 52.2 | 43.8 | 42.9 | 10.9 | 13.5 | 15.6 | 14.9 | 15.1 | 36.5 | 33.6 | 30.1 | 39.4 | 40.0 | 0.6 | 1.6 | 2.1 | 2.0 | 2.0 |
| South Asia | 76.1 | 68.0 | 67.6 | 66.9 | 68.5 | 8.5 | 11.3 | 11.6 | 10.6 | 10.9 | 15.8 | 23.2 | 22.4 | 29.3 | 28.2 | −0.4 | −2.5 | −1.6 | −6.9 | −7.6 |
| ASEAN | 69.0 | 57.6 | 58.2 | 56.8 | 57.2 | 12.4 | 9.6 | 9.4 | 10.7 | 10.8 | 23.3 | 33.8 | 23.4 | 28.2 | 29.4 | −4.7 | −1.0 | 9.0 | 4.3 | 2.6 |
| ASEAN6 | 68.5 | 55.9 | 57.2 | 55.6 | 56.5 | 10.5 | 9.7 | 9.6 | 11.2 | 11.3 | 23.4 | 34.9 | 23.1 | 27.9 | 29.4 | −2.5 | −0.5 | 10.1 | 5.3 | 2.7 |
| CLMV | 76.7 | 84.2 | 71.3 | 68.0 | 63.4 | 27.5 | 8.9 | 6.8 | 5.3 | 5.2 | 19.4 | 14.2 | 24.4 | 29.7 | 29.4 | −23.5 | −7.3 | −2.5 | −3.0 | 1.9 |
| GCC | 35.3 | 49.6 | 41.7 | 30.9 | 30.9 | 14.8 | 25.5 | 20.5 | 15.5 | 15.9 | 18.8 | 15.7 | 18.0 | 24.8 | 25.2 | 31.1 | 9.1 | 19.8 | 28.8 | 28.0 |
| China | 55.6 | 47.0 | 46.7 | 35.8 | 34.7 | 11.2 | 14.1 | 15.8 | 13.3 | 13.8 | 33.1 | 36.1 | 35.1 | 48.3 | 48.7 | 0.1 | 2.7 | 2.4 | 2.6 | 2.8 |
| India | 74.8 | 65.2 | 65.1 | 63.7 | 65.3 | 9.4 | 11.7 | 12.6 | 11.2 | 11.5 | 15.9 | 24.5 | 23.2 | 31.7 | 30.1 | −0.1 | −1.4 | −0.9 | −6.6 | −7.0 |
| Japan | 49.2 | 52.9 | 56.4 | 60.2 | 60.6 | 10.7 | 13.3 | 16.9 | 20.3 | 20.4 | 38.8 | 32.9 | 25.3 | 20.4 | 21.0 | 1.2 | 0.9 | 1.4 | −0.9 | −2.0 |
| Australia | 54.5 | 58.1 | 59.1 | 54.4 | 55.6 | 13.9 | 18.2 | 17.8 | 18.0 | 18.1 | 31.8 | 24.0 | 23.0 | 27.7 | 27.5 | −0.3 | −0.2 | 0.2 | −0.2 | −1.2 |
| US | 62.4 | 66.1 | 68.6 | 71.2 | 70.8 | 18.3 | 16.7 | 14.3 | 17.1 | 16.5 | 18.9 | 18.6 | 20.9 | 15.5 | 16.1 | 0.4 | −1.3 | −3.8 | −3.8 | −3.5 |
| EU15 | 58.0 | 58.1 | 58.7 | 58.3 | 58.5 | 16.3 | 19.9 | 19.7 | 21.8 | 21.7 | 26.1 | 22.6 | 21.3 | 18.9 | 17.8 | −0.5 | −0.7 | 0.3 | 1.1 | 2.0 |

Unit: Percentage.
Sources: Official national accounts in each country, including author adjustments.
Note: Final demand shares in country groups are computed by using the PPP for GDP. Household consumption includes consumption of NPISHs. Investment includes GFCF plus changes in inventories.

25: Based on the metadata survey on national accounts in Asian countries, Japan is an exceptional country that estimates GDP from its expenditure side. In other countries, GDP is estimated from the production side (value added in industries), and some countries record statistical discrepancy as the difference in the estimates between production-based GDP and the sum of final expenditures. In this Databook, statistical discrepancy is mainly attributed to household consumption when data is recorded. Readers should keep in mind that it can have some impacts on the share of final demand: e.g., it accounts for 2.5% of GDP in 1990 in the Thailand SNA published as of the end of 2011.

consumption for mature economies tends to be stable and trending upward in recent years, It is more volatile and largely trending downward in economies undergoing rapid transformation, such as the Asian Tigers in the 1970s and 1980s, and India and China in the present day, as the investment share increases for their development effort.

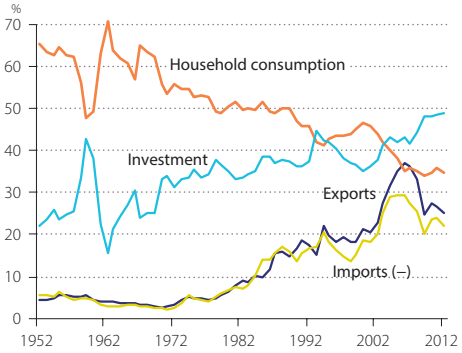



**Figure 22 Final Demand Shares in GDP of China, 1952–2012**
——Share of final demands with respect to GDP at current market prices

Sources: National accounts by National Bureau Statistics of China, including author interpolation.

China's household consumption has been trending downward as a share of GDP. It fell from 55.6% in 1970 to 46.7% in 2000. This compares with the early Communist era when household consumption was more volatile and at a higher level of over 60% of GDP (Figure 22). China was less well-off then. Figure 22 shows how household consumption share and investment share mirror each other. As the decline in household consumption share accelerated in the 2000s, plummeting to 34.7% in 2012, the investment share rose rapidly to 48.7% of GDP from 35.1% in 2000. Investment has overtaken household consumption as the largest component in GDP expenditure since 2004, and the divide shows no sign of narrowing. There also is a notably rapid rise in exports as a share of GDP since the 1980s when China began to open its economy, from around 5.0% or below in the 1950s and 1960s to its peak of 37.0% in 2006 before softening to 24.9% in 2012.

With a low consumption ratio, coupled with an unsustainable rise in investment and an overdependence on exports, China faces huge internal and external imbalances. If not addressed, this could jeopardize its medium-term growth prospects. A low consumption share of GDP is not merely a reflection of consumer behavior or preference, but a manifestation of an array of underlying distortions in the economy. An undervalued currency with a wide range of factor price distortions which favors the production of tradables over non-tradables, may result in an unusually low consumption ratio and a heavy reliance on exports. Lax corporate governance of state-owned enterprises is not conducive to distribution of dividends and therefore, in effect, may act to subsidize investment. Additionally, in the absence of a social safety net, well-developed domestic financial markets may provide a strong incentive for precautionary saving on the part of households (Eichengreen, Park, and Shin 2011). All of these factors suggest that there are policy levers available to the government to impede or rebalance the economy.[26]

In recent years, even labor-abundant China faced a tightened supply of surplus labor at its coasts, putting an upward pressure on wages (See Box 4, p. 60). This could be good news for the world, as a higher labor share of GDP will enable higher household consumption, helping the domestic market fulfill its potential. This will make China less dependent on foreign demand as well as generate demand for foreign products. Early signs that the Chinese economy may have started moving in the right direction were evident when the decline in the consumption ratio halted (even turning up slightly since its recent trough in 2009) and external imbalances narrowed to 2.8% in 2012, which is

26: In recent years, the local governments have been ratcheting up debt, which the central government struggles to count, let alone control. Although currently a financial meltdown is unlikely, the pace and scale of debt being piled up is starting to cause jitters. See, for example, the Economist, "Local-government debt: Counting Ghosts," 4 January 2014, and the Economist, "Local government: Emerging from the Shadows," 19 April 2014.

the lowest since 2004. Since the peak of 8.8% in 2007, net exports have been shrinking. Only time will tell if this is the start of a more persistent trend that reflects fundamental adjustments to the underlying economy.

India, another fast-emerging economy, has seen its household consumption share declining rapidly in the past four decades, from 74.8% in 1970 to 65.3% in 2012 (Table 7). In contrast, the share of household consumption was relatively stable in the US at around 62–63% for the 1970s and 1980s before edging up to 70.8% of GDP in 2012. From a historical perspective, the current level is below that experienced during the Great Depression in the US, when the consumption share was over 75%, even as high as 83% in 1932, and above its all-time low of below 50% in 1944 during World War II (Figure 23).

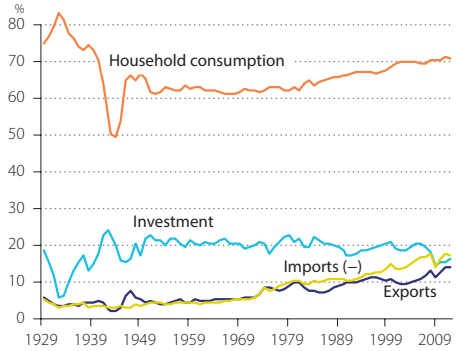



**Figure 23 Final Demand Shares in GDP of the US, 1929–2012**

——Share of final demands with respect to GDP at current market prices

Sources: National accounts by Bureau of Economic Analysis, US.

The share of household consumption in EU15, which is at around 58%, has stayed fairly stable over the past four decades. The Asian average, meanwhile, has hovered in the lower 50% range until recently when the gap with EU15 widened, largely reflecting the trend in China (Table 7). Australia's consumption ratio has never exceeded 60% of GDP and has dipped in the past decade to 55.6% in 2012, reflecting a pickup in the investment share. Within Asia, all regions display a decline in household consumption ratios. South Asia maintains the highest share, despite its fall from 76.1% in 1970 down to 68.5% in 2012. In contrast, GCC economies are unusually skewed towards net exports because of their oil production.

Overall, Asian countries invest significantly more than the US and EU15 as a share of GDP. Historically, the gap in the investment share between Asia29 and EU15 never exceeded 10 percentage points. However, since the beginning of the 1990s, it has started to widen (except for the period of the Asian Financial Crisis). In 2012, the difference was over 17 percentage points. In the 1970s, EU15 was investing on average 4% more of their GDP than the US. Thereafter, the EU15 investment share converged to the US level. They were out of synch with each other temporarily in the late 1980s and early 1990s. For the past five years, a divergence has opened up with the US investment share of GDP declining faster than that of EU15 (Figure 31.3). In 2012, investment accounted for 16.1% and 17.8% of final demand in the US and EU15, respectively, compared with 35.9% for Asia23. Australia's investment level has been closer to the level of the APO20 than the US/EU15. In 2012 it accounted for over a quarter of final demand. The share of investment in China is the biggest final demand component of GDP since 2004. At 48.7% in 2012, it is probably unsustainable in the long term. East Asia has the highest investment ratio among the Asian regions. While South Asia caught up with them in 2007, since then the paths of the two regions diverged in opposite directions. Now South Asia is converging with ASEAN countries, the investment intensity of which has not recovered since the Asian financial crisis of the late 1990s.

Compared to other components of final demand, the contribution of net exports to the Asian economy has always been more volatile. Having increased in Asia23 between 1990 and 2000 from –0.1% to 2.8%, the contribution of net exports has been ebbing away once again to 0.1% in 2012. In contrast, the net export share in China has been steady at a rate of 2.4–2.8% over the past two decades. This

compares with the oil-exporting GCC countries at 9.1% in 1990, rising to 19.8% in 2000 and further to 28.0% in 2012. Including the GCC countries, the contribution of net exports to the GDP of Asia29 was 2.1% in 2012, compared to 2.9% in 1970 when net exports accounted for nearly a third of final demand in GCC countries. In the US, there is an observable trend of persistent deficit between exports and imports, which has considerably expanded from 0.5% of GDP in 1980 to nearly 6.0% in the mid-2000s before narrowing to 3.5% in 2012. South Asia is the only Asian region that consistently runs a fluctuating trade deficit over the years. Lately, it has become historically sizable at 7.6% of GDP in 2012. In EU15, net exports have become a positive component in the past two decades, accounting for 2.0% in 2012.

The regional averages disguise the great variation displayed by individual countries. Figure 24 shows the cross-country comparisons of final demand shares in current-price GDP in 1995 and 2012. Countries are arranged in descending order of their household consumption shares. Although most countries fall to the right of the US, there are a handful of Asian countries that have a higher consumption ratio than the US. Bangladesh, Cambodia, Nepal, Pakistan, and the Philippines fell to the left of the US in both years of comparisons. A deficit in net exports tends to be associated with high household consumption. Countries with a low income will struggle to defer consumption. It is no coincidence

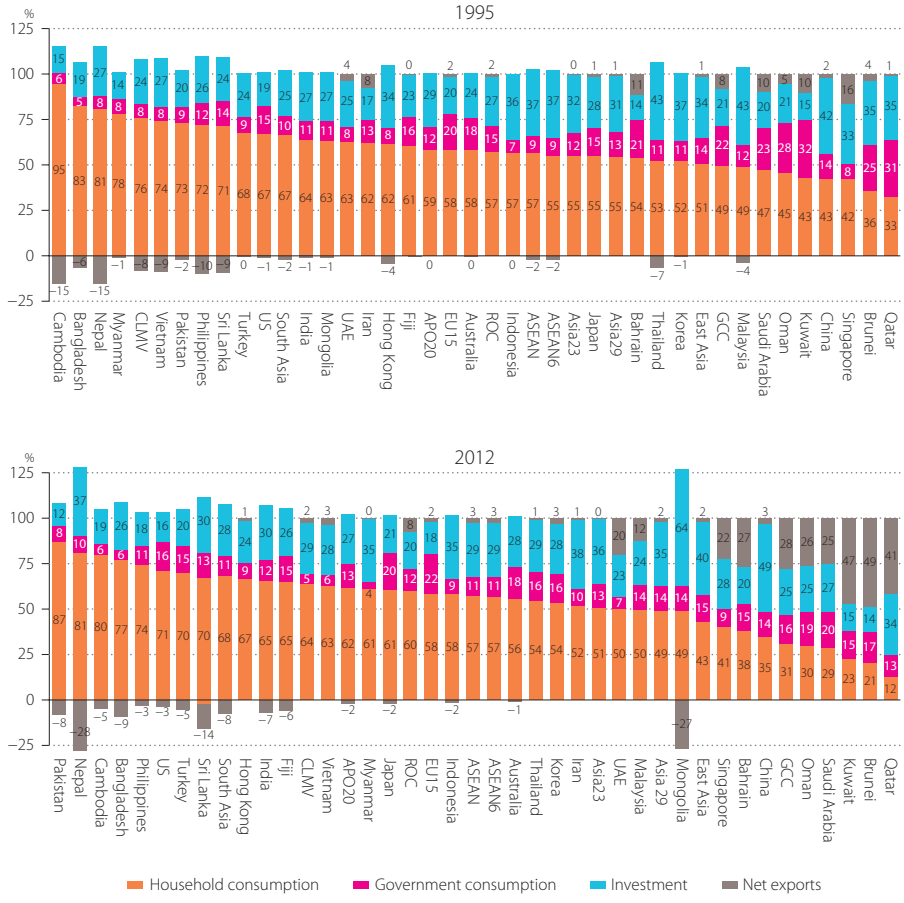



**Figure 24 Final Demand Shares in GDP, 1995 and 2012**
——Share of final demands with respect to GDP at current market prices

Sources: Official national accounts in each country, including author adjustments.
Note: Household consumption includes consumption of NPISHs. Investment includes GFCF plus changes in inventories.

that countries clustered on the left of Figure 24 tend to be those in the bottom income groups[27] among the countries studied in this report (see Table 14, p. 87). Countries with a high proportion of dependent population (under-15, over-65) also tend to have a high household consumption share in their GDP (see Figure 25).

At the other end of the spectrum, GCC and other oil-exporting countries tend to cluster at the low end of household consumption share of GDP in both years of comparison. The average household consumption share for GCC countries has been squeezed by net exports (which in turn are dominated by erratic oil revenues), from 49.3% in 1995 to 30.9% in 2012.[28] Given that a large part of GCC countries' GDP is not sustainable income, it may in fact be prudent for oil-exporting countries not to overconsume beyond their sustainable levels and instead purposefully invest to generate a steady income stream in the eventuality of oil depletion, regardless of how distant this may seem now. Among the non-oil-exporting Asian countries, Singapore had the smallest household consumption share. However, since 2002 China has replaced Singapore in that position, with a share of 34.7% in 2012.

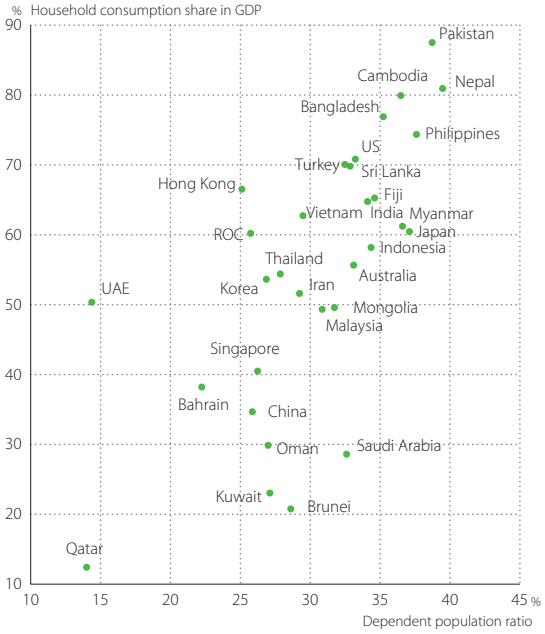



**Figure 25 Ratio of Dependent Population and Consumption Share in GDP at Current Market Prices, 2012**

——Shares of dependent population (under-15, over-65) to total population and consumption share to GDP

Sources: Population data by national statistical office in each country; World Bank, *World Development Indicators 2013*; official national accounts in each country with author estimates.

Net exports are particularly important in a handful of economies. In 2012 in Singapore export shares were at 197%, and in Hong Kong 230%, reflecting their port function in Asia. This explains why the total values of exports and imports are exceptionally high, relative to the size of GDP in these economies (Figure 26). Once the 2008 SNA is implemented, however, these values will be adjusted to reflect a change in ownership of goods, rather than accounting for goods moved for processing without incurring actual transactions.

Figure 27 shows the long-term trends of household consumption share of GDP for selected Asian countries. The Asian Tigers have been the consistent high performers, and come at the top for most of the level indicators presented in Chapter 3. As seen in Figure 27.1, Singapore and Korea showed the most rapid relative retrenchment in household consumption as a share of GDP in their initial stage of development. While the downward trend continues in Singapore, it has halted and been mildly reversed in Korea since the late 1980s. Between 1970 and 2012, the household consumption share of

27: The Lao PDR is also in the bottom income bracket; it is, however, omitted from Figure 24 because of a lack of final demand data.

28: It should also be noted that the shares are calculated in current market prices. Revenues from oil exports are notoriously erratic. It is possible that a sudden surge in export revenues relative to imports can squeeze the shares of other components of final demand without any real change in the underlying behavior in the economies. For example, Qatar has the smallest share of household consumption, which shrank from 32.7% in 1995 to 12.4% in 2012, while over the same period, net exports swung from 1.0% to 41.3%. Similarly, net exports for GCC countries as a whole swung from 8.0% to 28.0%, squeezing household consumption from 49.3% in 1995 to 30.9% in 2012.

GDP fell from 69.1% of GDP to 40.6% and from 74.1% to 53.5% in Singapore and Korea, respectively. In contrast, household consumption as a share of GDP, at 66.7% in 2012, has been rising in Hong Kong since the mid-2000s. The household consumption share did fall from 64.8% in 1970 to nearly 55% in the late 1980s, but it was subsequently reversed. Similarly, relative household consumption fell in the ROC, from 56.6% in 1970 to under 50% in the mid-1980s. Since then, it has been on an upward climb until the 2000s when it stabilized at around 60%.

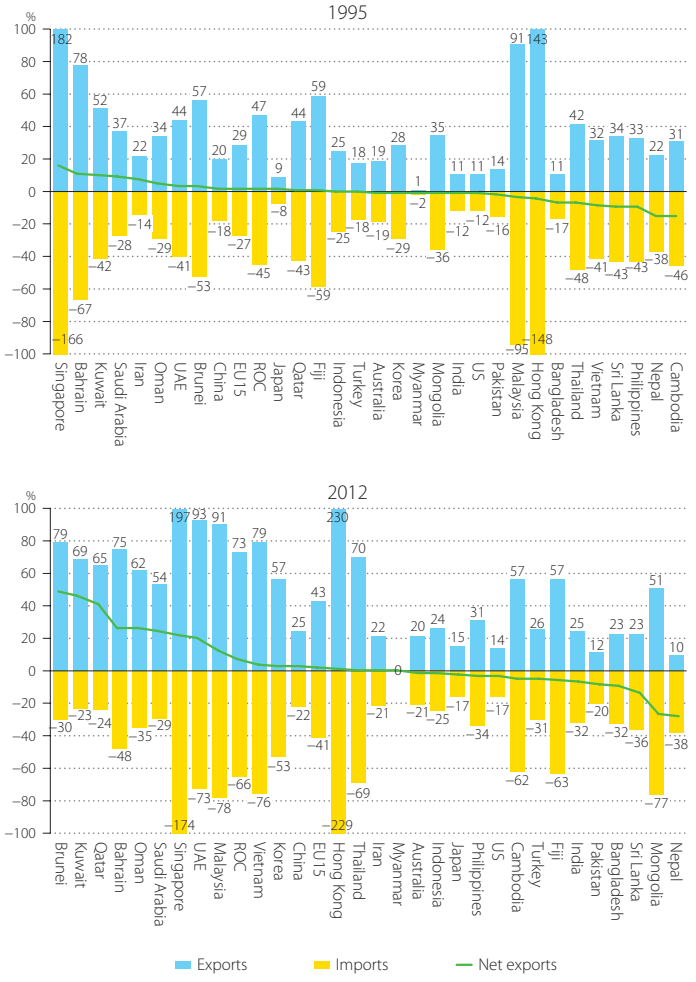



**Figure 26 Export and Import Shares in GDP, 1995 and 2012**
——Share of exports and imports with respect to GDP at current market prices

Sources: Official national accounts in each country, including author adjustments.

Figure 27.2 plots the trends of household consumption in the three largest Asian economies by size. The downward long-term trend in India and China is unmistakable.[29] The falling share of household consumption may partially reflect the falling labor income share of GDP and/or an uneven distribution of economic gain between the rich and the poor in these countries. India has a dependent population (under-15, over-65) of 34.6%, compared with 25.8% in China. This may help explain why India has had to sustain a relatively high share of household consumption despite its falling trend over time, whereas China's share has fallen below the norm of country's experience (Figure 25). There are, however, tentative signs that the downward trend in household consumption share seen in China may have bottomed out in recent years. In contrast, the household consumption share in Japan has been rising slowly since 1970, from just under 50% in 1970 to over 60% in 2012. With a rapidly aging population, this rising trend can be expected to continue. Japan's share of dependent population stood at 37.1% in 2012, nearly 60% of

29: The Chinese official statistics on household consumption could be misleading. Zhang and Tain (2013), for example, point out three potential sources of a significant downward bias in Chinese consumption data. Firstly, the method used to impute rents for owner-occupiers does not take into account land costs, and in turn greatly underestimates the market values of housing. Secondly, private consumption on company accounts is misclassified as business costs (i.e., intermediate consumption), or investment expenditure. Thirdly, sample selection bias (under-representation of high income households) and reporting errors also contribute to the underestimation of household consumption. The authors suggest that taking into account these factors could add 10–15 percentage points to China's consumption, which would bring it to a level more comparable with other East Asian countries.

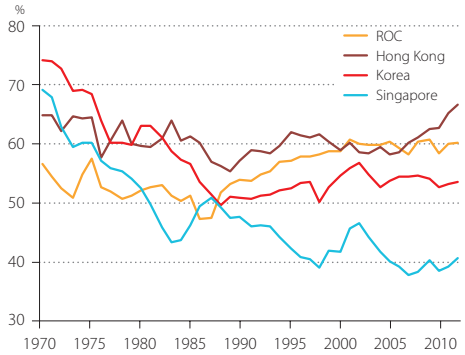



Figure 27.1

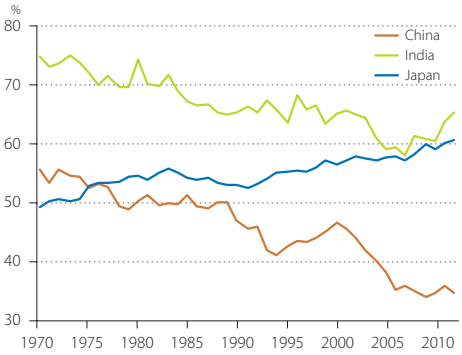



Figure 27.2

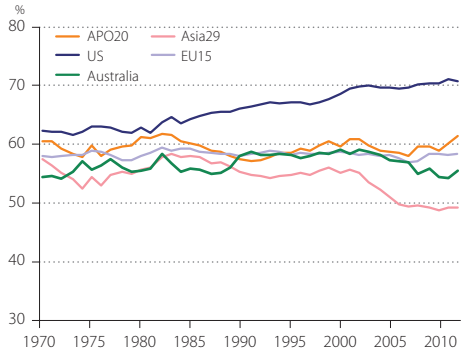



Figure 27.3

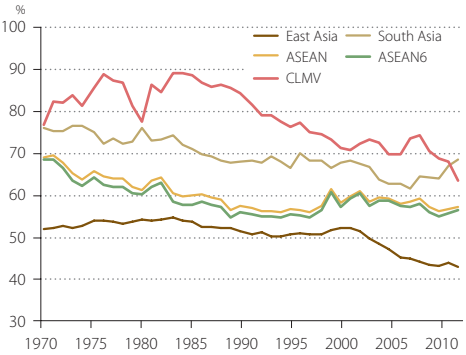



Figure 27.4

**Figure 27 Long-Term Trend of Household Consumption Share in GDP, 1970–2012**
——Share of household consumption with respect to GDP at current market prices

Sources: Official national accounts in each country, including author adjustments.

which was accounted for by the over-65 age group (Figure 28). To a lesser extent, all the Asian Tigers, China, Australia, and the US have a high proportion of over-65 relative to other countries.

Figure 27.3 illustrates the observations of Table 7, plotting Asian group averages against those of the reference countries. The US household consumption share has been climbing since the mid-1980s to over 70% of GDP since 2008, from a level of around 62%. Today the US level is more than 10% higher than that of EU15 and the APO20.[30] The share in EU15 has been stable, fluctuating within a narrow range between 57% and 60% since the mid-1990s. In 1970, household consumption accounted for around 60% of GDP in APO countries. It rose to a peak of 61.8% in 1982 before falling back and hovering around 59%. Since the early 1990s, however, it has been trending upwards and went over the 60% mark in 2012. After the bubble economy burst and its economy floundered, the investment share of GDP shrank – with household consumption and government consumption both inflating their shares to sustain final demand (see Figure 24). In contrast, the consumption share for Asia29 declined rapidly from 57.5% to below 50% over the past decade. This largely reflects China's recent household consumption behavior as it gained gravity in the regional economy. Australia's levels have been fluctuating between that of EU15 and Asia29 in the 1970s and 1980s, and inclined towards EU15's level

30: It is worth noting that the GDP share of government consumption in EU15 was 8.4 percentage points higher than the average of Asia23 in 2012 (Table 7). In fact, when it comes to welfare measurement, actual individual consumption, as opposed to household consumption, is preferred because the former takes into account expenditures by NPISHs and government expenditures on individual consumption goods and services (such as education and health) in addition to household consumption.

in the 1990s. Its trend in the past decade has diverged again and become similar to Asia29, albeit at different levels. The trends of South Asia and East Asia are dominated by those of India and China, respectively (Figure 27.4).

The decomposition of household consumption reveals a huge diversity of consumption patterns among individual countries, partly reflecting their income levels and partly the idiosyncratic characteristics of the society. Figure 29 strongly illustrates the cross-country version of Engel's Law, which says that basic necessities will account for a high proportion of household consumption for a lower per capita income group and vice versa. More specifically, countries where food and non-alcoholic beverages account for a large proportion of consumption tend to have low income (i.e., in groups L3 or L4 in Table 14). The other end of the spectrum is occupied by the rich Asian countries, namely, the Asian Tigers and Japan. Figure 30 traces the decreasing long-term path of Japan's Engel's Curve for the period 1949–2012. The countries' levels in 2012 are mapped against Japan's experience (as circles). Among the selected countries, it is staggering to note that in 2012, 54.7% of Bangladesh's household consumption was spent on food and non-alcoholic beverages at one end of the spectrum, compared with only 7.9% in the US at the other end. This translates into the fact that low-income countries spend 30–50% of their GDP on food and non-alcoholic beverages, which corresponds to Japan's experience in the 1950s and the 1960s. Eating out, recreation and culture are luxuries that the least well-off countries cannot afford in contrast to their richer counterparts. Besides food and non-alcoholic beverages, housing/utilities and transportation are the other two large spending categories. In rich economies, these two categories account for bigger shares in household consumption than food and non-alcoholic beverages. Idiosyncratic spending, such as education in Indonesia and Korea accounting for 7.5% and 6.7% of household consumption, respectively, and health in the US, accounting for one-fifth of consumption, are not reflected in other countries.

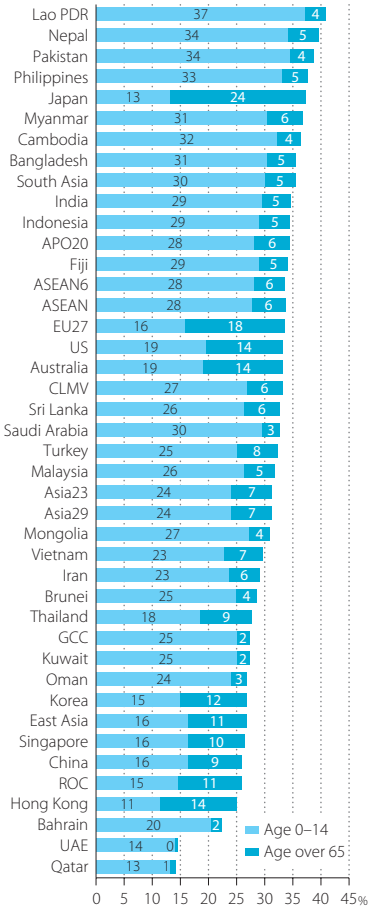



**Figure 28 Share of Dependent Population, 2012**

Sources: Population data by national statistical office in each country; World Bank, *World Development Indicators 2013*.

Figure 31 looks at the long-term trend of investment share in GDP across countries. Historically, an investment share in the region of 40% or above seems to be unsustainable in the long run. We see that Japan's investment share of GDP steadily declined over the past decades from 38.8% in 1970 to 21.0% in 2012 (Figure 31.2). In the initial period, Singapore also sustained an investment share of 40% or above. Since the mid-1980s, however, it has seen a downward trend, in spite of its fluctuations. In 2012, the investment ratio was 27.6%. The investment share hit around 40% in the ROC and Korea at different times but these were no more than temporary spikes (Figure 31.1). In contrast, the investment share in China and India has been rising. India in particular has been investing very aggressively since 2000, coming as close as 5.6 percentage points to China's 41.7% share in 2007. Since then, the gap has widened to 18.6 percentage points in 2012 as investment in India softened (Figure 31.2). At

48.7% in 2012, China's investment share has reached a level previously unseen in Asia. If history is any guide, the contribution of investment to final demand in China will drop sooner or later. South Asia and East Asia's investment shares are dominated by the effort in India and China, respectively. ASEAN's investment share used to be around 35%, but it fell sharply to the lowest point of 20.1% in 1999 in the aftermath of the Asian financial crisis. Since then it has been slowly inching up, reaching 29.3% in 2012. In the past two and a half decades, the investment share in GCC countries has fluctuated between 15–30% of GDP (Figure 31.4).

Figure 32 shows the nominal investment share of six types of assets for some selected countries.[31] For most countries, investment is still very much construction-based (i.e., in dwellings, non-residential buildings, and other structures). However, the expansion of IT capital in the past four decades is significant in the US, Japan, the Asian Tigers, and Malaysia, even at the current price comparisons. The real-term comparisons are conducted at the flow and stock levels in Chapter 5.

Figure 33 plots the long-term trend of net export share in GDP from 1970 to 2012. Among the selected countries, India can be identified as prone to running a trade deficit, which deteriorated rapidly from the mid-2000s to 7.0% of GDP in 2012 (Figure 33.2). In contrast, net exports, which used to be a huge drag on the Asian Tigers, Singapore, and Korea in the 1970s, have rapidly improved their position. In recent years, net exports are making a positive contribution to GDP for all of the Asian Tigers. The share of net

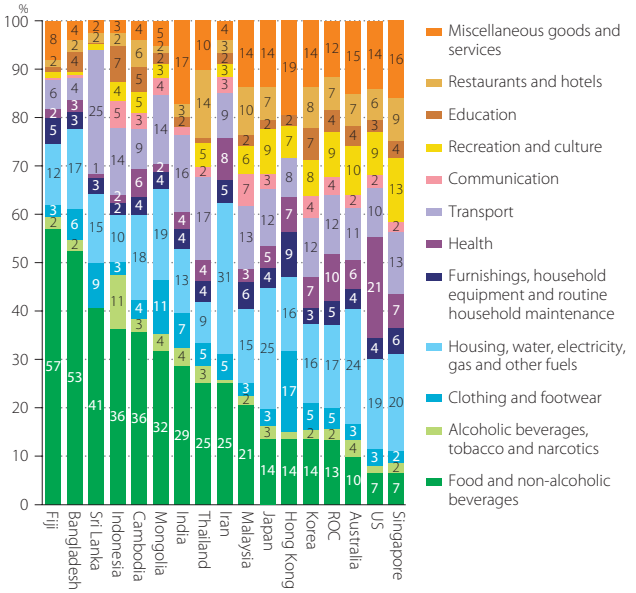



**Figure 29 Household Consumption by Purpose, 2012**

Sources: Official national accounts in each country.
Note: For data of Hong Kong, transportation includes communication; recreation and culture includes hotels; miscellaneous goods and services include restaurants. For data of Sri Lanka, transportation includes communication; food and non-alcoholic beverages includes alcoholic beverages, tobacco and narcotics. For Fiji and Indonesia and Iran, the observation periods are 2009 and 2010, respectively.

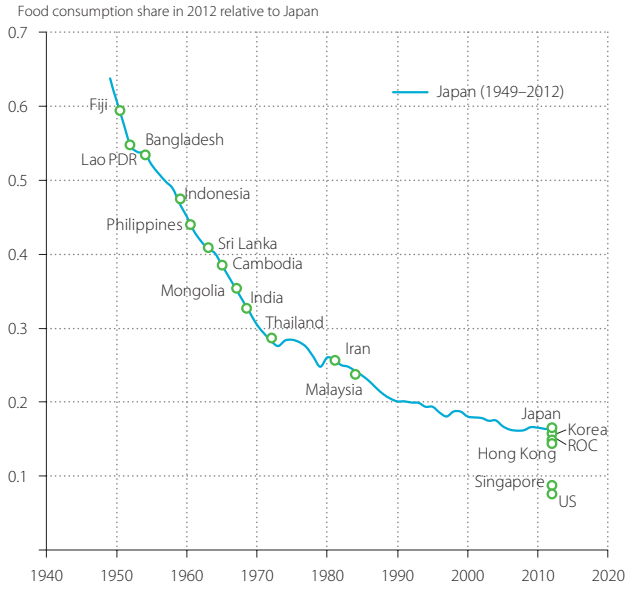



**Figure 30 Engel Curve of Japan during 1949–2012 and Levels of Asian Countries in 2012**
——Share of food in household consumption

Sources: Official national accounts in each country. The historical data of Japan is based on JSNA by ESRI, Cabinet Office of Japan.
Note: Food is defined as sum of food and non-alcoholic beverages and alcoholic beverages, tobacco and narcotics. For Fiji and Indonesia, Iran, and the Lao PDR, the observation periods are 2009, 2010, and 2005, respectively.

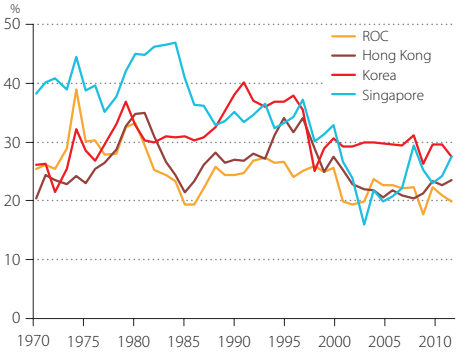



Figure 31.1

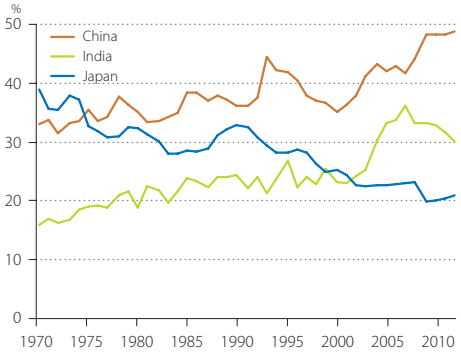



Figure 31.2

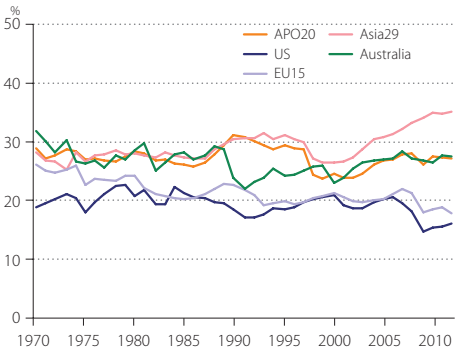



Figure 31.3

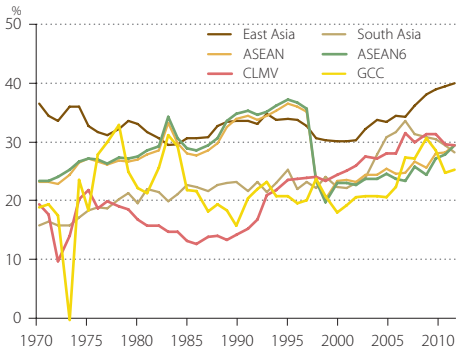



Figure 31.4

**Figure 31 Long-Term Trend of Investment Share in GDP, 1970–2012**
——Share of investment with respect to GDP at current market prices

Sources: Official national accounts in each country, including author adjustments.


**Figure 32 Investment Share by Type of Asset, 1970 and 2012**

Sources: Official national accounts in each country, including author adjustments based on input–output tables and trade data.

31: The investment data by type of assets includes our own estimates for the countries where data is not available. Although our estimates are constructed based on ten classifications of assets, they have been aggregated into six assets for the purposes of this table. The IT capital is defined as IT hardware, communications equipment, and computer software.

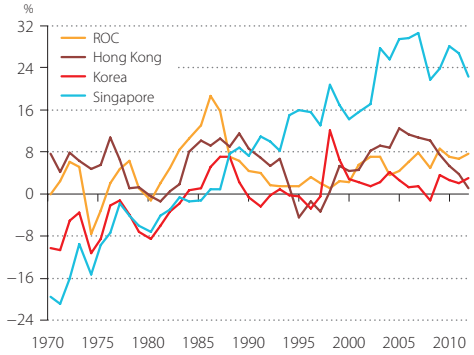



Figure 33.1

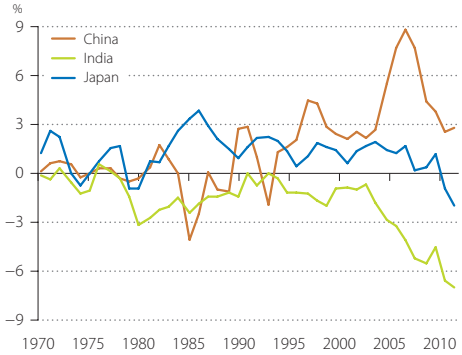



Figure 33.2

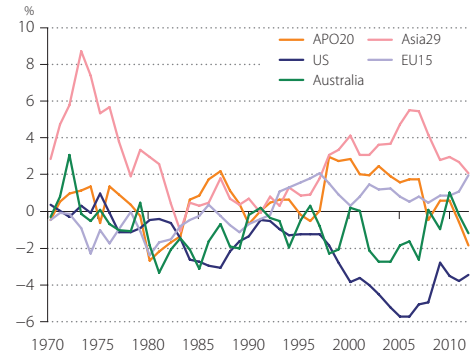



Figure 33.3

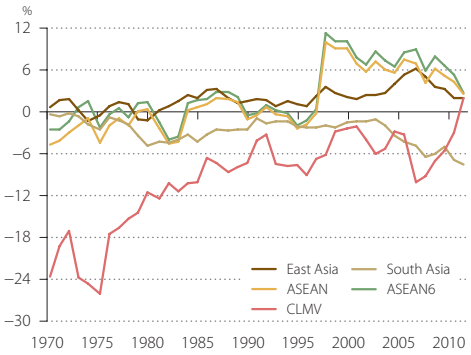



Figure 33.4

**Figure 33 Long-Term Trend of Net Export Share in GDP, 1970–2012**
——Share of net exports with respect to GDP at current market prices

Sources: Official national accounts in each country, including author adjustments.

exports in Singapore is particularly large, at 22.3% in 2012, compared with 3.1%, 7.6%, and 1.1% for Korea, the ROC, and Hong Kong, respectively (Figure 33.1). China is another country that has turned around its net export position to transform it into a significant positive contribution to final demand. The net export share of GDP peaked at 8.8% in 2007. Since then, it has lagged to 2.8% in 2012. Japan had enjoyed a trade surplus for most of the period compared, but recently, its trade balance has turned negative amounting to –0.9% in 2011 deepening to –2.0 in 2012 (Figure 33.2). In the aftermath of the triple disaster (earthquake, tsunami, and nuclear) in 2011, Japan had to increase imports to meet the shortfall of energy production as a result of the shutdown of its nuclear power plants. This trend may change in response to its new energy policy, which will in turn reduce imports.

Figure 33.3 illustrates the external imbalance of the world's major economies. Both the US and EU15 faced a trade deficit at the beginning of this period. While EU15 managed to recover, being in surplus since the early 1990s (within a range of 0–2% of GDP), the US position has significantly deteriorated since the middle of the 1990s, despite a tremendous effort in restoring its trade balance in the late 1980s. In 2012, the size of the US trade deficit stood at 3.5% of its GDP, compared to its recent dip to 5.8% of GDP in 2006. Australia has been running a trade deficit for most of this period. Only in the past few years has its trade balance been in surplus. In contrast, Asia29's trade has been in surplus continuously and a near mirror-image of the US. Asia29's net exports share of GDP was 2.1%, compared to the recent peak of 5.5% in 2012. Addressing this external imbalance has been highlighted as a necessary step to healthy and sustained growth in the world economy.

The time series of ASEAN's trade balance has a clear structural break which is marked by the Asian financial crisis of 1997 (Figure 33.4). The impact was a trade balance spike in 1998 at 9.9%, up from 0.3% in the previous year. Trade balance moderated over time to the more normal level of 2.6% in 2012. In recent years, the trade performance of CLMV has been strong and is in surplus for the first time since 1970.[32] Its improvement has been rapid, from a deficit of 10.1% in 2007 to a surplus of 1.9% in 2012. This should not be a surprise when CLMV is picking up the slack from China as the workshop of the world. If the time series of China's net exports is any guide, CLMV's trade surplus could continue to expand for more years to come.

## 4.2 Demand-Side Growth Decomposition

Figure 34 shows the decomposition of the average annual economic growth by final demand for the periods 1990–2000 and 2000–2012, respectively. Here, Asia29 grew faster in the latter period than the former (at 5.9% on average per annum compared with 4.9%, as presented in Table 3, p. 19).[33] The earlier period embodied the atypical economic event of the Asian financial crisis, which caused some erratic contributions by the final demand components observed in some countries in the late 1990s. In the 1990s overall, the engine of growth for most countries in Asia was household consumption, while investment growth was more subdued.[34]

On the back of the Asian financial crisis, investment growth surged strongly. Its impact on real GDP growth became more significant in Asia in the 2000s, especially in the fast-growing economies. For example, investment contributed 5.9 percentage points in China, 3.8 percentage points in Myanmar,

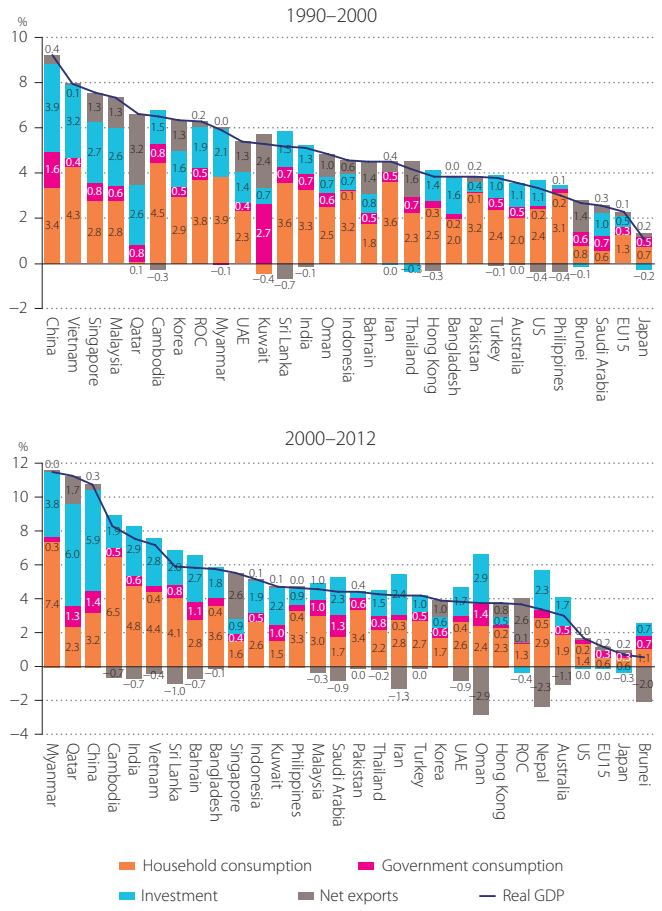



**Figure 34 Final Demand Contributions to Economic Growth, 1990–2000 and 2000–2012**

——Decomposition: Average annual growth rate of GDP at constant market prices

Sources: Official national accounts in each country, including author adjustments.

32: The huge deficit of CLMV in the 1970s due to a large impact by the Vietnam War.

33: The Törnqvist quantity index is adopted for calculating the growth of real GDP. Using this index, the growth of real GDP into the products of contributions by final demands can be decomposed:

$$\underbrace{\ln\left(GDP^{t} / GDP^{t-1}\right)}_{\text{Real GDP growth}} = \underbrace{\sum_i (1/2)\left(s_i^{t} + s_i^{t-1}\right) \ln\left(Q_i^{t} / Q_i^{t-1}\right)}_{\text{Contribution of final demand } i}$$

where $Q_i^t$ is quantity of final demand $i$ in period $t$ and $s_i^t$ is expenditure share of final demand $i$ in period $t$. Thus, the real GDP growth may diverge from the official estimates or those presented in Table 3.

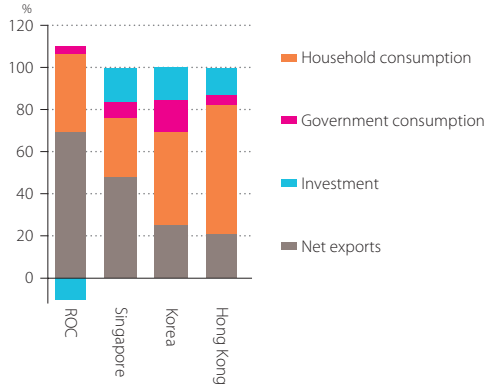



**Figure 35 Final Demand Contribution Shares to Economic Growth of the Asian Tigers, 2000–2012**
——Shares of final demand contributions to growth rate of GDP at constant market prices

Sources: Official national accounts in each country, including author adjustments.

2.9 percentage points in India, and 2.8 percentage points in Vietnam. China grew by 10.7% on average per year in the latter period. The role played by investment has strengthened, with its contribution to economic growth expanding between the two periods from 42.4% to 55.1%, squeezing the contribution of net exports from 4.3% to 2.8%, and that of household consumption from 37.0% to 29.9%. However, for Singapore and the ROC, the strength of net exports was the real economic story, accounting for 47.9% and 69.9% of their economic growth on average per year between 2000 and 2012, respectively. Even in the other two Asian Tigers, net exports accounted for 25.3% and 21.5% of Korea's and Hong Kong's economic growth, respectively (Figure 35). In contrast, net exports have been a drag on economic growth in India over both periods, making a negative contribution of –2.2% and –10.0%, respectively. In some of these economies, the contribution of household consumption to economic growth was really squeezed. For example, from 36.5% in 1990–2000 to 29.4% in 2000–2012 in China, from 36.7% to 28.3% in Singapore, and from 59.7% to 36.6% in the ROC. In contrast, the role played by household consumption in economic growth increased in the US and Japan, from 72.4% to 84.1% and from 66.0% to 78.9%. Overall economic growth in Japan slowed from 1.1% to 0.7% between the two periods compared. This was a sluggish performance, especially relative to the acceleration that most Asian economies experienced. Also, in the latter period net exports made negative contributions in more countries than previously, with its impact in certain oil-exporting countries particularly large.

In the 2000s, economic growth slowed in both the US and EU15 from 3.3% on average per year in 1990–2000 to 1.6% in 2000–2012, and from 2.3% to 1.1%, respectively. In terms of contributions, household consumption increased from 72.4% to 84.1% and government spending tripled from 4.7% to 15.2% in the US over the two periods. Investment in the US took a plunge, however, from a contribution of 34.0% to –1.2% over the two periods. However, its net exports improved from –11.0% to 1.9%. EU15 had a similar pattern where the contribution of government spending doubled over the two periods from 14.9% to 29.8%, making up the slack in the contribution of investment which went from 22.3% to –2.9%, while household consumption remained more or less stable. Its net exports also improved from –5.6% to 21.0%.

Figure 36 shows the impacts of the global financial crisis and countries' path of recovery from the viewpoint of final demand between 2007 and 2012. The crisis made its adverse impact felt through investment in most countries, and to a lesser extent, through net exports. Drastic contraction in investment became commonplace in countries from 2008–2009. China's robust growth in investment

34: The exceptions are some of the oil-producing countries, which enjoyed a positive contribution from net exports bigger than most countries, and China, which experienced the fastest economic growth among the countries studied, averaging 9.2% per year, 42.4% of which was driven by investment, compared with 36.5% by household consumption. This compares with average annual growths of 3.3% in the US and 2.3% in EU15. The contribution from household consumption was 72.4% and 57.2%, whereas investment growth accounted for 34.0% and 22.3% of overall growth in the US and EU15, respectively.

## Box 3 National Accounts in Asian Countries

Understanding data comparability is essential for the construction of an international database, and requires significant effort and expert knowledge. Between September and December 2013, metadata surveys on the national accounts and other statistical data required for international comparisons of productivity were conducted among APO member economies. The aim of these surveys was to gather the metadata of the input data series required to populate the APO Productivity Database.

Broadly speaking, cross-country data inconsistency can arise from variations in one or more of the three aspects of a statistic: definitions, coverage, and methodology. The international definitions and guidelines work to standardize countries' measurement efforts. However, country data can deviate from the international best practice and vary in terms of omissions and coverage achieved. Countries can also vary in their estimation methodology and assumptions. This may account for part of the differences observable in the data, as well as interfere with comparisons of countries' underlying economic performance.

Most of the economic performance indicators in this report are GDP-related. The surveys therefore put much emphasis on discerning countries' GDP compilation practices. For GDP, the 1993 SNA is used as the standard, noting how countries' practices deviate from it. Since there are differences between the 1993 SNA and its predecessor (1968 SNA) in some concepts and coverage, it is important to know in which year in the data series definitions and classification started to switch over. This allows identification in breaks in the time series. Figure B3 presents the current situation in compilations and data availability of the backward estimates based on the 1968 SNA, the 1993 SNAs, and the 2008 SNA (including the future plan for introducing the 2008 SNA). For example, Japan started to publish national accounts based on the 1968

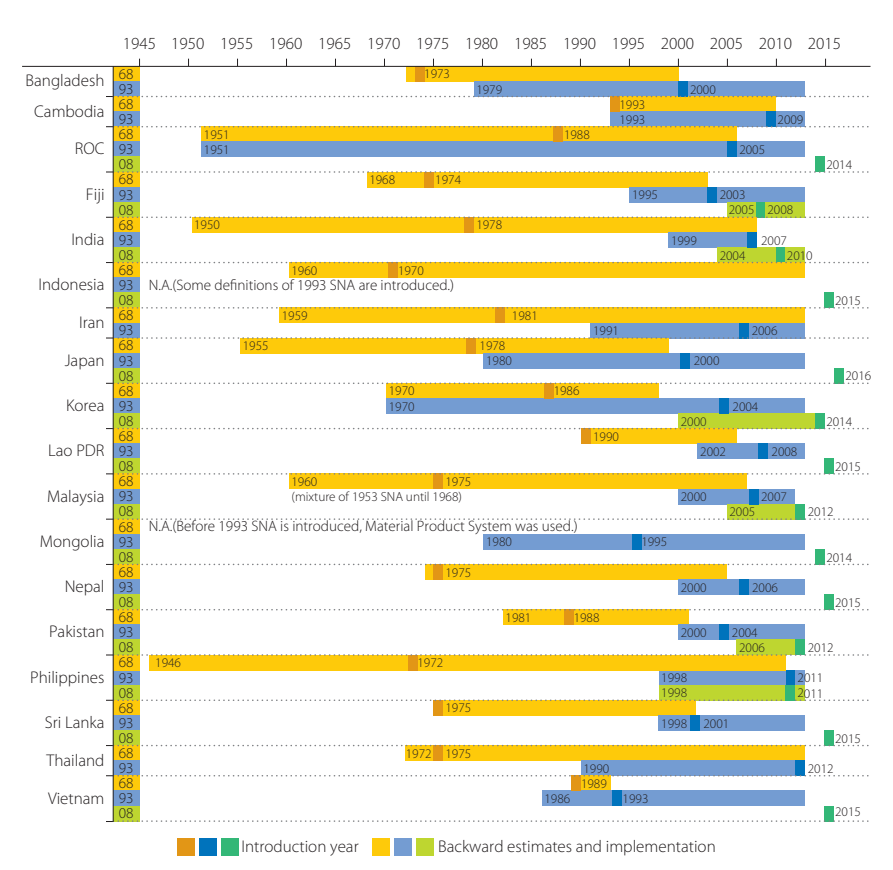



**Figure B3 Implementation of the 1968 and 1993 SNA and Plan for the 2008 SNA**

Source: APO Metadata Survey 2013.

continued on next page >

> continued from previous page

SNA in 1978 (backward estimates based on the 1968 SNA are available from 1955 at present) and national accounts based on the 1993 SNA in 2000 (backward estimates based on the 1993 SNA are available from 1980 at present), and will introduce the 2008 SNA progressively and switch it in 2016.

As Figure B3 suggests, countries differ in their year of introduction, the extent of implementation, and backward estimates available. According to the survey response, most APO countries are currently 1993 SNA compliant (partly or fully), although for some countries the switchover was a relatively recent affair. For Indonesia, the 1993 SNA is an ambition for the near future. The starting year of the official 1993 SNA-compliant time series therefore varies a great deal across countries, reflecting the differences in the availability of backward estimates. Countries may have adopted the 1993 SNA as the framework for their national accounts, but the extent of compliance in terms of coverage may vary. The APO Productivity Database tries to reconcile the national accounts variations and provide harmonized estimates for international comparison. See Appendix 1 for details of the adjustments.



was a result of prompt active policy intervention in face of the potential detrimental effects of the crisis on the economy, and shrinking net exports. Hong Kong and Japan also suffered from the negative impact of net exports on growth. Investment rebounded strongly in 2009–2010 with favorable policy levers, but moderated in the subsequent years when the effects of policy faded out. Only China and Singapore sustained their robust investment growth. The global financial crisis hit the US and EU15 earlier and deeper with retrenchment in household consumption as well as investment. These economies subsequently recovered, but EU15 was pulled down again in 2011–2012 when it faced its specific adverse economic shock originated from the euro crisis.

In comparison, the impact of the Asian financial crisis was more contained. Figure 37 suggests that the impact was contained within Asia, except for the handful of countries effected, it marked an exceptional time. In 1998, investment took a nosedive in Indonesia, Korea, Malaysia, Singapore, and Thailand. Household consumption also fell, albeit to a lesser extent. The crisis however greatly boosted these countries' net exports, likely to have benefitted from the rapid devaluation of the Asian currencies at the time of the crisis. This helped to bolster the effected economies against the retrenchment in other components of final demand.

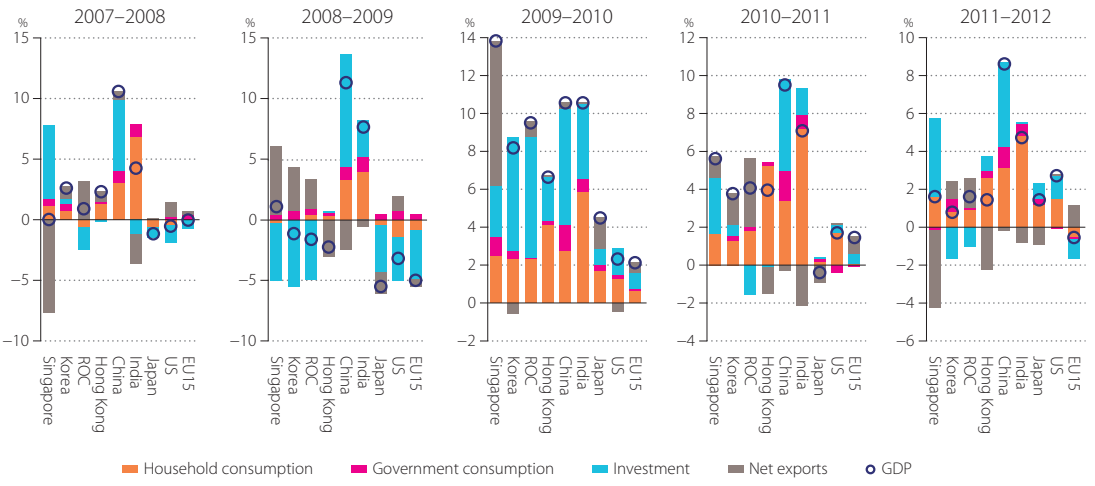



**Figure 36 Impacts of Global Financial Crisis and Recoveries, 2007–2012**
——Annual growth rate of GDP at constant market prices and contributions of final demands

Sources: Official national accounts in each country, including author adjustments.

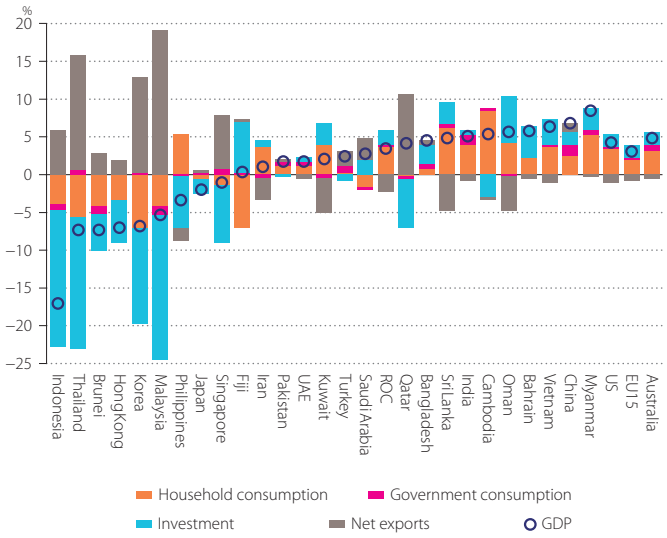



**Figure 37 Impacts of Asian Financial Crisis, 1997–1998**
——Annual growth rate of GDP at constant market prices and contributions of final demands

Sources: Official national accounts in each country, including author adjustments.

Figure 38 shows how the contribution of economic growth by final demand varies across countries and over time for the period 1970–2012. The immediate impact of the global financial crisis of 2007–2008 is represented in the data. Most countries felt an adverse impact in 2008 and 2009, with the exception of India where in 2009 growth rebounded strongly from a slowdown in the previous year. The impact on the Asian countries varied both in magnitude and nature. Japan's recession was particularly deep with the economy falling by 1.1% and 5.6% in 2008 and 2009, respectively, compared with 2.1% growth in 2007. The economic retrenchment in Japan was deeper than the –3.1% in the US and –4.9% in the EU15 in 2009. Besides Japan, other Asian countries either experienced a mild recession or a growth slowdown. Even so, relative to their rapid growth, the magnitude of the impact could still be substantial. For example, growth in Singapore dropped from 11.8% in 2007 to 0.2% and 1.0% in 2008 and 2009, respectively. Similarly, growth in Hong Kong slowed from 6.3% in 2007 to 2.3% 2008 before moving into the negative zone of –2.3% in 2009. The corresponding real GDP growth figures for the ROC were 5.8% in 2007, 0.9% in 2008, and –1.5% in 2009. India's growth slowed from 10.1% in 2007 to 4.2% in 2008 before bouncing back to 7.8% in 2009. In contrast, the slowdown in China was more gradual although it lasted longer. From 13.1% in 2007, growth decelerated to 10.6% in 2010, and further dipped to 8.6% in 2012, which was the slowest in more than a decade. Most countries experienced a rebound (strongly in some cases) in 2010, but it was largely due to some temporary effects, which wore off and resulted in a more subdued growth trajectory beyond 2010. For example, growth in Japan swung from 4.5% in 2010 to 0.5% in 2011 (reflecting a country-specific economic shock, namely the triple disaster of 2011) and 1.4% in 2012, and similarly from 10.5% to 7.1% and 4.8% in India, from 13.8% to 5.7% and 1.6% in Singapore, and from 9.5% to 4.1% and 1.7% in the ROC. The US also bounced back strongly in 2010 from –3.1% in 2009 to 2.3%, which subsequently slowed in 2011 to 1.8% before returning to 2.7% in 2012. A similar pattern can be seen in EU15 when the economy revived in 2010 from a –4.9% growth in 2009 to 2.1%, which slowed to 1.6% in 2011. Growth went negative (at –0.5%) again in 2012 under the impact of a region-specific economic shock (the euro crisis). For Asia29, the figures were 8.0% in 2010 and 5.2% in 2012.

The channels through which economic growth was adversely impacted also varied across countries. Japan's recession in 2009 was largely accounted for by a sharp fall in investment (3.9 percentage points) and, to a lesser extent, a fall in net exports (1.7 percentage points). Meanwhile the 0.4% growth of government spending canceled out the 0.4% fall in household consumption. Similarly, in the ROC, investment fell by 4.9% in 2009, while household consumption and net exports grew, albeit more slowly than it had previously enjoyed. Growth in government consumption was stronger to negate some of the adverse impact. In Singapore, net exports and investment in 2008 accounted for –7.7

percentage points and 6.1 percentage points of the final demand growth, respectively. The reverse was true in 2009 with net exports accounting for 5.7 percentage points and investment –4.9 percentage points of final demand growth. In China, the financial contagion was through trades. Net exports were the only component to fall (by 2.4 percentage points) in 2009, while other final demand components expanded handsomely. In the subsequent years, investment growth softened from an all-time high of 9.3 percentage points in 2009 to the decade-norm of 4.5 percentage points in 2012. This contributed to a slowdown in growth. It is worth noting that the level of investment growth in China in the past decade is unprecedented historically. Hong Kong also took a hard hit in terms of net exports in 2009, which fell by 3.0 percentage points. Household consumption growth slowed considerably in 2009 to 0.4 percentage point before bouncing back to its normal range of 3–5%. In the US and EU15, the vulnerability in 2009 was in investment and household consumption. Consumers were cautious with their spending as households repaired their balance sheets and job prospects became uncertain. Household consumption fell by 1.4 percentage points and 0.9 percentage points, whereas investment fell by 3.6 percentage points and 4.0 percentage points in the US and EU15, respectively. In the subsequent years, there was no further retrenchment in these activities, which still struggled to grow. When the final demand components returned to growth, we see governments in the US and EU15 go through a period of fiscal austerity in 2011 and 2012, when government consumption contracted marginally. As the euro crisis deepened and was answered with further austerity policy, both household consumption and investment contracted in 2012. That is, of the four final demand components, only net exports were growing. Japan was the only Asian country in which the global financial storm of 2007–2008 caused deeper retrenchment in its economy than the Asian financial crisis of 1997–1998 (Figure 37).

It is difficult to understand the oil-exporting economies fully without analyzing the oil market in parallel. Its volatility can be clearly observed from Figure 38, with huge peaks and valleys, particularly in the 1970s. The oil booms of the 1970s brought benefits, but the downturn hurt. Net exports remain erratic, but overall volatility seems to have reduced in the past two decades. Qatar experienced the fastest GDP growth among the oil-exporting countries in recent years with very strong investment growth. However, its economy is still very dependent on oil and gas and related industries, which accounted for 56% of its GDP in 2012 (Figure 67, p. 88) – roughly 80% of its export earnings, and 70% of government revenues in the 2000s.[35] In contrast, Bahrain has diversified into a regional banking and financial center and benefited from the regional boom in recent years. Even so, petroleum production and processing accounted for 25.5% of its GDP in 2012 (Figure 67) – about 60% of export earnings, and 75% of government revenues in the 2000s.[36] The economic fortunes of these countries are therefore intimately tied with the rest of the world via their dependence on the oil and gas industry. For example, demand for oil has been driven by the rapid growth in emerging economies. If, for instance, China's growth slows, the demand for oil will also relent. Their future depends on how well they can diversify away from oil and gas while the stock of natural resources remains.

35: Data from the series of *Annual Statistical Abstract,* State of Qatar.
36: Data from the Ministry of Finance, Kingdom of Bahrain.


Bahrain
Bangladesh
Brunei
Cambodia
China
ROC
Hong Kong
India
Indonesia
Iran
Japan
Korea
Kuwait
Malaysia
Mongolia
Myanmar
Nepal
Oman
%
1971 1976 1981 1986 1991 1996 2001 2006 2011
Household consumption
Government consumption
Investment
Net exports
Real GDP


**Figure 38 Final Demand Decomposition of Real GDP Growth, 1970–2012**

Sources: Official national accounts in each country, including author adjustments.

# 5 Productivity

Productivity performance is crucial to a country's future economic prospects, especially when many countries are facing aging populations. As the factors of inputs (labor and capital devoted to production) cannot increase indefinitely, productivity gains, which enable an economy to produce more for the same amount of inputs, are the only route to sustainable economic growth in the long run. It follows that monitoring and improving national productivity capability (the supply side of the economy) are important aspects of public policy in many countries.



Used as a ratio of an output volume measure to an input volume measure, productivity is simple as a notion. When it comes to applying it, however, one quickly realizes the complexity in operationalizing this notion to suit different purposes, especially in a world with data limitations. Consequently, there are different measures of productivity for different purposes, and different estimation approaches and definitions subject to the data used. In the Databook, national accounts are the basis for productivity estimates, and, in turn, growth accounting with the appropriate choice of index numbers is adopted as estimation approach.[37] Two productivity measures are mainly presented in this chapter, namely labor productivity and TFP.

Labor productivity can be measured in a number of ways, depending on the definitions of output and labor input measures. The preferred measure is the basic-price GDP per actual hour worked, which adjusts to allow for different work patterns across countries and across time.[38] However, total actual hours worked cannot be collated for all countries. In order to include all countries and define the Asian country groups, the labor productivity measure in terms of GDP per worker is used in Section 5.1. As workers in high-performing Asian countries tend to work longer hours on average than those in the US, the worker-based labor productivity gaps, in this instance, cast the Asian countries in a particularly favorable light. Section 5.2 sees the focus shift to alternative estimates of labor productivity measure, namely GDP per hour worked for some selected Asian countries. In Section 5.3, capital input is included as another key factor of production and the TFP estimates are presented for 18 Asian countries and the US,[39] based on the estimates of capital services (see Appendix 3).

## *5.1 Per-Worker Measure of Labor Productivity*

Figure 39 presents the cross-country comparisons of labor productivity levels in 2012, measured as GDP per worker in US dollars. The countries naturally bundle into groups. On this measure, Singapore is the leading economy, more than 10% larger than the US level.[40] Hong Kong and the ROC follow at some distance. While Iran is close to the top, it is worth noting that it has the lowest employment rate in Asia (Figure 21, p. 32). Japan took the fifth place, with productivity levels at 35% below the US. Korea and Malaysia followed, with gaps of 47% and 55%, respectively. Thereafter, a number of

37: The growth accounting approach is based on the microeconomic production theory and the nominal accounting balance of input and output of production. The standard model was presented by Solow (1957) and has been developed by researchers such as H. Zvi Griliches, Dale W. Jorgenson, Charles R. Hulten, and W. Erwin Diewert. See OECD (2001) for a presentation of definitions, theoretical foundations, and a number of practical issues in measuring productivity.

38: GDP is valued at basic prices in this chapter, as opposed to GDP at market prices used in the previous chapters. GDP at basic prices is defined as GDP at market prices, minus net indirect taxes on products. Since it reflects prices actually paid and received by the producer, it is more relevant to productivity comparisons. As most Asian countries do not provide official estimates for GDP at basic prices in their national accounts, they are calculated based on available tax data. See Appendix 1 for the methods employed for our calculations.

39: In this Databook, the TFP estimates were newly developed for Bangladesh and backwardly estimated until 1970 for Vietnam. The estimates for factor incomes are revised through the examinations with Vietnam Productivity Centre (VPC) in May 2014.

40: Cross-country level productivity comparisons are notoriously difficult to make and hence subject to much data uncertainty. Estimates should therefore be taken as indicative for broad groupings rather than precise ranking. The level of labor productivity in Singapore was slightly lower than the US level in 2011, in the Databook 2013 which was based on the 2005 benchmark PPP. However, in this Databook, it was upwardly revised by 16% due to the use of the new 2011 benchmark PPP. (See Box 1)

countries from among the Asia group followed with labor productivity levels at less than 25% of the US, pulling down the average performance of the group to 20% for the APO20, 20% for Asia29, and 18% for ASEAN. Bringing up the rear were China and India, with productivity levels that were 16% and 12% of the US level, respectively.

In 2000–2012, the APO20 as a group has achieved little change in its labor productivity relative to the US, stagnating at around 20%, while Asia23's has risen from 13% to 18% (Table 8). In 2000, Hong Kong sustained a productivity gap of 17% with the US, but by 2012 the gap had narrowed to around 6%. In contrast, the relative productivity level of Singapore against the US has been slightly deteriorated over the last 12 years.

China and India are the two giant and fast-emerging economies in Asia. China began with one-third of India's productivity levels in 1970. Four decades later it shows signs of pulling ahead of India (Figure 40). China's relative performance against the US moved up from 2% in 1970 to 7% in 2000 and 16% in 2012, compared with the corresponding figures of 6%, 8%, and 12% for India.[41]

The figures for GCC countries and Brunei are uncharacteristically high, especially in 1970. There are noticeable variations within the country group. The atypically high figures in the early period reflect the natural resource rents (the value of the resource over and above the cost of extraction) which are erroneously included in these countries' GDP. The extent of exaggeration appears to be proportional to their oil production. Saudi Arabia has the largest proven oil reserves in the world and is the largest world oil exporter. Kuwait has the fourth-largest oil reserves in the world. In addition, Qatar has become the fourth-largest exporter of liquefied natural gas. In contrast, Bahrain has the smallest oil reserve compared to its peers. Its dependence on oil is therefore considerably lower and it has worked to diversify its economy over the past decade (see Figure 82, p. 104).[42]

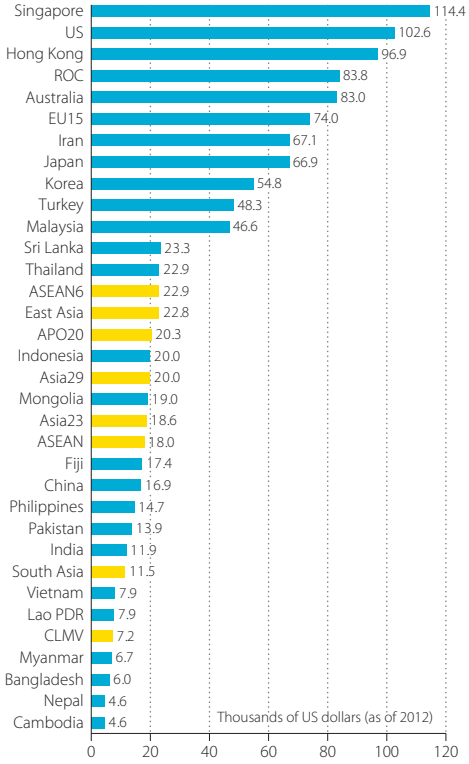



**Figure 39 Labor Productivity Level by Per-Worker GDP, 2012**
——GDP at constant basic prices per worker, using 2011 PPP, reference year 2012

Source: APO Productivity Database 2014.01.

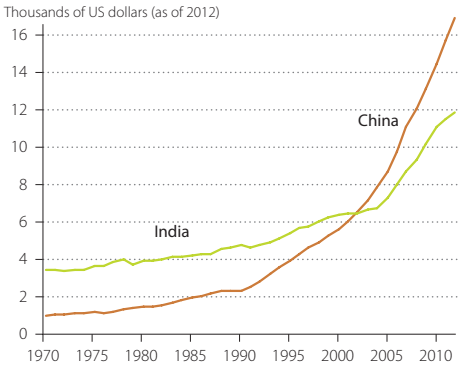



**Figure 40 Labor Productivity Trends of China and India, 1970–2012**
——GDP at constant basic prices per worker, using 2011 PPP, reference year 2012

Source: APO Productivity Database 2014.01.

41: If the comparisons were with the region's leader at different times, India's relative labor productivity has actually fallen, while China has managed to make a substantial leap to close in on the leader, albeit from a very low level.

## Table 8 Per-Worker Labor Productivity Levels, 1970, 1980, 1990, 2000, 2010, and 2012

——GDP at constant basic prices per worker, using 2011 PPP, reference year 2012

| 1970 | | (%) | 1980 | | (%) | 1990 | | (%) | 2000 | | (%) | 2010 | | (%) | 2012 | | (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Iran | 39.2 | 100.0 | Singapore | 43.2 | 100.0 | Singapore | 64.5 | 100.0 | Singapore | 95.3 | 100.0 | Singapore | 113.7 | 100.0 | Singapore | 114.4 | 100.0 |
| Singapore | 30.6 | 78.2 | Iran | 42.2 | 97.5 | Hong Kong | 56.2 | 87.1 | Hong Kong | 69.8 | 73.2 | Hong Kong | 95.8 | 84.2 | Hong Kong | 96.9 | 84.7 |
| Japan | 26.3 | 67.0 | Japan | 37.6 | 86.9 | Japan | 53.9 | 83.5 | ROC | 62.1 | 65.2 | ROC | 82.1 | 72.2 | ROC | 83.8 | 73.3 |
| Hong Kong | 21.5 | 54.8 | Hong Kong | 35.6 | 82.3 | Iran | 42.2 | 65.3 | Japan | 60.3 | 63.2 | Iran | 69.2 | 60.8 | Iran | 67.1 | 58.6 |
| Fiji | 15.0 | 38.2 | ROC | 23.6 | 54.6 | ROC | 38.9 | 60.2 | Iran | 46.9 | 49.3 | Japan | 66.2 | 58.2 | Japan | 66.9 | 58.5 |
| ROC | 13.3 | 34.1 | Malaysia | 19.0 | 44.0 | Korea | 25.2 | 39.1 | Korea | 40.0 | 41.9 | Korea | 53.8 | 47.3 | Korea | 54.8 | 47.9 |
| Malaysia | 12.4 | 31.6 | Fiji | 14.2 | 32.9 | Malaysia | 25.0 | 38.8 | Malaysia | 36.4 | 38.2 | Malaysia | 45.0 | 39.6 | Malaysia | 46.6 | 40.7 |
| Philippines | 9.1 | 23.2 | Korea | 13.4 | 31.0 | Fiji | 15.0 | 23.3 | Thailand | 16.9 | 17.8 | Thailand | 21.8 | 19.2 | Sri Lanka | 23.3 | 20.4 |
| Korea | 8.3 | 21.3 | Philippines | 10.7 | 24.8 | Thailand | 11.1 | 17.1 | Fiji | 15.6 | 16.4 | Sri Lanka | 20.5 | 18.0 | Thailand | 22.9 | 20.0 |
| Sri Lanka | 6.0 | 15.2 | Sri Lanka | 8.7 | 20.1 | Sri Lanka | 10.6 | 16.4 | Sri Lanka | 14.1 | 14.8 | Indonesia | 18.1 | 15.9 | Indonesia | 20.0 | 17.5 |
| Pakistan | 5.9 | 15.1 | Mongolia | 8.5 | 19.7 | Indonesia | 10.6 | 16.4 | Indonesia | 13.1 | 13.7 | Fiji | 17.0 | 14.9 | Mongolia | 19.0 | 16.6 |
| Mongolia | 5.7 | 14.5 | Indonesia | 8.1 | 18.8 | Pakistan | 10.0 | 15.5 | Pakistan | 12.1 | 12.7 | Mongolia | 14.7 | 12.9 | Fiji | 17.4 | 15.2 |
| Indonesia | 5.1 | 13.0 | Thailand | 7.1 | 16.4 | Philippines | 9.8 | 15.2 | Philippines | 11.3 | 11.9 | China | 14.5 | 12.7 | China | 16.9 | 14.8 |
| Thailand | 5.1 | 13.0 | Pakistan | 7.0 | 16.1 | Mongolia | 9.5 | 14.6 | Mongolia | 10.0 | 10.5 | Philippines | 13.7 | 12.1 | Philippines | 14.7 | 12.9 |
| India | 3.5 | 8.8 | India | 3.9 | 9.1 | India | 4.8 | 7.4 | India | 6.4 | 6.7 | Pakistan | 13.6 | 12.0 | Pakistan | 13.9 | 12.1 |
| Bangladesh | 3.3 | 8.5 | Bangladesh | 3.4 | 8.0 | Bangladesh | 3.5 | 5.5 | China | 5.6 | 5.9 | India | 11.1 | 9.7 | India | 11.9 | 10.4 |
| Vietnam | 2.3 | 5.9 | Vietnam | 2.4 | 5.6 | Nepal | 3.3 | 5.2 | Vietnam | 4.7 | 4.9 | Vietnam | 7.4 | 6.5 | Vietnam | 7.9 | 6.9 |
| China | 1.0 | 2.5 | Nepal | 2.3 | 5.4 | Lao PDR | 3.2 | 4.9 | Lao PDR | 4.5 | 4.8 | Lao PDR | 7.1 | 6.3 | Lao PDR | 7.9 | 6.9 |
| | | | Myanmar | 1.5 | 3.5 | Vietnam | 2.7 | 4.2 | Bangladesh | 4.5 | 4.7 | Myanmar | 6.1 | 5.4 | Myanmar | 6.7 | 5.9 |
| | | | China | 1.5 | 3.4 | China | 2.3 | 3.6 | Nepal | 4.1 | 4.3 | Bangladesh | 5.7 | 5.0 | Bangladesh | 6.0 | 5.3 |
| | | | | | | Myanmar | 1.5 | 2.3 | Cambodia | 2.7 | 2.8 | Nepal | 4.5 | 4.0 | Nepal | 4.6 | 4.0 |
| | | | | | | | | | Myanmar | 2.3 | 2.4 | Cambodia | 4.1 | 3.6 | Cambodia | 4.6 | 4.0 |
| Bahrain | 129.8 | 331.2 | Bahrain | 118.6 | 274.3 | Bahrain | 87.9 | 136.2 | Bahrain | 104.0 | 109.1 | Bahrain | 72.1 | 63.4 | Bahrain | 70.9 | 62.0 |
| Kuwait | 625.0 | 1595.2 | Kuwait | 244.3 | 565.1 | Kuwait | 99.2 | 153.7 | Kuwait | 193.1 | 202.6 | Kuwait | 144.5 | 127.0 | Kuwait | 157.5 | 137.6 |
| Oman | 120.1 | 306.5 | Oman | 164.0 | 379.4 | Oman | 175.4 | 271.8 | Oman | 151.6 | 159.1 | Oman | 107.8 | 94.8 | Oman | 88.9 | 77.7 |
| Qatar | 304.7 | 777.6 | Qatar | 258.0 | 597.0 | Qatar | 166.1 | 257.3 | Qatar | 222.0 | 232.9 | Qatar | 184.0 | 161.8 | Qatar | 209.4 | 182.9 |
| Saudi Arabia | 212.1 | 541.3 | Saudi Arabia | 213.1 | 493.0 | Saudi Arabia | 117.6 | 182.3 | Saudi Arabia | 131.4 | 137.8 | Saudi Arabia | 144.0 | 126.6 | Saudi Arabia | 140.7 | 123.0 |
| UAE | 97.5 | 248.9 | UAE | 359.3 | 831.1 | UAE | 223.7 | 346.5 | UAE | 192.9 | 202.4 | UAE | 143.4 | 126.1 | UAE | 141.6 | 123.7 |
| | | | Brunei | 414.2 | 958.3 | Brunei | 200.0 | 309.8 | Brunei | 180.0 | 188.9 | Brunei | 164.6 | 144.7 | Brunei | 163.8 | 143.1 |
| (regrouped) | | | (regrouped) | | | (regrouped) | | | (regrouped) | | | (regrouped) | | | (regrouped) | | |
| APO20 | 8.6 | 22.0 | APO20 | 11.1 | 25.6 | APO20 | 13.5 | 20.9 | APO20 | 15.7 | 16.5 | APO20 | 19.7 | 17.3 | APO20 | 20.3 | 17.7 |
| Asia23 | 5.1 | 12.9 | Asia23 | 6.5 | 15.0 | Asia23 | 7.8 | 12.1 | Asia23 | 10.8 | 11.4 | Asia23 | 17.2 | 15.1 | Asia23 | 18.6 | 16.3 |
| Asia29 | 5.7 | 14.5 | Asia29 | 7.6 | 17.5 | Asia29 | 8.6 | 13.3 | Asia29 | 11.7 | 12.3 | Asia29 | 18.4 | 16.2 | Asia29 | 20.0 | 17.4 |
| East Asia | 4.8 | 12.3 | East Asia | 6.5 | 15.1 | East Asia | 8.0 | 12.4 | East Asia | 11.9 | 12.4 | East Asia | 20.6 | 18.1 | East Asia | 22.8 | 19.9 |
| South Asia | 4.0 | 10.1 | South Asia | 4.5 | 10.4 | South Asia | 5.4 | 8.4 | South Asia | 7.0 | 7.4 | South Asia | 10.8 | 9.5 | South Asia | 11.5 | 10.0 |
| ASEAN | 6.4 | 16.3 | ASEAN | 7.9 | 18.3 | ASEAN | 9.8 | 15.1 | ASEAN | 12.5 | 13.1 | ASEAN | 16.7 | 14.7 | ASEAN | 18.0 | 15.7 |
| ASEAN6 | 7.1 | 18.1 | ASEAN6 | 10.1 | 23.3 | ASEAN6 | 12.5 | 19.4 | ASEAN6 | 16.4 | 17.2 | ASEAN6 | 21.3 | 18.7 | ASEAN6 | 22.9 | 20.0 |
| CLMV | 3.8 | 9.8 | CLMV | 2.3 | 5.4 | CLMV | 2.6 | 4.0 | CLMV | 3.8 | 4.0 | CLMV | 6.7 | 5.9 | CLMV | 7.2 | 6.3 |
| GCC | 277.4 | 708.0 | GCC | 240.4 | 556.1 | GCC | 134.9 | 208.9 | GCC | 153.4 | 160.9 | GCC | 141.4 | 124.4 | GCC | 139.6 | 122.0 |
| (reference) | | | (reference) | | | (reference) | | | (reference) | | | (reference) | | | (reference) | | |
| US | 54.6 | 139.4 | US | 60.6 | 140.2 | US | 70.2 | 108.8 | US | 84.6 | 88.7 | US | 100.5 | 88.4 | US | 102.6 | 89.6 |
| EU15 | 37.3 | 95.2 | EU15 | 48.2 | 111.4 | EU15 | 57.3 | 88.7 | EU15 | 68.9 | 72.3 | EU15 | 73.4 | 64.5 | EU15 | 74.0 | 64.7 |
| | | | | | | | | | EU27 | 61.5 | 64.5 | EU27 | 67.4 | 59.2 | EU27 | 68.5 | 59.9 |
| Australia | 48.2 | 122.9 | Australia | 55.3 | 127.9 | Australia | 59.8 | 92.6 | Australia | 73.9 | 77.5 | Australia | 80.3 | 70.6 | Australia | 83.0 | 72.5 |
| | | | | | | Turkey | 26.9 | 41.7 | Turkey | 34.1 | 35.8 | Turkey | 47.7 | 42.0 | Turkey | 48.3 | 42.2 |

Unit: Thousands of US dollars (as of 2012).
Source: APO Productivity Database 2014.01.

When labor productivity growth is compared however, the ranking of countries is substantially re-shuffled (Table 9). In the 2000s there was a spurt in labor productivity growth among low-income countries. While they were scattered around the table in the earlier periods, by 2000–2005 the six

42: The GCC countries have also been experiencing high population growth, especially in the late 1970s and the early 1980s. In 2000–2012, this has somewhat stabilized at around 3.0% per year, except in the Qatar and the UAE where the population grew at 9.8% and 9.2%, respectively. The working-age population has been expanding accordingly. Employment is erratic from one year to another, and this will be reflected in the labor productivity figures.

## Box 4 Turning Point in China

The Lewis model (Lewis, 1954) or the Fei-Ranis model (Fei and Ranis, 1964), which established development economics as a respectable academic discipline in the late 1950s and 1960s, proposed the concept of a turning point where a developing economy transforms itself from an unskilled-labor-abundant economy with seemingly unlimited supply of labor to a labor-scarce industrial economy. The Chinese economy seems to pass by its turning point in the latter half of the 2000s.

Figure B4 presents the price of labor relative to capital in China, Japan, and the Asian Tigers. Price of labor is defined as the average wage (total labor compensation, including our estimates of wages for self-employed and family workers, over total hours worked) and price of capital is estimated by the ex-post approach for measuring user cost of capital in the APO Productivity Database 2014 (see Appendix 3). The relative price index of labor/capital is normalized as 1.0 in 1970 in each country.

In Japan the prices of labor increased at the beginning of the 1970s, and for Korea and ROC the late 1980s and the beginning of the 1990s, respectively. In these periods, China's low price of labor could be a main source of superior price competitiveness in labor-intensive manufacturing. The turning point is found at around 2008, in which the price of labor started to increase sharply relative to capital.

Such a turning point emerges when a country makes effective movements of labor from agricultural/rural/informal sectors to industrial/urban/formal sectors. Although it is claimed that the aggravation of income disparity is a serious concern, the alleviation of poverty in China are certainly great achievements. The Chinese economy has overcome its first-round of economic development issues and now faces new challenges to move beyond the upper middle-income plateau.

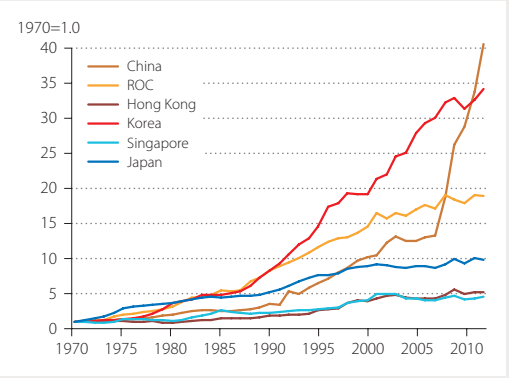



**Figure B4 Price of Labor Relative to Capital in China, Japan, and the Asian Tigers, 1970–2012**

Source: APO Productivity Database 2014.01.

countries with the fastest labor productivity growth were all from Group-L4 (as defined in Table 6, p. 29). In the latest period, 2005–2012, five out of the top six were from Group-L4 and one from Group-L3. Among them, China has been sustaining rapid productivity growth in the past two decades. Its growth accelerated to an average of 9.5% per year in 2005–2012 from 7.1% per year in 1995–2000 and 8.6% per year in 2000–2005. This compares with India at 6.9%, 3.4%, and 2.6% over the same periods. Labor productivity growth amongst the Asian Tigers was steady, ranging from 2.6% to 3.3% on average per year in 2000–2005. This performance was sustained in 2005–2012, except in Singapore. While Singapore's average annual productivity growth slowed significantly to 0.4%, the others enjoyed growth of about 2.4% in 2005–2012. The 2000s were an era when labor productivity deteriorated in GCC countries. The decline accelerated from –0.4% to –1.0% between the two halves of the 2000s.

As a group, Asia23 achieved the highest labor productivity growth in recent years, reaching 5.2% on average per year in 2005–2012, up from 3.6% in 2000–2005. Within Asia, labor productivity growth has been accelerating in both South Asia and East Asia, to 5.5% and 6.0% in 2005–2012, respectively. South Asia displayed a newfound vigor in recent years. In contrast, average annual productivity growth in the US slowed abruptly to 1.3% between 2005 and 2012, after a decade of over 2.0% growth per year. The EU15 shows signs of weakening as well, slowing in every successive period from 2.3% in the first half of the 1990s to 0.4% in the most recent period of 2005–2012. Japan's labor productivity

**Table 9 Labor Productivity Growth, 1990–1995, 1995–2000, 2000–2005, and 2005–2012**
——Average annual growth rate of GDP at constant basic prices per worker, using 2011 PPP

| 1990–1995 | | 1995–2000 | | 2000–2005 | | 2005–2012 | | 1990–2000 | | 2000–2012 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Kuwait | 13.1 | China | 7.1 | Myanmar | 10.4 | China | 9.5 | China | 8.9 | China | 9.1 |
| China | 10.6 | Oman | 6.4 | China | 8.6 | Myanmar | 7.9 | Kuwait | 6.7 | Myanmar | 8.9 |
| Thailand | 8.2 | Qatar | 5.5 | Vietnam | 5.5 | Mongolia | 7.2 | Vietnam | 5.4 | Mongolia | 5.3 |
| Malaysia | 6.6 | Myanmar | 5.5 | Lao PDR | 4.1 | India | 6.9 | ROC | 4.7 | India | 5.1 |
| Indonesia | 5.7 | Vietnam | 5.3 | Indonesia | 3.7 | Sri Lanka | 5.4 | Korea | 4.6 | Lao PDR | 4.6 |
| Vietnam | 5.4 | Korea | 4.2 | Cambodia | 3.6 | Cambodia | 5.0 | Myanmar | 4.4 | Vietnam | 4.4 |
| ROC | 5.2 | ROC | 4.1 | Iran | 3.5 | Lao PDR | 4.9 | Thailand | 4.3 | Cambodia | 4.4 |
| Korea | 5.0 | Lao PDR | 3.9 | Hong Kong | 3.3 | Vietnam | 3.6 | Singapore | 3.9 | Sri Lanka | 4.2 |
| Cambodia | 4.3 | Singapore | 3.7 | Singapore | 3.1 | Indonesia | 3.4 | Malaysia | 3.7 | Indonesia | 3.5 |
| Singapore | 4.1 | Cambodia | 3.4 | Malaysia | 3.0 | Philippines | 3.0 | Cambodia | 3.7 | Iran | 3.0 |
| Sri Lanka | 4.1 | India | 3.4 | Thailand | 2.9 | Bangladesh | 2.9 | Lao PDR | 3.6 | Hong Kong | 2.7 |
| Hong Kong | 3.7 | Philippines | 2.9 | Korea | 2.9 | Iran | 2.6 | India | 3.0 | Korea | 2.6 |
| Pakistan | 3.5 | Mongolia | 2.5 | Mongolia | 2.7 | Korea | 2.4 | Qatar | 2.9 | Thailand | 2.5 |
| Lao PDR | 3.3 | Bangladesh | 2.3 | ROC | 2.6 | ROC | 2.4 | Sri Lanka | 2.9 | ROC | 2.5 |
| Myanmar | 3.2 | Nepal | 1.7 | India | 2.6 | Hong Kong | 2.4 | Bangladesh | 2.3 | Bangladesh | 2.5 |
| Bahrain | 3.0 | Sri Lanka | 1.7 | Sri Lanka | 2.5 | Thailand | 2.2 | Hong Kong | 2.2 | Philippines | 2.2 |
| India | 2.6 | Saudi Arabia | 1.6 | Pakistan | 2.0 | Malaysia | 1.4 | Indonesia | 2.1 | Malaysia | 2.1 |
| Nepal | 2.4 | Japan | 1.3 | Bangladesh | 1.9 | Nepal | 1.3 | Nepal | 2.0 | Singapore | 1.5 |
| Bangladesh | 2.3 | Fiji | 1.2 | Fiji | 1.5 | Saudi Arabia | 1.1 | Pakistan | 1.9 | Pakistan | 1.1 |
| Iran | 1.4 | Malaysia | 0.9 | Japan | 1.2 | Japan | 0.6 | Bahrain | 1.7 | Nepal | 1.0 |
| Japan | 0.9 | Iran | 0.7 | Philippines | 1.1 | Pakistan | 0.6 | Philippines | 1.4 | Fiji | 0.9 |
| Saudi Arabia | 0.6 | UAE | 0.7 | Oman | 1.1 | Fiji | 0.4 | Japan | 1.1 | Japan | 0.9 |
| Qatar | 0.3 | Hong Kong | 0.6 | Kuwait | 0.9 | Singapore | 0.4 | Saudi Arabia | 1.1 | Saudi Arabia | 0.6 |
| Philippines | −0.1 | Thailand | 0.4 | Nepal | 0.5 | Qatar | −0.2 | Iran | 1.1 | Qatar | −0.5 |
| Brunei | −0.2 | Bahrain | 0.4 | Saudi Arabia | −0.2 | Brunei | −0.9 | Mongolia | 0.6 | Brunei | −0.8 |
| Fiji | −0.4 | Pakistan | 0.3 | Brunei | −0.6 | Bahrain | −2.1 | Fiji | 0.4 | Kuwait | −1.7 |
| Mongolia | −1.3 | Kuwait | 0.2 | Qatar | −0.9 | UAE | −3.1 | Brunei | −1.0 | UAE | −2.6 |
| UAE | −3.7 | Indonesia | −1.5 | UAE | −1.8 | Kuwait | −3.5 | Oman | −1.5 | Bahrain | −3.2 |
| Oman | −9.3 | Brunei | −1.9 | Bahrain | −4.8 | Oman | −8.4 | UAE | −1.5 | Oman | −4.5 |
| (regrouped) | | (regrouped) | | (regrouped) | | (regrouped) | | (regrouped) | | (regrouped) | |
| APO20 | 2.1 | APO20 | 0.9 | APO20 | 1.2 | APO20 | 2.8 | APO20 | 1.5 | APO20 | 2.1 |
| Asia23 | 3.9 | Asia23 | 2.6 | Asia23 | 3.6 | Asia23 | 5.2 | Asia23 | 3.3 | Asia23 | 4.5 |
| Asia29 | 3.8 | Asia29 | 2.5 | Asia29 | 3.5 | Asia29 | 5.1 | Asia29 | 3.2 | Asia29 | 4.4 |
| East Asia | 4.5 | East Asia | 3.4 | East Asia | 4.8 | East Asia | 6.0 | East Asia | 3.9 | East Asia | 5.5 |
| South Asia | 2.5 | South Asia | 2.7 | South Asia | 2.1 | South Asia | 5.5 | South Asia | 2.6 | South Asia | 4.1 |
| ASEAN | 4.6 | ASEAN | 0.3 | ASEAN | 3.1 | ASEAN | 3.0 | ASEAN | 2.5 | ASEAN | 3.0 |
| ASEAN6 | 5.4 | ASEAN6 | 0.0 | ASEAN6 | 2.9 | ASEAN6 | 2.7 | ASEAN6 | 2.7 | ASEAN6 | 2.8 |
| CLMV | 2.9 | CLMV | 4.8 | CLMV | 6.0 | CLMV | 4.7 | CLMV | 3.8 | CLMV | 5.3 |
| GCC | 0.6 | GCC | 1.9 | GCC | −0.4 | GCC | −1.0 | GCC | 1.3 | GCC | −0.8 |
| (reference) | | (reference) | | (reference) | | (reference) | | (reference) | | (reference) | |
| US | 1.5 | US | 2.3 | US | 2.1 | US | 1.3 | US | 1.9 | US | 1.6 |
| EU15 | 2.3 | EU15 | 1.4 | EU15 | 0.9 | EU15 | 0.4 | EU15 | 1.8 | EU15 | 0.6 |
| | | EU27 | 1.5 | EU27 | 1.3 | EU27 | 0.6 | EU27 | 1.5 | EU27 | 0.9 |
| Australia | 2.2 | Australia | 2.0 | Australia | 1.3 | Australia | 0.8 | Australia | 2.1 | Australia | 1.0 |
| Turkey | 1.3 | Turkey | 3.4 | Turkey | 5.9 | Turkey | 0.7 | Turkey | 2.4 | Turkey | 2.9 |

Unit: Percentage.
Source: APO Productivity Database 2014.01.

growth performed closer to that of other mature economies. Having managed to grow at 1.2% on average per year for a decade in 1995–2005, labor productivity growth in Japan has slowed to 0.6% per year on average since 2005.

Figure 41 shows labor productivity levels relative to the US (= 100) for Asian countries. The same grouping as in Section 3.2, based on the speed of catch-up with the US in per capita GDP, is used here. Broadly speaking, countries that are catching up faster with the US in per capita GDP (Group-C1) are also faster catching up in labor productivity (Figure 41.1). Similarly, countries with deteriorating

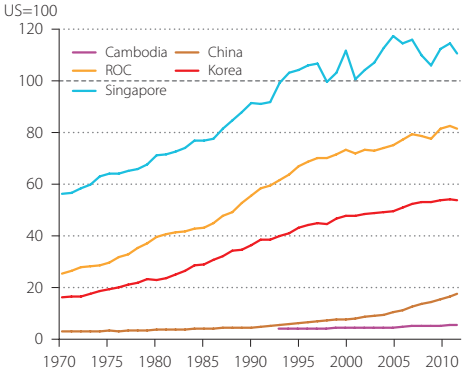



Figure 41.1: Group-C1 Countries

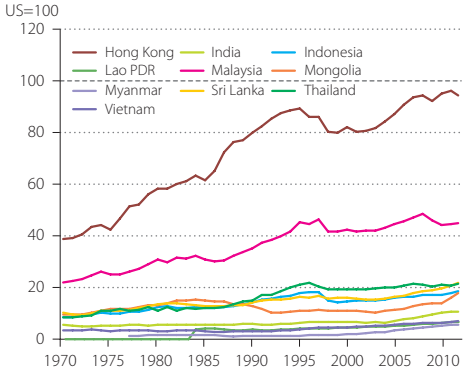



Figure 41.2: Group-C2 Countries

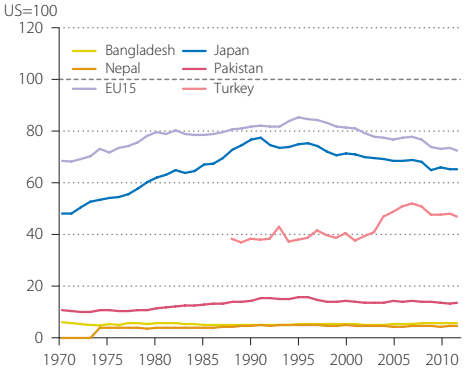



Figure 41.3: Group-C3 Countries

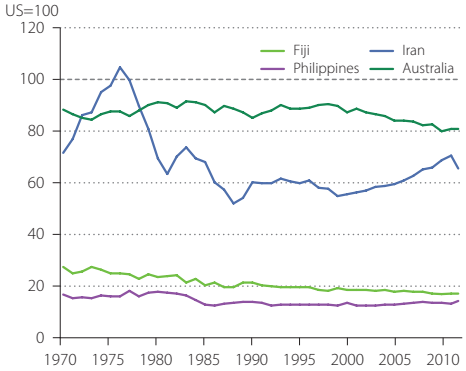



Figure 41.4: Group-C4 Countries

**Figure 41 Labor Productivity Level Relative to the US, 1970–2012**
——Indices of GDP at constant basic prices per worker, using 2011 PPP

Source: APO Productivity Database 2014.01.

relative per capita GDP (Group-C4) also present signs of deterioration or of little change against the US in terms of labor productivity (Figure 41.4).

Among the countries that are catching up with the US in per capita GDP (Group-C1 and Group-C2), the Asian Tigers have made a tremendous effort in improving their relative labor productivity over the past four decades. Singapore passed the US in the middle of the 1990s and Hong Kong closed the gap from 39% in 1970 to 6% in 2012 (Figures 41.1 and 41.2). Similarly, the ROC and Korea reduced a gap of around 80% initially to 20% and 45% by 2012, respectively (Figure 41.1). Malaysia is making steady progress, raising its relative productivity level from 23% of the US in 1970 to 45% in 2012 (Figure 41.2). The rest of the countries in these two groups all display an initial relative labor productivity level of below 15%, but have shown signs of a strong and promising start in their catch-up process in the past decade.[43]

Countries that have managed modest catch-up with the US (Group-C3) or have a declining per capita GDP against the US (Group-C4) are also those with stagnant or deteriorating relative labor productivity. Japan is the only high-income Asian country in this group, while the rest (except Iran) are all low-income countries with per capita GDP less than 30% of the US. Japan showed strong catch-up

43: Among these countries, the impact of the Asian financial crisis of 1997–1998 in temporarily stalling the progress of Thailand and Indonesia can be clearly seen. They are slowly recovering lost ground.

behaviors in the earlier period, with relative labor productivity peaking at 77% of the US in 1991. Since then the gap has widened again to over 30% in 2012. Similarly EU15, a reference economy with high income, has seen its productivity gap double against the US since 1995, from 12% to 28% in 2012; whereas the low-income countries have managed little catch-up (Figure 41.3) or a declining relative productivity level (Figure 41.4). Iran (a Group-L2 country) experienced a drastic decline in its relative labor productivity from its former peak of 105% in 1976 to 52% in 1988, before recovering to 65% in 2012.



## 5.2 Per-Hour Measure of Labor Productivity

The per-worker-based labor productivity gaps presented in Section 5.1 are most likely conservative estimates, since workers in high-performing Asian countries tend to work longer hours than those in the US on average. To adjust for this discrepancy, total hours worked are constructed in our database for 18 Asian countries, although the quality of the estimates may vary considerably across countries.[44] Figure 42 shows how the productivity gap against the US in 2012 varies depending on which measure of labor productivity is used.[45] The productivity gap with the US widens for all Asian countries when the differences in working hours are taken into account. However, for 11 of these countries, the adjustments are within 2–5 percentage points, and hence are not deemed as statistically significant. In contrast, the choice of labor productivity measure makes a significant difference for the previously high-performing countries in their relative performance. On a per-hour GDP basis, the labor productivity gap with the US widens by 14–31 percentage points for the Asian Tigers. Europeans generally work fewer hours. This is reflected in comparisons of hourly labor productivity showing EU15 in a more favorable light against the US, albeit only marginally.

Based on GDP at constant basic prices per hour worked, US labor productivity has been able to sustain a big lead over even the Asian high performers (Table 10).[46] In 1970, the US productivity level was nearly 2.5 times that of Japan. This gap was reduced to around 36% in 1990. Since 1990, Japan's pace in closing the gap has slowed. By 2012, a sizable

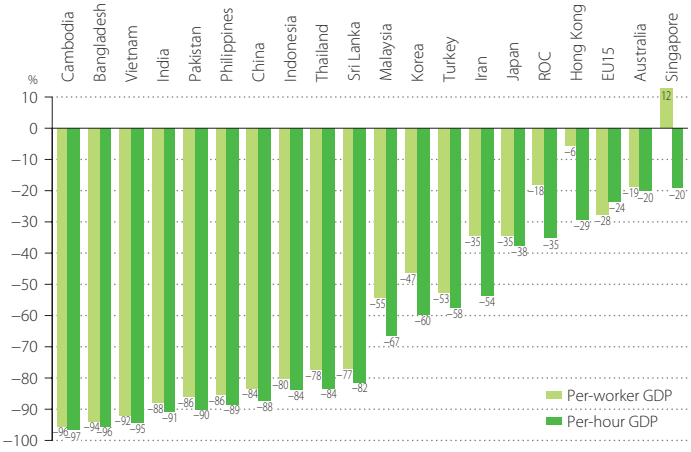



**Figure 42 Labor Productivity Gap by Per-Worker and Per-Hour GDP Relative to the US, 2012**

——GDP at constant basic prices per worker and hour, using 2011 PPP

Source: APO Productivity Database 2014.01.

44: Cross-country comparisons of hours worked are notoriously difficult, not least because harmonized data is rarely readily available. In the countries studied, three published their total hours worked as part of their official statistics, but not for the whole period studied in this report, and the publications may have been constructed based on different methodologies. Some countries only published estimates for average weekly hours worked, which need estimates of number of weeks worked to derive the total average hours worked per worker. Others may have only estimated benchmark hours worked available, which are then extrapolated to form a series. Consequently, growth of employment and growth of total hours worked become identical, as in the case of China and Thailand. In reading the results, it is therefore important to bear in mind the data limitations. See Appendix 4 for an explanation of the estimation procedure of total hours worked.

45: The labor productivity gap for country x is country x's labor productivity divided by the US's labor productivity in Figure 42.

**Table 10 Per-Hour Labor Productivity Levels, 1970, 1980, 1990, 2000, 2010, and 2012**
——GDP at constant basic prices per hour, using 2011 PPP, reference year 2012

| 1970 | | (%) | 1980 | | (%) | 1990 | | (%) | 2000 | | (%) | 2010 | | (%) | 2012 | | (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Iran | 16.1 | 100.0 | Singapore | 20.3 | 100.0 | Singapore | 28.5 | 100.0 | Singapore | 39.7 | 100.0 | Singapore | 49.0 | 100.0 | Singapore | 49.5 | 100.0 |
| Singapore | 13.9 | 86.0 | Japan | 18.1 | 89.3 | Japan | 26.7 | 93.8 | Japan | 33.1 | 83.3 | Hong Kong | 40.2 | 82.1 | Hong Kong | 43.4 | 87.7 |
| Japan | 12.4 | 76.9 | Iran | 17.3 | 85.3 | Hong Kong | 24.0 | 84.4 | Hong Kong | 30.6 | 76.9 | ROC | 39.0 | 79.6 | ROC | 39.8 | 80.4 |
| Hong Kong | 8.3 | 51.6 | Hong Kong | 14.2 | 69.9 | Iran | 17.4 | 60.9 | ROC | 27.8 | 70.0 | Japan | 38.2 | 78.0 | Japan | 38.4 | 77.5 |
| Malaysia | 5.6 | 34.7 | ROC | 9.8 | 48.3 | ROC | 16.9 | 59.3 | Iran | 19.3 | 48.6 | Iran | 29.3 | 59.8 | Iran | 28.3 | 57.2 |
| ROC | 5.5 | 34.2 | Malaysia | 8.6 | 42.2 | Malaysia | 11.1 | 39.1 | Korea | 15.6 | 39.2 | Korea | 23.7 | 48.5 | Korea | 24.4 | 49.4 |
| Philippines | 3.9 | 24.2 | Korea | 4.9 | 23.9 | Korea | 9.2 | 32.4 | Malaysia | 15.5 | 39.1 | Malaysia | 19.6 | 40.0 | Malaysia | 20.5 | 41.4 |
| Sri Lanka | 3.8 | 23.5 | Philippines | 4.8 | 23.5 | Sri Lanka | 5.4 | 19.1 | Thailand | 7.4 | 18.7 | Sri Lanka | 10.2 | 20.8 | Sri Lanka | 11.3 | 22.7 |
| Korea | 3.0 | 18.7 | Sri Lanka | 4.4 | 21.5 | Indonesia | 5.3 | 18.7 | Sri Lanka | 7.2 | 18.1 | Thailand | 9.5 | 19.5 | Thailand | 10.0 | 20.3 |
| Indonesia | 2.6 | 16.4 | Indonesia | 4.2 | 20.6 | Thailand | 5.0 | 17.7 | Indonesia | 6.5 | 16.4 | Indonesia | 8.7 | 17.7 | Indonesia | 9.9 | 19.9 |
| Pakistan | 2.5 | 15.4 | Thailand | 3.2 | 15.9 | Philippines | 4.5 | 15.8 | Philippines | 5.3 | 13.4 | China | 6.6 | 13.4 | China | 7.7 | 15.5 |
| Thailand | 2.3 | 14.4 | Pakistan | 3.0 | 14.8 | Pakistan | 4.3 | 15.0 | Pakistan | 5.1 | 13.0 | Philippines | 6.5 | 13.3 | Philippines | 6.9 | 13.9 |
| India | 1.6 | 9.8 | India | 1.8 | 8.7 | India | 2.2 | 7.6 | India | 2.9 | 7.4 | Pakistan | 5.9 | 12.1 | Pakistan | 6.1 | 12.3 |
| Bangladesh | 1.6 | 9.7 | Bangladesh | 1.6 | 8.0 | Bangladesh | 1.8 | 6.2 | China | 2.6 | 6.5 | India | 5.1 | 10.5 | India | 5.5 | 11.1 |
| Vietnam | 1.0 | 5.9 | Vietnam | 1.0 | 4.9 | Vietnam | 1.1 | 3.9 | Bangladesh | 2.2 | 5.6 | Vietnam | 3.1 | 6.3 | Vietnam | 3.4 | 6.8 |
| China | 0.4 | 2.8 | China | 0.7 | 3.3 | China | 1.1 | 3.7 | Vietnam | 2.0 | 4.9 | Bangladesh | 2.4 | 4.9 | Bangladesh | 2.5 | 5.1 |
| | | | | | | | | | Cambodia | 1.1 | 2.8 | Cambodia | 1.6 | 3.4 | Cambodia | 1.8 | 3.7 |
| (reference) | | | (reference) | | | (reference) | | | (reference) | | | (reference) | | | (reference) | | |
| US | 30.7 | 190.7 | US | 35.6 | 175.0 | US | 41.5 | 145.8 | US | 50.0 | 125.9 | US | 60.7 | 123.9 | US | 61.5 | 124.3 |
| | | | | | | | | | EU15 | 41.9 | 105.6 | EU15 | 46.3 | 94.7 | EU15 | 47.0 | 95.0 |
| | | | Australia | 30.1 | 148.2 | Australia | 33.5 | 117.6 | Australia | 41.5 | 104.5 | Australia | 47.4 | 96.9 | Australia | 49.1 | 99.3 |
| | | | | | | Turkey | 14.4 | 50.7 | Turkey | 17.6 | 44.3 | Turkey | 25.4 | 51.9 | Turkey | 26.0 | 52.6 |

Unit: US dollar (as of 2012).
Source: APO Productivity Database 2014.01.

gap of 38% remained. The gap between the US and the Asian leader of the past decade (Singapore) has been constant at around 20%. This is in contrast with the picture painted by the per-worker productivity measure, in which the Asian leaders have overcome or almost closed the gap with the US (Figure 41).

The levels of labor productivity for the top six economies – Japan, Iran, and the four Asian Tigers – maintained their relative positions for almost four decades. The progress of labor productivity in these countries during 1970–2012 is shown in Figure 43. Within four decades, GDP per hour has roughly tripled for Japan and Singapore. Hong Kong and the ROC have improved by five and eight times in this period and have overcome Japan in 2006 and 2010, respectively. They were ahead of Korea, despite the duo's effort in catching up with Japan by 2.3% per year on average, respectively, over the past four decades (1970–2012). If they could maintain this effort at the same pace, it would take Korea 20 years to finally draw level with Japan.

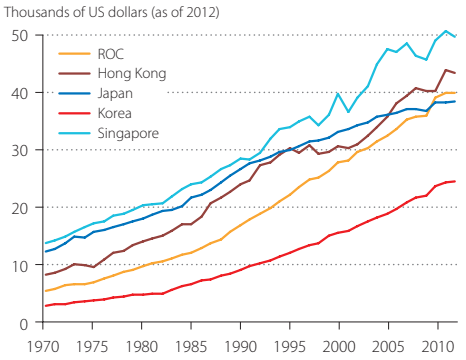



**Figure 43 Labor Productivity Trends in Japan and the Asian Tigers, 1970–2012**
——GDP at constant basic prices per hour, using 2011 PPP, reference year 2012

Unit: Thousands of US dollars (as of 2012).
Source: APO Productivity Database 2014.01.

46: Note that the differentials in the labor quality per hour worked among countries have not been accounted for in this comparison: labor productivity will tend to be overestimated if labor quality has been rising, and vice versa.

Over the past four decades, hourly labor productivity growth ranged from 1.2% (Bangladesh) to 6.8% (China) on average per year, compared with the US at 1.7% and Australia at 1.5% (Figure 44). Among the 16 Asian countries compared, only Bangladesh, Iran, and the Philippines grew slower than the US. Between the two sub-periods (1970–1990 and 1990–2012), there is a notable deceleration in the hourly productivity growth for 11 of 16 Asian countries. For example, 2.6 percentage points and 2.2 percentage points were shaved off productivity growth in the earlier period in Hong Kong and Japan, respectively. Five Asian countries managed to accelerate their productivity improvement after 1990. Among these, China's performance is the most outstanding, with productivity growth more than doubling from 4.3% to 9.0% between the two sub-periods.

The deceleration of labor productivity growth, in most countries, between the two sub-periods, reflect weaknesses in output growth. Figure 45 shows all countries except Bangladesh experienced a slowdown in hours-worked growth between the sub-periods, which should have worked to boost labor productivity growth, all other things being equal.[47] For labor productivity growth to slow implies that output growth must have been decelerating more than labor input in percentage points. In China, output growth was reinforced by the slower pace of labor input growth to result in an extraordinary

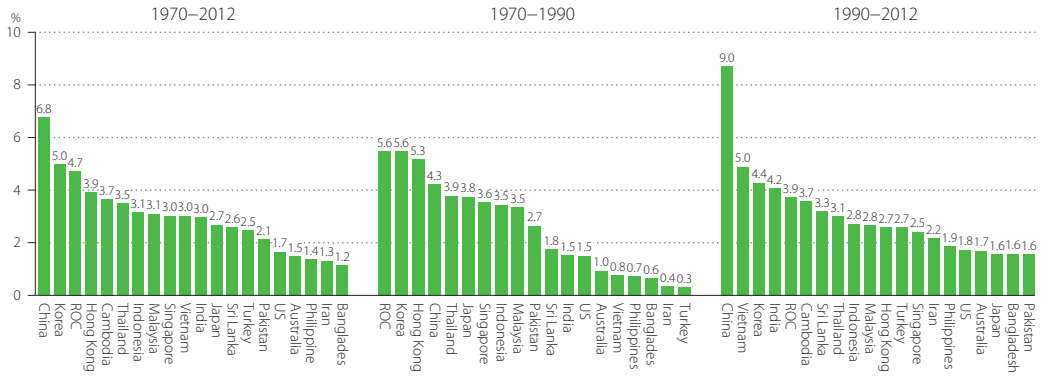



**Figure 44 Labor Productivity Growth, 1970–2012, 1970–1990, and 1990–2012**
——Average annual growth rate of GDP at constant basic prices per hour

Source: APO Productivity Database 2014.01.
Note: The starting periods for Australia, Cambodia, and Turkey are 1978, 1993, and 1988, respectively.

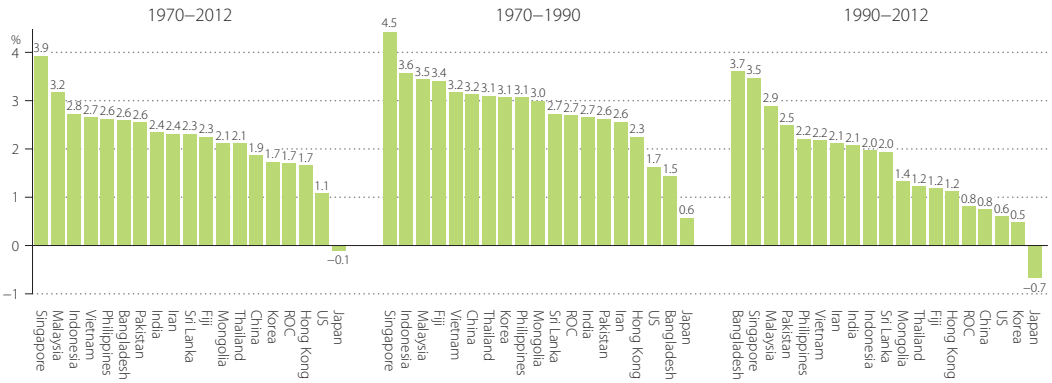



**Figure 45 Labor Input Growth, 1970–2012, 1970–1990, and 1990–2012**
——Average annual growth rate of total hours worked

Source: APO Productivity Database 2014.01.

**Table 11 Labor Productivity Growth, 1990–1995, 1995–2000, 2000–2005, and 2005–2012**
——Average annual growth rate of GDP at constant basic prices per hour, using 2011 PPP

| 1990–1995 | | 1995–2000 | | 2000–2005 | | 2005–2012 | | 1990–2000 | | 2000–2012 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| China | 10.6 | China | 7.1 | China | 8.6 | China | 9.5 | China | 8.9 | China | 9.1 |
| Thailand | 7.4 | Vietnam | 6.6 | Vietnam | 6.7 | India | 7.0 | Vietnam | 5.7 | India | 5.2 |
| Indonesia | 6.4 | Korea | 4.9 | Cambodia | 4.0 | Sri Lanka | 5.2 | Korea | 5.2 | Vietnam | 4.5 |
| Malaysia | 6.0 | ROC | 4.5 | Korea | 4.0 | Cambodia | 4.4 | ROC | 5.0 | Cambodia | 4.2 |
| Korea | 5.5 | Singapore | 3.2 | Iran | 3.7 | Korea | 3.6 | Thailand | 3.9 | Korea | 3.8 |
| Cambodia | 5.4 | Philippines | 3.0 | Singapore | 3.5 | Indonesia | 3.5 | Singapore | 3.3 | Sri Lanka | 3.7 |
| ROC | 5.4 | India | 2.5 | Indonesia | 3.3 | ROC | 3.0 | Malaysia | 3.3 | Indonesia | 3.4 |
| Vietnam | 4.7 | Bangladesh | 2.5 | Hong Kong | 3.1 | Vietnam | 2.9 | India | 3.0 | Iran | 3.2 |
| Hong Kong | 4.6 | Japan | 2.0 | ROC | 3.0 | Iran | 2.8 | Sri Lanka | 2.8 | ROC | 3.0 |
| Sri Lanka | 4.2 | Cambodia | 1.7 | Malaysia | 3.0 | Philippines | 2.8 | Cambodia | 2.7 | Hong Kong | 2.9 |
| India | 3.6 | Sri Lanka | 1.4 | Thailand | 2.9 | Hong Kong | 2.8 | Hong Kong | 2.4 | Thailand | 2.5 |
| Singapore | 3.5 | Iran | 0.7 | India | 2.7 | Bangladesh | 2.3 | Bangladesh | 2.2 | Malaysia | 2.3 |
| Pakistan | 3.2 | Malaysia | 0.7 | Pakistan | 2.3 | Thailand | 2.2 | Japan | 2.1 | Philippines | 2.2 |
| Japan | 2.3 | Pakistan | 0.6 | Japan | 1.7 | Malaysia | 1.8 | Indonesia | 2.0 | Singapore | 1.8 |
| Bangladesh | 1.9 | Thailand | 0.4 | Sri Lanka | 1.7 | Japan | 0.9 | Pakistan | 1.9 | Pakistan | 1.4 |
| Iran | 1.4 | Hong Kong | 0.2 | Philippines | 1.3 | Pakistan | 0.8 | Philippines | 1.7 | Japan | 1.2 |
| Philippines | 0.4 | Indonesia | −2.4 | Bangladesh | −0.5 | Singapore | 0.6 | Iran | 1.1 | Bangladesh | 1.1 |
| (reference) | | (reference) | | (reference) | | (reference) | | (reference) | | (reference) | |
| US | 1.4 | US | 2.3 | US | 2.4 | US | 1.2 | US | 1.9 | US | 1.7 |
| | | EU15 | 1.8 | EU15 | 1.3 | EU15 | 0.7 | EU15 | 1.8 | EU15 | 0.9 |
| Australia | 2.1 | Australia | 2.2 | Australia | 1.9 | Australia | 1.1 | Australia | 2.1 | Australia | 1.4 |
| Turkey | 1.2 | Turkey | 2.8 | Turkey | 5.9 | Turkey | 1.3 | Turkey | 2.0 | Turkey | 3.3 |

Unit: Percentage.
Source: APO Productivity Database 2014.01.
Note: The annual average growth rate for Cambodia during 1990–1995 replicate their annual average growth rates of 1993–1995 due to absent data.

surge in labor productivity growth. Labor input growth slowed to 0.8% per year on average in the latter period, from 3.2% in the previous period. Japan was the only economy to experience an actual fall in labor input in the period 1990–2012. This served to compensate for a sluggish output growth during said period, and to sustain a positive labor productivity growth of 1.6% per year on average.

Table 11 looks more closely at the sub-period from 1990–2012, providing the growth rates of per hour-based labor productivity since 1990. The growth patterns of individual countries generally follow their counterparts closely in per-worker productivity growth, as illustrated in Table 9. In some countries the two measures diverge greatly and are not at all consistent through the periods compared.[48] This contrast was particularly stark in the first half of the 1990s, when Japan's hourly productivity growth was 2.3% compared with 0.9% in per-worker productivity growth. However, the divergence narrowed to 0.3 percentage points in the 2000s. Korea is another country in which hourly productivity growth was consistently higher than its per-worker counterpart. Instead of narrowing, the divergence widened to 1.1 percentage points in the second half of the 2000s. Hours worked in the ROC have also grown at a slower rate than number of workers. The portion ranged from 0.2 to 0.6 percentage points.

One can identify where countries are today in terms of their hourly productivity performance against a backdrop of Japan's historical experience. Figure 46 traces the long-term path of Japan's per-hour

47: By definition, positive labor productivity growth occurs when output grows faster than labor input. Figures 44 and 45 therefore tend to have an inverse relationship, namely that the higher the labor input growth, the lower the labor productivity growth, other things being equal.
48: For China and Thailand, both measures give the same productivity growth. This is a result of a statistical construct in our current database rather than the underlying trend.

labor productivity for the period 1885–2012 along the red line, expressed as relative to Japan's 2012 level (set equal to 1.0).[49] A structural break is observed during World War II when output collapsed. Countries' relative hourly productivity levels against Japan in 2012 are then mapped against Japan's growth experience (as circles). By so doing, a corresponding year can be located when Japan's hourly productivity level was the closest to the country in question. The two countries with the lowest hourly productivity in 2012 (Cambodia and Bangladesh) see levels corresponding to Japan's in the 1920s. Even if they manage Japan's long-term productivity growth of 2.9% on average per year, this means it will take them over a century to catch up with the Asian leader's current position (Singapore, Hong Kong, the ROC, and Japan). Most Asian countries are clustered around Japan's level in the 1950s and early 1970s. Among them, China has been leading the catch-up effort, with productivity growing three times faster than Japan's long-term average (Table 11), followed by India and Vietnam.

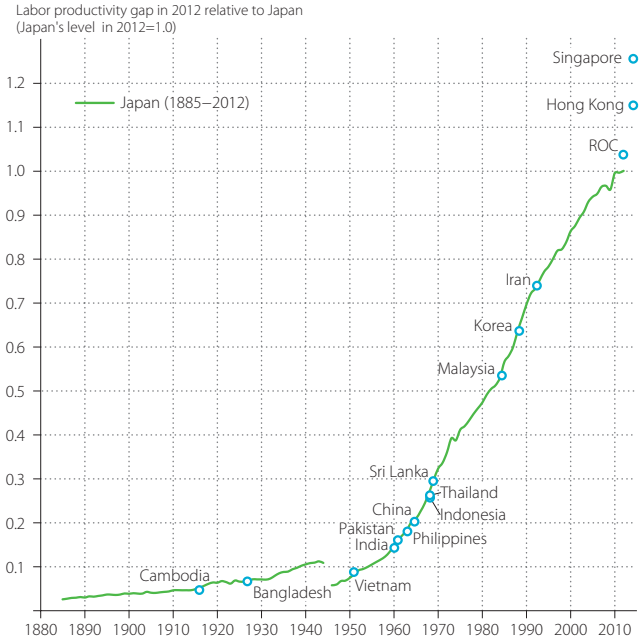



**Figure 46 Labor Productivity Trends of Japan during 1885–2012 and Levels of Asian Countries in 2012**
——GDP at constant basic prices per hour, using 2011 PPP

Sources: For historical data of Japan, the sources of GDP are Long-Term Economic Statistics by Ohkawa et al. (1974) during 1885–1954 and the JSNA by ESRI, Cabinet Office of Japan, during 1955–2012 (including author adjustments). Hours worked data is based on KEO Database, Keio University, during 1955–2012. During 1885–1954, the average hours worked per person are assumed to be constant. For the labor productivity level of Asian countries in 2012, it is based on the APO Productivity Database 2014.01.

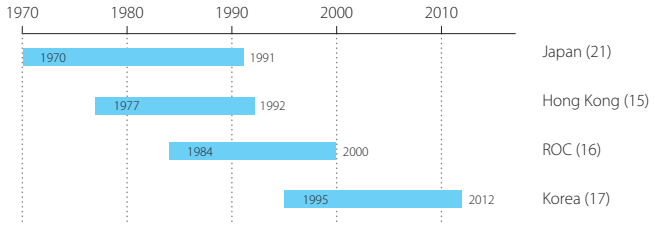



**Figure 47 Time Durations Taken to Improve Labor Productivity by Japan and the Asian Tigers**

Sources: See Figure 46.

In pole position are the Asian Tigers, of which Singapore, Hong Kong, and the ROC have already surpassed Japan. Figure 47 compares the time periods taken by each country to raise its labor productivity from 30–70% of Japan's level today (unit of measurement on the y-axis of Figure 46). What Japan had achieved in the 21 years from 1970 to 1991, Hong Kong, the ROC, and Korea managed to achieve in 15, 16, and 17 years, respectively (Figure 47). Although the speed of catch-up for latecomers is somewhat increasing, most Asian countries will still take a long time to catch up with the leaders, currently clustered at around Japan's 1960 levels.

49: While mindful that level comparisons of productivity among countries and over periods, are subject to a great degree of data uncertainty, they should provide a rough sketch of the productivity divergence in Asia.

## 5.3 Total Factor Productivity

Labor productivity in the previous sections is only a one-factor or partial-factor productivity measure and does not provide a full perspective of production efficiency. An observation of low labor productivity could suggest production inefficiency, but it could also reflect different capital intensities in the chosen production method under the relative labor-capital price faced by the economy concerned. By observing movements in labor productivity alone, it is not easy to distinguish which is the case. In populous Asian economies, which are relatively abundant in low-skilled labor, production lines may be deliberately organized in a way to utilize this abundant, and hence relatively cheap, resource. It follows that the chosen production method is most likely to be (low-skilled) labor-intensive and with little capital, manifested in low labor productivity. This is why economists analyze TFP, which is GDP per unit of combined inputs, to arrive at a more complete picture of a country's production efficiency.[50]

Capital input is a key factor for measuring TFP, and is defined by capital services – the flow of services from productive capital stock, as recommended in the new SNA.[51] The required basis for estimating capital services is the appropriate measure of capital stock. The SNA recommends constructing the national balance sheet accounts for official national accounts, but this is still not common practice in the national accounts of many Asian countries.[52] Even where estimates of net capital stocks are available for the whole economy, assumptions and methodologies can differ considerably among countries. In response to this challenge, harmonized estimates for productive capital stocks and capital services have been constructed and compiled within the APO Productivity Database built on the same methodology and assumptions.[53] In this methodology, changes in the quality of capital are incorporated into the measurement of capital services in two ways: changes in the composition are captured by explicitly differentiating assets into ten types and; an appropriate and harmonized deflator is used for IT capital to reflect the rapid quality change embodied in IT-related assets (see Appendix 2).

The current APO Productivity Database estimates capital services and TFP for 18 Asian countries[54] for which long-time investment data by type of asset are available or estimated.[55] Their economic growth is decomposed into sources from factor inputs and TFP based on the methodology developed by Jorgenson and Griliches (1967). This report defines output as GDP at constant basic prices, and factors inputs as labor, IT capital, and non-IT capital.[56] Labor input is measured by total hours worked (except for Fiji and Mongolia), without adjustments for changes in labor quality.[57]

Cross-country comparisons of TFP growth for the 18 Asian countries and the US are shown in Figure 48 for the period 1970–2012, and the two sub-periods 1970–1990 and 1990–2012. The average annual

50: Different types of inputs and outputs are aggregated by using index numbers, and TFP is calculated as the output quantity index divided by the input quantity index. In this chapter, the Törnqvist index is used for aggregating labor and 10 types of capital inputs.
51: See the chapter on capital services and the national accounts of the 2008 SNA (United Nations, 2009). The second edition of the *OECD Capital Manual* (2009) provides a comprehensive framework for constructing prices and quantities of capital services.
52: Based on our metadata survey, half of APO member economies do not estimate the balance sheet accounts within the official national accounts; these countries are Bangladesh, the ROC, Iran, Korea, the Lao PDR, Mongolia, Nepal, Pakistan, Sri Lanka, and Vietnam (but the National Wealth Survey is available in the ROC and Korea for some selected years).
53: The Department of Statistics Malaysia developed a new set of comprehensive capital stock statistics in April 2011 following the *OECD Capital Manual* (2009). The correlations between these official estimates (Department of Statistics Malaysia, 2013) and our estimates for the period of 1970–2012 are high; they are 88.7% and 93.7% for the growth rates of net and productive capital stock, respectively. In this report, capital input is defined as capital services computed from our estimates of productive capital stock, so as to ensure that the same methodology and same asset classification are applied for the 18 Asian countries compared.
54: In APO Productivity Database 2014, the TFP estimate for Bangladesh was newly developed and the estimate for Vietnam was backwardly estimated until 1970.

growth rate of TFP during the entire observation period ranges from almost 0–2%, with the exception of China which has achieved considerably high growth of TFP over 3%. Taking the US as the reference economy, with TFP growth of 0.9% on average per year, 11 Asian countries achieved higher TFP growth than the US.

Looking at the sub-periods (1970–1990 and 1990–2012), one can discern that the two were not identical and, in fact, had quite significant differences in terms of the magnitude of growth and countries' relative performance. Eleven of the 18 Asian countries experienced acceleration in TFP growth. China and Iran accelerated the most between the two sub-periods: from 1.7% to 4.4%, and from –1.4% to 1.6%, respectively. More modestly, the TFP growths in India and Mongolia improved from 0.5% on average per year in the earlier period to 2.4% since 1990 and from –0.03% to 2.1%, respectively.[58] Three countries saw their productivity growth more than halved: Thailand,[59] Hong Kong, and Japan. TFP growth in the ROC, Malaysia, and the US was changed slightly.

In terms of its contribution to economic growth, TFP has played a significant role in Asian fast-growing economies over the past decades. During the period of 1970–2012, China achieved the fastest output growth of 8.7% on average per year. This is followed by Singapore and Korea, growing at 7.1% and

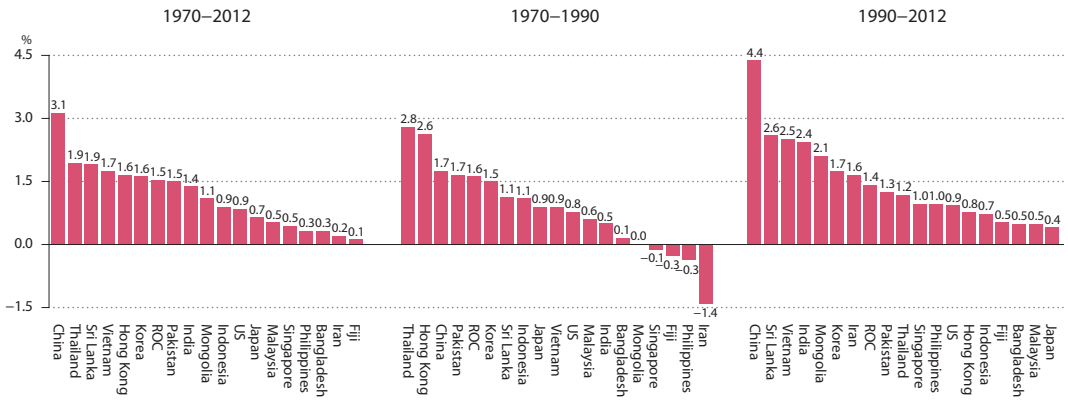



**Figure 48 TFP Growth, 1970–2012, 1970–1990, and 1990–2012**

Source: APO Productivity Database 2014.01.
Note: The labor inputs for Fiji and Mongolia are defined by numbers of employment.

55: In measuring TFP, income generated from domestic production should be separated into labor compensation and returns to capital. The national accounts readily provide the estimates of labor compensation for employees as a component of value added; labor compensation for the self-employed is not separately estimated but is combined with returns to capital in mixed income, except China, where labor remuneration in the national accounts includes labor income for the self-employed (Holz, 2006). In the Databook, it is assumed that the per-worker wages for self-employed and family workers are 20% to 80% of the per-worker wage for employees in the countries where the appropriate wage data is not available, in order to measure total labor compensation. For sensitivity of our TFP results to our assumptions, see Box 5 (p. 86).

56: IT capital is defined as a composite asset of IT hardware (computers and copying machines), communications equipment, and computer software.

57: The failure to take into account improvements in labor quality leads to TFP overestimation. The current APO Productivity Database estimates the labor quality index for only a handful of countries, and covering more Asian countries is the next challenge. The estimate of quality adjusted labor input for Singapore was developed in 2012. See Nomura and Amano (2012).

58: In Mongolia, subsoil assets may have a significant role in economic growth, although they are omitted in our measures of capital inputs.

59: Warr (2006) shows that the average annual TFP growths of Thailand were 2.0% in the period of economic boom (1986–1996), –9.0% during the Asian financial crisis (1996–1998), and 1.6% in the period of recovery (1998–2002). These compare with our estimates of 3.0%, –8.6%, and 2.5%, respectively. The contribution rates of TFP and labor quality (to economic growth) in Vu (2013) are estimated as 0.7% and 0.3%, respectively, on average per year during 1990–2010. The sum of both is comparable with our estimate of TFP growth of 1.2% in 1990–2012.

6.8% on average per year, respectively (Figure 49). From these GDP growths, the TFP contribution accounted for over 30% of economic growth in five of the 18 Asian countries compared (Figure 50). Among them, TFP contribution was the largest in Sri Lanka (38%), China (36%), Thailand (35%), and Pakistan (31%). The TFP accounted for about a quarter of economic growth in Hong Kong (29%), Japan (25%), the ROC (24%), and Korea (24%). In contrast, TFP performance was erratic in Singapore, resulting in its relatively small contribution of only 7% to economic growth over the same period.

China's productivity performance was outstanding in this period. The average TFP growth was 3.1% per year during 1970–2012 (Figure 49). This compares with the long-run estimates of 3.8% during 1978–2005 in Holz (2006) and also 3.8% during 1978–2004 in Bosworth and Collins (2008). The Chinese experience of long-term TFP growth of about 3.0% is not unprecedented in Asia. According to Jorgenson and Nomura (2005), Japan achieved an annual TFP growth of 3.1% during 1960–1973, even after improvements in labor quality had been taken into account in the estimation of labor growth (and, as such, eliminating overestimation in TFP).[60] Both the ROC and Korea[61] also achieved a TFP growth of 2.4% and 2.2%, respectively, during the period 1985–2000,[62] as shown in the second chart of Figure 51. Since 2000, TFP growth was 2.9% in India.

In the long run, TFP growth has no impact on economic growth for the Philippines and Fiji, while labor input growth explained 58% and 35% of their economic growth, respectively (Figure 50). Looking at the breakdown of the period in Figure 51, one can see the Philippines and Fiji were running an overall negative TFP growth only in the period 1970–1985, at –1.5% and –1.2% on average per annum, respectively.[63]

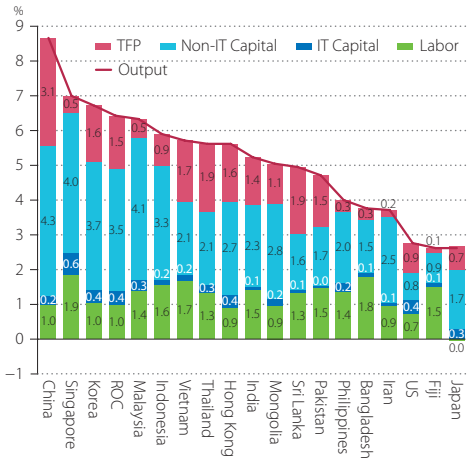



**Figure 49 Sources of Economic Growth, 1970–2012**

Source: APO Productivity Database 2014.01.
Note: The labor inputs for Fiji and Mongolia are defined by numbers of employment.

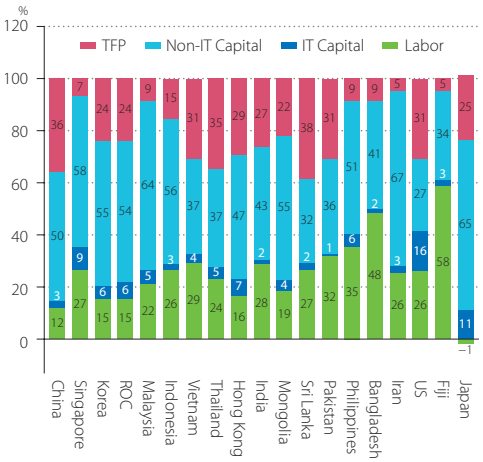



**Figure 50 Contribution Shares of Economic Growth, 1970–2012**

Source: APO Productivity Database 2014.01.
Note: The labor inputs for Fiji and Mongolia are defined by numbers of employment.

60: In the same period 1960–1973, the average annual contribution rate of labor quality improvement to growth is measured as 0.54% in Jorgenson and Nomura (2005). As a measure of the TFP contribution that is comparable with the estimates in this Databook, their estimate can be recognized as 3.6% per year during the same period.
61: Note that economic growth at the aggregate level for Korea has been revised upward considerably in the KSNA published in 2010. The main revisions stem from the introduction of a chain index in Korea's system of national accounts. As a result, Korea's GDP growth at constant market prices has been revised up from 7.0% to 8.6% on average in the 1970s, from 8.4% to 9.3% in the 1980s, and from 5.9% to 6.3% in the 1990s.
62: The National Statistics, Republic of China, published the TFP estimates for the period 1982–1999. The correlation of TFP growth rates between their estimates and ours is 0.76 for the whole period. For 1985–2000, our estimate is around 1 percentage point smaller than their estimate of 3.6% (1985–1999).

Negative TFP growth can be caused by many things, including a rapid, temporary decline in demand or the inefficient use of resources by political interventions to the economy. This is unlikely to be sustainable in the long run. As shown in the year-on-year changes of growth decomposition in each country (Figure 57), the Philippine's TFP fell severely in the beginning of the 1980s, in which the economy declined by 15.4% for two years from 1983–1985 under the regime of Ferdinand Marcos. In Mongolia, negative TFP growths are observed before the transition to market economy in 1992.

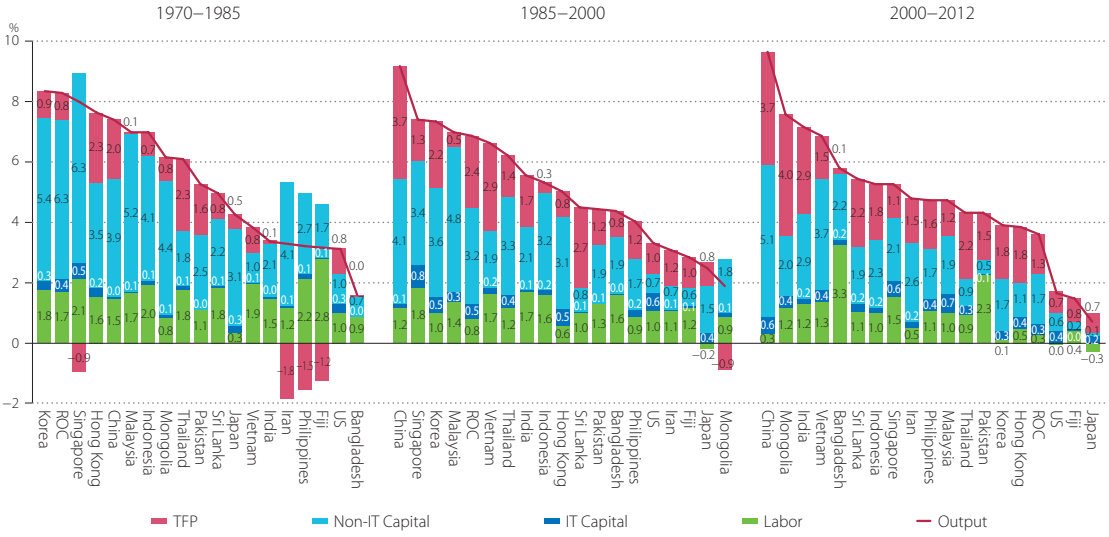



**Figure 51 Sources of Economic Growth, 1970–1985, 1985–2000, and 2000–2012**

Source: APO Productivity Database 2014.01.

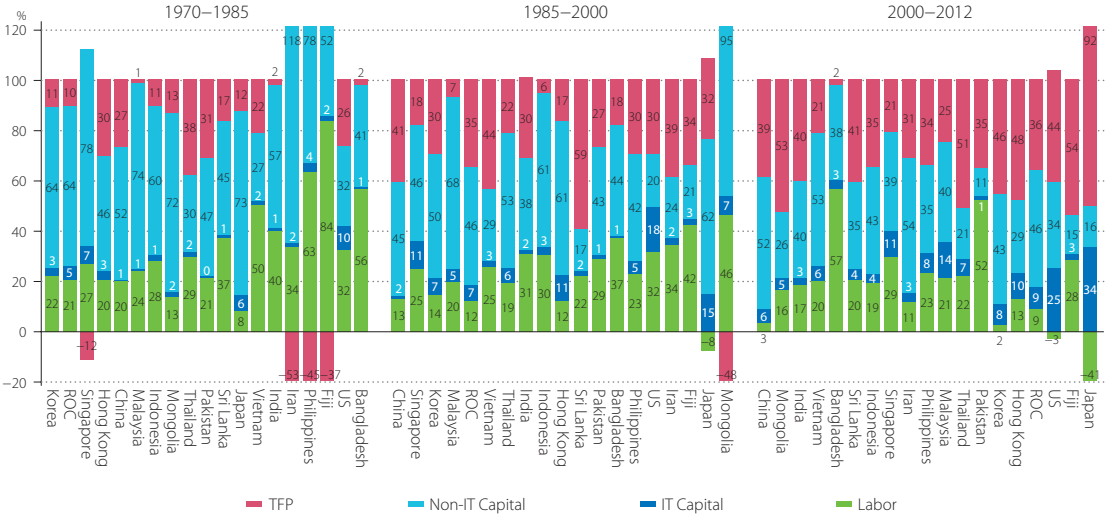



**Figure 52 Contribution Shares of Economic Growth, 1970–1985, 1985–2000, and 2000–2012**

Source: APO Productivity Database 2014.01.

63: Negative TFP growth for both countries is also observed in other studies. Baier, Dwyer, and Tamura (2006) estimate the average annual growth rate of TFP of Fiji at –0.75% during 1960–2000. Cororaton (2002) shows that the average annual TFP growth of the Philippines was –1.09% during 1970–2000.

It is clear from Figure 50 that economic growth was predominantly explained by the contribution of capital input in most of the Asian countries, which ranged from 34% in Sri Lanka to 76% in Japan. Among the Asian Tigers, the contribution of capital services ranged from 54% in Hong Kong to 67% in Singapore, whereas in China and India, it accounted for 52% and 45% of economic growth, respectively. This compares with 41% in the US, of which 16 percentage points were contributed by IT capital, a share unmatched by Asian countries. Japan has been leading Asian countries in terms of contribution from IT capital (11% of economic growth) whereas in other Asian countries it has been 1–9%, with China and India trailing behind.

One prevalent characteristic of Asian countries is their investment intensity as a share of GDP (Figure 31, p. 46), and in turn its contribution to economic growth (Figures 50 and 52). There is policy significance in identifying the driver(s) behind the rapid economic growth in Asian countries. If growth has been driven by capital accumulation more than capital assimilation, the Asian model may prove to be too expensive for many less well-off countries to emulate. According to our findings (Figures 51 and 52), it is true that, historically, capital accumulation has played a much more significant role in the Asian countries than in the US. However, the relative contribution shares are not constant across countries and over time. There have been periods when (and in some countries where) capital assimilation as reflected in TFP growth also contributed significantly toward driving growth.

Looking at Figure 52, capital accumulation was the dominant factor in the early period 1970–1985, typically explaining two-thirds to three-quarters of economic growth achieved. In Thailand, Pakistan, China, and Hong Kong, however, the contribution of TFP growth was still significant, accounting for 30–38% of their respective economic growth. In the subsequent periods, the contribution of capital input became progressively smaller, falling to a share of below 55% on average, while the contribution of TFP became progressively more significant, rising to a share of above 35% on average in 2000–2012. The evident rise in the contribution of IT capital is also noteworthy. In 1970–1985, IT capital accounted for less than 5% of economic growth in all Asian countries, except Japan and Singapore. By the 2000s, the IT capital share rose to above 5% in most countries, with the exceptions of Bangladesh, India, Iran, Pakistan, Sri Lanka, and Indonesia. Between 1985–2000 and 2000–2012, the contribution of IT capital more than doubled in Malaysia and Japan, from 5% to 14%, and from 15% to 34%, respectively. Hong Kong sustained an IT share of around 10% in the same period. This yearly accumulation of IT investment may have paved the way for countries to capitalize on the productivity gain from the IT revolution. Reflecting on these results, capital accumulation appears to be a necessary step to economic growth. Countries may go through cycles of capital accumulation and assimilation. Although a prerequisite, capital accumulation does not guarantee TFP growth. Some countries may be more capable than others in reaping the benefits through capital assimilation. The reasons as to why this is so, are beyond the scope of this report.

Figure 53 places our estimates among those of OECD for 17 other OECD countries to give readers a wider perspective.[64] Countries are arranged according to their average economic growth per annum for the past decade, in descending order. In so doing, the wedge in economic growth is clearly displayed, with all Asian countries (barring Fiji and Japan) having been filtered out to occupy the top end. Asian countries are also among those that experienced the fastest TFP growth in the 2000s: 3.9% in China, 3.8% in Mongolia, 3.1% in India, 2.2% in Sri Lanka, 2.1% in Hong Kong, and 2.0% in both Korea and Thailand. Though growing at a more subdued pace, the contribution made by TFP in the slower-growing, mature economies should not be underestimated. For example, TFP accounted for half or more of economic growth in Germany (67%), Austria (56%), Sweden (52%), and Finland (50%).

Table 12 and Figure 54 show the growth accounting decomposition for individual countries in five-year intervals covering the period 1970–2012. The relative importance of drivers behind economic

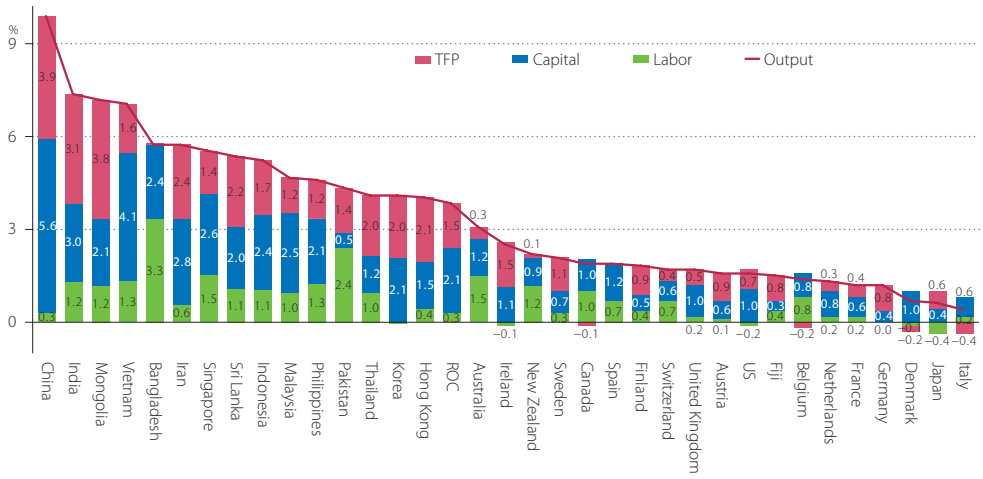



**Figure 53 Comparison of Sources of Economic Growth with OECD Countries, 2000–2011**

Sources: APO Productivity Database 2014.01 for APO member economies and China and the US; OECD Stat (Dataset: Multi-Factor Productivity) for OECD countries (except Japan and Korea). The ending years are different: Australia and Portugal are until 2010 and the UK is until 2009.

growth changes over time. It is a common experience in most countries that a large part of the vibrant growth in the initial period is driven by input growth. TFP growth becomes more prominent and makes a steady contribution in the later periods. Hong Kong's TFP growth peaked at 5.2% in 1975–1980, and was robust at 3.6% in 1985–1990, when TFP growth also peaked in the ROC, Korea, Singapore, and Japan, at 4.0%, 3.2%, 2.3%, and 2.1%, respectively. Thereafter, TFP growth slowed until recent years when countries experienced productivity growth resurgence. This resurgence is also shared by Malaysia and the Philippines. TFP growth in Mongolia has been particularly strong since 1995. It has also bounced back in Indonesia[65] and Thailand[66] from a negative standing following the Asian financial crisis of the late 1990s, but has lapsed again since 2005. In contrast, the US experienced a surge in TFP growth in the second half of the 1990s, which was sustained into the early 2000s before the adverse cyclical effect hit in 2005–2012.

Looking at the decomposition of economic growth in China and India, the two key drivers have been non-IT capital input growth and TFP growth. While the contribution from non-IT capital has been relatively stable in terms of percentage points, it is TFP performance that has more bearing in determining the overall economic growth over time. For example, the low economic growth that China experienced in 1985–1990 was explained largely by the lack of TFP growth. Similarly, when output growth slowed from its peak in the latter half of the 1990s, it was due to the slowdown in TFP growth from

64: The multi-factor productivity in the OECD Productivity Database (OECD, 2013), referred as TFP in this report, defines total input as the weighted average of the growth rates of total hours worked and capital services. Comparing OECD's TFP estimates for the whole economy with ours, there are mainly two differences in assumptions. Firstly, capital services of residential buildings are included in our estimates of capital input in order to be consistent with output that includes the imputed cost of owner-occupied housing. Secondly, the compensation of capital is defined in our estimates as the residual of the value added and the compensation of labor (compensations for employees, self-employed persons, and contributing family workers), whereas the OECD defines it as the imputed value of capital services based on the assumptions of an ex-ante rate of returns on capital. Thus, although both apply the same Törnqvist index, the weights to aggregate labor and capital can differ. Other than these, our methodology and assumptions in measuring capital services are designed to be largely consistent with the OECD methodology, and the impact of the differences in assumptions on the volume estimates of capital services is judged to be limited.

65: Van der Eng (2008) provides estimates of capital stock for Indonesia and Van der Eng (2009) shows that annual average TFP growth increased from –4.4% during 1995–2000 to 1.7% during 2000–2007 in Indonesia. Warr (2006) also finds that TFP growth increased from –8.4% during 1996–1998 to 1.5% during 1998–2002.

66: Bosworth (2005) shows that annual average TFP growth increased from –4.6% during 1996–1999 to 2.1% during 1999–2004 in Thailand. Warr (2006) also finds that TFP growth increased from –9.0% during 1996–1998 to 1.6% during 1998–2002.

## Table 12 Output Growth and Contributions of Labor, Capital, and TFP

| | | Output | Labor | | Capital | | | | TFP | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | IT | | Non-IT | | | |
| Bangladesh | 1970–1975 | −2.0 | −0.6 | (30) | 0.0 | (0) | 0.2 | (−11) | −1.7 | (82) |
| | 1975–1980 | 3.7 | 1.2 | (33) | 0.0 | (0) | 0.5 | (14) | 1.9 | (52) |
| | 1980–1985 | 3.1 | 2.1 | (66) | 0.0 | (0) | 1.2 | (39) | −0.2 | (−5) |
| | 1985–1990 | 3.7 | 1.5 | (40) | 0.0 | (0) | 1.7 | (46) | 0.5 | (13) |
| | 1990–1995 | 4.3 | 1.6 | (38) | 0.0 | (1) | 1.7 | (40) | 0.9 | (21) |
| | 1995–2000 | 5.1 | 1.7 | (34) | 0.0 | (1) | 2.3 | (46) | 1.0 | (20) |
| | 2000–2005 | 5.3 | 4.0 | (77) | 0.1 | (1) | 2.3 | (43) | −1.1 | (−21) |
| | 2005–2010 | 6.0 | 2.8 | (47) | 0.3 | (4) | 2.2 | (36) | 0.8 | (13) |
| | 2010–2012 | 6.3 | 2.4 | (37) | 0.2 | (3) | 2.0 | (32) | 1.7 | (28) |
| | 1970–2012 | 3.8 | 1.8 | (48) | 0.1 | (2) | 1.5 | (41) | 0.3 | (9) |
| ROC | 1970–1975 | 8.5 | 2.0 | (24) | 0.5 | (6) | 6.6 | (78) | −0.7 | (−8) |
| | 1975–1980 | 10.1 | 1.9 | (19) | 0.4 | (4) | 5.3 | (52) | 2.5 | (24) |
| | 1980–1985 | 6.2 | 1.1 | (18) | 0.4 | (6) | 4.0 | (64) | 0.8 | (12) |
| | 1985–1990 | 8.5 | 1.2 | (14) | 0.3 | (4) | 3.1 | (36) | 4.0 | (47) |
| | 1990–1995 | 7.0 | 1.0 | (14) | 0.3 | (5) | 3.4 | (49) | 2.3 | (33) |
| | 1995–2000 | 5.1 | 0.3 | (6) | 0.8 | (15) | 3.1 | (61) | 0.9 | (18) |
| | 2000–2005 | 3.5 | 0.3 | (7) | 0.6 | (18) | 2.1 | (59) | 0.6 | (16) |
| | 2005–2010 | 4.0 | 0.2 | (4) | 0.1 | (2) | 1.5 | (38) | 2.3 | (56) |
| | 2010–2012 | 2.8 | 0.9 | (32) | 0.1 | (4) | 1.1 | (38) | 0.7 | (25) |
| | 1970–2012 | 6.4 | 1.0 | (15) | 0.4 | (6) | 3.5 | (54) | 1.5 | (24) |
| Hong Kong | 1970–1975 | 6.2 | 1.9 | (30) | 0.2 | (3) | 2.7 | (44) | 1.5 | (23) |
| | 1975–1980 | 11.0 | 1.9 | (17) | 0.2 | (2) | 3.6 | (33) | 5.2 | (48) |
| | 1980–1985 | 5.6 | 0.9 | (16) | 0.3 | (5) | 4.1 | (74) | 0.2 | (4) |
| | 1985–1990 | 7.4 | 0.4 | (5) | 0.4 | (6) | 3.0 | (41) | 3.6 | (48) |
| | 1990–1995 | 5.1 | 0.2 | (5) | 0.4 | (9) | 3.4 | (67) | 1.0 | (20) |
| | 1995–2000 | 2.6 | 1.2 | (48) | 0.7 | (27) | 2.7 | (105) | −2.1 | (−80) |
| | 2000–2005 | 4.1 | 0.5 | (12) | 0.5 | (13) | 1.3 | (31) | 1.8 | (44) |
| | 2005–2010 | 3.9 | 0.8 | (21) | 0.3 | (8) | 1.1 | (28) | 1.6 | (42) |
| | 2010–2012 | 3.2 | −0.3 | (−10) | 0.2 | (7) | 0.8 | (25) | 2.5 | (79) |
| | 1970–2012 | 5.6 | 0.9 | (16) | 0.4 | (7) | 2.7 | (47) | 1.6 | (29) |
| Indonesia | 1970–1975 | 8.3 | 2.1 | (25) | 0.0 | (1) | 3.8 | (46) | 2.3 | (28) |
| | 1975–1980 | 7.8 | 1.6 | (20) | 0.1 | (2) | 4.5 | (58) | 1.6 | (20) |
| | 1980–1985 | 4.8 | 2.2 | (47) | 0.1 | (3) | 4.1 | (86) | −1.7 | (−35) |
| | 1985–1990 | 7.5 | 2.3 | (30) | 0.1 | (2) | 2.9 | (39) | 2.2 | (29) |
| | 1990–1995 | 7.6 | 0.7 | (9) | 0.2 | (3) | 3.6 | (47) | 3.1 | (41) |
| | 1995–2000 | 0.8 | 1.8 | (225) | 0.2 | (19) | 3.2 | (399) | −4.4 | (−543) |
| | 2000–2005 | 4.6 | 0.7 | (16) | 0.2 | (3) | 1.9 | (42) | 1.8 | (39) |
| | 2005–2010 | 5.6 | 1.7 | (31) | 0.2 | (4) | 2.4 | (43) | 1.3 | (23) |
| | 2010–2012 | 6.2 | −0.1 | (−2) | 0.2 | (4) | 2.8 | (45) | 3.3 | (53) |
| | 1970–2012 | 5.9 | 1.6 | (26) | 0.2 | (3) | 3.3 | (56) | 0.9 | (15) |
| Japan | 1970–1975 | 4.4 | −0.3 | (−7) | 0.4 | (8) | 4.9 | (112) | −0.6 | (−14) |
| | 1975–1980 | 4.3 | 0.9 | (22) | 0.2 | (5) | 2.6 | (60) | 0.5 | (12) |
| | 1980–1985 | 4.2 | 0.4 | (9) | 0.2 | (6) | 1.9 | (46) | 1.7 | (40) |
| | 1985–1990 | 4.9 | 0.4 | (9) | 0.4 | (9) | 1.9 | (40) | 2.1 | (42) |
| | 1990–1995 | 1.7 | −0.4 | (−21) | 0.3 | (19) | 1.7 | (100) | 0.0 | (1) |
| | 1995–2000 | 0.8 | −0.7 | (−79) | 0.3 | (39) | 0.9 | (110) | 0.3 | (30) |
| | 2000–2005 | 1.2 | −0.3 | (−27) | 0.4 | (33) | 0.3 | (27) | 0.8 | (66) |
| | 2005–2010 | 0.3 | −0.4 | (−133) | 0.2 | (53) | 0.0 | (13) | 0.6 | (167) |
| | 2010–2012 | 0.5 | 0.2 | (31) | 0.0 | (3) | −0.2 | (−50) | 0.6 | (116) |
| | 1970–2012 | 2.6 | 0.0 | (−1) | 0.3 | (11) | 1.7 | (65) | 0.7 | (25) |

| | | Output | Labor | | Capital | | | | TFP | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | IT | | Non-IT | | | |
| China | 1970–1975 | 5.7 | 1.0 | (18) | 0.0 | (1) | 4.2 | (73) | 0.5 | (8) |
| | 1975–1980 | 6.3 | 1.1 | (17) | 0.0 | (1) | 4.0 | (64) | 1.2 | (19) |
| | 1980–1985 | 10.2 | 2.4 | (23) | 0.0 | (0) | 3.4 | (34) | 4.3 | (43) |
| | 1985–1990 | 7.6 | 2.2 | (29) | 0.1 | (1) | 4.3 | (57) | 0.9 | (12) |
| | 1990–1995 | 11.6 | 0.6 | (5) | 0.1 | (1) | 3.8 | (33) | 7.1 | (61) |
| | 1995–2000 | 8.3 | 0.7 | (8) | 0.2 | (3) | 4.3 | (52) | 3.1 | (38) |
| | 2000–2005 | 9.3 | 0.4 | (4) | 0.7 | (7) | 4.3 | (46) | 3.9 | (42) |
| | 2005–2010 | 10.6 | 0.2 | (2) | 0.6 | (5) | 5.7 | (53) | 4.2 | (39) |
| | 2010–2012 | 8.1 | 0.2 | (3) | 0.4 | (5) | 5.3 | (65) | 2.1 | (26) |
| | 1970–2012 | 8.7 | 1.0 | (12) | 0.2 | (3) | 4.3 | (50) | 3.1 | (36) |
| Fiji | 1970–1975 | 5.6 | 4.1 | (73) | 0.1 | (2) | 1.9 | (35) | −0.5 | (−9) |
| | 1975–1980 | 3.7 | 2.8 | (76) | 0.1 | (2) | 2.0 | (53) | −1.1 | (−31) |
| | 1980–1985 | 0.7 | 1.5 | (204) | 0.0 | (6) | 1.3 | (181) | −2.1 | (−291) |
| | 1985–1990 | 3.8 | 1.0 | (27) | 0.1 | (3) | 0.0 | (1) | 2.6 | (69) |
| | 1990–1995 | 2.7 | 1.9 | (70) | 0.2 | (7) | 1.0 | (38) | −0.4 | (−15) |
| | 1995–2000 | 2.1 | 0.7 | (32) | 0.0 | (−1) | 0.7 | (35) | 0.7 | (34) |
| | 2000–2005 | 2.0 | 0.3 | (15) | 0.1 | (3) | 0.4 | (21) | 1.2 | (61) |
| | 2005–2010 | 0.7 | 0.4 | (56) | 0.1 | (11) | 0.1 | (19) | 0.1 | (14) |
| | 2010–2012 | 2.2 | 0.7 | (33) | −0.1 | (−3) | −0.1 | (−2) | 1.6 | (73) |
| | 1970–2012 | 2.6 | 1.5 | (58) | 0.1 | (3) | 0.9 | (34) | 0.1 | (5) |
| India | 1970–1975 | 2.9 | 1.1 | (38) | 0.0 | (1) | 2.1 | (72) | −0.3 | (−10) |
| | 1975–1980 | 3.1 | 1.2 | (38) | 0.0 | (1) | 2.1 | (68) | −0.2 | (−8) |
| | 1980–1985 | 5.0 | 2.2 | (43) | 0.0 | (1) | 2.1 | (41) | 0.8 | (15) |
| | 1985–1990 | 5.9 | 2.2 | (38) | 0.1 | (1) | 2.0 | (34) | 1.6 | (27) |
| | 1990–1995 | 5.1 | 0.9 | (18) | 0.1 | (1) | 2.1 | (41) | 2.0 | (39) |
| | 1995–2000 | 5.7 | 2.0 | (35) | 0.1 | (2) | 2.1 | (38) | 1.4 | (25) |
| | 2000–2005 | 6.6 | 2.5 | (37) | 0.1 | (2) | 2.0 | (31) | 2.0 | (30) |
| | 2005–2010 | 8.4 | −0.1 | (−1) | 0.2 | (3) | 3.5 | (42) | 4.7 | (56) |
| | 2010–2012 | 5.4 | 1.2 | (22) | 0.2 | (4) | 3.4 | (63) | 0.6 | (11) |
| | 1970–2012 | 5.3 | 1.5 | (28) | 0.1 | (2) | 2.3 | (43) | 1.4 | (27) |
| Iran | 1970–1975 | 9.4 | 0.9 | (9) | 0.0 | (0) | 4.6 | (48) | 3.9 | (42) |
| | 1975–1980 | −2.9 | 1.5 | (−52) | 0.1 | (−2) | 5.5 | (−192) | −9.9 | (346) |
| | 1980–1985 | 3.8 | 1.1 | (30) | 0.0 | (1) | 2.2 | (58) | 0.4 | (12) |
| | 1985–1990 | 1.4 | 1.2 | (87) | 0.1 | (4) | 0.2 | (18) | −0.1 | (−9) |
| | 1990–1995 | 3.7 | 0.8 | (22) | 0.1 | (2) | 0.9 | (24) | 1.9 | (52) |
| | 1995–2000 | 4.1 | 1.2 | (28) | 0.1 | (2) | 1.1 | (26) | 1.8 | (43) |
| | 2000–2005 | 6.8 | 1.1 | (16) | 0.2 | (3) | 2.4 | (36) | 3.1 | (46) |
| | 2005–2010 | 5.2 | 0.2 | (4) | 0.2 | (3) | 2.9 | (56) | 2.0 | (37) |
| | 2010–2012 | −1.6 | 0.0 | (−2) | 0.1 | (−8) | 2.1 | (−132) | −3.8 | (242) |
| | 1970–2012 | 3.7 | 0.9 | (26) | 0.1 | (3) | 2.5 | (67) | 0.2 | (5) |
| Korea | 1970–1975 | 9.3 | 2.3 | (24) | 0.2 | (2) | 5.7 | (62) | 1.1 | (12) |
| | 1975–1980 | 7.3 | 1.8 | (25) | 0.4 | (5) | 6.5 | (90) | −1.4 | (−19) |
| | 1980–1985 | 8.5 | 1.4 | (16) | 0.3 | (4) | 3.9 | (45) | 3.0 | (35) |
| | 1985–1990 | 9.7 | 1.9 | (20) | 0.6 | (6) | 4.0 | (41) | 3.2 | (33) |
| | 1990–1995 | 7.4 | 1.2 | (16) | 0.4 | (5) | 4.1 | (56) | 1.7 | (23) |
| | 1995–2000 | 4.9 | 0.0 | (0) | 0.5 | (11) | 2.8 | (58) | 1.6 | (32) |
| | 2000–2005 | 4.5 | 0.3 | (6) | 0.5 | (12) | 1.9 | (43) | 1.7 | (38) |
| | 2005–2010 | 3.9 | −0.4 | (−9) | 0.2 | (5) | 1.6 | (41) | 2.5 | (63) |
| | 2010–2012 | 2.7 | 0.7 | (26) | 0.1 | (5) | 1.4 | (53) | 0.4 | (16) |
| | 1970–2012 | 6.7 | 1.0 | (15) | 0.4 | (6) | 3.7 | (55) | 1.6 | (24) |

7.1% on average per annum in the previous period to 3.1%. Thereafter, output growth has accelerated to reflect the pickup in TFP growth in the 2000s. In India, TFP growth was insignificant in the 1970s. Since then, it has accelerated and has increasingly accounted for a greater proportion of economic growth. In 2005–2012, India achieved TFP growth of 3.5% – its highest in the past four decades. Through trial and error, China and India invested first and then learned how to combine inputs efficiently. Both have reaped the benefits of their efforts in robust TFP growth, while the contribution from labor input growth dwindles over time in the two countries.

Tracking the size and growth of IT capital has become a standard practice in productivity research, following attempts to establish the driving force behind productivity resurgence in developed economies. This started with the US in the 1990s. Unlike technological advancements in the past, which were largely confined to manufacturing, IT is a technology that can permeate the economy and bring about significant production gains in, for example, wholesale and retail, banking and finance, and

| | | Output | Labor | | Capital | | | | TFP | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | IT | | Non-IT | | | |
| Malaysia | 1970–1975 | 7.7 | 1.8 | (23) | 0.1 | (1) | 4.7 | (61) | 1.2 | (15) |
| | 1975–1980 | 8.2 | 1.7 | (21) | 0.1 | (1) | 4.8 | (59) | 1.6 | (19) |
| | 1980–1985 | 5.1 | 1.5 | (29) | 0.1 | (2) | 5.9 | (117) | −2.5 | (−49) |
| | 1985–1990 | 6.9 | 1.6 | (23) | 0.2 | (2) | 3.0 | (44) | 2.2 | (31) |
| | 1990–1995 | 9.2 | 1.1 | (12) | 0.3 | (3) | 6.0 | (65) | 1.8 | (20) |
| | 1995–2000 | 4.8 | 1.4 | (30) | 0.5 | (11) | 5.3 | (111) | −2.5 | (−52) |
| | 2000–2005 | 4.6 | 0.6 | (12) | 0.7 | (16) | 2.1 | (45) | 1.3 | (27) |
| | 2005–2010 | 4.6 | 1.3 | (28) | 0.7 | (15) | 1.7 | (37) | 1.0 | (21) |
| | 2010–2012 | 5.1 | 1.3 | (26) | 0.5 | (10) | 1.8 | (36) | 1.5 | (29) |
| | 1970–2012 | 6.3 | 1.4 | (22) | 0.3 | (5) | 4.1 | (64) | 0.5 | (9) |
| Pakistan | 1970–1975 | 3.6 | 1.4 | (39) | 0.0 | (1) | 2.2 | (62) | −0.1 | (−2) |
| | 1975–1980 | 5.8 | 0.9 | (15) | 0.0 | (0) | 2.6 | (45) | 2.3 | (40) |
| | 1980–1985 | 6.4 | 1.1 | (17) | 0.0 | (0) | 2.6 | (41) | 2.7 | (42) |
| | 1985–1990 | 5.6 | 1.2 | (22) | 0.1 | (1) | 2.7 | (47) | 1.7 | (30) |
| | 1990–1995 | 4.6 | 0.7 | (16) | 0.1 | (2) | 2.2 | (48) | 1.6 | (34) |
| | 1995–2000 | 3.2 | 1.9 | (59) | 0.0 | (1) | 0.9 | (29) | 0.4 | (12) |
| | 2000–2005 | 4.9 | 1.9 | (40) | 0.1 | (1) | 0.4 | (9) | 2.4 | (50) |
| | 2005–2010 | 4.1 | 2.8 | (69) | 0.1 | (2) | 0.6 | (14) | 0.6 | (15) |
| | 2010–2012 | 3.5 | 1.6 | (47) | 0.0 | (1) | 0.3 | (9) | 1.5 | (43) |
| | 1970–2012 | 4.7 | 1.5 | (32) | 0.0 | (1) | 1.7 | (36) | 1.5 | (31) |
| Singapore | 1970–1975 | 9.1 | 2.6 | (28) | 0.6 | (6) | 7.9 | (87) | −1.9 | (−21) |
| | 1975–1980 | 8.2 | 2.4 | (29) | 0.4 | (5) | 5.2 | (63) | 0.2 | (3) |
| | 1980–1985 | 6.6 | 1.4 | (21) | 0.6 | (9) | 5.7 | (86) | −1.1 | (−16) |
| | 1985–1990 | 8.3 | 2.2 | (27) | 0.8 | (10) | 3.0 | (36) | 2.3 | (28) |
| | 1990–1995 | 8.2 | 2.2 | (26) | 0.9 | (11) | 3.3 | (41) | 1.8 | (22) |
| | 1995–2000 | 5.6 | 1.1 | (20) | 0.7 | (12) | 3.9 | (70) | −0.1 | (−2) |
| | 2000–2005 | 4.7 | 0.5 | (12) | 0.6 | (13) | 2.1 | (44) | 1.5 | (32) |
| | 2005–2010 | 6.4 | 2.6 | (40) | 0.6 | (9) | 2.0 | (32) | 1.2 | (19) |
| | 2010–2012 | 3.9 | 1.5 | (39) | 0.4 | (11) | 2.2 | (56) | −0.2 | (−6) |
| | 1970–2012 | 7.0 | 1.9 | (27) | 0.6 | (9) | 4.0 | (58) | 0.5 | (7) |
| Thailand | 1970–1975 | 5.5 | −0.2 | (−4) | 0.1 | (1) | 2.0 | (36) | 3.7 | (67) |
| | 1975–1980 | 7.4 | 4.5 | (61) | 0.2 | (2) | 1.8 | (24) | 1.0 | (13) |
| | 1980–1985 | 5.3 | 1.0 | (19) | 0.2 | (3) | 1.8 | (34) | 2.3 | (44) |
| | 1985–1990 | 9.8 | 3.1 | (31) | 0.3 | (3) | 2.3 | (24) | 4.2 | (42) |
| | 1990–1995 | 8.1 | 0.3 | (4) | 0.5 | (7) | 4.9 | (60) | 2.3 | (29) |
| | 1995–2000 | 0.7 | 0.2 | (26) | 0.3 | (43) | 2.7 | (372) | −2.4 | (−341) |
| | 2000–2005 | 5.3 | 1.3 | (24) | 0.2 | (4) | 0.6 | (12) | 3.2 | (60) |
| | 2005–2010 | 3.6 | 0.7 | (21) | 0.4 | (11) | 1.1 | (31) | 1.3 | (37) |
| | 2010–2012 | 3.7 | 0.6 | (16) | 0.3 | (7) | 1.0 | (26) | 1.9 | (50) |
| | 1970–2012 | 5.6 | 1.3 | (24) | 0.3 | (5) | 2.1 | (37) | 1.9 | (35) |
| US | 1970–1975 | 2.7 | 0.5 | (19) | 0.2 | (8) | 1.2 | (46) | 0.7 | (28) |
| | 1975–1980 | 3.6 | 1.7 | (47) | 0.3 | (7) | 1.1 | (29) | 0.6 | (17) |
| | 1980–1985 | 3.2 | 0.8 | (26) | 0.4 | (14) | 0.7 | (23) | 1.2 | (36) |
| | 1985–1990 | 3.2 | 1.3 | (40) | 0.5 | (16) | 0.8 | (24) | 0.6 | (20) |
| | 1990–1995 | 2.5 | 0.7 | (27) | 0.5 | (18) | 0.5 | (21) | 0.8 | (34) |
| | 1995–2000 | 4.2 | 1.2 | (28) | 0.8 | (19) | 0.8 | (18) | 1.5 | (35) |
| | 2000–2005 | 2.4 | 0.0 | (−1) | 0.6 | (25) | 0.7 | (31) | 1.1 | (46) |
| | 2005–2010 | 0.7 | −0.5 | (−71) | 0.3 | (49) | 0.6 | (86) | 0.2 | (36) |
| | 2010–2012 | 2.3 | 1.0 | (43) | 0.2 | (9) | 0.1 | (4) | 1.0 | (45) |
| | 1970–2012 | 2.8 | 0.7 | (26) | 0.4 | (16) | 0.8 | (27) | 0.9 | (31) |

| | | Output | Labor | | Capital | | | | TFP | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | IT | | Non-IT | | | |
| Mongolia | 1970–1975 | 6.5 | 0.6 | (9) | 0.0 | (1) | 2.9 | (45) | 2.9 | (45) |
| | 1975–1980 | 5.4 | 0.9 | (17) | 0.1 | (1) | 3.3 | (61) | 1.1 | (20) |
| | 1980–1985 | 6.6 | 1.0 | (15) | 0.2 | (4) | 7.0 | (106) | −1.6 | (−24) |
| | 1985–1990 | 3.8 | 2.3 | (61) | 0.2 | (4) | 3.9 | (101) | −2.5 | (−66) |
| | 1990–1995 | −1.8 | −0.2 | (12) | 0.1 | (−5) | 1.0 | (−55) | −2.6 | (148) |
| | 1995–2000 | 3.6 | 0.5 | (14) | 0.2 | (5) | 0.5 | (14) | 2.4 | (68) |
| | 2000–2005 | 6.3 | 2.0 | (32) | 0.3 | (4) | 0.6 | (9) | 3.4 | (55) |
| | 2005–2010 | 6.3 | 0.6 | (10) | 0.4 | (7) | 2.9 | (45) | 2.3 | (37) |
| | 2010–2012 | 13.9 | 0.6 | (5) | 0.6 | (5) | 3.2 | (23) | 9.4 | (68) |
| | 1970–2012 | 5.0 | 0.9 | (19) | 0.2 | (4) | 2.8 | (55) | 1.1 | (22) |
| Philippines | 1970–1975 | 5.6 | 3.0 | (53) | 0.1 | (2) | 2.0 | (36) | 0.5 | (9) |
| | 1975–1980 | 5.9 | 1.7 | (28) | 0.1 | (2) | 3.3 | (55) | 0.9 | (15) |
| | 1980–1985 | −1.3 | 1.8 | (−134) | 0.1 | (−11) | 2.7 | (−202) | −6.0 | (447) |
| | 1985–1990 | 5.0 | 0.9 | (19) | 0.1 | (2) | 0.7 | (14) | 3.2 | (65) |
| | 1990–1995 | 2.5 | 1.2 | (46) | 0.1 | (3) | 1.8 | (70) | −0.5 | (−18) |
| | 1995–2000 | 4.5 | 0.6 | (14) | 0.4 | (10) | 2.5 | (57) | 0.9 | (19) |
| | 2000–2005 | 4.5 | 1.2 | (28) | 0.6 | (13) | 1.8 | (40) | 0.9 | (19) |
| | 2005–2010 | 4.8 | 0.9 | (19) | 0.3 | (5) | 1.6 | (32) | 2.1 | (44) |
| | 2010–2012 | 5.1 | 1.1 | (23) | 0.1 | (3) | 1.5 | (30) | 2.3 | (45) |
| | 1970–2012 | 4.0 | 1.4 | (35) | 0.2 | (6) | 2.0 | (51) | 0.3 | (9) |
| Sri Lanka | 1970–1975 | 4.2 | 2.0 | (48) | 0.0 | (1) | 1.9 | (45) | 0.3 | (7) |
| | 1975–1980 | 5.6 | 1.4 | (26) | 0.0 | (1) | 2.0 | (36) | 2.1 | (38) |
| | 1980–1985 | 5.0 | 2.0 | (41) | 0.1 | (2) | 2.8 | (56) | 0.1 | (2) |
| | 1985–1990 | 3.3 | 0.2 | (6) | 0.0 | (1) | 1.1 | (34) | 2.0 | (59) |
| | 1990–1995 | 5.3 | 0.6 | (12) | 0.1 | (1) | 0.3 | (6) | 4.3 | (81) |
| | 1995–2000 | 4.9 | 2.1 | (43) | 0.2 | (4) | 0.8 | (16) | 1.8 | (37) |
| | 2000–2005 | 4.0 | 1.4 | (36) | 0.2 | (6) | 1.6 | (40) | 0.7 | (18) |
| | 2005–2010 | 6.2 | 0.6 | (10) | 0.3 | (4) | 1.9 | (30) | 3.4 | (55) |
| | 2010–2012 | 7.1 | 1.5 | (21) | 0.1 | (1) | 2.5 | (36) | 3.0 | (43) |
| | 1970–2012 | 4.9 | 1.3 | (27) | 0.1 | (2) | 1.6 | (32) | 1.9 | (38) |
| Vietnam | 1970–1975 | 1.8 | 1.2 | (70) | 0.0 | (1) | 1.0 | (54) | −0.4 | (−25) |
| | 1975–1980 | 3.5 | 1.2 | (35) | 0.1 | (2) | 1.1 | (30) | 1.2 | (34) |
| | 1980–1985 | 6.2 | 3.3 | (53) | 0.1 | (2) | 1.1 | (17) | 1.7 | (28) |
| | 1985–1990 | 4.4 | 2.0 | (46) | 0.1 | (3) | 1.2 | (27) | 1.0 | (23) |
| | 1990–1995 | 8.1 | 2.4 | (30) | 0.1 | (2) | 1.7 | (21) | 3.9 | (48) |
| | 1995–2000 | 7.3 | 0.5 | (7) | 0.3 | (4) | 2.8 | (38) | 3.8 | (52) |
| | 2000–2005 | 8.0 | 0.8 | (10) | 0.3 | (4) | 3.2 | (39) | 3.8 | (47) |
| | 2005–2010 | 6.2 | 2.1 | (34) | 0.5 | (9) | 4.2 | (68) | −0.7 | (−11) |
| | 2010–2012 | 5.7 | 0.8 | (14) | 0.4 | (7) | 3.5 | (61) | 1.0 | (17) |
| | 1970–2012 | 5.7 | 1.7 | (29) | 0.2 | (4) | 2.1 | (37) | 1.7 | (31) |

Unit: Average annual growth rate (percentage), contribution share in parentheses.
Source: APO Productivity Database 2014.01.

transportation and telecommunications (service sectors that have traditionally struggled with slow productivity growth). Given the share of the service sector in the economy (Figure 70, p. 90), its potential and implications for economic development and productivity gains could therefore be immense. A frequent question asked by policymakers and researchers is how best to capitalize on the productivity potential invited by this IT revolution. As with non-IT capital, it involves a process of accumulation and assimilation. IT capability becomes a factor which determines an economy's long-term growth prospects.[67]

Japan has been leading Asian countries in terms of IT capital contribution to economic growth (Figures 50 and 52). Japan's shift in capital allocation took off in earnest in the mid-1990s, with the contribution

67: The 2008 SNA formally acknowledges the IT sector's importance to the modern economy and has made it more easily identifiable and separable in industry classification and asset type.


**Figure 54 Individual Countries' Growth Accounting Decomposition, 1970–2012**

Source: APO Productivity Database 2014.01.

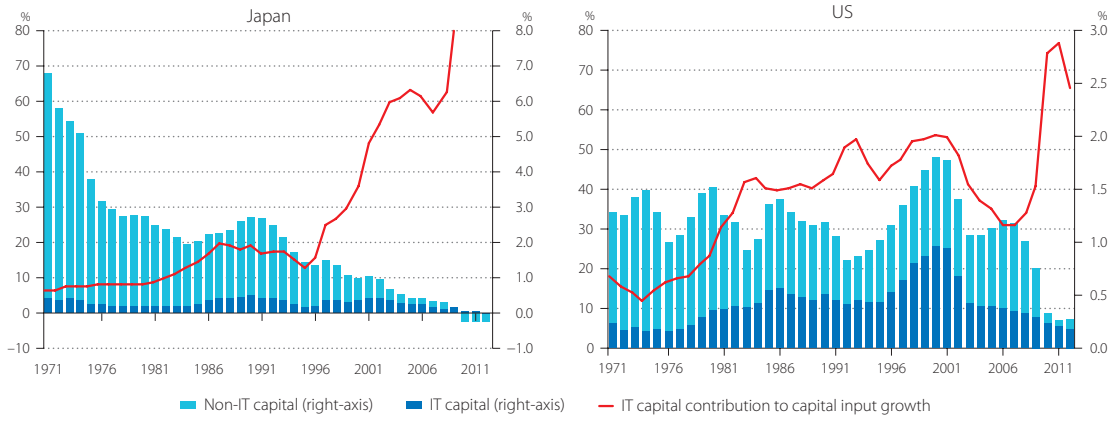



**Figure 55 IT Capital Contribution to Capital Input Growth of Japan and the US, 1970–2012**

Source: APO Productivity Database 2014.01.

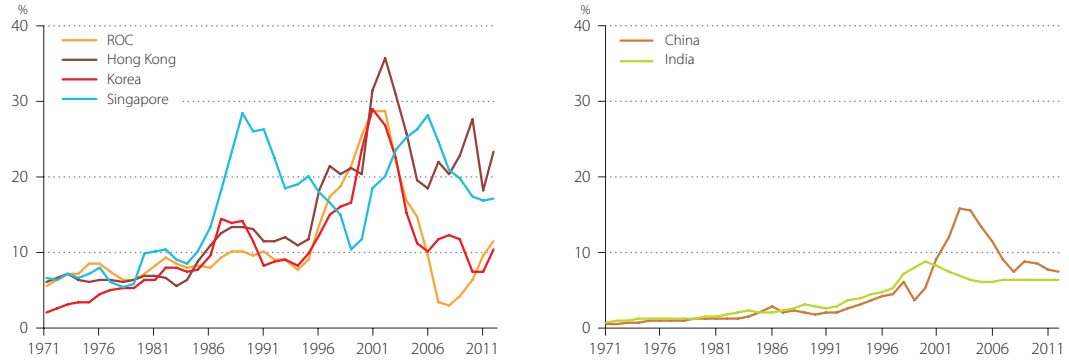



**Figure 56 IT Capital Contribution to Capital Input Growth of the Asian Tigers, China, and India, 1970–2012**

Source: APO Productivity Database 2014.01.

of IT capital to capital input growth rising from a low of 12% in 1995 to a peak of 63% in 2005 (Figure 55).[68] It took place in a period when Japan's overall investment growth slowed significantly after the economic collapse of the early 1990s (Figure 38, p. 54). After years of excesses, Japan shifted away from non-IT to IT capital as a profitable investment. In contrast, the US started its shift toward IT capital much earlier than any Asian economy and over a longer period of time. For two decades (between 1983 and 2003), IT capital accounted for over 40% of the US' capital input growth, reaching height of over 50% at the turn of the millennium. In recent years, the slowdown in total capital growth has concentrated more on non-IT capital, resulting in spikes in the contribution of IT capital in both Japan and the US. The findings here are in accordance with Jorgenson, Ho, and Stiroh (2005). Based on their measurement, IT capital in the 1980s contributed 31.9% of the growth of total capital inputs in the US, but only 13.5% in Japan.[69] Since 1995, the Japanese economy had been rapidly shifting its capital allocation from non-IT to IT capital. In 2002, the contribution of IT capital in Japan rose to 53.3%, which is higher than the US' 49.8%.

68: Japan's capital services recorded negative growth in 2009–2011, for the first time after World War II, although IT capital services increased. This period has been omitted from our calculations of the IT capital contribution share in total capital input in Figure 55.


A similar allocation shift to IT capital is also found in the Asian Tigers (Figure 56).[70] In Korea, the ROC, and Hong Kong, the contribution of IT capital to total capital input peaked in excess of 30% at the turn of the millennium, from a share of 10% or below before 1995. In contrast, Singapore had two local peaks. The first at the end of 1980s when the contribution of IT capital reached 29%. The second in 2005–2006 when it peaked at 28% again. China was a latecomer in terms of investing in IT capital with a surge in its contributions only taking off around 2000 and peaking at 16% in the early 2000s. There has not been as big a drive in IT pickups in India as in other Asian countries. Rather, the process has been gradual with a clear step-up in effort from a minimal level in the early 1990s. The share of IT capital reached 9% in the early 2000s before lessening recently.

69: Based on our estimates, IT capital contributes 38.5% in the US and 18.5% in Japan to the growth of total capital input. Although the estimates in the 1980s in this report are somewhat higher than the industry-level estimates in Jorgenson, Ho, and Stiroh (2005) and Jorgenson and Nomura (2005), the trends of both the US and Japan shown in Figure 55 are very similar to Figure 3 in Jorgenson and Nomura (ibid.).

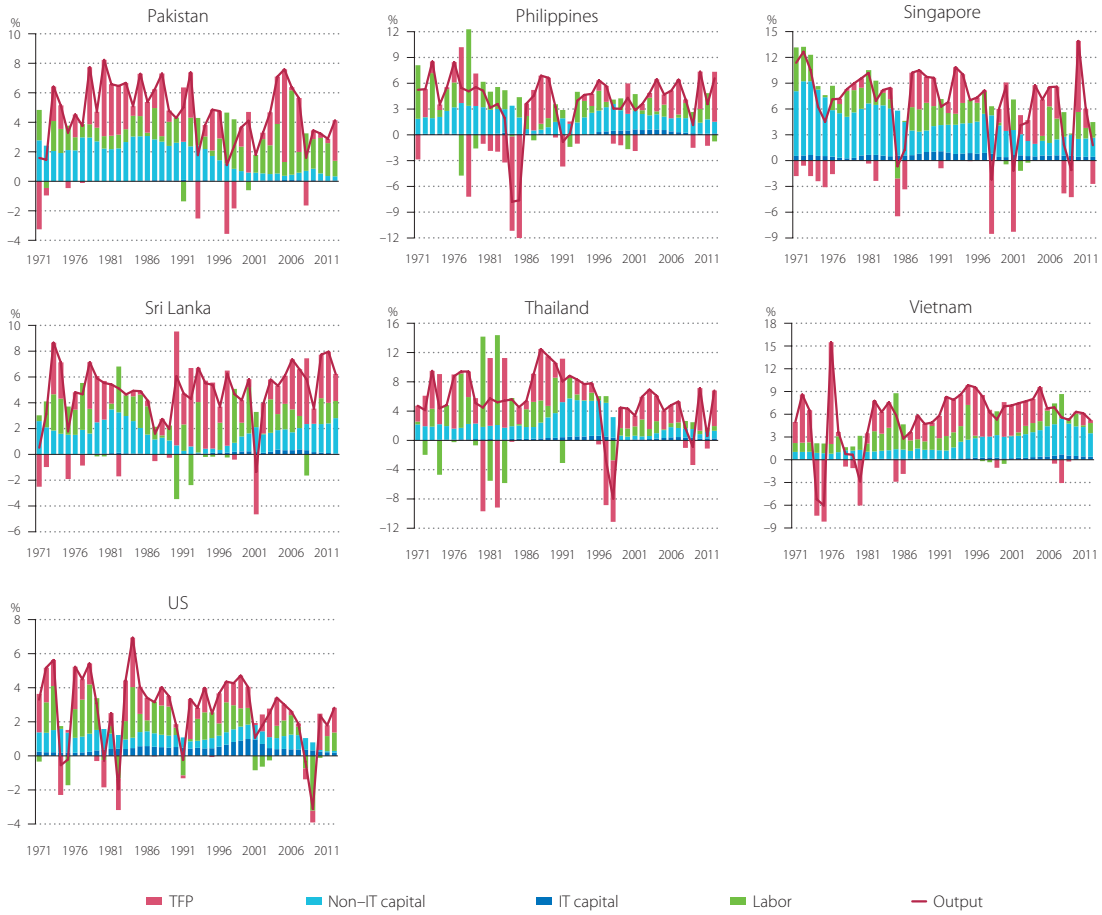



**Figure 57 Individual Countries' Growth Accounting Decomposition (year-on-year), 1970–2012**

Source: APO Productivity Database 2014.01.

## 5.4 Enhancement of Labor Productivity

Although TFP more accurately measures how efficiently an economy utilizes its factor inputs, labor productivity and its drivers are of interest because of the close link to GDP per capita. Within the same growth accounting framework, average labor productivity growth at the aggregate level can be broken down into effects of capital deepening (as measured by capital input per hour worked), which reflect the capital–labor substitution, and of TFP. In other words, these factors are key in fostering labor productivity.

70: The quality of the data on investment for IT capital (IT hardware, communications equipment, and computer software) varies considerably among countries. If the official estimates are not available in their national accounts, the investment data by type of asset in benchmark Input–Output Tables (IOT) and the time-series IOTs (if available) are used to separate IT capital investment from GFCF in the national accounts. In the years when the IOTs are not available, domestic production and import data (UN Comtrade Database) for IT hardware and communication equipment is used to interpolate the estimates of IT investments. Thus, data inconsistency could pose a problem. Where software is excluded from the GFCF definition compliant to the 1968 SNA, software investment is estimated as described in Appendix 1. In addition, the constant-quality prices for IT capital are hardly available for most Asian countries. If they are not available, the prices for IT capital are estimated by harmonizing Japan's price indices, as described in Appendix 2. Thus, readers are cautioned about data uncertainty and should expect that the decompositions of contributions of capital services into IT and non-IT capital may be considerably revised for some countries, when more reliable data sources for estimation become available.

Capital deepening has been taking place in all of the countries compared, albeit to various degrees (Figure 58). Experience of countries suggests that capital deepening is an accompanying process of rapid economic development. The relatively early starters (Japan and the Asian Tigers) underwent more rapid capital deepening than other countries compared, and in the earlier rather than the latter period. The reverse is true for the emerging Asian economies where concerted efforts were made to increase capital intensity in the latter period. In 1990–2012, China, Vietnam, India, Indonesia, and Thailand moved up to occupy the top spots among the Asian Tigers, while Singapore and Japan stepped down in the rankings. In 1970–1990, the capital–labor ratio was rising by 10.2% and 9.5% on average per year in Korea and the ROC, respectively. Over the subsequent two decades it slowed to 7.1% and 5.8% respectively. Meanwhile, China's pace doubled between the two periods, from 5.3% to 10.6% on average per year. In Vietnam, it has accelerated to 7.1% since 1990. In the US, the pace of capital deepening also increased from 2.1% to 2.3% between the two sub-periods.

While labor productivity steadily improved for all countries (Figure 44), the growth rate of capital productivity (as the other measure of partial productivity) remains negative for almost all countries during 1970–2012 (Figure 59). Although rates of capital deepening in Korea and the ROC were outstanding, at 8.6% and 7.5% per year, on average during this period their capital productivity

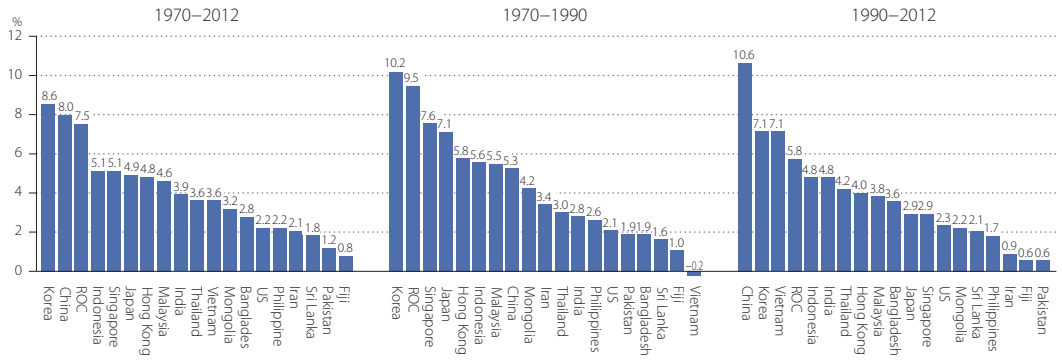



**Figure 58 Capital Deepening, 1970–2012, 1970–1990, and 1990–2012**

Source: APO Productivity Database 2014.01.
Note: The labor inputs for Fiji and Mongolia are defined by numbers of employment.

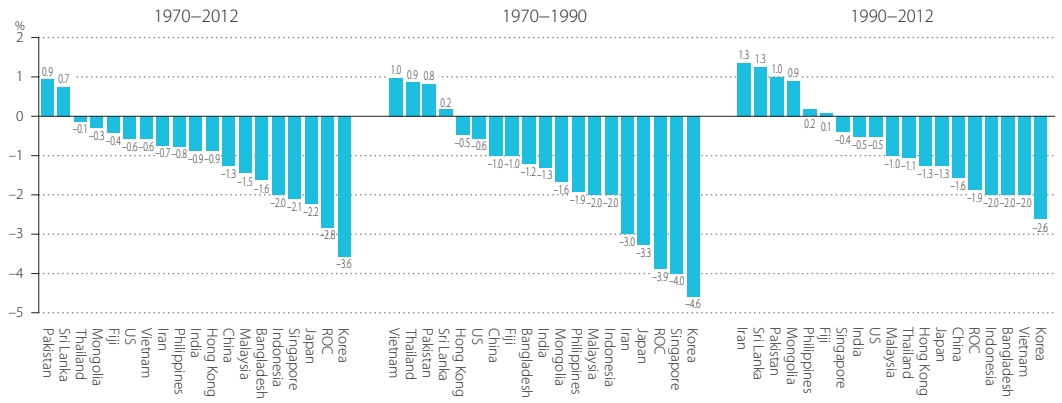



**Figure 59 Capital Productivity Growth, 1970–2012, 1970–1990, and 1990–2012**

Source: APO Productivity Database 2014.01.

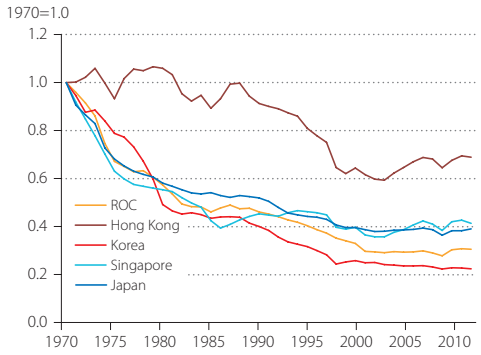



**Figure 60 Capital Productivity Trends in Japan and the Asian Tigers, 1970–2012**

Source: APO Productivity Database 2014.01.

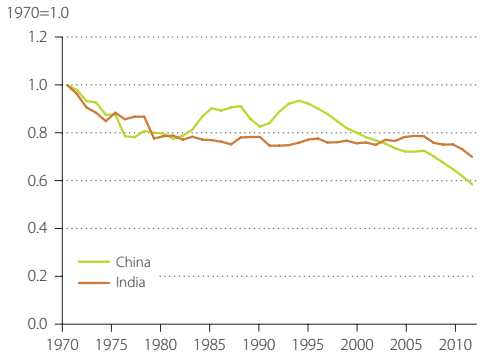



**Figure 61 Capital Productivity Trends in China and India, 1970–2012**

Source: APO Productivity Database 2014.01.

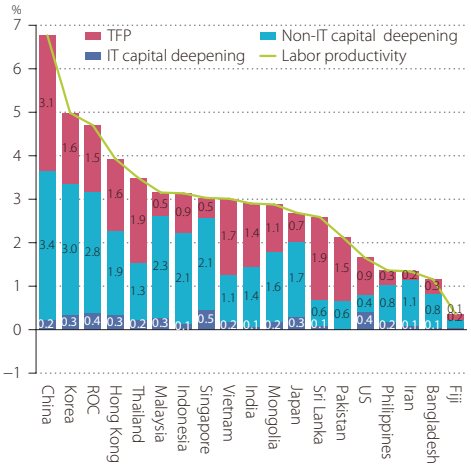



**Figure 62 Sources of Labor Productivity Growth, 1970–2012**

Source: APO Productivity Database 2014.01

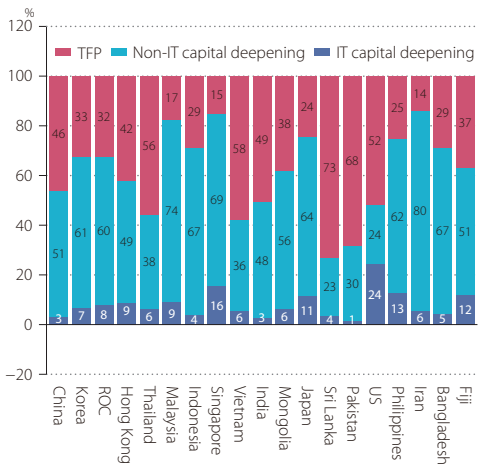



**Figure 63 Contribution Shares of Labor Productivity Growth, 1970–2012**

Source: APO Productivity Database 2014.01.

experienced the sharpest decline of 3.6 and 2.8% per year, respectively (Figure 60). In contrast, the deterioration of capital productivity (by 1.3%) was relatively mild in China as shown in Figure 59, despite its fast capital deepening of 8.0% (Figure 58).

Looking at the two sub-periods of 1970–1990 and 1990–2012, overall the rate of deterioration in capital productivity for all countries was slower in the latter period. China's performance is particularly impressive. Its acceleration in capital deepening in the latter period did not compromise its capital productivity as much as the early starters (Figure 61). In 1990–2012, China's capital–labor ratio rose by 10.6% whereas its capital productivity fell by 1.6%. This compares with Korea's performance in 1970–1990 when its capital–labor ratio rose by 10.2% while capital productivity fell by 4.6%.

Labor productivity growth can be decomposed into contributions from capital deepening and TFP growth. Capital deepening should raise labor productivity, all other things being equal. It remains the prime motor of labor productivity growth, generally explaining 50% of it. Taking the US as the reference economy, with contribution share of capital deepening to labor productivity growth of 48.1% on

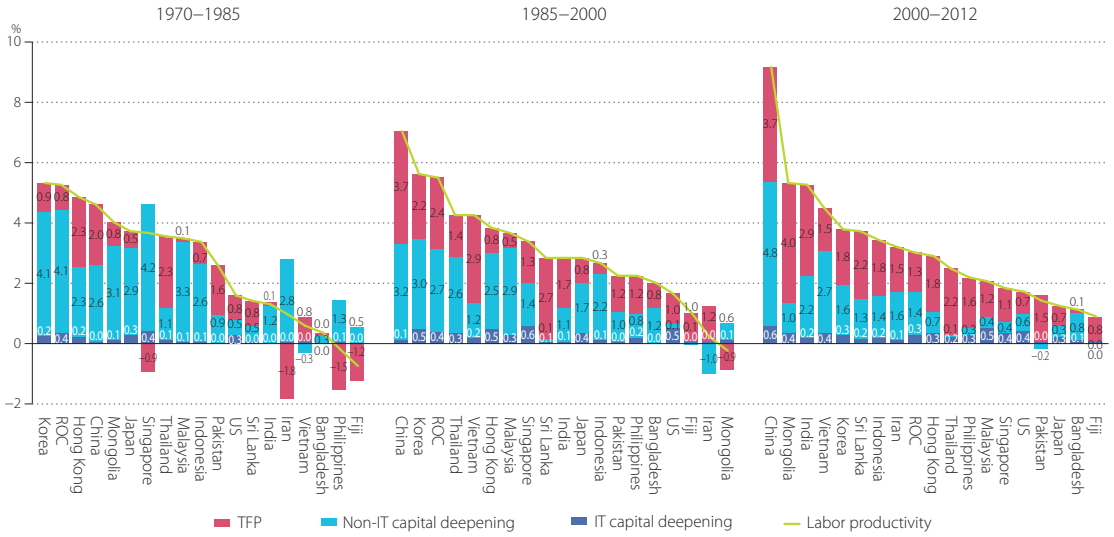



**Figure 64 Sources of Labor Productivity Growth, 1970–1985, 1985–2000, and 2000–2012**

Source: APO Productivity Database 2014.01.

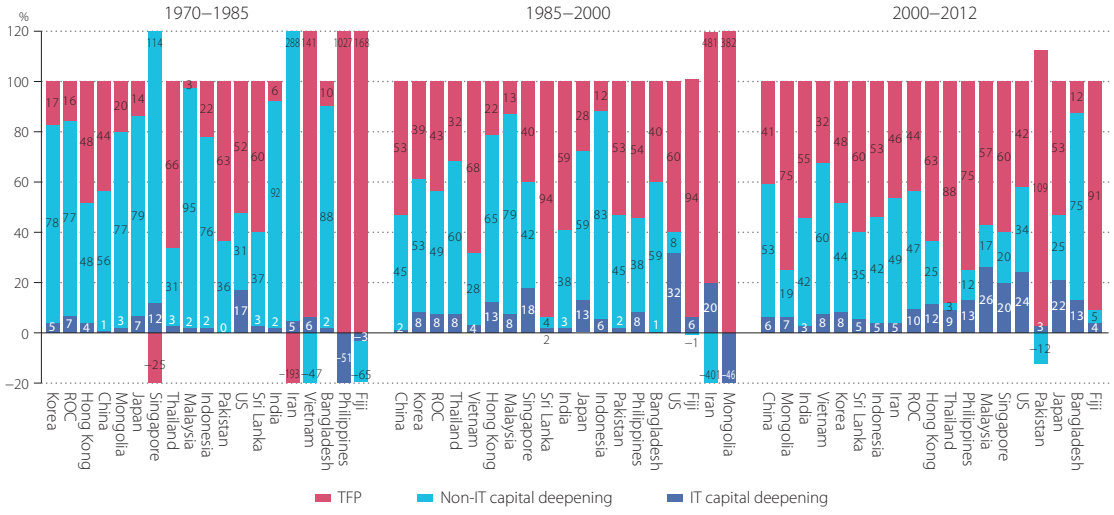



**Figure 65 Contribution Shares of Labor Productivity Growth, 1970–1985, 1985–2000, and 2000–2012**

Source: APO Productivity Database 2014.01.

average in 1970–2012, it has been a main engine to enhance labor productivity in 14 Asian countries (Figure 63). The exceptions to this observation are Sri Lanka, Pakistan, Vietnam, and Thailand, in which the role of TFP has been more significant.

Within this long period, the composition of labor productivity growth has seen substantial shifts (Figures 64 and 65). In the earlier period of 1970–1985, TFP growth was enjoyed by 11 out of the 18 Asian countries compared. It was a significant drag on labor productivity growth in four countries (Iran, the Philippines, Fiji, and Singapore). During the middle period of 1985–2000, all countries (except Mongolia) achieved positive TFP growth to bolster labor productivity growth. By 2000–2012, TFP growth


**Figure 66 Decomposition of Labor Productivity Growth, 1970–2012**

Source: APO Productivity Database 2014.01.

## Table 13 Role of TFP and Capital Deepening in Labor Productivity Growth, 1970–2012

| | | Labor Productivity | Capital deepening | | | | TFP | |
|---|---|---|---|---|---|---|---|---|
| | | | IT | | Non-IT | | | |
| Bangladesh | 1970–1975 | −1.3 | 0.0 | (0) | 0.4 | (−31) | −1.7 | (131) |
| | 1975–1980 | 2.1 | 0.0 | (0) | 0.1 | (6) | 1.9 | (93) |
| | 1980–1985 | 0.2 | 0.0 | (3) | 0.4 | (164) | −0.2 | (−67) |
| | 1985–1990 | 1.6 | 0.0 | (1) | 1.1 | (68) | 0.5 | (31) |
| | 1990–1995 | 1.9 | 0.0 | (1) | 1.0 | (52) | 0.9 | (47) |
| | 1995–2000 | 2.5 | 0.0 | (1) | 1.5 | (59) | 1.0 | (40) |
| | 2000–2005 | −0.5 | 0.1 | (−12) | 0.6 | (−125) | −1.1 | (237) |
| | 2005–2010 | 2.0 | 0.2 | (11) | 1.0 | (50) | 0.8 | (38) |
| | 2010–2012 | 3.0 | 0.2 | (6) | 1.1 | (36) | 1.7 | (59) |
| | 1970–2012 | 1.2 | 0.1 | (5) | 0.8 | (67) | 0.3 | (29) |
| ROC | 1970–1975 | 4.8 | 0.4 | (9) | 5.1 | (105) | −0.7 | (−14) |
| | 1975–1980 | 6.7 | 0.4 | (5) | 3.9 | (58) | 2.5 | (37) |
| | 1980–1985 | 4.3 | 0.3 | (8) | 3.2 | (75) | 0.8 | (17) |
| | 1985–1990 | 6.5 | 0.3 | (4) | 2.3 | (35) | 4.0 | (61) |
| | 1990–1995 | 5.4 | 0.3 | (6) | 2.8 | (52) | 2.3 | (42) |
| | 1995–2000 | 4.5 | 0.7 | (16) | 2.9 | (64) | 0.9 | (20) |
| | 2000–2005 | 3.0 | 0.6 | (20) | 1.9 | (62) | 0.6 | (19) |
| | 2005–2010 | 3.7 | 0.1 | (2) | 1.4 | (37) | 2.3 | (61) |
| | 2010–2012 | 1.0 | 0.1 | (6) | 0.3 | (25) | 0.7 | (68) |
| | 1970–2012 | 4.7 | 0.4 | (8) | 2.8 | (60) | 1.5 | (32) |
| Hong Kong | 1970–1975 | 3.2 | 0.2 | (5) | 1.6 | (50) | 1.5 | (45) |
| | 1975–1980 | 7.5 | 0.2 | (3) | 2.0 | (27) | 5.2 | (70) |
| | 1980–1985 | 3.8 | 0.3 | (7) | 3.3 | (87) | 0.2 | (6) |
| | 1985–1990 | 6.7 | 0.4 | (6) | 2.7 | (40) | 3.6 | (53) |
| | 1990–1995 | 4.6 | 0.4 | (9) | 3.1 | (68) | 1.0 | (22) |
| | 1995–2000 | 0.2 | 0.6 | (292) | 1.7 | (807) | −2.1 | (−999) |
| | 2000–2005 | 3.1 | 0.5 | (15) | 0.9 | (28) | 1.8 | (57) |
| | 2005–2010 | 2.3 | 0.2 | (10) | 0.5 | (20) | 1.6 | (70) |
| | 2010–2012 | 3.8 | 0.2 | (6) | 1.1 | (28) | 2.5 | (66) |
| | 1970–2012 | 3.9 | 0.3 | (9) | 1.9 | (49) | 1.6 | (42) |
| Indonesia | 1970–1975 | 4.4 | 0.0 | (1) | 2.1 | (47) | 2.3 | (53) |
| | 1975–1980 | 4.8 | 0.1 | (2) | 3.1 | (65) | 1.6 | (33) |
| | 1980–1985 | 0.9 | 0.1 | (10) | 2.5 | (266) | −1.7 | (−177) |
| | 1985–1990 | 3.9 | 0.1 | (3) | 1.5 | (40) | 2.2 | (57) |
| | 1990–1995 | 6.4 | 0.2 | (3) | 3.1 | (48) | 3.1 | (48) |
| | 1995–2000 | −2.4 | 0.1 | (−5) | 1.9 | (−80) | −4.4 | (185) |
| | 2000–2005 | 3.3 | 0.1 | (4) | 1.3 | (41) | 1.8 | (55) |
| | 2005–2010 | 2.4 | 0.2 | (7) | 0.9 | (40) | 1.3 | (54) |
| | 2010–2012 | 6.5 | 0.2 | (4) | 2.9 | (45) | 3.3 | (51) |
| | 1970–2012 | 3.1 | 0.1 | (4) | 2.1 | (67) | 0.9 | (29) |
| Japan | 1970–1975 | 4.8 | 0.4 | (8) | 5.1 | (105) | −0.6 | (−13) |
| | 1975–1980 | 2.8 | 0.2 | (7) | 2.0 | (74) | 0.5 | (19) |
| | 1980–1985 | 3.6 | 0.2 | (6) | 1.7 | (47) | 1.7 | (46) |
| | 1985–1990 | 4.2 | 0.4 | (10) | 1.7 | (40) | 2.1 | (50) |
| | 1990–1995 | 2.3 | 0.4 | (15) | 2.0 | (84) | 0.0 | (1) |
| | 1995–2000 | 2.0 | 0.4 | (19) | 1.3 | (68) | 0.3 | (13) |
| | 2000–2005 | 1.7 | 0.4 | (24) | 0.5 | (30) | 0.8 | (45) |
| | 2005–2010 | 1.1 | 0.2 | (19) | 0.4 | (31) | 0.6 | (50) |
| | 2010–2012 | 0.2 | 0.0 | (3) | −0.3 | (−150) | 0.6 | (247) |
| | 1970–2012 | 2.7 | 0.3 | (11) | 1.7 | (64) | 0.7 | (24) |

| | | Labor Productivity | Capital deepening | | | | TFP | |
|---|---|---|---|---|---|---|---|---|
| | | | IT | | Non-IT | | | |
| China | 1970–1975 | 3.7 | 0.0 | (1) | 3.2 | (86) | 0.5 | (13) |
| | 1975–1980 | 4.2 | 0.0 | (1) | 3.0 | (71) | 1.2 | (28) |
| | 1980–1985 | 5.9 | 0.0 | (1) | 1.5 | (25) | 4.3 | (74) |
| | 1985–1990 | 3.4 | 0.1 | (2) | 2.4 | (70) | 0.9 | (27) |
| | 1990–1995 | 10.6 | 0.1 | (1) | 3.4 | (32) | 7.1 | (67) |
| | 1995–2000 | 7.1 | 0.2 | (3) | 3.8 | (54) | 3.1 | (44) |
| | 2000–2005 | 8.6 | 0.7 | (8) | 4.0 | (47) | 3.9 | (46) |
| | 2005–2010 | 10.2 | 0.6 | (5) | 5.5 | (54) | 4.2 | (41) |
| | 2010–2012 | 7.7 | 0.4 | (6) | 5.2 | (67) | 2.1 | (28) |
| | 1970–2012 | 6.8 | 0.2 | (3) | 3.4 | (51) | 3.1 | (46) |
| Fiji | 1970–1975 | −0.5 | 0.0 | (−5) | 0.0 | (−5) | −0.5 | (110) |
| | 1975–1980 | −0.5 | 0.0 | (−3) | 0.6 | (−112) | −1.1 | (216) |
| | 1980–1985 | −1.2 | 0.0 | (−2) | 0.8 | (−67) | −2.1 | (170) |
| | 1985–1990 | 2.3 | 0.1 | (3) | −0.4 | (−16) | 2.6 | (113) |
| | 1990–1995 | −0.4 | 0.2 | (−38) | −0.2 | (39) | −0.4 | (98) |
| | 1995–2000 | 1.2 | 0.0 | (−3) | 0.5 | (44) | 0.7 | (59) |
| | 2000–2005 | 1.5 | 0.1 | (4) | 0.3 | (17) | 1.2 | (79) |
| | 2005–2010 | 0.1 | 0.1 | (47) | 0.0 | (−19) | 0.1 | (72) |
| | 2010–2012 | 1.2 | −0.1 | (−8) | −0.3 | (−28) | 1.6 | (136) |
| | 1970–2012 | 0.4 | 0.0 | (12) | 0.2 | (51) | 0.1 | (37) |
| India | 1970–1975 | 1.1 | 0.0 | (2) | 1.4 | (125) | −0.3 | (−27) |
| | 1975–1980 | 1.1 | 0.0 | (2) | 1.4 | (119) | −0.2 | (−21) |
| | 1980–1985 | 1.6 | 0.0 | (2) | 0.8 | (49) | 0.8 | (49) |
| | 1985–1990 | 2.3 | 0.0 | (2) | 0.7 | (31) | 1.6 | (67) |
| | 1990–1995 | 3.6 | 0.1 | (2) | 1.5 | (43) | 2.0 | (56) |
| | 1995–2000 | 2.5 | 0.1 | (5) | 1.0 | (38) | 1.4 | (57) |
| | 2000–2005 | 2.7 | 0.1 | (4) | 0.7 | (24) | 2.0 | (72) |
| | 2005–2010 | 8.5 | 0.2 | (3) | 3.5 | (42) | 4.7 | (55) |
| | 2010–2012 | 3.4 | 0.2 | (6) | 2.6 | (77) | 0.6 | (18) |
| | 1970–2012 | 3.0 | 0.1 | (3) | 1.4 | (48) | 1.4 | (49) |
| Iran | 1970–1975 | 7.5 | 0.1 | (1) | 3.5 | (47) | 3.9 | (52) |
| | 1975–1980 | −6.0 | 0.0 | (−1) | 3.8 | (−63) | −9.9 | (164) |
| | 1980–1985 | 1.4 | 0.0 | (2) | 0.9 | (66) | 0.4 | (32) |
| | 1985–1990 | −1.4 | 0.0 | (−3) | −1.3 | (94) | −0.1 | (8) |
| | 1990–1995 | 1.4 | 0.0 | (3) | −0.6 | (−39) | 1.9 | (136) |
| | 1995–2000 | 0.7 | 0.1 | (9) | −1.1 | (−150) | 1.8 | (241) |
| | 2000–2005 | 3.7 | 0.2 | (4) | 0.4 | (12) | 3.1 | (84) |
| | 2005–2010 | 4.6 | 0.1 | (3) | 2.5 | (54) | 2.0 | (43) |
| | 2010–2012 | −1.7 | 0.1 | (−8) | 2.0 | (−123) | −3.8 | (231) |
| | 1970–2012 | 1.3 | 0.1 | (6) | 1.1 | (80) | 0.2 | (14) |
| Korea | 1970–1975 | 5.4 | 0.1 | (3) | 4.1 | (76) | 1.1 | (21) |
| | 1975–1980 | 4.2 | 0.3 | (8) | 5.2 | (126) | −1.4 | (−34) |
| | 1980–1985 | 6.4 | 0.3 | (4) | 3.1 | (48) | 3.0 | (48) |
| | 1985–1990 | 6.5 | 0.5 | (8) | 2.7 | (42) | 3.2 | (50) |
| | 1990–1995 | 5.5 | 0.4 | (6) | 3.5 | (63) | 1.7 | (31) |
| | 1995–2000 | 4.9 | 0.5 | (11) | 2.8 | (57) | 1.6 | (32) |
| | 2000–2005 | 4.0 | 0.5 | (13) | 1.8 | (44) | 1.7 | (43) |
| | 2005–2010 | 4.5 | 0.2 | (5) | 1.8 | (40) | 2.5 | (55) |
| | 2010–2012 | 1.5 | 0.1 | (6) | 1.0 | (65) | 0.4 | (29) |
| | 1970–2012 | 5.0 | 0.3 | (7) | 3.0 | (61) | 1.6 | (33) |

had become the dominant driver of labor productivity growth in 12 of the 18 countries compared. At the same time, the contribution from IT capital deepening was also strengthening, from a range of 0–12% in 1970–1985, to 1–20% in 1985–2000, and 3–26% in 2000–2012. This may have accounted for a boost of countries' TFP performance. In the mid period of 1985–2000, the contribution of IT capital deepening in the US was ahead of Asian countries accounting for 32% of labor productivity growth. Coincidentally, this was also the period when the share of TFP growth was the largest, at 60%.

Figure 66 and Table 13 show the decomposition of labor productivity growth for individual countries in five-year intervals covering the period 1970–2012. Productivity is procyclical in nature. In turn, it is difficult to discern fundamental shifts from short-term fluctuations. However, over a period spanning four decades, it can be observed that labor productivity growth in the two fast-growing emerging Asian economies (China and India) is accelerating. China has clearly leapt from a growth rate of around

| | | Labor Productivity | Capital deepening | | | | TFP | |
|---|---|---|---|---|---|---|---|---|
| | | | IT | | Non-IT | | | |
| Malaysia | 1970–1975 | 4.0 | 0.1 | (1) | 2.8 | (70) | 1.2 | (29) |
| | 1975–1980 | 4.5 | 0.1 | (2) | 2.9 | (63) | 1.6 | (35) |
| | 1980–1985 | 1.9 | 0.1 | (4) | 4.3 | (224) | −2.5 | (−128) |
| | 1985–1990 | 3.6 | 0.1 | (4) | 1.3 | (36) | 2.2 | (61) |
| | 1990–1995 | 6.6 | 0.3 | (4) | 4.5 | (68) | 1.8 | (28) |
| | 1995–2000 | 0.9 | 0.4 | (49) | 3.0 | (324) | −2.5 | (−273) |
| | 2000–2005 | 3.0 | 0.7 | (22) | 1.1 | (36) | 1.3 | (42) |
| | 2005–2010 | 1.2 | 0.5 | (40) | −0.2 | (−18) | 1.0 | (78) |
| | 2010–2012 | 1.7 | 0.3 | (18) | −0.1 | (−4) | 1.5 | (86) |
| | 1970–2012 | 3.2 | 0.3 | (9) | 2.3 | (74) | 0.5 | (17) |
| Pakistan | 1970–1975 | 0.2 | 0.0 | (7) | 0.2 | (129) | −0.1 | (−36) |
| | 1975–1980 | 3.7 | 0.0 | (0) | 1.4 | (37) | 2.3 | (62) |
| | 1980–1985 | 3.9 | 0.0 | (0) | 1.2 | (31) | 2.7 | (68) |
| | 1985–1990 | 3.0 | 0.1 | (2) | 1.3 | (43) | 1.7 | (55) |
| | 1990–1995 | 3.2 | 0.1 | (2) | 1.5 | (49) | 1.6 | (49) |
| | 1995–2000 | 0.6 | 0.0 | (3) | 0.2 | (31) | 0.4 | (66) |
| | 2000–2005 | 2.3 | 0.0 | (2) | −0.2 | (−8) | 2.4 | (106) |
| | 2005–2010 | 0.5 | 0.1 | (10) | −0.2 | (−35) | 0.6 | (125) |
| | 2010–2012 | 1.4 | 0.0 | (2) | −0.2 | (−12) | 1.5 | (110) |
| | 1970–2012 | 2.1 | 0.0 | (1) | 0.6 | (30) | 1.5 | (68) |
| Singapore | 1970–1975 | 4.5 | 0.5 | (11) | 5.9 | (133) | −1.9 | (−43) |
| | 1975–1980 | 3.2 | 0.3 | (9) | 2.7 | (84) | 0.2 | (7) |
| | 1980–1985 | 3.4 | 0.5 | (16) | 3.9 | (117) | −1.1 | (−32) |
| | 1985–1990 | 3.4 | 0.6 | (18) | 0.5 | (14) | 2.3 | (68) |
| | 1990–1995 | 3.5 | 0.6 | (18) | 1.0 | (29) | 1.8 | (52) |
| | 1995–2000 | 3.2 | 0.5 | (17) | 2.7 | (86) | −0.1 | (−3) |
| | 2000–2005 | 3.5 | 0.5 | (15) | 1.5 | (43) | 1.5 | (42) |
| | 2005–2010 | 0.6 | 0.2 | (39) | −0.8 | (−133) | 1.2 | (195) |
| | 2010–2012 | 0.5 | 0.3 | (54) | 0.5 | (90) | −0.2 | (−44) |
| | 1970–2012 | 3.0 | 0.5 | (16) | 2.1 | (69) | 0.5 | (15) |
| Thailand | 1970–1975 | 5.9 | 0.1 | (1) | 2.2 | (37) | 3.7 | (62) |
| | 1975–1980 | 0.8 | 0.1 | (11) | −0.3 | (−33) | 1.0 | (122) |
| | 1980–1985 | 3.8 | 0.2 | (4) | 1.3 | (35) | 2.3 | (61) |
| | 1985–1990 | 5.0 | 0.2 | (4) | 0.6 | (12) | 4.2 | (84) |
| | 1990–1995 | 7.4 | 0.5 | (7) | 4.6 | (62) | 2.3 | (32) |
| | 1995–2000 | 0.4 | 0.3 | (79) | 2.5 | (659) | −2.4 | (−637) |
| | 2000–2005 | 2.9 | 0.1 | (4) | −0.4 | (−16) | 3.2 | (111) |
| | 2005–2010 | 2.1 | 0.3 | (16) | 0.4 | (21) | 1.3 | (64) |
| | 2010–2012 | 2.5 | 0.2 | (9) | 0.4 | (17) | 1.9 | (74) |
| | 1970–2012 | 3.5 | 0.2 | (6) | 1.3 | (38) | 1.9 | (56) |
| US | 1970–1975 | 1.9 | 0.2 | (10) | 1.0 | (51) | 0.7 | (38) |
| | 1975–1980 | 1.0 | 0.2 | (21) | 0.2 | (20) | 0.6 | (60) |
| | 1980–1985 | 1.9 | 0.4 | (22) | 0.3 | (16) | 1.2 | (62) |
| | 1985–1990 | 1.2 | 0.5 | (38) | 0.1 | (9) | 0.6 | (53) |
| | 1990–1995 | 1.4 | 0.4 | (29) | 0.2 | (11) | 0.8 | (60) |
| | 1995–2000 | 2.3 | 0.7 | (30) | 0.1 | (6) | 1.5 | (64) |
| | 2000–2005 | 2.4 | 0.6 | (24) | 0.7 | (31) | 1.1 | (45) |
| | 2005–2010 | 1.5 | 0.4 | (25) | 0.9 | (58) | 0.2 | (17) |
| | 2010–2012 | 0.7 | 0.1 | (18) | −0.5 | (−73) | 1.0 | (155) |
| | 1970–2012 | 1.7 | 0.4 | (24) | 0.4 | (24) | 0.9 | (52) |

| | | Labor Productivity | Capital deepening | | | | TFP | |
|---|---|---|---|---|---|---|---|---|
| | | | IT | | Non-IT | | | |
| Mongolia | 1970–1975 | 5.1 | 0.0 | (1) | 2.1 | (41) | 2.9 | (58) |
| | 1975–1980 | 3.1 | 0.1 | (2) | 2.0 | (63) | 1.1 | (35) |
| | 1980–1985 | 3.9 | 0.2 | (5) | 5.3 | (136) | −1.6 | (−41) |
| | 1985–1990 | −1.9 | 0.1 | (−4) | 0.6 | (−30) | −2.5 | (135) |
| | 1990–1995 | −1.3 | 0.1 | (−7) | 1.2 | (−86) | −2.6 | (194) |
| | 1995–2000 | 2.5 | 0.1 | (6) | −0.1 | (−2) | 2.4 | (96) |
| | 2000–2005 | 2.7 | 0.2 | (7) | −0.9 | (−35) | 3.4 | (128) |
| | 2005–2010 | 5.0 | 0.4 | (8) | 2.2 | (45) | 2.3 | (47) |
| | 2010–2012 | 12.8 | 0.6 | (5) | 2.8 | (22) | 9.4 | (74) |
| | 1970–2012 | 2.9 | 0.2 | (6) | 1.6 | (56) | 1.1 | (38) |
| Philippines | 1970–1975 | 1.0 | 0.1 | (5) | 0.5 | (46) | 0.5 | (50) |
| | 1975–1980 | 3.1 | 0.1 | (2) | 2.1 | (69) | 0.9 | (29) |
| | 1980–1985 | −4.6 | 0.1 | (−2) | 1.3 | (−29) | −6.0 | (132) |
| | 1985–1990 | 3.4 | 0.1 | (3) | 0.0 | (1) | 3.2 | (96) |
| | 1990–1995 | 0.4 | 0.0 | (11) | 0.8 | (222) | −0.5 | (−133) |
| | 1995–2000 | 3.0 | 0.4 | (14) | 1.7 | (57) | 0.9 | (29) |
| | 2000–2005 | 1.3 | 0.5 | (36) | 0.0 | (−2) | 0.9 | (66) |
| | 2005–2010 | 2.8 | 0.2 | (6) | 0.5 | (17) | 2.1 | (76) |
| | 2010–2012 | 2.8 | 0.1 | (3) | 0.5 | (17) | 2.3 | (81) |
| | 1970–2012 | 1.4 | 0.2 | (13) | 0.8 | (62) | 0.3 | (25) |
| Sri Lanka | 1970–1975 | −0.1 | 0.0 | (−35) | −0.4 | (613) | 0.3 | (−478) |
| | 1975–1980 | 2.9 | 0.0 | (2) | 0.7 | (25) | 2.1 | (74) |
| | 1980–1985 | 1.4 | 0.1 | (5) | 1.2 | (87) | 0.1 | (8) |
| | 1985–1990 | 3.0 | 0.0 | (1) | 1.0 | (33) | 2.0 | (66) |
| | 1990–1995 | 4.2 | 0.0 | (1) | −0.1 | (−2) | 4.3 | (101) |
| | 1995–2000 | 1.4 | 0.1 | (9) | −0.6 | (−40) | 1.8 | (131) |
| | 2000–2005 | 1.7 | 0.2 | (12) | 0.8 | (47) | 0.7 | (42) |
| | 2005–2010 | 5.3 | 0.3 | (5) | 1.6 | (30) | 3.4 | (65) |
| | 2010–2012 | 4.9 | 0.1 | (1) | 1.8 | (37) | 3.0 | (62) |
| | 1970–2012 | 2.6 | 0.1 | (4) | 0.6 | (23) | 1.9 | (73) |
| Vietnam | 1970–1975 | −0.6 | 0.0 | (0) | −0.1 | (21) | −0.4 | (79) |
| | 1975–1980 | 1.4 | 0.0 | (3) | 0.1 | (10) | 1.2 | (87) |
| | 1980–1985 | 1.0 | 0.1 | (7) | −0.9 | (−89) | 1.7 | (181) |
| | 1985–1990 | 1.3 | 0.1 | (8) | 0.2 | (15) | 1.0 | (77) |
| | 1990–1995 | 4.7 | 0.1 | (2) | 0.8 | (16) | 3.9 | (82) |
| | 1995–2000 | 6.6 | 0.3 | (4) | 2.6 | (39) | 3.8 | (57) |
| | 2000–2005 | 6.7 | 0.3 | (4) | 2.7 | (40) | 3.8 | (56) |
| | 2005–2010 | 2.4 | 0.4 | (19) | 2.6 | (109) | −0.7 | (−28) |
| | 2010–2012 | 4.3 | 0.4 | (9) | 2.9 | (68) | 1.0 | (23) |
| | 1970–2012 | 3.0 | 0.2 | (6) | 1.1 | (36) | 1.7 | (58) |

Unit: Average annual growth rate (percentage), contribution share in parentheses.
Source: APO Productivity Database 2014.01.

4% in the 1970s to a rate of 8–10% in the 2000s, with its transition period in the early 1990s. India's passage to accelerating labor productivity growth is more gradual than China's, from around 1% in the 1970s to 7.0% in 2005–2012. Both TFP growth and capital deepening took a leap in 2005–2012 to reinforce the positive trend. In contrast, the early starters (Japan and the Asian Tigers) have been experiencing a slowdown in labor productivity growth since their heights of the late 1980s. In both Hong Kong and Korea, labor productivity growth appeared to stabilize in the 2000s, but at a lower rate than previously. Singapore's productivity performance, albeit robust, compared with other mature economies like the US, has been very modest against its Asian counterparts. A recent peak of 3.2–3.5% in the 1990s, is compared with over 6% in Hong Kong, the ROC, and Korea in the late 1980s. The US clearly enjoyed a labor productivity growth spurt in the late 1990s (2.3%) and early 2000s (2.4%), the origin of which attracted much research attention at the time. In recent years, it has returned to its long-term average of under 2%.

## Box 5 Sensitivity of TFP Estimates

TFP computations based on the growth accounting framework depends on data that is sometimes difficult to observe. One such task is calculating the wages for the self-employed and unpaid family workers. As a crude approximation in this report, it is assumed that per-worker wages for the self-employed and contributing family workers are 20–80% of the per-worker wage for employee in the countries where the appropriate wage data is not available, in order to estimate the labor compensation for total employment. The future review on this assumption affects TFP estimates directly through the revision of factor income shares and indirectly through the estimates of the ex post rate of return and thus the aggregate measure of capital services.

The right-hand chart of Figure B5.1 presents the labor income share (the ratio of compensation for employees to the basic-price GDP) based on the official national accounts (including author adjustments in basic-price GDP for some countries) in 18 Asian countries and the US in 2012 and the left chart provides the employee share to total employment. There is a large divergence in labor income share for employees among the Asian countries. Roughly, this divides into two groups: countries with approximately a 50% share and countries with an approximately a 30% share of compensation for employees. This does not necessarily reflect differences in the number of employees in total employment. Although Malaysia has a high employee share of 79%, the labor income share is only 32%.

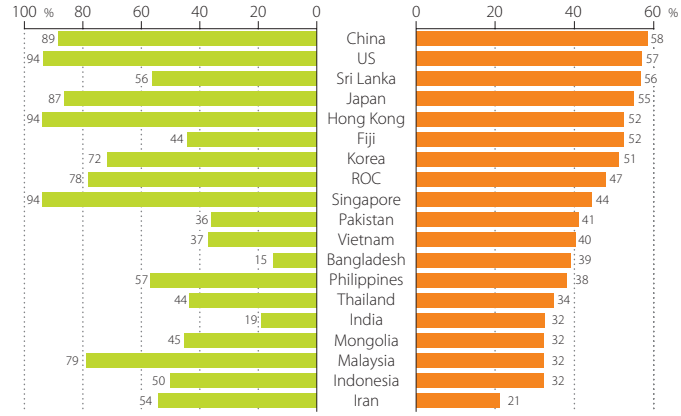



**Figure B5.1 Labor Income Share for Employees, 2012**

Sources: Official national accounts in each country, including author adjustments.

Figure B5.2 illustrates the sensitivity of TFP estimates by changing the factor income share during the period 1970–2012. In general, the growth rate of capital input is higher than that of labor input, so the higher income share of labor results in higher estimates of TFP growth. In other words, labor productivity is improved much faster over a given period than capital productivity, the growth of which tends to be frequently negative (see Figures 44 and 59). The TFP estimate reflects the improvement of labor productivity more when the labor income share increases. In Malaysia, with TFP growth of 0.5% on average during the period 1970–2012, the true estimate could be 1.1% if the current labor income share is underestimated by 10%.

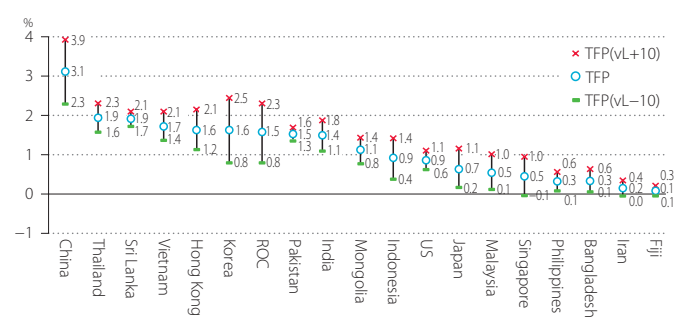



**Figure B5.2 Sensitivity of TFP Estimates by the Change of Income Share, 1970–2012**

Source: APO Productivity Database 2014.01.
Note: The labor inputs for Fiji and Mongolia are defined by number of employment.

# 6 Industry Perspective

This chapter provides the industry origins of economic growth and labor productivity improvement in Asian countries. Industry decomposition allows an insight into the source of a country's economic dynamics, which, in turn, determines its overall performance and characteristics, its strengths, and its vulnerabilities. On one hand, a broad industry base reflects diversification and sophistication in the economy, and in turn is more resourceful in weathering economic shocks. On the other hand, reliance on a narrow industry-base leaves economies more vulnerable to shocks and more susceptible to volatility. Industry structure is a key indicator of an economy's stage of development. As a rough sketch, at one end of the spectrum are predominantly agricultural- and rural-based economies, while at the other end the agriculture sector is negligible and the service sector is the dominant economic base. The middle realm is occupied by manufacturing as the main driver of economic growth. As an economy matures, its depth and sophistication increases and its resilience to economic shocks should be strengthened accordingly. Furthermore, the different composition of economic activities among countries is also one of the main sources of the huge gap in average labor productivity at the aggregate level, as observed in Chapter 5. By analyzing the industry structure of Asian economies, one can clearly trace the path of economic development and identify countries' respective stages based on their characteristics.[71]



## 6.1 Output and Employment

Table 6 (p. 29) in Section 3.2 introduces a country grouping according to stages of development (as measured by per capita GDP relative to the US). Table 14 regroups countries based on the same set of criteria as in Table 6, but applies it to 2012 income levels. The difference in relative per capita GDP between the two tables reflects the impact of their catch-up efforts since 1970, or the year of first recorded data.

Comparing Table 14 with Table 6, it is notable that 13 of the 29 Asian economies have moved up in income group, whereas 14 have stagnated. Among them, the most upwardly mobile countries are the ROC and Korea, both in the fast catch-up group. They have moved up two income levels during the past four decades to

**Table 14 Country Groups Based on the Current Economic Level and the Pace of Catching Up**
——Level and average annual growth rate of GDP at constant market prices, using 2011 PPP

| Per capita GDP level to the US in 2012 | Annual rate to catch-up to the US | | | |
|---|---|---|---|---|
| | (C1) >3% | (C2) 1% <–< 3% | (C3) 0% <–< 1% | (C4) < 0% |
| (L1) 60% < | ROC, Korea, Singapore | Hong Kong | Japan, EU15, Oman | Bahrain, Brunei, Kuwait, Qatar, Saudi Arabia, UAE, Australia |
| (L2) 30% <–< 60% | | Malaysia, Thailand | Turkey | Iran |
| (L3) 10% <–< 30% | China | India, Indonesia, Mongolia, Sri Lanka, Vietnam | | Fiji, Philippines |
| (L4) < 10% | Cambodia | Lao PDR, Myanmar | Bangladesh, Nepal Pakistan | |

Sources: Official national accounts in each country, including author adjustments.
Note: The annual catch-up rates are based on the data during 1970–2012. The starting years for some countries are different due to data availability: Cambodia (1987–), the Lao PDR (1984–), and Nepal (1974–).

71: Constructing the industry origins of labor productivity growth requires confronting a large volume of data from different sources. Issues of data inconsistency arising from fragmentation of national statistical frameworks can present enormous hurdles to researchers in this field. The industry data in this chapter is mainly based on official national accounts. Where back data is not available, series are spliced together using different benchmarks and growth rates. Data inconsistencies in terms of concepts, coverage, and data sources have not been fully treated although levels of breakdown are deliberately chosen to minimize the potential impact of these data inconsistencies. In this sense, the industry data in APO Productivity Database should be treated as a work in progress and it is difficult to advise on data uncertainty. These data will be further developed and examined in the near future. Readers should bear these caveats in mind in interpreting the results.

join Japan in the top income group. Singapore and Hong Kong have also moved up one income group to the L1 level. Malaysia and Thailand have moved up one level to L2. Both China and India have moved up to L3, although they are in different catch-up groups. Indonesia and Vietnam (in Group-C2) have also improved their income level to L3. This means the number of lowest-income countries has decreased from 11 at the start of the period to six (Cambodia, the Lao PDR, Myanmar, Bangladesh, Nepal, and Pakistan) as of 2012. As expected, there were few movements in country groups with little or no catch-up.

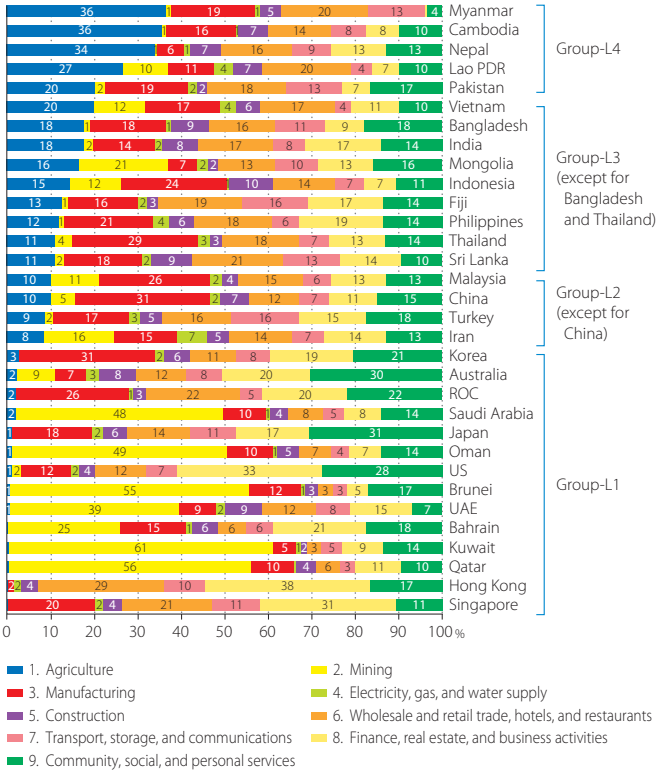



**Figure 67 Industry Shares of Value Added, 2012**

Sources: Official national accounts in each country, including author adjustments.

Countries at the lower rungs of the development ladder tend to have a bigger agriculture sector as a share of value added.[72] Figure 67 shows the industry composition[73] of the Asian economies in 2012, and indicates a broad, negative correlation between the share of the agriculture sector and the relative per capita GDP against the US. Half of the Asian countries compared have an agriculture sector accounting for over 10% of total value added. They all have a relative per capita GDP that is 20% below the US. Among them, the three countries with the biggest agricultural share are all in the lowest income group (with a per capita GDP less than 10% of the US). In contrast, the agriculture sector is 10% or less of the total value added for Group-L2 countries, compared with 3% or less for Group-L1 economies. In particular, agriculture accounts for less than 1% in the US, and is negligible in Hong Kong and Singapore. Note also how finance, real estate, and business activities grow in importance as one moves up income levels. The finance sector is especially prominent in Hong Kong (38%), Singapore (31%), and the US (33%). Mining appears to be what defines oil-exporting countries, typically accounting for over 40% of total value added, except in Bahrain (26%), Iran (16%), and the UAE (39%), which are countries that have managed to diversify mining. Finance is the biggest sector in Bahrain, accounting for 21% of total value added, whereas it is the second largest sector (15%) in the UAE, following mining.

72: In Chapter 5, GDP is adjusted to be valued at basic prices (including our estimates, if the official estimates at basic prices are not available). However, the definition of GDP by industry differs among countries in this chapter due to data availability. GDP is valued at factor cost for Fiji and Pakistan; at basic prices for Cambodia, Hong Kong, India, Korea, the Lao PDR, Mongolia, Nepal, and Singapore; at producers' prices for Iran, the ROC and the Philippines; and at market prices for Bangladesh, Indonesia, Japan, Malaysia, Sri Lanka, Thailand, and Vietnam.

73: The nine industries are 1–agriculture; 2–mining; 3–manufacturing; 4–electricity, gas, and water supply; 5–construction; 6–wholesale and retail trade, hotels, and restaurants; 7–transport, storage, and communications; 8–finance, real estate, and business activities; and 9–community, social, and personal services. See Appendix 6 for the concordance with the ISIC, Revision 3.

For fostering productivity in the less-developed countries, it is important to adopt existing technologies from the advanced economies. In this view, manufacturing is a key sector in propelling countries to make a leap in economic development. It accounts for around 20% of total value added or more in eight of the 29 Asian countries compared. Among these, manufacturing is the largest sector in China, Korea, and Thailand, equivalent to around 30% of total value added, while in the ROC, Malaysia, and Indonesia it accounts for a quarter or more. Our TFP estimate in Chapter 5 shows a positive correlation between the TFP growth during 2000–2012 and the shares of manufacturing in 2012 in 18 Asian countries and the US (Figure 68). At the other end of the spectrum are six countries where manufacturing accounts for less than 10%. Among these, two are oil-exporting countries and the other three are Hong Kong (2%), Mongolia (7%), and Nepal (6%). These compare with the values for the US at 12% and Australia at 7%.

Figure 69 shows the breakdown of the manufacturing sector, comprising nine sub-industries, for 17 selected Asian countries and the US.[74] The dominance of machinery and equipment in Asian manufacturing can be clearly seen, particularly in the ROC and Singapore (close to 60% of manufacturing's total value added), and Korea (50%) and Japan (45%). These compare with 40% in the US. At the other end are countries dominated by light manufacturing (e.g., the food products,

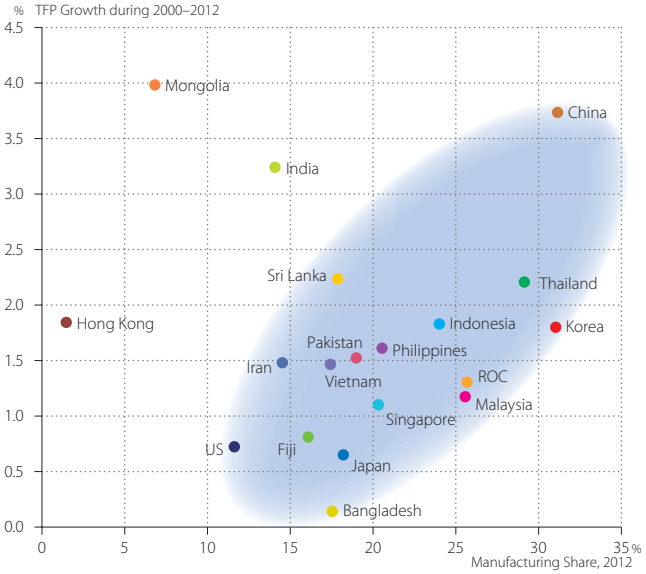



**Figure 68 Manufacturing Share and TFP Growth, 2000–2012**

Sources: Official national accounts in each country, including author adjustments, and APO Productivity Database 2014.01.

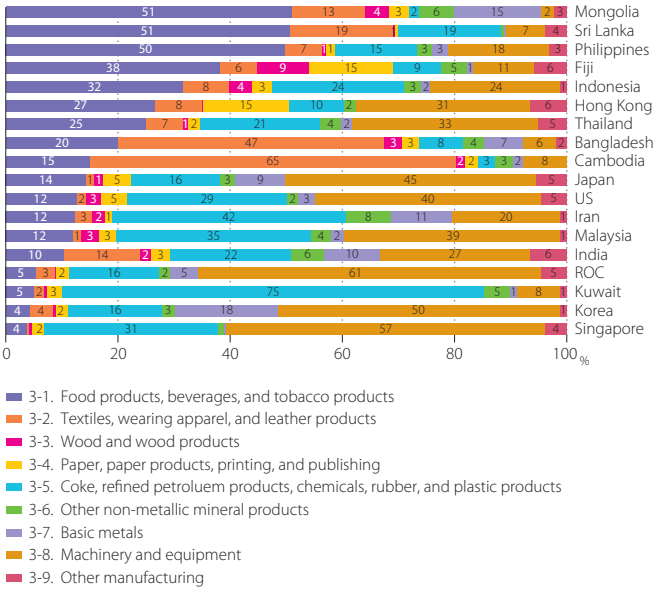



**Figure 69 Industry Shares of Value Added in Manufacturing, 2012**

Sources: Official national accounts in each country, including author adjustments.

74: Manufacturing consists of nine sub-industries: 3.1–food products, beverages, and tobacco products; 3.2–textiles, wearing apparel, and leather products; 3.3–wood and wood products; 3.4–paper, paper products, printing, and publishing; 3.5–coke, refined petroleum products, chemicals, rubber, and plastic products; 3.6–other non-metallic mineral products; 3.7–basic metals; 3.8–machinery and equipment; and 3.9–other manufacturing. See Appendix 3 for the concordance with ISIC, Revision 3.

beverages, and tobacco products sector in the Philippines, Sri Lanka, Fiji, and Mongolia, and the textiles, wearing apparel, and leather products sector in Cambodia and Bangladesh). Coke, refined petroleum products, chemicals, rubber, and plastic products are also a prominent subsector, not least in Kuwait, where they account for two-thirds of the country's manufacturing value added.

Figure 70 shows the industry shares of value added and employment by the four country groups based on 2012 income levels, compared with the Asia29 average and the US for the years 1980, 1990, 2000, and 2012.[75] The first thing to note is that in 2012, the service sector accounted for the largest share of total value added in all country groups, independent of their economic development.[76] That said, Group-L1 has always had the biggest service sector among all Asian countries. This has become much more distinctive as the bulk of the economy in this group continues to shift heavily toward services over time. By 2012, the service sector accounted for 62% of total value added in Group-L1, compared to 80% in the US and 54% in Group-L2.[77] The weight of the service sector is similar in Group-L3 and Group-L4 at 47% to 53%. This reflects the relative importance of manufacturing to the former, and agriculture for the latter, at their particular stages of development.

The second noteworthy point is that Asia29 remains a region dominated by agriculture as far as employment is concerned, despite its downward trend. In the past three decades, the agricultural employment share for Asia29 dropped from 61% in 1980 to 38% in 2012. In the past three decades, the value-added share of agriculture in Group-L3 has more than halved from 30% in 1980 to 13% in 2012, with the most rapid shift taking place in the 1990s. Employment in the sector was also cut by one-third

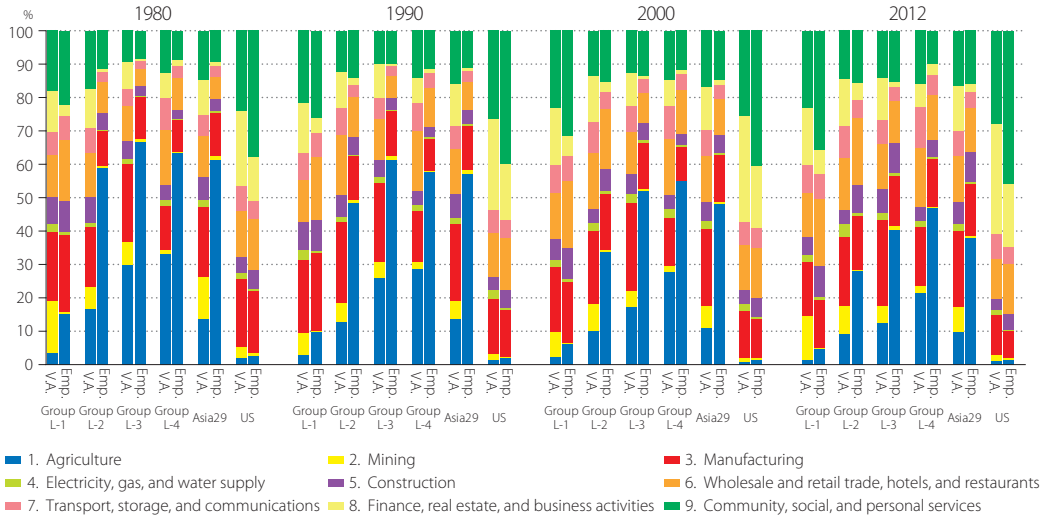



**Figure 70 Industry Shares of Value Added and Employment by Country Group, 1980, 1990, 2000, and 2012**

Sources: Official national accounts in each country, including author adjustments.

75: The group averages as industry share of value added are based on a country's industry GDP, using exchange rates for the whole economy without consideration of the differences in relative prices of industry GDP among countries.

76: The service sector is defined in this Databook as 6–wholesale and retail trade, hotels, and restaurants; 7–transport, storage, and communications; 8–finance, real estate, and business activities; and 9–community, social, and personal services.

77: If Figure 67 was to rank by the size of the service sector, Hong Kong would top the table at 93.0%, followed by the US (79.9%), and other Group-L1 countries, namely the ROC (68.2%), Japan (72.6%), and Singapore (73.9%). Fiji is an exception, with a large service sector share (65.2%) relative to its per capita GDP level.

over the same period. The least well-off countries, in contrast, have not been as successful in diversifying away from agriculture, which accounted for 21% of total value added and 47% of employment in 2012, compared with 33% and 64%, respectively, in 1980. In the meantime, the richest economies continued to squeeze agriculture even though it had a share of only 4% in total value added and 16% in total employment in 1980. By 2012, the figures had fallen to 2% and 5%, respectively.

Comparisons of the value added and employment shares also reveal some interesting facts. Agriculture is the only industry sector that consistently has a disproportionately higher employment share than justified by its share in value added across all country groups. This suggests that agriculture is still highly labor-intensive and/or there may be a high level of underemployment in the sector in Asia, both of which imply that the labor productivity level is low compared to other industry sectors.[78] Thus, countries with a big agriculture sector often have low per capita GDP, and shifting out of agriculture will help boost economy-wide labor productivity. The US is an exception, where its agricultural value-added share and employment share are similar; suggesting that labor productivity in this sector is higher than that experienced in Asian countries. The reverse is true for the sector of finance, real estate, and business activities, which often generate a much bigger value-added share than suggested by its employment share. In 2012, the sector accounted for 33% of total value added generated by 19% of employment in the US, and 14% and 2%, respectively, in Asia29. While the value-added share of the sector has grown by 11 percentage points in the US over the past three decades, it has only grown by 3 percentage points in Asia29.

The third point to note is that the industry structure in Asian countries differs from that in the US regarding the relative importance of manufacturing, even in Group-L1 countries, where manufacturing accounts for 17% of the economies' value added, compared with 12% in the US in 2012. The US economy is highly skewed toward the service sector, accounting for 80% of the total value added, compared with an average of 62% in Group-L1 countries. Certainly, its share of finance, real estate, and business activities at 33% was much larger than the share in Group-L1 countries, at 17%. This suggests that Asian economies could experience further deindustrialization and a shift in prominence toward services as they continue to mature. The relative prominence of manufacturing in the Asian regional economy as a whole is reflected in the fact that income groups are not filtered out by the size of a country's manufacturing sector.[79] In Asia, the manufacturing employment share is typically smaller than the value-added share it generates. Furthermore the value-added share of the sector has been shrinking in the high-income groups (i.e., Group-L1 and Group-L2) whereas in Group-L3 countries it has been relatively stable, and slowly expanding in Group-L4, reflecting their different developmental stage.

Figure 71 shows how the share of the agriculture industry in total value added shrank over time in the Asian economies. This could reflect the actual decline in agricultural output and/or the relatively rapid expansion in other sectors. Despite the broad spread, the downward trend is unmistakable, even for Group-L4 countries. The share of the agriculture sector displays a long-term declining trend in all countries, albeit at different paces and at different starting times. Looking at the available data, the share of agriculture in most Asian countries (excluding the oil-exporting countries) clustered around the 30–50% band in the 1970s, trending down to the 10–20% band by 2012. Vietnam and Mongolia are two countries where the agriculture sector experienced similar declines but within a much shorter

78: Gollin, Parente, and Rogerson (2004) and Caselli (2005) demonstrate the negative correlation between employment share of agriculture and GDP per worker. They show that the agriculture sector was relatively large in less well-off countries and agricultural labor productivity was lower than that in other sectors.

79: If Figure 67 was to rank by the size of the manufacturing sector, China would lead with a share of 31.1%, followed by Thailand and Korea at 29.1% and 31.1%, respectively.

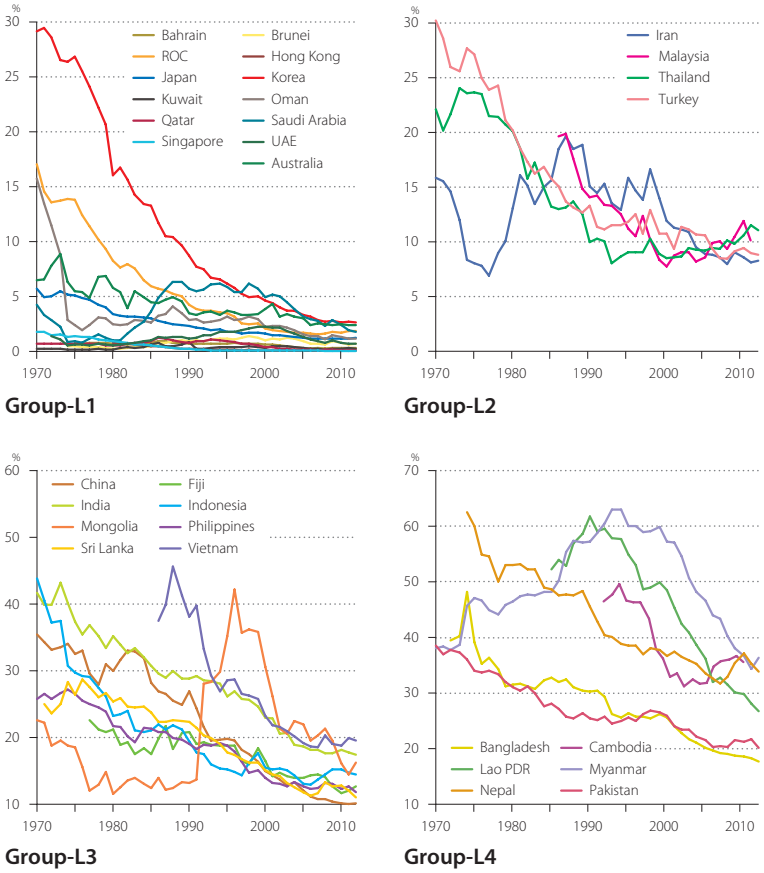



**Figure 71 Long-Term Trends of Value-added Share in the Agriculture Sector, 1970–2012**

Sources: Official national accounts in each country, including author adjustments.

period (from the late 1980s and mid-1990s, respectively). The relative decline of agriculture was most rapid in Korea, from 29.0% of total value added in 1970 to 2.6% in 2012. In many countries, the share of the agriculture sector more than halved between 1970 and 2012: for example, from 44% to 15% in Indonesia, from 42% to 18% in India, and from 40% in 1972 to 18% in Bangladesh. In China, the share of this sector also significantly declined, from 36% in 1970 to 10% in 2012.

Despite the relative decline of agriculture's share in total value added, employment in the sector for Asia as a whole still accounted for 40% of total employment in 2012. Figure 72 shows countries' industry shares in total employment, and ranks them by size of employment in the agriculture sector.[80] Group-L4 and Group-L3 countries and Thailand cluster at the top in Figure 72, with the share of agricultural employment ranging from 31% (Sri Lanka) to 73% (Nepal). Figure 73 traces the historical trajectory of Japan's employment share of agriculture for the period 1885–2012 and the countries' levels in 2012, mapped against Japan's experience (as circles). Large shares of agriculture employment over 30% in 12 countries correspond to Japan's level at the end of the 1950s and the onset of high economic growth. This may indicate there is much room for improving labor productivity and per capita income.

80: Data for the Lao PDR and Myanmar are unavailable for Figure 72.

The trend of employment share over time (Figure 74) suggests that the relative decline in the share of agriculture in total value added has been accompanied by a downward trend in its share in total employment.[81] This trend is unmistakable in most of the countries plotted in Figure 74.[82] Between 1970 and 2012, the employment share in agriculture shrank from 50% to 6% in Korea and from 20% to 5% in Japan. Employment in agriculture also fell rapidly in the ROC, from 25% in 1978 to 5% in 2012. In China, the share has declined from 71% in 1978 to 33% in 2012.

It is the manufacturing sector that largely absorbs workers who have been displaced from the agriculture sector, especially in the initial stages of economic development. Figure 75 traces the trajectory of growth rates of GDP and employment in combination with manufacturing for several Asian countries and the US over the past four decades. Each dot represents the average annual growth rate in the 1970s, 1980s, 1990s, and 2000s (2000–2012). The growth rate in the 2000s is illustrated by a white dot. If manufacturing GDP and employment grow at the same rate, a dot will be on a 45° line through the origin running from the lower left to upper right quadrants. Despite positive gains in manufacturing GDP, for the US and Japan, the overall growth in manufacturing employment was negative, except during the 1970s for the US and the 1980s for Japan.

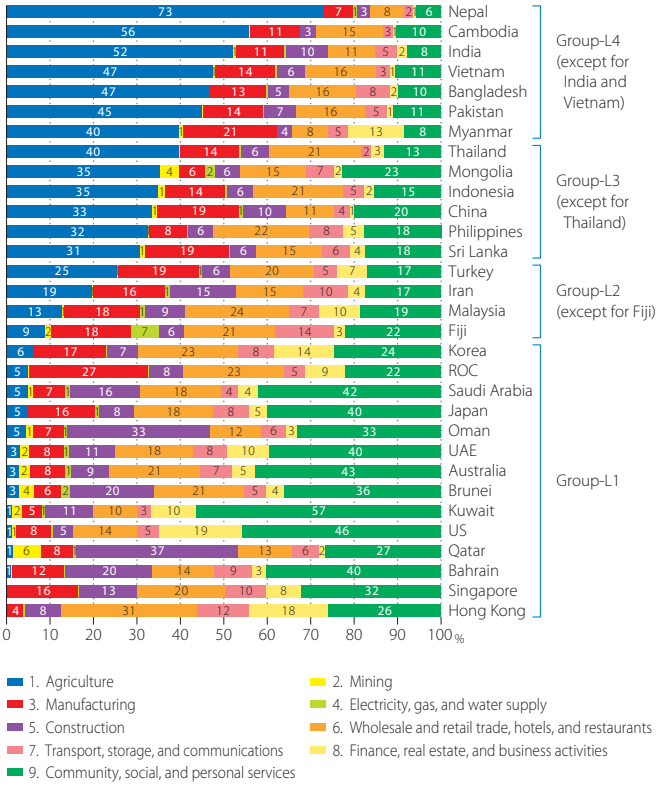



**Figure 72 Industry Shares of Employment, 2012**

Sources: Official national accounts in each country, including author adjustments.

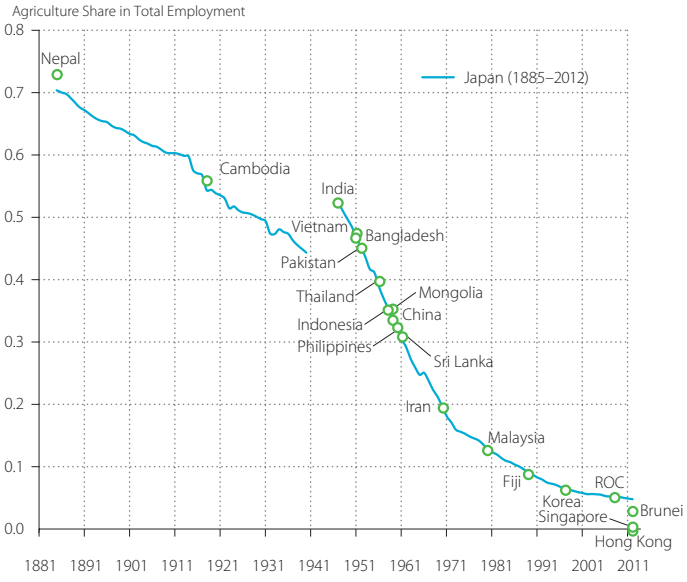



**Figure 73 Employment Share of Agriculture in Japan during 1885–2012 and Levels of Asian Countries in 2012**

Sources: Official national accounts in each country, including author adjustments. The sources of historical data of Japan are Long-Term Economic Statistics by Ohkawa et al. (1974) during 1885–1954 and Population Censuses since 1920.

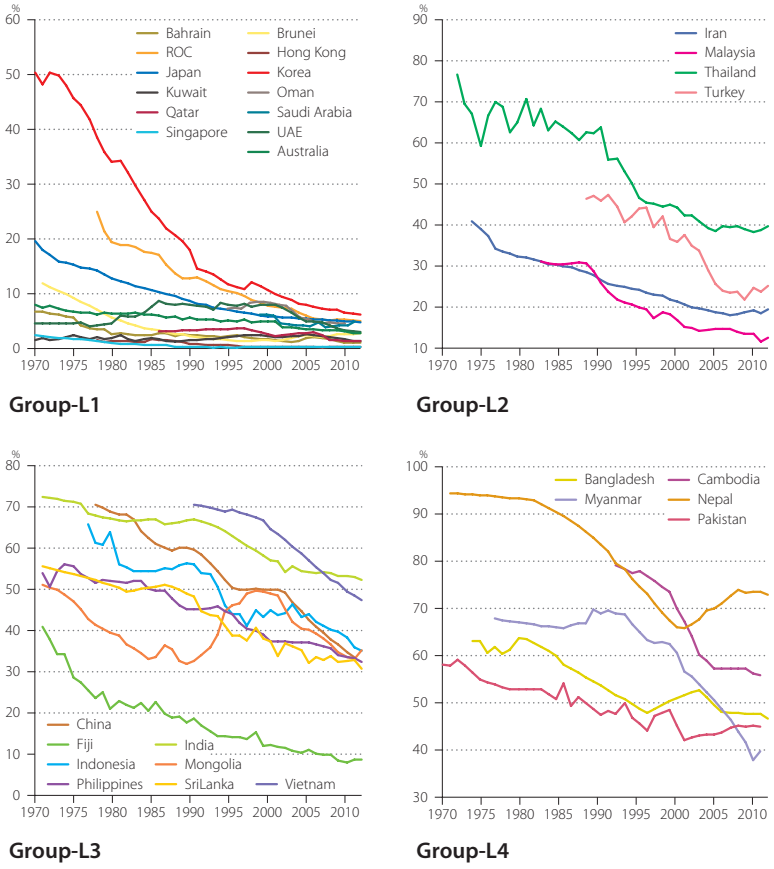



**Figure 74 Long-Term Trends of Employment Share in the Agriculture Sector, 1970–2012**

Sources: Official national accounts in each country, including author adjustments.

In Korea and the ROC, expansions of manufacturing output could allow for increases of employment in the 1970s and the 1980s, but since the 1990s manufacturing has no longer been an absorption sector of employment, regardless of the sound expansion of production in this sector (Figure 75). The experiences of Singapore, Indonesia, and Thailand are closer to the 45° line through the origin, which implies well-balanced growth of output and employment in the manufacturing sector. The job creation role of manufacturing still seems effective or becoming more important in Indonesia and Pakistan, but it is diminishing rapidly in India and Iran.

81: Nepal's employment-by-industry figures are constructed by interpolating benchmark data taken from its labor force survey as well as its population census. Figure 74 indicates that its share of agriculture has increased since 1999. This reflects the employment share of agriculture at 66% in the population census of 2001 and its share of 74% in the labor force survey of 2008.

82: However, the decline in a share does not always reflect an actual fall in employment for the agriculture sector; rather, it could reflect total employment rising faster than employment in agriculture. Countries that have been experiencing a consistent fall in actual employment in the agriculture sector are, for example, the ROC, Hong Kong, Japan, and Korea, whereas in Cambodia, India, Iran, Nepal, and Pakistan, actual employment has been rising. Other countries such as Thailand, Indonesia, Singapore, Malaysia, and Vietnam have no established trend in employment growth. China, however, has seen actual employment in agriculture falling since the turn of the millennium.

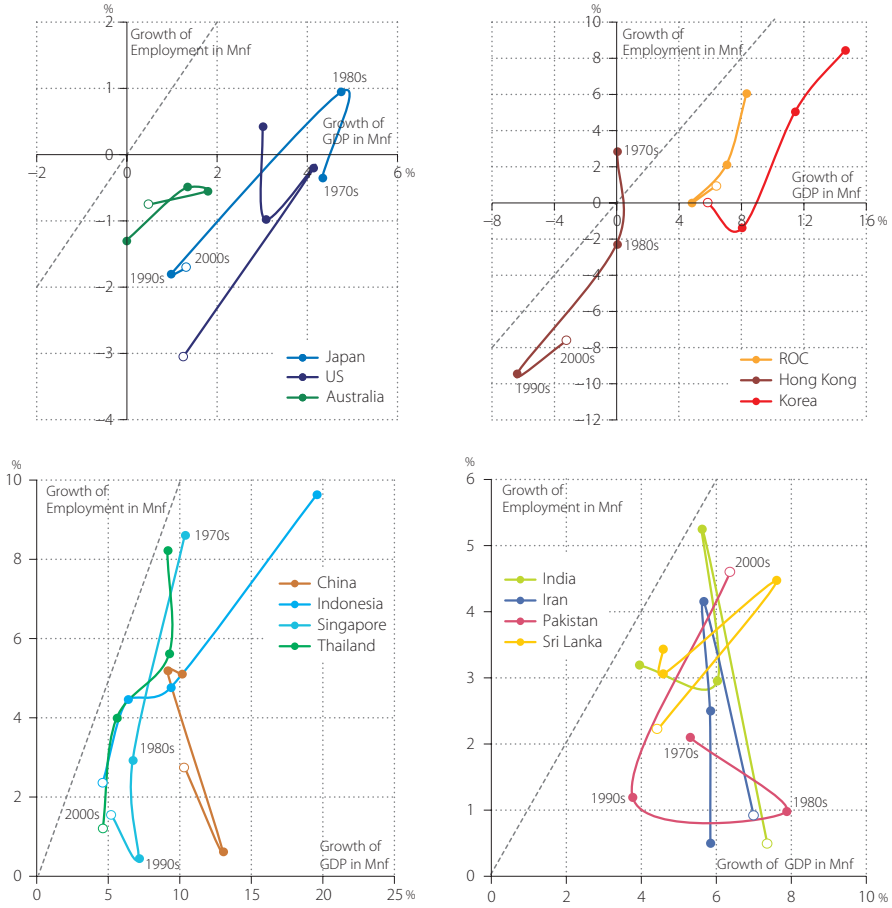



**Figure 75 Job Creation in Manufacturing, 1970–2012**
——Average annual growth rates of GDP at constant prices and number of employment

Sources: Official national accounts in each country, including author adjustments.
Note: Each dot represents the average annual growth rate in manufacturing (mnf) in the 1970s, 1980s, 1990s, and 2000s (2000–2012). The white dots indicate the rate in the latest decade.

## 6.2 Industry Growth

In Section 3.1, it can be seen that, as a region, growth in Asia29 accelerated in the most recent period 2005–2012, averaging 6.2% per annum, up from 5.6% in 2000–2005. China and India have been the two main drivers among the Asian economies, accounting for 45% and 16% of the region's growth during 1990–2012, respectively (Figure 7, p. 20). However, looking at the industry composition, the origins of economic growth in China and India are quite different. Bosworth and Collins (2008) indicate that China's economic growth has been fueled by industry sector expansion,[83] whereas India economic growth has been led by service sector expansion, based on their observation during 1978–2004. Although the findings broadly support their conclusion, it also discerns that the nature of growth in China may have started shifting more toward services in recent years.

83: The industry sector in Bosworth and Collins (2008) is equivalent to the industry groups 2–5 in this report.

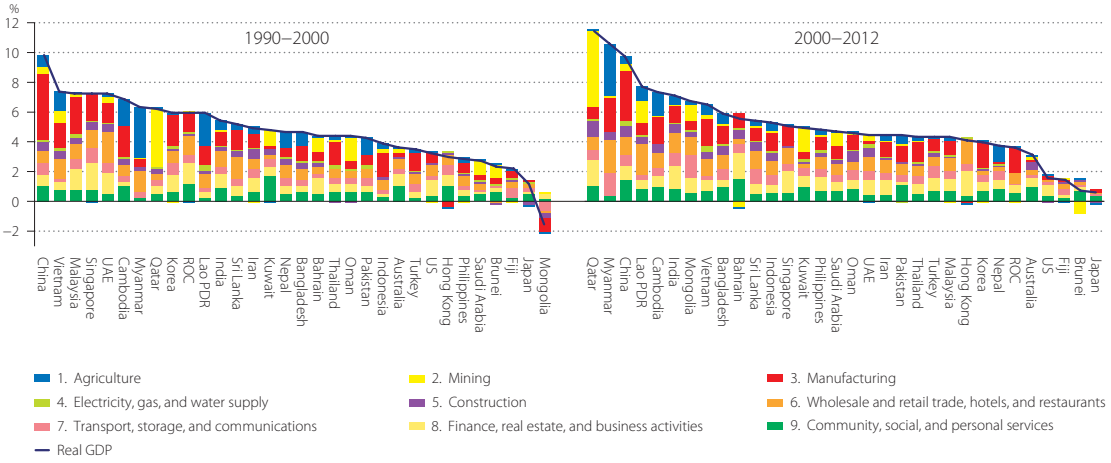



**Figure 76 Industry Origins of Economic Growth, 1990–2000 and 2000–2012**
——Industry decomposition: Average annual growth rate of GDP at constant prices

Sources: Official national accounts in each country, including author adjustments.

Our results show that manufacturing had been the biggest contributor to economic growth in China until the 2000s when the service sector overtook manufacturing in this respect (Figure 76).[84] The gap between contributions of manufacturing and services was the widest in the early 1990s; narrowing in the late 1990s until a redress in 2000–2012, with manufacturing and services accounting for 35% (Figure 77) and 44% (Figure 78) of economic growth, respectively. In contrast, economic growth in India has always been dominated by services. Its growth has only become more pronounced over time. The contribution of manufacturing and services to economic growth were 16% (Figure 77) versus 64% (Figure 78) in 2000–2012, compared with 18% and 51% in 1985–1990. The increased prominence of the service sector has weakened, not so much manufacturing's hold, but agriculture's, where the contribution shrank from 18% in the late 1980s to 9% in the latest period of comparisons.

Manufacturing has sustained its prominence in Thailand, Korea, and the ROC, contributing 32%, 42%, and 48% to economic growth in 2000–2012, respectively. Its importance is modest in Singapore at 25% (Figure 77). In Hong Kong, it has been a drag on economic growth in the past decade or so. During the Asian crisis, the most impaired economies were Thailand and Indonesia, and the sectors which bore the brunt were construction, wholesale and retail trade, hotels, and restaurants, and finance, real estate, and business activities. In contrast, manufacturing played a significant role in bolstering the economy at the time (Figure 77).

The service sector plays an equal, if not more important, role in Asian economic growth. Services made the biggest contribution to economic growth in all Asian countries except Qatar (Figure 78). The story behind India's recent growth has been one of services. Modern information and communication technology have allowed India to take an unusual path in its economic development, bypassing a

84: The Törnqvist quantity index is adopted for calculating the growth of real GDP. Using this index, the growth of real GDP into the products of contributions by industries can be decomposed:
$\underbrace{\ln\left(GDP^{t} / GDP^{t-1}\right)}_{\text{Real GDP growth}} = \underbrace{\sum_j (1/2)\left(s_j^{t} + s_j^{t-1}\right) \ln\left(Q_j^{t} / Q_j^{t-1}\right)}_{\text{Contribution of an industry } j}$ where $Q_j^t$ is real GDP of an industry $j$ in period $t$ and $s_j^t$ is the nominal GDP share of an industry $j$ in period $t$.

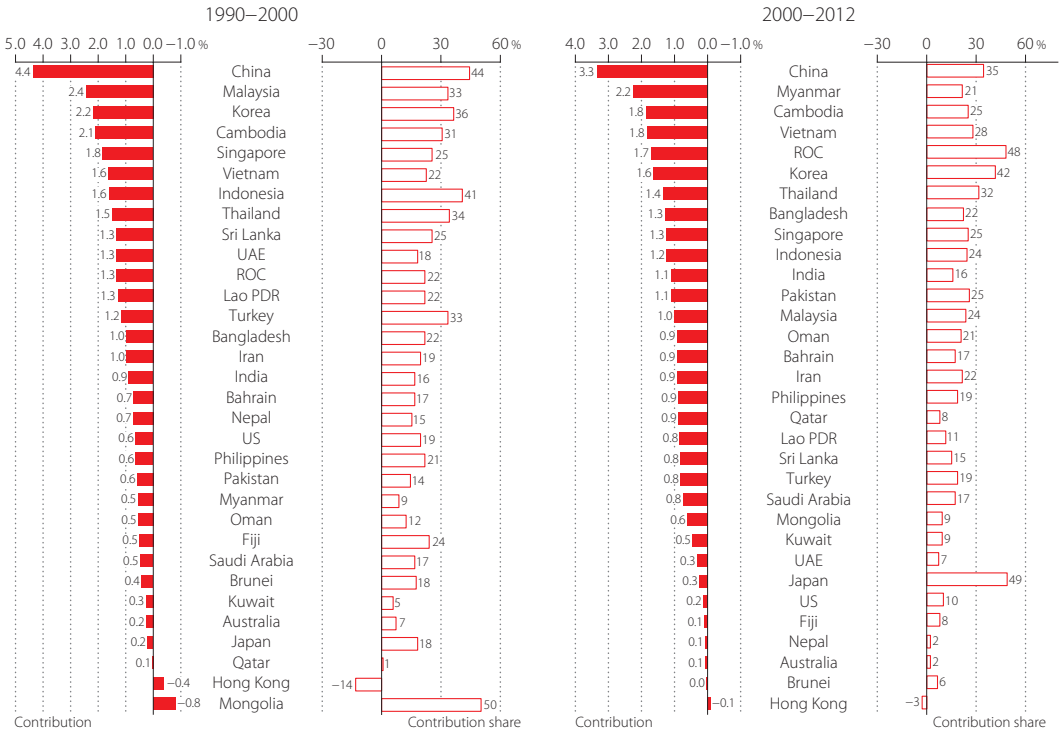



**Figure 77 Contribution of Manufacturing to Economic Growth, 1990–2000 and 2000–2012**

Sources: Official national accounts in each country, including author adjustments.

stage when manufacturing steers growth.[85] Within the service sector, contribution is quite evenly spread among the sub-sectors, more recently the iron/steel and motor vehicle sectors have been intensively developed.[86] For further improvement in per capita GDP and to capitalize on the demographic dividend (see Box 2, p. 34), expansion of labor-intensive manufacturing may be required in India for greater job creation.

Economic growth in the Asian Tigers was also dominated by the service sector, albeit more so in Singapore and Hong Kong than in the ROC and Korea, where manufacturing remained a significant force. The service sector accounted for 51% of growth in the ROC for the period 2000–2012, 52% in Korea, 71% in Singapore, and 102% in Hong Kong, counterbalancing the negative contribution of 3% by manufacturing and 2% by construction (Figure 78). These compare with 99% in the US, to counterbalance the negative contribution of 12% by construction. In the 2000s, growth in Hong Kong was highly skewed toward wholesale and retail trade, hotels, and restaurants, accounting for 40% of growth. This compares with 21% in Singapore and 18% in the ROC. In contrast, the sector contributed only 7% to Korea's growth over the same period. Finance, real estate, and business activities also played an important role, contributing 43% to growth in Hong Kong, 29% in Singapore, and 14% in the ROC.

85: The computer software industry in India depends considerably on export demands. According to India's *Input–Output Table 2006–2007*, 82% of the output in computer and related activities is exported. This export is equivalent to 14.8% of total exports in India and is the second-largest export product (among 130 products in this table).

86: In 2013, India was the 6th largest producer (3.9 million) of motor vehicles (87.3), following Korea (4.5), Germany (5.7), Japan (9.6), the US (11.0), and China (22.1), based on a survey by OICA (International Organization of Motor Vehicle Manufacturers). India moved up in the rankings from 15th (0.8) in 2000 to 12th (1.6) in 2005.

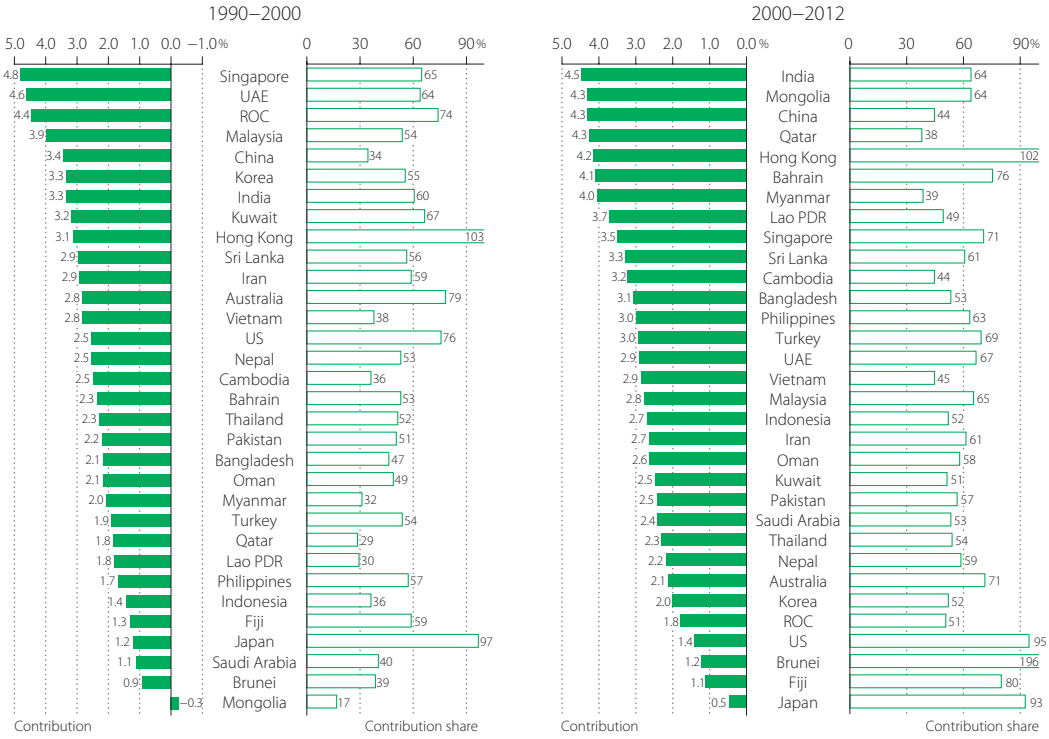



**Figure 78 Contribution of Service Sector to Economic Growth, 1990–2000 and 2000–2012**

Sources: Official national accounts in each country, including author adjustments.

The oil-exporting countries have different industry structures from other countries, with their reliance on mining for growth. The sector is volatile in nature and could in turn give rise to big swings in its economies from one period to another. In 2000–2012, mining accounted for almost half of economic growth in Qatar, 33% in Kuwait, 20% in Saudi Arabia, and only 3% in Iran, reflecting a drop in the demand toward the end of 2008 and 2009 (Figure 76). Still, it has been a drain on growth, in some cases a quite significant one. Its contribution was –7% in Bahrain and –134% in Brunei, reflecting a reduction in oil or gas production. These countries would do well to diversify. Bahrain has been successful in branching into finance, real estate, and business activities, which accounted for 32% of the 5.5% overall growth over the same period. Oman also sustained growth of 4.5% on average per year, 58% of which originated from the service sector. Brunei has not managed as well, with dismal growth of 0.7% on average per year between 2000 and 2012. Oil and gas production activities are also reflected in Mongolia and the Lao PDR, where mining accounted for 17% and 18% of overall economic growth, respectively, in the 2000s.

For some Asian countries, agriculture is still the biggest sector. The four countries in which the agriculture sector has the largest share in total value added are Myanmar, Cambodia, Nepal, and the Lao PDR (Figure 67). For the period 2000–2012, agriculture in Myanmar, Nepal, and Cambodia had the highest contribution to economic growth among all Asian countries, accounting for 33%, 30%, and 22% of growth, respectively.[87] In the latest period, agricultural output is still expanding in the majority of

87: In Myanmar, agriculture accounted for over 36.4% of GDP in 2012. Since 1988, the government has continued its modest steps to liberalize the sector and marketing controls have been made less onerous. As a result, farm production has increased. According to official statistics, the quality of which has been questionable, this sector accounted for 32.9% of GDP growth in 2000–2012.

**Table 15 Output Growth by Industry, 2000–2012**
——Average annual growth rate of industry GDP at constant prices

| | 1. Agriculture | | 2. Mining | | 3. Manufacturing | | 4. Electricity, gas, and water supply | | 5. Construction | | 6. Wholesale and retail trade, hotels, and restaurants | | 7. Transport, storage, and communications | | 8. Finance, real estate, and business activities | | 9. Community, social, and personal services | | Total economy |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bahrain | −0.8 | (−0.0) | −1.7 | (−0.4) | 7.4 | (0.9) | 12.3 | (0.2) | 7.6 | (0.6) | 5.3 | (0.4) | 9.0 | (0.5) | 6.8 | (1.7) | 8.8 | (1.5) | 5.5 |
| Bangladesh | 3.5 | (0.7) | 7.6 | (0.1) | 7.5 | (1.3) | 7.2 | (0.1) | 7.1 | (0.6) | 6.4 | (0.9) | 7.1 | (0.7) | 4.5 | (0.4) | 5.6 | (1.0) | 5.8 |
| Brunei | 3.1 | (0.0) | −1.3 | (−0.8) | 0.2 | (0.0) | 2.6 | (0.0) | 4.5 | (0.1) | 5.1 | (0.2) | 4.2 | (0.1) | 4.0 | (0.2) | 3.9 | (0.7) | 0.6 |
| Cambodia | 4.7 | (1.6) | 18.1 | (0.1) | 10.3 | (1.8) | 11.0 | (0.1) | 7.8 | (0.5) | 7.3 | (1.1) | 7.2 | (0.5) | 8.4 | (0.7) | 8.9 | (1.0) | 7.3 |
| China | 4.2 | (0.5) | 10.3 | (0.5) | 10.3 | (3.3) | 10.3 | (0.3) | 11.4 | (0.7) | 11.9 | (1.2) | 8.6 | (0.7) | 10.7 | (1.0) | 10.1 | (1.4) | 9.7 |
| ROC | 0.5 | (0.0) | −2.6 | (−0.0) | 6.4 | (1.7) | 2.6 | (0.0) | −0.4 | (−0.0) | 3.1 | (0.6) | 3.1 | (0.2) | 2.5 | (0.5) | 2.5 | (0.5) | 3.6 |
| Fiji | 0.0 | (0.0) | 0.8 | (0.0) | 0.8 | (0.1) | 2.4 | (0.1) | 2.1 | (0.1) | 2.0 | (0.3) | 2.0 | (0.3) | 1.5 | (0.3) | 1.2 | (0.2) | 1.4 |
| Hong Kong | −3.1 | (−0.0) | −3.1 | (−0.0) | −3.2 | (−0.1) | 1.5 | (0.0) | 0.2 | (0.0) | 6.1 | (1.7) | 4.0 | (0.5) | 5.0 | (1.7) | 1.7 | (0.3) | 4.1 |
| India | 3.2 | (0.6) | 3.8 | (0.1) | 7.4 | (1.1) | 5.7 | (0.1) | 8.2 | (0.6) | 7.9 | (1.3) | 11.3 | (0.9) | 9.7 | (1.5) | 6.1 | (0.8) | 7.1 |
| Indonesia | 3.5 | (0.5) | 1.2 | (0.1) | 4.6 | (1.2) | 7.3 | (0.1) | 6.7 | (0.5) | 6.2 | (0.9) | 11.7 | (0.7) | 6.5 | (0.5) | 5.3 | (0.5) | 5.2 |
| Iran | 3.3 | (0.3) | 0.8 | (0.2) | 7.0 | (0.9) | 6.5 | (0.1) | 2.5 | (0.1) | 4.9 | (0.7) | 8.1 | (0.6) | 6.3 | (0.9) | 3.0 | (0.4) | 4.3 |
| Japan | −1.5 | (−0.0) | −8.1 | (−0.0) | 1.3 | (0.3) | −2.0 | (−0.0) | −2.4 | (−0.1) | 0.1 | (0.0) | 1.4 | (0.1) | 0.1 | (0.0) | 1.1 | (0.3) | 0.5 |
| Korea | 0.9 | (0.0) | −1.3 | (−0.0) | 5.9 | (1.6) | 5.0 | (0.1) | 1.2 | (0.1) | 2.6 | (0.3) | 4.8 | (0.4) | 3.3 | (0.7) | 3.3 | (0.6) | 3.9 |
| Kuwait | 10.2 | (0.0) | 3.3 | (1.6) | 7.0 | (0.5) | 12.6 | (0.2) | 4.2 | (0.1) | 2.8 | (0.2) | 10.6 | (0.6) | 4.4 | (0.7) | 6.1 | (1.0) | 4.9 |
| Lao PDR | 2.8 | (0.9) | 36.8 | (1.4) | 9.0 | (0.8) | 5.6 | (0.2) | 9.0 | (0.5) | 10.0 | (2.0) | 8.5 | (0.4) | 8.6 | (0.5) | 9.7 | (0.8) | 7.6 |
| Malaysia | 2.9 | (0.3) | −0.0 | (−0.0) | 3.6 | (1.0) | 4.5 | (0.1) | 3.9 | (0.1) | 6.2 | (0.8) | 6.0 | (0.4) | 6.8 | (0.9) | 5.7 | (0.7) | 4.3 |
| Mongolia | 2.2 | (0.3) | 5.7 | (1.1) | 7.9 | (0.6) | 4.0 | (0.1) | 9.7 | (0.3) | 11.8 | (1.3) | 12.6 | (1.6) | 8.5 | (0.9) | 4.3 | (0.6) | 6.7 |
| Myanmar | 7.4 | (3.5) | 12.5 | (0.1) | 17.4 | (2.2) | 11.1 | (0.1) | 16.5 | (0.6) | 9.9 | (2.2) | 15.0 | (1.5) | 22.3 | (0.0) | 11.1 | (0.3) | 10.5 |
| Nepal | 3.2 | (1.1) | 3.8 | (0.0) | 1.3 | (0.1) | 5.4 | (0.1) | 3.3 | (0.2) | 1.7 | (0.2) | 6.3 | (0.6) | 4.3 | (0.6) | 7.2 | (0.8) | 3.7 |
| Oman | 2.8 | (0.0) | 0.1 | (0.1) | 10.6 | (0.9) | 9.2 | (0.1) | 17.9 | (0.7) | 6.0 | (0.5) | 13.2 | (0.7) | 6.4 | (0.6) | 5.7 | (0.8) | 4.5 |
| Pakistan | 2.7 | (0.6) | 4.8 | (0.1) | 6.4 | (1.1) | −0.4 | (−0.0) | 3.3 | (0.1) | 4.2 | (0.7) | 3.1 | (0.4) | 5.2 | (0.4) | 6.4 | (1.0) | 4.3 |
| Philippines | 2.8 | (0.4) | 9.7 | (0.1) | 3.9 | (0.9) | 4.1 | (0.2) | 4.3 | (0.2) | 5.2 | (0.9) | 6.6 | (0.5) | 6.3 | (1.0) | 4.6 | (0.6) | 4.7 |
| Qatar | 5.4 | (0.0) | 9.5 | (5.0) | 10.1 | (0.9) | 7.9 | (0.1) | 20.3 | (1.1) | 14.8 | (0.9) | 21.0 | (0.7) | 14.9 | (1.7) | 10.6 | (1.0) | 11.3 |
| Saudi Arabia | 1.2 | (0.0) | 2.1 | (0.9) | 7.6 | (0.8) | 10.3 | (0.1) | 6.1 | (0.3) | 9.6 | (0.7) | 11.6 | (0.5) | 6.8 | (0.6) | 3.7 | (0.6) | 4.6 |
| Singapore | 0.9 | (0.0) | 0.0 | (0.0) | 5.2 | (1.3) | 3.8 | (0.1) | 3.3 | (0.1) | 5.6 | (1.1) | 4.0 | (0.5) | 5.3 | (1.4) | 4.8 | (0.5) | 5.0 |
| Sri Lanka | 2.9 | (0.4) | 12.9 | (0.2) | 4.4 | (0.8) | 6.3 | (0.1) | 7.9 | (0.6) | 5.2 | (1.2) | 8.3 | (1.0) | 5.6 | (0.7) | 4.0 | (0.4) | 5.4 |
| Thailand | 2.4 | (0.2) | 4.6 | (0.1) | 4.6 | (1.4) | 5.6 | (0.2) | 3.3 | (0.1) | 3.7 | (0.7) | 5.8 | (0.4) | 6.0 | (0.7) | 3.4 | (0.5) | 4.3 |
| UAE | −2.8 | (−0.0) | 0.9 | (0.3) | 3.0 | (0.3) | 9.0 | (0.2) | 7.4 | (0.7) | 4.8 | (0.9) | 7.7 | (0.6) | 6.0 | (1.0) | 7.5 | (0.5) | 4.4 |
| Vietnam | 3.6 | (0.7) | 2.5 | (0.2) | 9.6 | (1.8) | 10.2 | (0.4) | 8.0 | (0.5) | 7.5 | (1.2) | 8.0 | (0.3) | 5.5 | (0.6) | 6.6 | (0.7) | 6.5 |
| (regrouped) | | | | | | | | | | | | | | | | | | | |
| APO20 | 2.9 | (0.3) | 1.8 | (0.1) | 4.7 | (0.9) | 2.9 | (0.1) | 3.5 | (0.2) | 4.4 | (0.7) | 5.9 | (0.5) | 4.7 | (0.7) | 3.2 | (0.6) | 4.0 |
| Asia23 | 3.5 | (0.4) | 5.2 | (0.2) | 7.2 | (1.7) | 5.9 | (0.2) | 6.1 | (0.4) | 6.4 | (0.9) | 6.8 | (0.6) | 6.1 | (0.8) | 5.1 | (0.8) | 5.9 |
| Asia29 | 3.4 | (0.3) | 4.0 | (0.3) | 7.2 | (1.6) | 6.1 | (0.2) | 6.3 | (0.4) | 6.5 | (0.9) | 7.0 | (0.6) | 6.1 | (0.8) | 5.1 | (0.8) | 5.8 |
| East Asia | 3.7 | (0.3) | 10.0 | (0.3) | 7.9 | (2.1) | 6.2 | (0.2) | 5.8 | (0.3) | 6.5 | (0.8) | 5.5 | (0.5) | 5.0 | (0.7) | 5.0 | (1.0) | 6.1 |
| South Asia | 3.1 | (0.6) | 4.2 | (0.1) | 7.1 | (1.1) | 4.7 | (0.1) | 7.9 | (0.5) | 7.1 | (1.2) | 9.4 | (0.8) | 9.1 | (1.3) | 6.1 | (0.8) | 6.6 |
| ASEAN | 3.6 | (0.4) | 1.5 | (0.1) | 4.9 | (1.2) | 6.0 | (0.1) | 5.9 | (0.3) | 5.7 | (0.9) | 8.2 | (0.6) | 6.2 | (0.7) | 4.9 | (0.6) | 4.9 |
| ASEAN6 | 3.1 | (0.4) | 1.2 | (0.1) | 4.4 | (1.2) | 5.2 | (0.1) | 5.5 | (0.3) | 5.4 | (0.9) | 8.0 | (0.6) | 6.2 | (0.7) | 4.7 | (0.5) | 4.8 |
| CLMV | 5.1 | (1.4) | 3.6 | (0.2) | 11.0 | (1.9) | 10.0 | (0.3) | 9.3 | (0.5) | 8.3 | (0.0) | 10.7 | (0.6) | 5.8 | (0.5) | 7.2 | (0.6) | 6.1 |
| GCC | 1.0 | (0.0) | 2.5 | (1.1) | 6.9 | (0.7) | 10.1 | (0.1) | 7.9 | (0.4) | 7.4 | (0.7) | 10.7 | (0.6) | 6.7 | (0.8) | 5.1 | (0.7) | 5.1 |
| (reference) | | | | | | | | | | | | | | | | | | | |
| US | 1.4 | (0.0) | 1.2 | (0.0) | 1.2 | (0.2) | 0.4 | (0.0) | −2.8 | (−0.1) | 1.4 | (0.2) | 3.6 | (0.3) | 2.1 | (0.7) | 1.2 | (0.3) | 1.5 |
| Australia | 1.1 | (0.0) | 3.8 | (0.3) | 3.0 | (0.1) | 1.0 | (0.0) | 6.4 | (0.4) | 3.0 | (0.4) | 3.4 | (0.3) | 3.1 | (0.6) | 3.0 | (0.9) | 3.0 |
| Turkey | 1.8 | (0.2) | 1.7 | (0.0) | 4.0 | (0.8) | 4.9 | (0.1) | 4.0 | (0.2) | 3.5 | (0.6) | 5.6 | (0.9) | 5.8 | (0.9) | 4.0 | (0.6) | 4.3 |

Unit: Average annual growth rate (percentage), contribution in parentheses.
Sources: Official national accounts in each country, including author adjustments.

Asian countries, suggesting that the shrinkage in its value-added share (Figure 71) over the recent period is more a result of rapid growth in other sectors than any actual contraction of the sector.

Comparisons across the country groups in Table 15 reveal that Asia enjoyed more vibrant growth than the US in all sectors. It is notable that the US was more directly affected by the global financial crisis of 2008–2009 than Asia. Overall construction retrenched in the US in the 2000s, while growth has been strongest in CLMV and the GCC countries at 8.8% and 7.9% per year on average, respectively. Apart

from construction, the other fast-growing sectors in CLMV and the GCC countries were transportation, storage, and communications (at over 10% per year on average), presumably reflecting their effort in building and upgrading infrastructure for their development needs. Finance, real estate, and business activities also enjoyed robust expansion at 9.1% per year on average in South Asia. Manufacturing has been growing at 10.5% per year on average in CLMV, compared with 4.4% in ASEAN6.

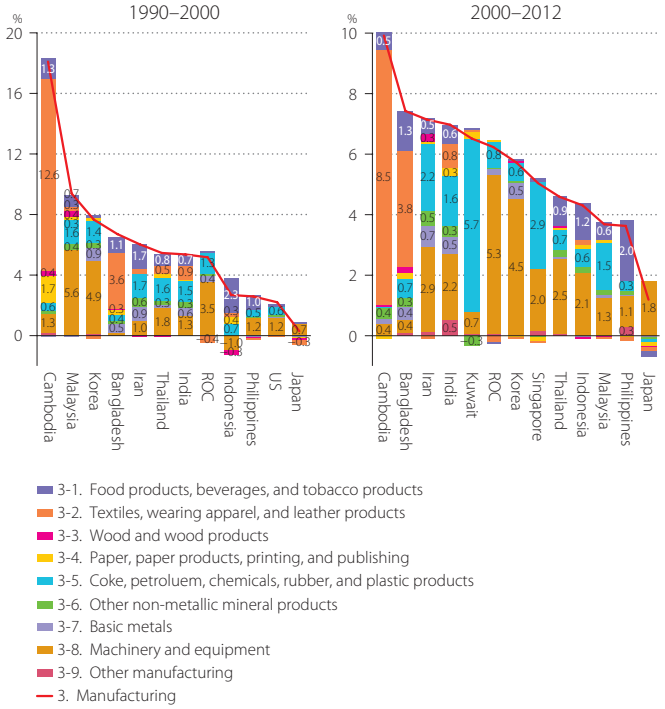



**Figure 79 Industry Origins of Output Growth in Manufacturing, 1990–2000 and 2000–2012**
——Sub-industry decomposition: Average annual growth rate of GDP at constant prices of manufacturing

Sources: Official national accounts in each country, including author adjustments.

Figure 79 presents the sub-industry origins of average annual growth of manufacturing GDP for selected Asian countries for the periods 1990–2000 and 2000–2012.[88] Manufacturing in Asia has been dominated by 3-8 (machinery and equipment) accounting for 40% or more of overall manufacturing growth in half of the Asian countries compared. In Korea and the ROC, it was over 80%. The sub-sector 3-1 (food products, beverages, and tobacco products) is the largest contributor in the Philippines for 2000–2012, accounting for 54% of manufacturing output growth. In Bangladesh and Cambodia, manufacturing growth has been dominated by the sub-sector of 3-2 (textiles, wearing apparel, and leather products), whereas in Kuwait, and to a lesser extent Singapore and Malaysia, it is 3-5 (coke, petroleum, chemicals, rubber, and plastic products).

Figure 80 contrasts industry contributions to economic growth for the periods of 1990–2000 and 2000–2012, as well as between the US and Asian averages.[89] Even within such a short period, one can see that the industry structure of growth is changing. The first striking feature is the dominance of manufacturing in Asian countries. Between 1990 and 2000, its contribution to economic growth in Asia23 was 32% compared to 19% in the US. Although its significance has fallen in recent years, it still accounted for 29% of economic growth in Asia23 between 2000 and 2012, compared with 10% in the US. This, however, masks a divergence within Asia. In the earlier period, manufacturing accounted for 38% of growth in East Asia but only 17% in South Asia. The corresponding figures were 35% and 17%

88: The Törnqvist quantity index is adopted for calculating the growth of real GDP of manufacturing. Using this index, the growth of real GDP of manufacturing into the products of contributions by sub-industries of manufacturing can be decomposed:
$\underbrace{\ln\left(GDP^{t} / GDP^{t-1}\right)}_{\text{Real GDP growth of manufacturing}} = \sum_{j} \underbrace{(1/2)\left(s_{j}^{t} + s_{j}^{t-1}\right) \ln\left(Q_{j}^{t} / Q_{j}^{t-1}\right)}_{\text{Contribution of a sub-industry } j}$ where $Q_{j}^{t}$ is real GDP of a sub-industry $j$ in period $t$ and $s_{j}^{t}$ is the nominal GDP share of a sub-industry $j$ in period $t$.

89: Asian averages are calculated using the Törnqvist index to aggregate the growth rates of industry GDP of each country based on the two-period average of each country's shares of industry GDP to the gross regional products as weights.

in 2000–2012. The differential is somewhat narrowing.

In ASEAN, manufacturing's contribution was reduced to 25% in 2000–2012 from 33% in the 1990s, while wholesale and retail trade, hotels, and restaurants increased from 16% to 18%. In the US, the finance, real estate, and business activities sub-sector made the biggest contribution in both periods, accounting for 31% of economic growth in 1990–2000 and rising to 44% in 2000–2012. In contrast, its contribution in Asia23 was 13% in the period 2000–2012. Mining in GCC countries took a hit in 2008–2009 due to the downturn in the world economy. Consequently, the contribution of mining fell from 24% to 21% between the two periods while construction's share increased from 6% to 9%. Finance, real estate, and business activities became the biggest contributors of economic growth in GCC countries, with its share rising from 12% to 16% between the two periods.

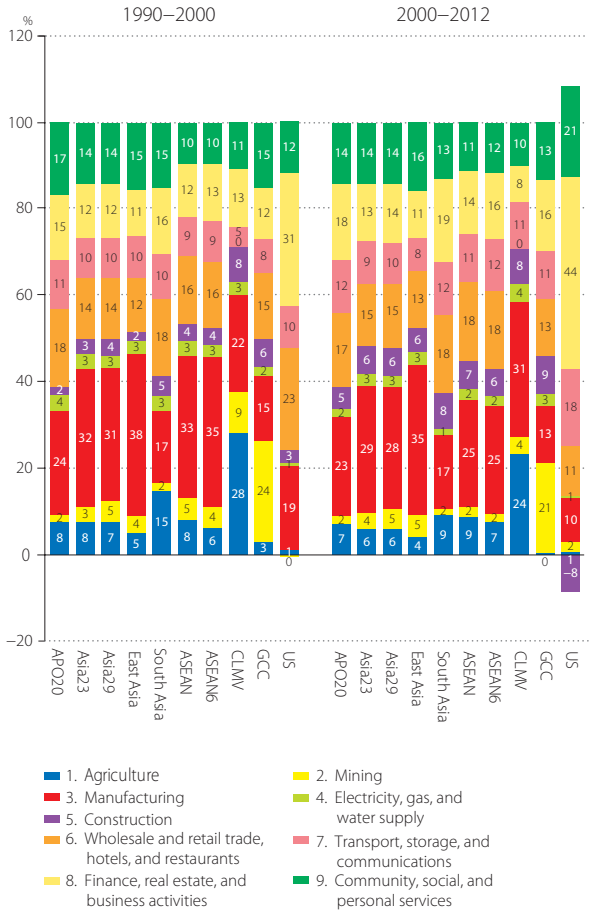



**Figure 80 Industry Origins of Regional Economic Growth, 1990–2000 and 2000–2012**
——Contribution share

Sources: Official national accounts in each country, including author adjustments.

Figure 81 presents industry contributions to regional economic growth in Asia29 during 2000–2012, decomposing Figure 7 (p. 20) in Section 3.1 into countries' industry origins.[90] In each industry contribution, the top eight countries are presented. The top four industries in terms of contributions to regional growth were manufacturing (29%), wholesale and retail trade (15%), finance, real estate, and business activities (13%), and community, social, and personal services (14%). A total of 29% of Asian economic growth originated from the expansion of its manufacturing sector, two-thirds of which was accounted for by China. In other words, China's manufacturing sector alone accounted for nearly 17% of the region's economic growth. This was followed by China's community, social, and personal services (7.3%) and wholesale and retail trade, hotels, and restaurants (6.4%).

Over a period of four decades there has been a noticeable shift in the industry origins of economic growth (Figure 82). For the ROC and Korea, manufacturing has been a clear driving force behind

90: The average growth rate of the Asian economy for 2000–2012 is set at 100%. Asian economic growth is calculated as the sum of the contributions over countries and industries:
$\sum_x (1/2)\left(S_x^t + S_x^{t-1}\right) \underbrace{\sum_j (1/2)\left(s_{x,j}^t + s_{x,j}^{t-1}\right) \ln\left(Q_{x,j}^t / Q_{x,j}^{t-1}\right)}_{\text{Contribution of an industry } j \text{ in a country } x}$ where $Q_{x,j}^t$ is real GDP of an industry $j$ in a country $x$ in period $t$, $s_{x,j}^t$ is GDP share of an industry $j$ in a country $x$ with respect to GDP of a country $x$ in period $t$ and $s_x^t$ is GDP share of a country $x$ with respect to the regional GDP in period $t$. All the industries whose contribution is more than 0.25% are shown in Figure 81.

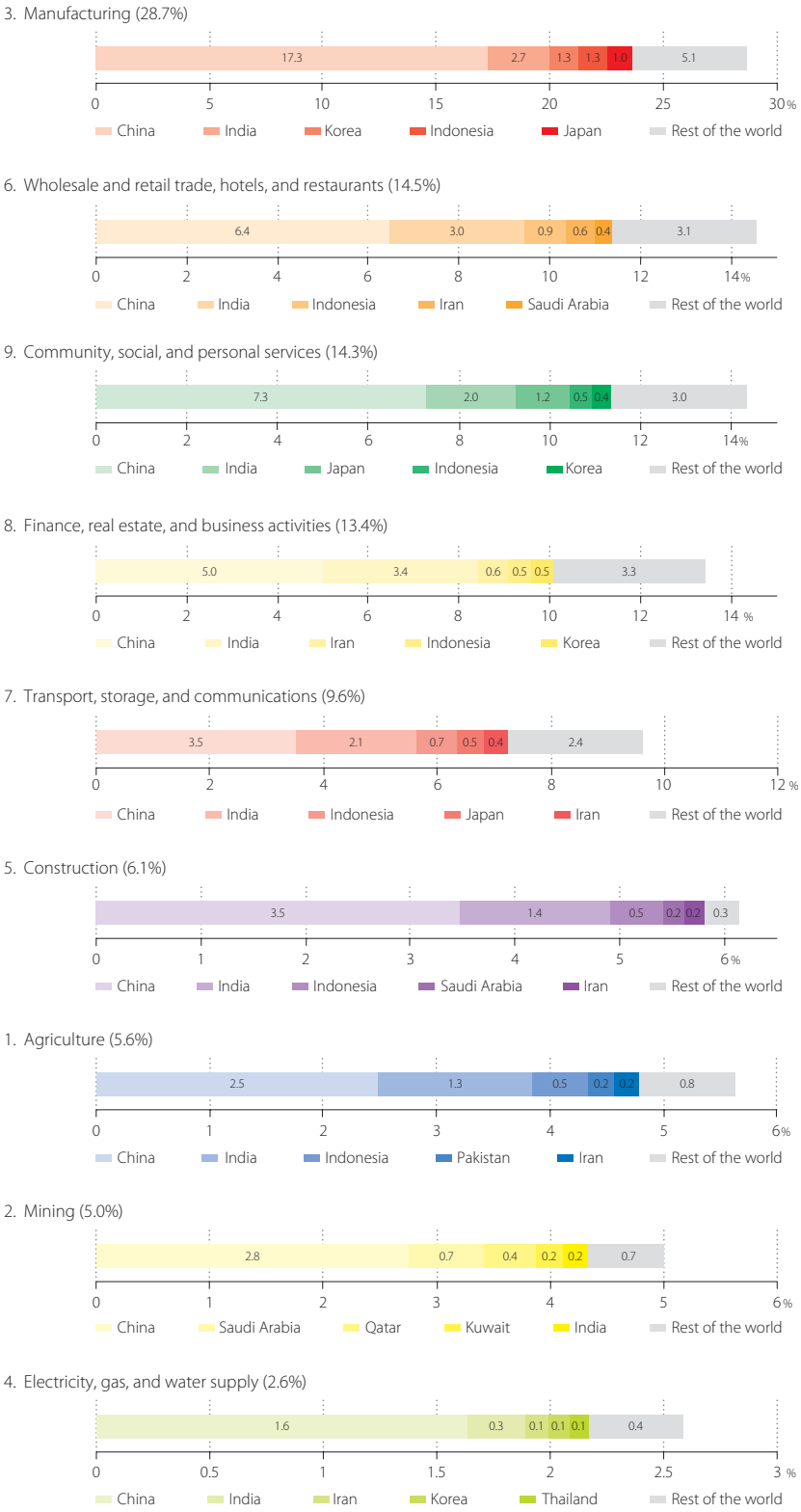



**Figure 81 Industry Origins of Asian Economic Growth, 2000–2012**
——Contribution to regional growth of GDP at constant prices, using 2011 PPP

Sources: Official national accounts in each country, including author adjustments.

economic growth on the whole. In the decade between the mid-1980s and the mid-1990s, however, the importance of manufacturing retreated in the ROC temporarily while the economy developed its service sector. Since the mid-1990s, the role of manufacturing in the ROC has increased again, although compared to its heydays of the 1970s and 1980s its impact in terms of percentage points is much reduced. In Singapore, finance, real estate, and business activities, as well as wholesale and retail trade, hotels, and restaurants are important drivers alongside the manufacturing sector. Working within the data constraints, Hong Kong appears a clear service-driven economy in recent years. While the lack of diversification of the oil-exporting countries cannot be missed; historically, the dominance of the mining sector influenced the economic volatility of these countries. In recent years the GCC countries have been making efforts in diversifying, especially into the service sector, with different degrees of success. Bahrain and Oman are leading the way and have yielded results. The largely agricultural countries are Myanmar, the Lao PDR, Cambodia, Nepal, and Pakistan, and, to a lesser extent, Vietnam and Bangladesh. In the Philippines, construction was driving economic growth in the first half of the period, but it never recovered its dominance after its crash in the mid-1980s. In the second half, economic growth was better balanced, with the development of finance, real estate, and business activities in particular.



## 6.3 Labor Productivity by Industry

Section 5.1 discusses per-worker measures of labor productivity performance in level terms, and identifies a large gap between Asia as a whole and the US. In 2012, Singapore and Hong Kong were the countries that had labor productivity levels comparable to the US. Besides these two, the best performers in Asia achieved productivity levels that were at least 40% of the US. However, Asia collectively was dragged down by a long tail of countries with labor productivity of less than 20% of the US level. This pulled down the average performance to 19% of the US for the APO20 and 18% for Asia23 (Table 8, p. 59). In growth terms, however, Asia's performance far exceeded the US, allowing the countries to gradually close the gap with the US over time. Labor productivity growth in Asia23 was 5.2% per year on average between 2005 and 2012, compared to 1.3% in the US (Table 9, p. 61).

Table 16 presents cross-country comparisons in labor productivity growth by industry[91] for the period 2000–2012.[92] Positive labor productivity growth was achieved across all sectors for Asia23. If one focuses on the regional economy, the findings highlight the fact that service industries no longer hamper an economy's productivity performance, but are as capable as manufacturing in achieving productivity growth. In fact, there are no significant differences between manufacturing and some services in Asia23; i.e., manufacturing (at 5.0% on average per year), electricity (4.2%), transport, storage, and communications (4.1%), and agriculture (4.0%). Construction was the sector with the slowest productivity growth at 0.7%.

91: Labor productivity growth in Table 16 is defined simply as per-worker GDP at constant prices by industry ($v_j$). The industry decomposition of labor productivity growth for the whole economy ($v$) in Figure 83 (industry contribution in Table16) is based on the equation $v = \sum_j \overline{w}_j v_j^*$ where the weight is the two-period average of value-added shares. In this decomposition, the number of workers as a denominator of labor productivity ($v_j^*$) is adjusted, weighting the reciprocal of the ratio of real per-worker GDP by industry to its industry average. Thus, the industry contribution ($\overline{w}_j v_j^*$) is emphasized more in industries in which the per-worker GDP is higher than the industry average, in comparison with the impact ($\overline{w}_j v_j$) of using the non-adjusted measure of labor productivity.

92: The data presented in this chapter is subject to bigger uncertainty than those in previous chapters and the quality across countries is also more varied. Employment data of the less developed countries often lacks frequency as well as industry details. Neither does the industry classification of employment data necessarily correspond to those of industry output data. Consequently, the quality of labor productivity estimates at the industry level is compromised. Furthermore, estimates of the manufacturing sector should be of better quality than those of the service sector as many countries have occasional manufacturing censuses, but do not have a similar census covering the service sector.


Bahrain
Bangladesh
Brunei
Cambodia
China
ROC
Hong Kong
India
Indonesia
Iran
Japan
Korea
Kuwait
Lao PDR
Malaysia
Mongollia
Myanmar
Nepal
%
1971 1976 1981 1986 1991 1996 2001 2006 2011
1. Agriculture
2. Mining
3. Manufacturing
4. Electricity, gas, and water supply
5. Construction
6. Wholesale and retail trade, hotels, and restaurants
7. Transport, storage, and communications
8. Finance
9. Community, social, and personal services
Real GDP


**Figure 82 Industry Origins of Economic Growth, 1970–2012**
——Industry decomposition: Average annual growth rate of GDP at constant prices

Sources: Official national accounts in each country, including author adjustments.

Figure 83 shows the industry origins of average labor productivity growth per year in two periods: 1990–2000, and 2000–2012.[93] In the past two decades, the role played by agriculture (both positive and negative) has been diminishing in Asian countries. While the importance of manufacturing has never waned in some countries (e.g., Korea, the ROC, China, and Thailand), it has not been a major contributor in India in its recent development process, or in Hong Kong and Sri Lanka in the 2000s.

**Table 16 Labor Productivity Growth by Industry, 2000–2012**
——Average annual growth rate of industry labor productivity

| | 1. Agriculture | 2. Mining | 3. Manufacturing | 4. Electricity, gas, and water supply | 5. Construction | 6. Wholesale and retail trade, hotels, and restaurants | 7. Transport, storage, and communications | 8. Finance, real estate, and business activities | 9. Community, social, and personal services | Total economy |
|---|---|---|---|---|---|---|---|---|---|---|
| Bahrain | −4.9 (−0.1) | 4.3 (−0.3) | 2.2 (0.1) | 19.4 (0.2) | −6.9 (−1.7) | −2.3 (−0.9) | −3.6 (−0.4) | 6.4 (1.8) | 0.3 (−1.8) | −3.1 |
| Bangladesh | 1.0 (−0.6) | 6.4 (0.1) | 1.7 (0.6) | 6.9 (0.1) | −0.6 (0.3) | 3.1 (0.4) | 2.1 (0.4) | −4.7 (0.3) | 4.6 (0.9) | 2.5 |
| Brunei | −4.4 (−0.1) | −4.8 (−0.9) | 0.6 (0.0) | 0.4 (0.0) | −5.7 (−1.3) | −0.8 (−0.8) | −0.5 (−0.1) | 3.5 (0.2) | 5.0 (1.2) | −1.9 |
| Cambodia | 3.8 (1.0) | 13.6 (0.1) | 3.3 (1.2) | −3.3 (0.0) | −3.6 (0.3) | 0.2 (0.1) | 1.3 (0.4) | 1.3 (0.6) | 0.9 (0.3) | 4.0 |
| China | 7.0 (1.6) | 8.4 (0.5) | 7.6 (2.9) | 7.7 (0.3) | 7.3 (0.4) | 8.0 (0.9) | 7.0 (0.6) | 8.5 (1.0) | 7.7 (1.0) | 9.1 |
| ROC | 3.0 (0.2) | 5.9 (0.0) | 5.5 (1.5) | 2.8 (0.0) | −0.5 (−0.0) | 1.9 (0.3) | 2.9 (0.2) | −0.2 (0.2) | 0.1 (0.0) | 2.5 |
| Fiji | 2.1 (0.2) | −0.3 (0.1) | 1.7 (0.3) | −3.1 (−0.2) | −7.0 (−0.3) | 0.0 (0.0) | 1.8 (0.3) | −2.4 (0.2) | 1.6 (0.3) | 0.9 |
| Hong Kong | −2.4 (−0.0) | 0.0 (0.0) | 4.4 (0.2) | 2.6 (0.0) | 0.3 (0.0) | 4.8 (1.1) | 2.4 (0.2) | 1.7 (1.2) | −0.2 (−0.2) | 2.6 |
| India | 1.9 (−0.1) | 4.5 (0.1) | 6.9 (1.0) | 8.0 (0.1) | −1.8 (−0.0) | 4.2 (0.9) | 7.5 (0.7) | 5.4 (1.4) | 5.9 (0.8) | 5.0 |
| Indonesia | 3.8 (0.6) | −4.3 (0.1) | 2.2 (0.9) | 3.8 (0.1) | 1.1 (0.3) | 4.3 (0.5) | 10.9 (0.7) | −2.7 (0.3) | 0.4 (−0.1) | 3.3 |
| Iran | 2.3 (0.1) | 1.1 (0.2) | 6.1 (0.8) | 4.9 (0.1) | −2.1 (−0.5) | 2.6 (0.4) | 3.9 (0.2) | 1.6 (0.8) | 3.5 (0.5) | 2.6 |
| Japan | 0.4 (0.1) | −2.0 (−0.0) | 3.0 (0.6) | −2.2 (−0.0) | −0.7 (0.0) | 0.0 (0.0) | 0.8 (0.1) | 0.2 (0.0) | 0.3 (0.0) | 0.7 |
| Korea | 4.1 (0.3) | −0.2 (−0.0) | 5.9 (1.7) | 3.5 (0.1) | 0.2 (0.0) | 2.9 (0.3) | 2.6 (0.3) | −0.8 (0.2) | −0.8 (−0.2) | 2.6 |
| Kuwait | 7.5 (0.0) | −1.6 (1.7) | 0.5 (0.2) | 7.6 (0.1) | 1.3 (−0.4) | 1.0 (−0.2) | 6.1 (0.5) | −7.2 (−0.2) | −2.5 (−3.4) | −1.7 |
| Malaysia | 2.7 (0.2) | −8.9 (−0.1) | 3.4 (1.0) | −4.4 (0.0) | 0.3 (−0.2) | 1.7 (−0.2) | 0.6 (0.1) | −1.1 (0.3) | 4.3 (0.4) | 1.5 |
| Mongolia | 2.7 (0.6) | −2.0 (0.9) | 6.5 (0.5) | 2.6 (0.0) | 1.9 (−0.1) | 7.6 (0.6) | 6.5 (1.1) | 6.2 (0.8) | 0.5 (−0.2) | 4.4 |
| Nepal | −0.3 (−1.3) | −2.9 (0.0) | 1.0 (0.1) | 5.1 (0.1) | −1.0 (0.1) | 1.5 (0.3) | 1.5 (0.5) | 0.9 (0.5) | 7.8 (0.9) | 1.1 |
| Oman | 0.0 (0.0) | −1.9 (0.1) | 5.9 (0.6) | −2.1 (0.0) | −1.0 (−3.9) | 1.6 (−0.0) | 2.5 (0.2) | 0.3 (0.4) | 0.4 (−0.9) | −3.5 |
| Pakistan | 0.1 (−0.6) | −4.3 (0.1) | 1.8 (0.5) | −0.5 (0.0) | −1.4 (−0.2) | −0.4 (0.0) | −0.2 (0.2) | −2.5 (0.3) | 5.3 (0.8) | 1.2 |
| Philippines | 1.5 (−0.1) | 2.5 (0.1) | 2.9 (0.8) | 1.8 (0.1) | 0.8 (0.1) | 0.2 (−0.2) | 3.3 (0.2) | −1.6 (0.8) | 3.2 (0.4) | 2.1 |
| Qatar | −1.5 (−0.2) | −6.2 (4.3) | 1.5 (0.1) | 2.6 (0.1) | 2.6 (−5.1) | 3.2 (−0.7) | 3.5 (−0.1) | 8.6 (1.3) | 1.9 (−1.2) | −1.6 |
| Saudi Arabia | −1.5 (−0.1) | 1.5 (1.0) | 3.6 (0.5) | 7.6 (0.1) | −3.3 (−0.9) | 5.2 (−0.2) | 7.3 (0.3) | −0.4 (0.3) | 0.3 (−1.0) | 0.0 |
| Singapore | −6.3 (−0.0) | 0.0 (0.0) | 3.7 (1.0) | 1.1 (0.1) | 0.0 (−0.3) | 1.8 (0.3) | 0.6 (0.2) | −0.3 (1.0) | −0.1 (−1.0) | 1.3 |
| SriLanka | 3.2 (0.4) | 11.6 (0.2) | 2.2 (0.4) | 11.8 (0.2) | 6.0 (0.5) | 2.6 (0.8) | 5.2 (0.8) | −0.1 (0.5) | 3.0 (0.2) | 3.9 |
| Thailand | 1.5 (−0.1) | 0.5 (0.1) | 3.4 (1.2) | 7.0 (0.2) | −0.9 (−0.1) | 1.4 (0.2) | 6.1 (0.4) | 2.3 (0.6) | −0.5 (0.0) | 2.5 |
| UAE | −1.2 (0.0) | −4.8 (0.3) | −0.8 (−0.0) | 0.9 (0.1) | 5.8 (−0.2) | −2.1 (−0.4) | 0.4 (0.1) | −8.3 (−0.1) | −1.4 (−2.4) | −2.6 |
| Vietnam (regrouped) | 3.7 (0.8) | 1.7 (0.2) | 4.0 (1.1) | 2.6 (0.3) | −0.3 (0.1) | 2.6 (0.5) | 4.7 (0.2) | −4.3 (0.6) | −0.4 (0.1) | 3.9 |
| APO20 | 1.7 (−0.2) | 0.3 (0.1) | 3.3 (0.8) | 1.3 (0.1) | −3.1 (−0.2) | 1.5 (0.3) | 2.7 (0.3) | 0.1 (0.6) | 1.5 (0.4) | 2.0 |
| Asia23 | 4.0 (0.6) | 3.3 (0.2) | 5.0 (1.4) | 4.2 (0.1) | 0.7 (0.0) | 3.0 (0.5) | 4.1 (0.4) | 1.9 (0.7) | 2.9 (0.5) | 4.6 |
| Asia29 | 4.0 (0.6) | 2.1 (0.3) | 4.9 (1.4) | 4.3 (0.1) | 4.5 (0.0) | 3.0 (0.5) | 4.2 (0.4) | 1.8 (0.7) | 2.9 (0.5) | 4.5 |
| East Asia | 6.4 (1.3) | 7.6 (0.3) | 5.3 (1.7) | 3.6 (0.2) | 2.2 (0.1) | 3.2 (0.5) | 3.9 (0.4) | 2.7 (0.6) | 2.7 (0.5) | 5.5 |
| South Asia | 1.5 (−0.2) | 4.4 (0.1) | 5.5 (0.9) | 6.3 (0.1) | −1.7 (−0.0) | 3.3 (0.8) | 5.1 (0.6) | 4.0 (1.2) | 5.5 (0.8) | 4.3 |
| ASEAN | 3.4 (0.4) | −3.4 (0.1) | 2.3 (0.9) | 1.6 (0.1) | 4.1 (0.0) | 2.4 (0.3) | 5.8 (0.5) | −1.5 (0.5) | 0.7 (0.0) | 2.9 |
| ASEAN6 | 2.8 (0.2) | −4.5 (0.0) | 2.6 (0.9) | 2.0 (0.1) | 0.7 (0.0) | 2.5 (0.3) | 5.9 (0.5) | −1.4 (0.5) | 1.0 (0.0) | 2.7 |
| CLMV | 5.0 (1.4) | 2.5 (0.2) | 4.7 (1.3) | 1.5 (0.2) | 0.4 (0.2) | 2.8 (0.1) | 6.6 (0.5) | 3.5 (0.1) | −0.2 (0.1) | 4.2 |
| GCC (reference) | −1.1 (−0.0) | −2.0 (1.0) | 2.1 (0.3) | 5.2 (0.1) | −1.7 (−1.0) | 2.1 (−0.2) | 3.4 (0.2) | −2.9 (0.3) | −0.4 (−1.5) | −0.8 |
| US | 2.3 (0.0) | −2.4 (0.0) | 4.3 (0.5) | 1.2 (0.0) | −1.4 (−0.1) | 1.7 (0.2) | 4.6 (0.3) | 1.7 (0.6) | 0.1 (−0.1) | 1.4 |
| Australia | 3.7 (0.1) | −6.0 (0.2) | 1.2 (0.1) | −3.4 (−0.0) | 3.0 (0.2) | 1.5 (0.0) | 2.0 (0.2) | 0.9 (0.5) | 0.0 (−0.3) | 0.9 |
| Turkey | 3.6 (0.8) | −2.0 (0.0) | 2.3 (0.4) | −0.8 (0.1) | 2.8 (0.1) | 1.5 (0.2) | 3.8 (0.8) | −1.4 (0.5) | 1.3 (0.2) | 3.0 |

Unit: Average annual growth rate (percentage), contribution in parentheses.
Source: APO Productivity Database 2014.01.

93: Not all Asian countries are included, as employment by industry sector is not available for some countries.

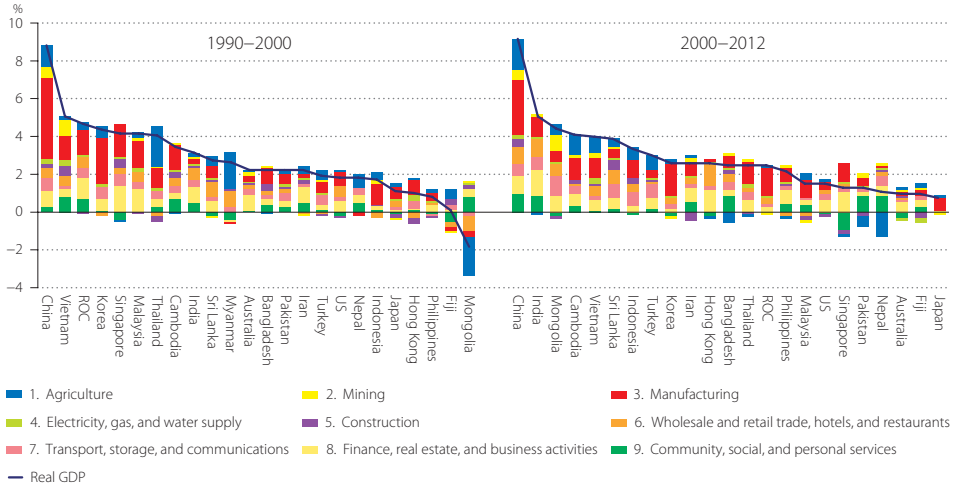



**Figure 83 Industry Origins of Labor Productivity Growth, 1990–2000 and 2000–2012**
——Industry decomposition: Average annual growth rate of GDP at constant prices

Source: APO Productivity Database 2014.01.

The manufacturing sector has been a major driving force behind productivity growth in most Asian countries, as shown in Figure 84. In the 1990s, manufacturing accounted for a significant part of labor productivity growth in Hong Kong (83%), Indonesia (63%), and China (49%). Nevertheless, its role has lessened in 2000–2012 to 7%, 28%, and 32%, respectively. In contrast, contributions from manufacturing strengthened from 56% to 64% in Korea, from 28% to 61% in the ROC, and from 55% to 80% in Japan between the two periods. In other economies, however, like Sri Lanka, Nepal, and Mongolia, in the 2000s manufacturing played a negligible role.

Traditionally, it has been difficult for the service sector to realize productivity growth, but modern advancements in information and communication technology have changed this. Many IT-intensive users are located in this sector, which is capable of capturing the productivity benefits arising from IT utilization. The growing importance of these services has been observed in explaining the productivity growth in Western economies of recent decades. In Asia, the contribution from services matches that of manufacturing. Among the four industries in the service sector, three are potentially IT-employing industries: wholesale and retail trade, hotels, and restaurants; transport, storage, and communications; and finance, real estate, and business activities.

Figure 85 presents the contribution of services in labor productivity growth by country. In 2000–2012, services were contributing at least one-third or more to labor productivity growth in most Asian countries. The contribution was predominant in Hong Kong and India, accounting for 91% and 77% of labor productivity growth, respectively. It also accounted for around two-thirds or more of labor productivity growth in the US, Sri Lanka, and Singapore. Korea had the lowest share from the service sector, accounting for one-fifth of labor productivity growth. There is an expansion of the role played by services in China between these two periods, from 26% to 38%. The contribution of services was also highly significant in South Asian countries like Bangladesh, India, Nepal, and Pakistan over the same term. Finance, real estate, and business activities made the largest contribution of 1.4 percentage points in India and 1.0 percentage point in Singapore, respectively.

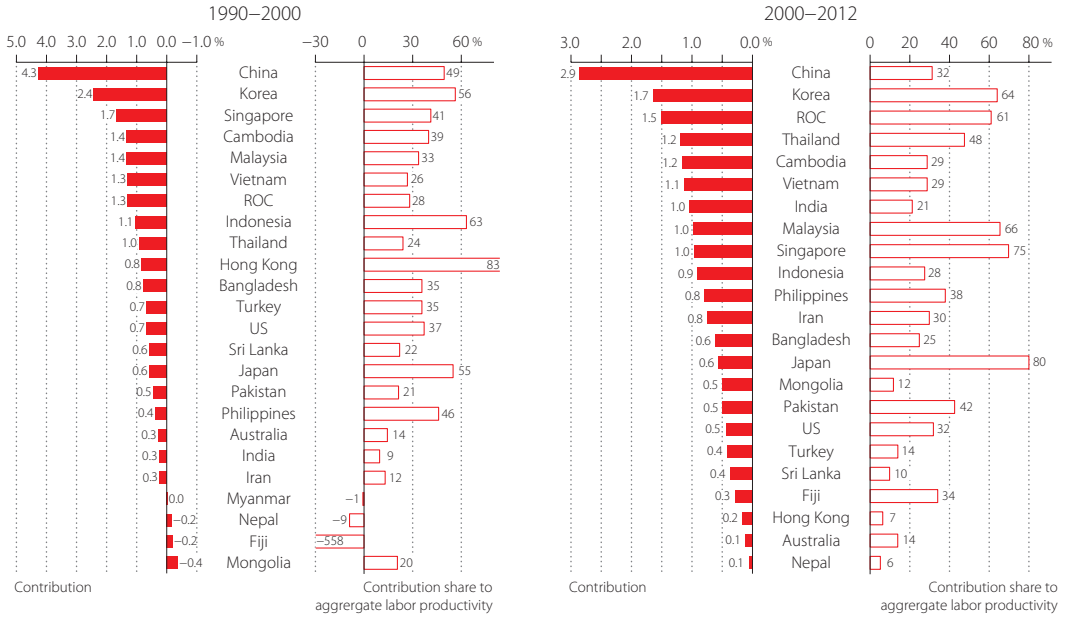



**Figure 84 Contribution of Manufacturing to Labor Productivity Growth, 1990–2000 and 2000–2012**

Source: APO Productivity Database 2014.01.

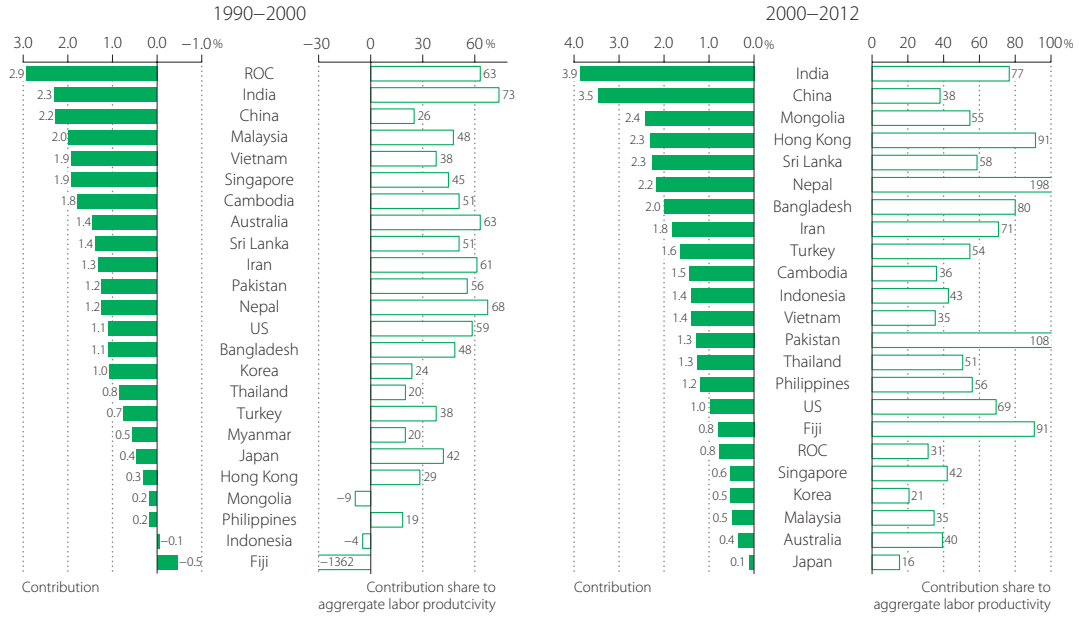



**Figure 85 Contribution of Service Sector to Labor Productivity Growth, 1990–2000 and 2000–2012**

Source: APO Productivity Database 2014.01.

## Box 6 Energy Productivity and CO2 Emission

In 2011, in order to produce 40% of the world output in Asia, 43% of world energy was consumed and 51% of world CO2 was emitted (Figure B6.1). This implies that Asia has lower energy productivity (output per energy consumption) and higher carbon intensity of energy at the aggregate level (mainly due to a larger consumption of coal). It is key to improve energy productivity and carbon intensity in the growing economies of Asia, in order to reduce CO2 emissions in the world in the long run.

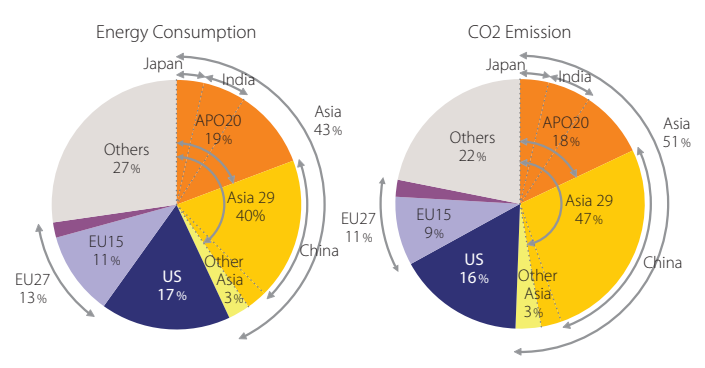



**Figure B6.1 Shares of Asia in World Energy Consumption and CO2 Emission, 2011**

Sources: IEA, *CO2 Emissions from Fuel Combustion 2013*; IEA, *Energy Balances of OECD Countries 2013*; IEA, *Energy Balances of non-OECD Countries 2013*.

The average level of energy productivity in Asia was inferior to the EU27 by 27% in 2011. There is a large diversity however, reflecting the differences in industrial structure and energy efficiency among countries. Figure B6.2 placed countries on the two partial productivity indicators of labor and energy, measured in 2011. Less-developed countries with lower labor productivity (such as the Philippines, Sri Lanka, Myanmar, and Bangladesh) tend to have higher energy productivity. To improve labor productivity in such countries, an effective strategy is to to expand the manufacturing sector (Figure 68). This frequently follows the deterioration in energy productivity, as in China, Thailand, and Korea. As a next stage of economic growth, well-developed countries will be able to pay more attention to improve energy productivity by abolishing implicit or explicit subsidies on energy prices and levying heavier taxes on energy consumptions. The C-shape relationship found between labor and energy productivities corresponds to the so-called Environmental Kuznets curve, as an inversed U-shape relationship between environmental quality (at the y-axis) and economic development (at the x-axis).

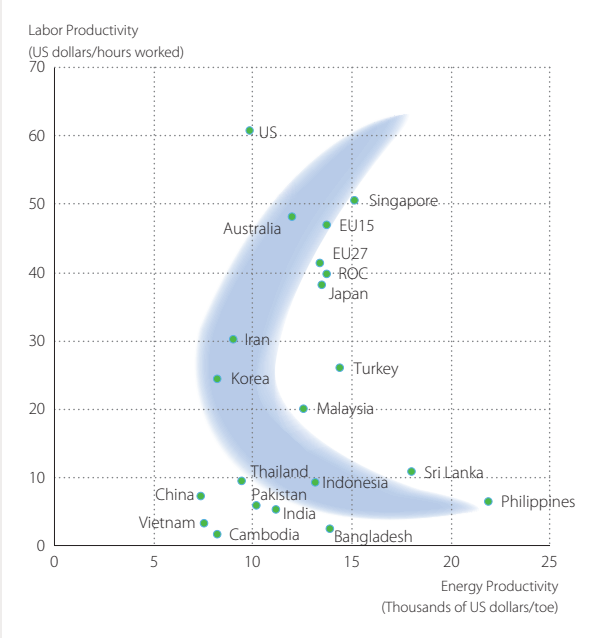



**Figure B6.2 Labor Productivity and Energy Productivity, 2011**

Sources: IEA, *Energy Balances of OECD Countries 2013*; IEA, *Energy Balances of non-OECD Countries 2013*; APO Productivity Database 2014.01.

continued on next page >

> continued from previous page

Figure B6.3 decomposes the sources of CO2 emission growth (from fuel combustion) in Asian countries during 2000–2011, based on the so-called Kaya identity. The growth in CO2 emissions is decomposed to three components: changes in real GDP, carbon intensity of energy, and energy intensity of GDP (the inverse of energy productivity). In many countries, the production expansion (real GDP growth) is the most significant factor to explain the growth of CO2 emissions. With an exception of Singapore, energy productivity has been improved in many Asian countries in this period, but it has a minor effect to offset an expansion of energy consumption. Singapore realized a large improvement in carbon intensity of energy by the shift from oil to LNG in electricity power generation. This helped offset the deterioration in energy productivity. Decoupling in the growths of GDP and CO2 emission was realized in only a few developed countries, like Japan (regardless of very low operation of nuclear power due to Fukushima Daiichi nuclear disaster in 2011), the US, and EU. Improvements in energy productivity and carbon intensity of energy are focused as a policy target for sustainable growth of the world economy in the long run.

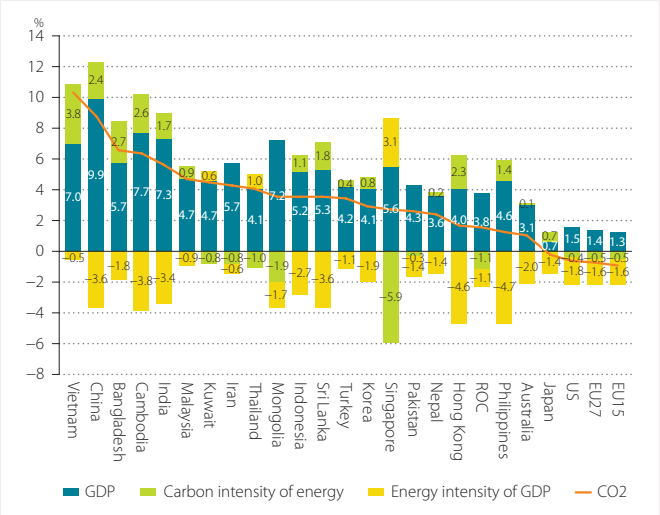



**Figure B6.3 Sources of CO2 Emission Growth, 2000–2011**

Sources: IEA, *Energy Balances of OECD Countries 2013;* IEA, *Energy Balances of non-OECD Countries 2013;* IEA, *CO2 Emissions from Fuel Combustion 2013;* Official national accounts in each country, including author adjustments.

# 7 Real Income

The standard GDP concept does not adequately measure welfare, as discussed in Section 3. Among its shortcomings is the neglect of the terms-of-trade effect. An improvement in the terms of trade (the relative prices of a country's exports to imports), unambiguously raises real income and in turn welfare.[94] In many ways, a favorable change in the terms of trade is synonymous with technological progress, making it possible to get more for less. That is, for a given trade balance position, a country can either import more for what it exports, or export less for what it imports.

## *7.1 Real Income and Terms of Trade*

By focusing on production *per se*, the real GDP concept does not capture this beneficial effect of the improvement in the terms of trade.[95] In contrast, real income focuses on an economy's consumption possibilities, and in turn captures the impact of a change in the relative price of exports to imports. Real income growth attributed to changes in the terms of trade can be significant when there are large fluctuations in import and export prices and the economy under concern is highly exposed to international trade, as many Asian economies are (see Figure 26, p. 42). For example, real income growth for oil-exporting countries was more than double that of real GDP growth in recent years (as in Saudi Arabia and Brunei). Meanwhile, there has been no significant difference between real income growth and real GDP growth in Myanmar, which is a relatively closed economy (Figure 92). In the recent decade, the trading gain has also driven a significant wedge between real income and real GDP in Australia. That is partly due to a fall in import prices, but owes more to the rising prices of its commodity exports.

The distinction between real income and real GDP lies in the differences between the corresponding deflators. Real GDP is calculated from a GDP deflator aggregating prices of household consumption, government consumption, investment, exports, and imports,[96] while real income is calculated from the prices of domestic expenditure, consisting of household consumption, government consumption, and investment. Therefore, real income can be understood as the amount of domestic expenditure that can be purchased with the current income flow.[97] As such, real income captures the purchasing power of the income flow. Furthermore, the Databook adopts the concept of gross national income (GNI) instead of GDP in its estimation of real income, to take into account net income transfer from abroad. Applying the method proposed by Diewert and Morrison (1986), the annual growth rate of real income can be fully attributed to three components: annual growth rate of real GDP, real income growth attributed to changes in prices of exports and imports (referred to as the trading gain),[98] and the effect of net income transfer.[99]

94: See Diewert and Morrison (1986) and Kohli (2004).

95: Kohli (2004) elaborates: "if real GDP is measured by a Laspeyres quantity index, as it is still the case in most countries, an improvement in the terms of trade will actually lead to a fall in real GDP."

96: The weight for import price changes is negative. Thus, if import prices decrease, this tends to raise the GDP deflator.

97: This definition of real income is the same as in Kohli (2004, 2006). An alternative definition is nominal GDP deflated by the price of household consumption; this is adopted by Diewert, Mizobuchi, and Nomura (2005) and Diewert and Lawrence (2006).

98: The term "trading gain" is used by some authors (Kohli, 2006). This term is adopted in this report.

99: Real income growth can be decomposed into two components as follows:

$$\underbrace{\ln\left(\frac{GNI^t}{GNI^{t-1}}\right)-\ln\left(\frac{P_D^t}{P_D^{t-1}}\right)}_{\text{Real income growth}}=\underbrace{\ln\left(\frac{GNI^t/GDP^t}{GNI^{t-1}/GDP^{t-1}}\right)}_{\text{Income transfer effect}}+\underbrace{\ln\left(GDP^t/GDP^{t-1}\right)-(1/2)\sum_i\left(s_i^t+s_i^{t-1}\right)\ln\left(P_i^t/P_i^{t-1}\right)}_{\text{Real GDP growth}}+$$

$$\underbrace{(1/2)\left(s_X^t+s_X^{t-1}\right)\left(\ln\left(P_X^t/P_X^{t-1}\right)-\ln\left(P_D^t/P_D^{t-1}\right)\right)-(1/2)\left(s_M^t+s_M^{t-1}\right)\left(\ln\left(P_M^t/P_M^{t-1}\right)-\ln\left(P_D^t/P_D^{t-1}\right)\right)}_{\text{Real income growth attributed to changes in the terms of trade (=trading gain)}}$$

where $P_i^t$ is price of final demand $i$ in period $t$ and $s_i^t$ is expenditure share of final demand $i$ in period $t$. $D$ is domestic expenditure, $X$ is export, and $M$ is import. Note that the real GDP growth based on this formulation may differ from that used in other chapters, since the implicit Törnqvist quantity index is adopted for calculating it.

A general observation is that over a long period of time the trading gain effect is, on average, small, but over a shorter period it could be very significant.[100] The findings presented in Table 17 confirm this observation. Excluding the oil-exporting countries, the trading gain effect in 16 out of 21 economies compared, fell within the margin of ±10% of real GDP growth on average for the long period of 1970–2012. Movements in terms of trade have been consistently unfavorable to Japan and the ROC.

**Table 17 Real Income and Terms of Trade, 1970–2012, 1995–2000, 2000–2005, and 2005–2012**
——Average annual growth rate of real income, real GDP, trading gain, and net primary income transfer from abroad

| 1970–2012 | | | | | 1995–2000 | | | | | 2000–2005 | | | | | 2005–2012 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Real income | Real GDP | Trading gain | Net primary income from abroad | | Real income | Real GDP | Trading gain | Net primary income from abroad | | Real income | Real GDP | Trading gain | Net primary income from abroad | | Real income | Real GDP | Trading gain | Net primary income from abroad |
| China | 8.63 | 8.65 | −0.01 | −0.01 | Vietnam | 7.37 | 7.41 | 0.21 | −0.26 | Myanmar | 12.24 | 12.24 | 0.00 | 0.00 | China | 11.03 | 11.05 | −0.06 | 0.03 |
| Singapore | 7.11 | 7.26 | −0.07 | −0.08 | China | 6.96 | 7.67 | −0.79 | 0.08 | China | 10.94 | 10.28 | 0.56 | 0.10 | Myanmar | 10.92 | 10.91 | 0.01 | 0.00 |
| Malaysia | 6.75 | 6.35 | 0.46 | −0.06 | Singapore | 6.43 | 6.46 | 0.23 | −0.27 | Cambodia | 10.11 | 10.37 | 0.00 | −0.26 | Mongolia | 10.55 | 9.75 | 1.88 | −1.09 |
| Korea | 6.45 | 6.94 | −0.47 | −0.02 | Philippines | 6.39 | 3.62 | 1.15 | 1.62 | Mongolia | 9.90 | 7.13 | 3.08 | −0.32 | India | 8.00 | 7.91 | 0.16 | −0.07 |
| Indonesia | 6.32 | 5.73 | 0.62 | −0.03 | India | 5.42 | 5.59 | −0.17 | 0.01 | Iran | 8.80 | 7.14 | 1.97 | −0.30 | Cambodia | 7.76 | 6.83 | 1.00 | −0.07 |
| ROC | 6.09 | 6.92 | −0.91 | 0.08 | ROC | 5.34 | 5.47 | −0.11 | −0.03 | Vietnam | 8.15 | 8.59 | −0.34 | −0.09 | Vietnam | 6.77 | 6.18 | 0.96 | −0.37 |
| Myanmar | 5.73 | 5.74 | 0.06 | −0.07 | Iran | 5.19 | 2.72 | 2.32 | 0.15 | India | 6.79 | 7.04 | −0.32 | 0.07 | Sri Lanka | 6.37 | 6.73 | −0.26 | −0.11 |
| Hong Kong | 5.61 | 5.64 | −0.07 | 0.05 | Cambodia | 5.17 | 5.44 | 0.04 | −0.31 | Malaysia | 6.75 | 4.76 | 1.24 | 0.75 | Bangladesh | 6.01 | 5.97 | −0.57 | 0.61 |
| India | 5.44 | 5.45 | 0.00 | −0.01 | Malaysia | 5.02 | 5.37 | 0.41 | −0.77 | Sri Lanka | 5.50 | 4.67 | 0.72 | 0.11 | Singapore | 5.45 | 5.99 | −1.20 | 0.65 |
| Thailand | 5.21 | 5.74 | −0.43 | −0.10 | Myanmar | 4.90 | 5.47 | 0.04 | −0.61 | Philippines | 5.40 | 4.25 | −0.28 | 1.44 | Philippines | 5.21 | 4.95 | −0.33 | 0.60 |
| Iran | 5.12 | 3.39 | 1.62 | 0.10 | Sri Lanka | 4.82 | 5.04 | −0.07 | −0.15 | Bangladesh | 5.22 | 5.40 | −0.45 | 0.27 | Malaysia | 5.04 | 4.48 | 0.47 | 0.09 |
| Sri Lanka | 5.02 | 5.37 | −0.26 | −0.09 | Bangladesh | 4.06 | 4.14 | −0.20 | 0.12 | Pakistan | 4.63 | 4.77 | −0.80 | 0.65 | Indonesia | 5.03 | 5.63 | −0.88 | 0.28 |
| Pakistan | 4.47 | 4.60 | −0.25 | 0.12 | Fiji | 3.55 | 3.66 | −1.12 | 1.00 | Thailand | 4.62 | 5.15 | −0.01 | −0.52 | Nepal | 3.97 | 3.32 | 0.69 | −0.04 |
| Philippines | 4.32 | 3.66 | −0.03 | 0.69 | Korea | 3.07 | 4.98 | −1.89 | −0.02 | Indonesia | 3.96 | 4.55 | −0.96 | 0.37 | Pakistan | 3.93 | 4.12 | −0.60 | 0.40 |
| Fiji | 3.06 | 2.34 | 0.52 | 0.19 | Pakistan | 2.74 | 3.14 | −0.02 | −0.37 | Korea | 3.71 | 4.47 | −0.84 | 0.08 | Thailand | 3.28 | 3.66 | −0.43 | 0.05 |
| Bangladesh | 3.04 | 3.13 | −0.30 | 0.21 | Hong Kong | 2.71 | 2.38 | 0.37 | −0.04 | Singapore | 3.71 | 4.82 | 0.14 | −1.25 | Hong Kong | 3.09 | 3.59 | −0.71 | 0.21 |
| Japan | 2.41 | 2.64 | −0.31 | 0.08 | Indonesia | 1.13 | 1.30 | 0.65 | −0.81 | Nepal | 2.94 | 3.46 | −0.59 | 0.07 | Korea | 2.65 | 3.49 | −0.93 | 0.09 |
| | | | | | Japan | 0.76 | 0.83 | −0.16 | 0.09 | Hong Kong | 2.89 | 4.00 | −1.00 | −0.11 | Iran | 2.23 | 2.09 | 0.04 | 0.10 |
| | | | | | Thailand | −0.84 | 0.36 | −1.20 | −0.01 | ROC | 2.36 | 3.60 | −1.47 | 0.22 | ROC | 1.44 | 3.69 | −2.35 | 0.10 |
| | | | | | | | | | | Fiji | 1.58 | 1.77 | 0.34 | −0.52 | Fiji | 0.31 | 0.08 | 0.14 | 0.09 |
| | | | | | | | | | | Japan | 1.04 | 1.18 | −0.34 | 0.21 | Japan | −0.05 | 0.36 | −0.52 | 0.12 |
| Bahrain | 5.84 | 4.84 | 1.32 | −0.32 | Bahrain | 6.04 | 3.51 | 2.87 | −0.35 | Bahrain | 7.84 | 6.52 | 1.33 | −0.02 | Bahrain | 7.49 | 5.34 | 3.68 | −1.53 |
| Kuwait | 5.71 | 0.94 | 4.40 | 0.38 | Kuwait | 6.38 | 1.63 | 4.41 | 0.34 | Kuwait | 11.10 | 7.63 | 4.64 | −1.18 | Kuwait | 6.02 | 2.64 | 4.15 | −0.77 |
| Oman | 8.12 | 6.42 | 1.60 | 0.10 | Oman | 7.54 | 4.03 | 3.90 | −0.38 | Oman | 8.23 | 3.58 | 4.44 | 0.21 | Oman | 8.21 | 3.90 | 4.68 | −0.37 |
| Qatar | 6.67 | 6.21 | 0.53 | −0.08 | Qatar | 13.49 | 8.63 | 5.83 | −0.97 | Qatar | 11.94 | 9.71 | 4.55 | −2.32 | Qatar | 14.45 | 12.39 | 1.26 | 0.81 |
| Saudi Arabia | 7.45 | 4.95 | 1.59 | 0.89 | Saudi Arabia | 4.47 | 2.65 | 2.02 | −0.21 | Saudi Arabia | 8.76 | 4.28 | 4.55 | −0.07 | Saudi Arabia | 7.16 | 4.53 | 2.44 | 0.19 |
| UAE | 10.58 | 10.03 | 0.22 | 0.32 | UAE | 8.03 | 6.57 | 1.87 | −0.42 | UAE | 6.37 | 4.70 | 1.75 | −0.08 | UAE | 5.88 | 3.21 | 2.89 | −0.22 |
| | | | | | Brunei | 5.39 | 1.81 | 3.59 | 0.00 | Brunei | 8.01 | 2.85 | 5.15 | 0.00 | Brunei | 5.52 | −1.11 | 6.56 | 0.08 |
| (reference) | | | | | (reference) | | | | | (reference) | | | | | (reference) | | | | |
| US | 2.71 | 2.76 | −0.07 | 0.02 | US | 4.27 | 4.20 | 0.08 | 0.00 | US | 2.39 | 2.36 | −0.04 | 0.08 | US | 1.16 | 1.13 | −0.09 | 0.12 |
| EU15 | 2.11 | 2.16 | −0.04 | 0.00 | EU15 | 2.87 | 2.88 | −0.09 | 0.07 | EU15 | 2.05 | 1.80 | 0.08 | 0.17 | EU15 | 0.42 | 0.63 | −0.20 | −0.01 |
| | | | | | EU27 | 2.82 | 2.85 | −0.12 | 0.09 | EU27 | 2.10 | 1.87 | 0.07 | 0.16 | EU27 | 0.52 | 0.77 | −0.20 | −0.06 |
| Australia | 3.51 | 3.29 | 0.25 | −0.03 | Australia | 4.01 | 3.74 | 0.12 | 0.15 | Australia | 4.25 | 3.30 | 1.18 | −0.23 | Australia | 3.80 | 2.84 | 0.73 | 0.22 |
| Turkey | 4.16 | 4.34 | −0.15 | −0.03 | Turkey | 3.98 | 4.37 | −0.31 | −0.08 | Turkey | 4.67 | 4.59 | 0.27 | −0.19 | Turkey | 3.23 | 3.88 | −0.65 | 0.01 |

Unit: Percentage.
Sources: Official national accounts in each country, including author adjustments.
Note: See footnote 99 for the definition of real GDP growth, real income growth, and trading gain growth. The starting years for some countries are different due to data availability during 1970–2012: Brunei (1989–), Cambodia (1993–), Mongolia (2000–), Nepal (2000–), and Vietnam (1989–).

100: Short-term trends in export and import prices cannot continue indefinitely. Negative and positive trading gain effects in shorter periods cancel each other out. In the end, the accumulated effect over a long period of time often becomes negligible.

In the short term, the spread of the trading gain effect is wider across countries. Australia has been benefiting from the continual surge in commodity prices in the past decade or so and, as such, its terms of trade have been turning strongly in its favor. The trading gain effect in Australia has therefore been rising from 3% on average per year in 1995–2000, to 36% in 2000–2005, and 26% in 2005–2012 of its real GDP growth. In terms of percentage points, the trading gain added 0.12, 1.18, and 0.73 percentage points to real GDP growth in the three consecutive periods. For the oil-exporting countries, the trading gain effect is almost always positive and significant, making it possible to sustain a rise in purchasing power with little real GDP growth in countries, such as Brunei, Kuwait, and UAE in 2005–2012.

Over the past four decades, net primary income from abroad has not moved outside the margin of ±10% of real GDP growth on average for all 27 countries compared, except for the Philippines, Kuwait, and Saudi Arabia. Net primary income from abroad has been a long-term significant contribution to the purchasing power of the Philippines, with remittances from large number of overseas workers. When its real GDP growth slowed (during the late 1990s), net primary income from abroad played an even greater role in cushioning the real income of Filipinos. Over the past four decades, net primary income from abroad augmented real GDP growth by 3.0% and 0.8% on average per year in Japan and the US, respectively. This has grown to be more significant (33% and 10%, respectively), in both countries as real GDP growth slowed from 2005–2012.

Figure 86 plots the time series of net primary income from abroad as a percentage of GDP. The role of net primary income from abroad has been shifting from negative to positive in Hong Kong, with the transition taking place in the mid-1990s leading up to the handover of Hong Kong from British rule to China in 1997. Since then, net primary income from abroad has been positive. A shift in the role of net primary income from abroad has also taken place in Korea from negative to a more or less neutral position in the 2000s. It has held positive in the ROC, oscillating around +2% of GDP, since 1980. Singapore's net primary income from abroad displayed the largest fluctuations, ranging from +1.9% in 1997 to –7.1% in 2004, but on the whole, it has been more negative than positive. In Japan and the Philippines, net primary income from abroad has risen strongly, albeit at different magnitudes. In Japan, it rose from 0.7% of GDP in 1990 to 3.2% in 2012, compared with 1.4% in 1990 and 31.4% in 2012 in the Philippines. In the US, it has always been positive, fluctuating within +1.7% of GDP, whereas in the EU15 it was marginally negative for the three decades between 1975 and 2005 before turning mildly positive.

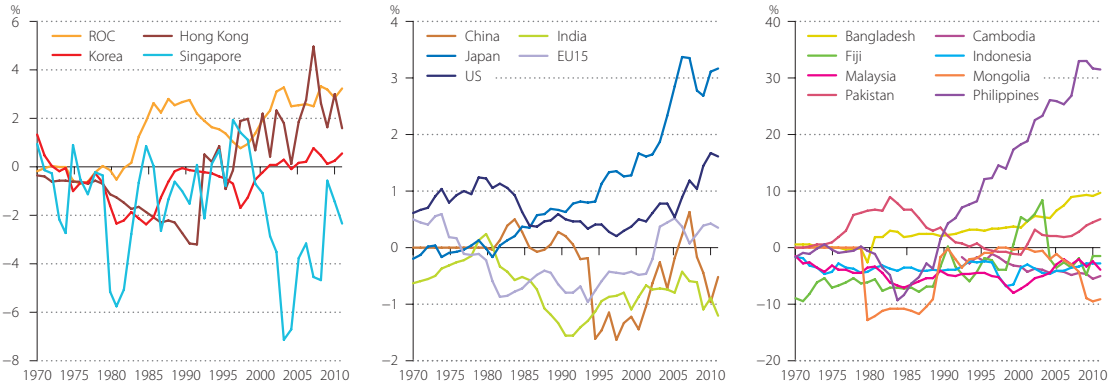



**Figure 86 Effect of Net Income Transfer on GDP, 1970–2012**

Sources: Official national accounts in each country, including author adjustments.

Combining both the trading gain effect and net primary income from abroad, real income growth for most of the countries compared fell within the margin of ±20% of real GDP growth (Figure 87). Kuwait and Brunei appear to be the outliers, with real income growth being 6.1 times and 3.4 times their respective long-term dismal real GDP growth of 0.9% and 1.4%.[101]

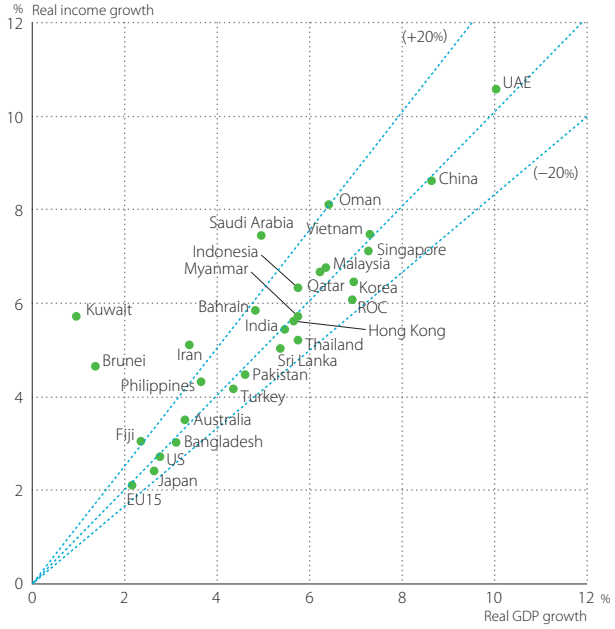



**Figure 87 Real Income and Real GDP Growth, 1970–2012**
——Average annual growth rate of GDP at constant prices and real income

Sources: Official national accounts in each country, including author adjustments.
Note: The starting years for some countries are different due to data availability during 1970–2012: Brunei (1989–), Cambodia (1993–), Mongolia (2000–), Nepal (2000–), and Vietnam (1989–).

Unlike the oil-exporting countries, at any one time roughly half of the Asian countries compared sustained a negative trading gain effect, albeit to variable extents, whereas the impact from net primary income from abroad was relatively less pronounced. The period of 1995–2000 reflects the impact of the Asian financial crisis. For Thailand, the trading gain effect more than outweighed the small positive average real GDP growth per year (0.4%), giving rise to a marginal fall in real income of –0.8%. In Korea, the negative trading gain also shaved 38% off real GDP growth of 5.0%, producing real income growth of 3.1%. At the start of the 2000s, the Asian economy recovered from the financial crisis, but the trading gain effect ran counter to welfare for some countries, with a negative impact that only intensified after 2005. For example, in the ROC, the trading gain effect caused real income growth to be 41% lower than real GDP growth in the period 2000–2005. However, in the period 2005–2012 it wiped out 64% of the handsome 3.7% real GDP growth on average per year, leaving real income to grow at 1.4%. Similarly, in Korea the trading gain effect caused real GDP growth to overestimate real income growth by 19% in the first half of the 2000s, which increased to 27% in the years 2005–2012 (Table 17 and Figure 88). In Japan, the negative trading gain effect more than wiped out the 0.5 percentage points of real GDP growth, leaving real income to actually fall by 0.1% per year on average in the period 2005–2012.

In contrast, the trading gain worked to counterbalance falling real GDP in Brunei, leaving it with a robust, real income growth of 6.6%, despite its contracting real GDP of 1.1% in the latest period (Table 17). In Saudi Arabia, real income growth was more than 170% faster than its real GDP growth. This takes place against the backdrop of strong oil prices, which spiked in mid-July 2008 to USD 145 per barrel. After dropping sharply to USD 30 per barrel by the end of 2008 (reflecting the fall in demand after the collapse of Lehman Brothers), it has steadily risen to, and held at, over USD 100 per barrel

101: According to Kohli (2004) study on real income of 26 OECD countries during 1980–1996, the trading gain on average over the entire period varies across countries, from the smallest effect of –0.8% (–30.9% of real income growth) per year in Norway to the largest of 0.63% (29.4% of real income growth) per year in Switzerland.

since 2010 (Figure 89). In the US, the trading gain effect has been unfavorable more often than not, but its positive net primary income from abroad has worked to counterbalance it and the difference between real GDP and real income growth is reduced. For example, in the latest period 2005–2012, the trading gain effect shaved 8.0% off real GDP growth. It was counterbalanced by the positive effect from net primary income from abroad, which added 10.4% to real GDP growth, leaving real income growth slightly lower than real GDP.

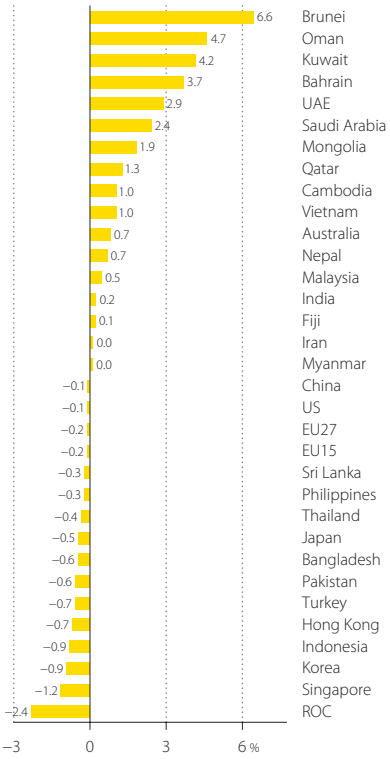



**Figure 88 Trading Gain Effect, 2005–2012**

——Average percentage points

Sources: Official national accounts in each country, including author adjustments.

Figure 90 provides the results of further decomposition of the trading gain into the terms-of-trade effect and the real exchange rate effect in Asian countries for the period 1970–2012.[102] The terms-of-trade effect is the part of real income growth attributed to the change in the relative price between exports and imports. The real exchange rate effect refers to the part of real income growth attributed to changes in the relative prices of traded goods and domestically consumed goods. By applying this result, real income growth can be decomposed into real GDP growth, terms-of-trade effect, real exchange rate effect, and net primary income from abroad. The first chart in Figure 90 applies this break-down to Asian countries for the period 1970–2012. It shows that the real exchange rate effect is generally much smaller than the terms-of-trade effect, implying that the relative prices of traded versus domestically consumed goods have been largely stable in most countries. The exceptions are Kuwait and Brunei where the real exchange rate effect accounted for 30% and 18% of real income growth. This might have reflected the weight of oil in the composition of their traded goods. The second chart shows the decomposition for the most recent period 2000–2012. It shows that the trading gain, particularly the terms-of-trade effect, is highly significant and favorable for the oil-exporting countries, but is significant and negative in a handful of Asian economies such as Hong Kong, the ROC, Indonesia, Korea, Malaysia, and Pakistan.


**Figure 89 Price of Crude Oil, 1986 January–2014 June**

Source: US Energy Information Administration, WTI spot prices FOB (Cushing, Oklahoma).

Figure 91 shows the decomposition of average annual real income growth covering two periods of major economic shocks faced by the Asian economies: during 1973–1979, which includes the two oil price hikes in 1974 and 1979, and 1996–1998 to capture the impact of the Asian financial crisis. High oil prices improved the terms for oil-exporting countries, such as Iran and Indonesia, and worsened the terms of trade for oil-importing countries. During the Asian financial crisis, the terms-of-trade effect was still the predominant factor in determining the difference between real income growth and real GDP growth. In Brunei, the terms-of-trade effect further reinforced the negative real GDP growth of –6.3%, reducing its real income growth a further 8.2 percentage points. In Iran, the negative terms-of-trade effect counteracted the 0.9% real GDP growth, giving real income growth of –1.5%. In Indonesia, the trading gain effect worked to counterbalance the contraction in real GDP, whereas in Thailand, it reinforced the negative real GDP growth. In the Philippines, although the strong favorable terms-of-trade effect was moderated by the negative real exchange rate effect, the resulting real income growth more than tripled the real GDP growth.[103]

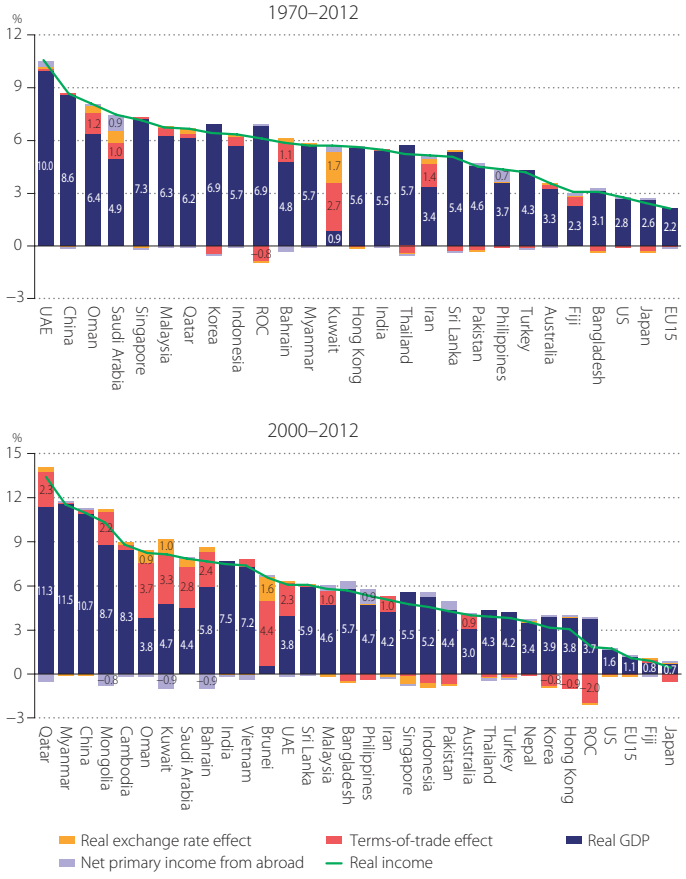



**Figure 90 Decomposition of Real Income Growth, 1970–2012 and 2000–2012**

Sources: Official national accounts in each country, including author adjustments.

Figure 92 shows this decomposition of real income in each Asian country, along with the US, EU15, Australia, and Turkey[104] from 1970, or the year of first data collection for the country in question. The

102: Following Kohli (2006), trading gain can be decomposed into two components as follows:

$$\underbrace{(1/2)\left(s_X^t + s_X^{t-1}\right)\left(\ln\left(P_X^t/P_X^{t-1}\right) - \ln\left(P_D^t/P_D^{t-1}\right)\right) - (1/2)\left(s_M^t + s_M^{t-1}\right)\left(\ln\left(P_M^t/P_M^{t-1}\right) - \ln\left(P_D^t/P_D^{t-1}\right)\right)}_{\text{Real income growth attributed to changes in the terms of trade (=trading gain)}} =$$

$$\underbrace{(1/4)\left(s_X^t + s_X^{t-1} + s_M^t + s_M^{t-1}\right)\left(\ln\left(P_X^t/P_X^{t-1}\right) - \ln\left(P_M^t/P_M^{t-1}\right)\right)}_{\text{Terms-of-trade effect}} +$$

$$\underbrace{(1/2)\left(s_X^t + s_X^{t-1} - s_M^t - s_M^{t-1}\right)\left((1/2)\ln\left(P_X^t/P_X^{t-1}\right) + (1/2)\ln\left(P_M^t/P_M^{t-1}\right) - \ln\left(P_D^t/P_D^{t-1}\right)\right)}_{\text{Real exchange rate effect}}$$

103: Kohli (2006) calculated the trading gain, the terms-of-trade effect, and the real exchange rate effect of Canada during 1982–2005. The average annual trading gain over the entire period is very low, at 0.1%. This is small by the standard of Asian economies. However, the trading gain later became significant, especially for the three years 2002–2005. Over these years, the average trading gain is 1.6% per year. This effect is decomposed into a terms-of-trade effect of 1.4% and a real exchange rate effect of –0.1%.

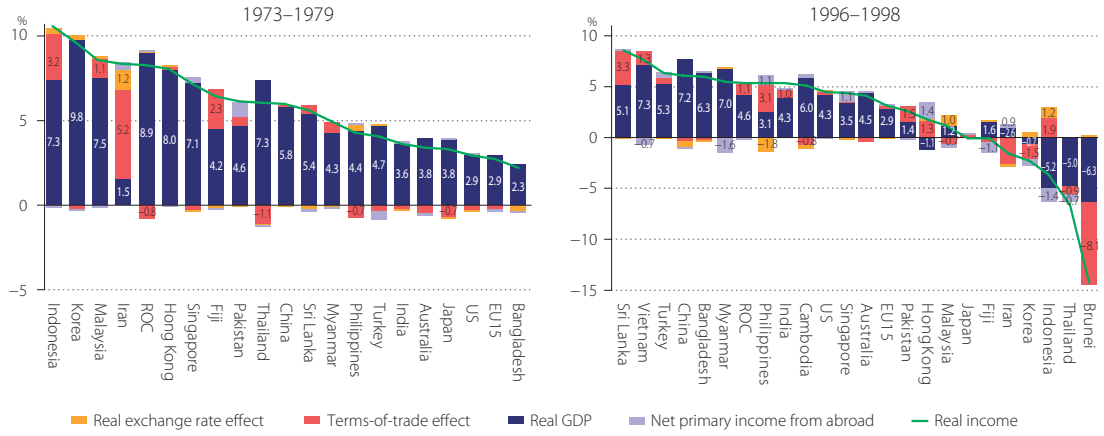



**Figure 91 Decomposition of Real Income Growth, 1973–1979 and 1996–1998**
——Decomposition: Average annual growth rate of real income

Sources: Official national accounts in each country, including author adjustments.

trading gain can be positive or negative, depending on the direction of change in the terms of trade. Its impact is modest for most countries, adding less than ±1 percentage point to annual real GDP growth, except for some oil-rich countries. In the short term, one sees extreme spikes in trading gain. For instance, as a consequence of the first oil price shock, the improvement in the terms of trade was responsible for around 80% of the 40.6% increase in real income in Iran in 1974. The opposite was true in EU15, where the negative trading gain effect counterbalanced real GDP growth, leaving virtually no growth to real income in the period 1974–1975. The effect of the second oil spike can be seen in the early 1980s. Sri Lanka, Malaysia, and Indonesia also experienced volatile variations in trading gains in the 1970s. The trading gain has been working against Singapore and the ROC's welfare for most of the period covered.

104: There are several studies on the decomposition of real income growth for other countries: Kohli (2004) for 26 OECD countries during 1980–1996, Kohli (2006) for Canada during 1981–2005, and Diewert and Lawrence (2006) for Australia during 1960–2004.


Bahrain
Bangladesh
Brunei
Cambodia
China
ROC
Hong Kong
India
Indonesia
Iran
Japan
Korea
Kuwait
Malaysia
Mongolia
Myanmar
Nepal
Oman
%
1971 1976 1981 1986 1991 1996 2001 2006 2011
Real GDP
Trading gain
Net primary income from abroad
Real income


**Figure 92 Sources of Real Income Growth, 1970–2012**

Sources: Official national accounts in each country, including author adjustments.

## 7.2 Trading Gain and Productivity Growth

When the trading gain is highly favorable, it can breed a sense of complacency with productivity performances suffering as a result. Resource-rich economies are susceptible to this pitfall because they are poised to reap some extremely positive trading gains when commodity prices turn in their favor over a sustained period of time. While commodity prices can rise, they can also fall. This is when countries' real income growth could suffer if fundamentals for real GDP growth are weak. Over the past four decades, only five countries have enjoyed a favorable trading gain effect of over 1% per year. They are Kuwait, Brunei, Iran, Oman, and Bahrain (all oil-exporting countries). Only Iran among them could achieve a significant positive growth in labor productivity (Figure 93). Australia is a rising economy that has benefited from recent hikes in commodity prices. These are likely to stay for a period of time, as a response to the vibrant growth in the emerging economies, especially China. The surge in its TFP in the 1990s stopped around the end of the century before turning negative about five years ago.[105] This was just at the stage when they were enjoying an all-time-high positive trading gain effect, with real income growth faster than real GDP growth by 38% during 2005–2012 (Table 17). A resource-rich country can suffer from "Dutch disease," which describes a phenomenon in which a country's currency is pushed up by the commodity boom, making other parts of its economy less competitive and potentially increasing the country's dependence on natural resources. This is how resource abundance can easily lead to resource dependence. A way to counteract Dutch disease is broad-based, robust productivity growth and industry diversification, in which Bahrain and Oman have shown some success (see Section 6.2 and Figure 76, p. 96).

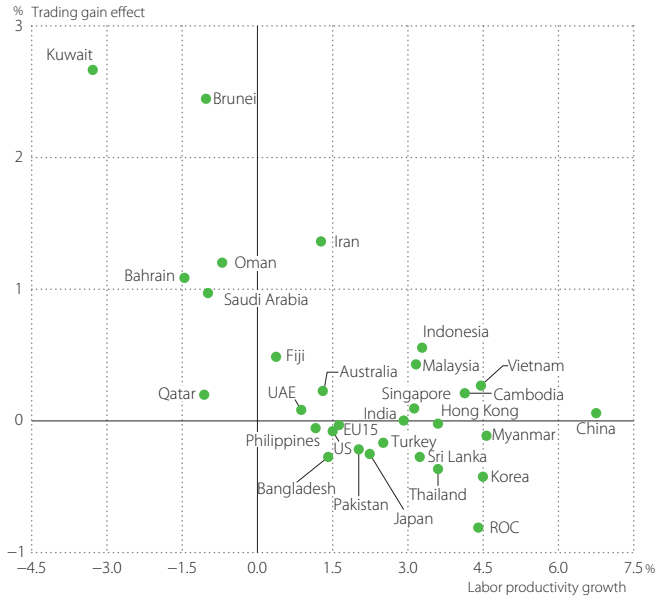



**Figure 93 Trading Gain Effect and Labor Productivity Growth, 1970–2012**

Sources: Official national accounts in each country, including author adjustments.
Note: The starting years for some countries are different due to data availability during 1970–2012: Brunei (1989–), Cambodia (1993–), Myanmar (1977–), Turkey (1988–), and Qatar (1975–).

Figure 93 also shows that many Asian countries have succeeded in achieving high growth of labor productivity while having to accept a deteriorating trading gain over the long run. These countries are typically resource importers whose voracious demand for commodities pushes up their import prices. Meanwhile, export prices tend to fall as a result of their achievement in productivity improvement, resulting in unfavorable movements in terms of trade. This is particularly the case in countries where economic growth is highly dependent on export promotion. In such instances, a negative trading gain is partly a side-effect of productivity success. Although the trading gain effect partly negates their real GDP growth, they are better positioned than before their development took off, and without productivity improvements.

105: *The Economist*, 28 May 2011, "Special Report on Australia: No worries?"

## Box 7 Resource-Rich Countries and the Possible Dutch Disease

Resource price hikes are certainly blessings for resource-exporting economies when prices are increasing. Figure B7 illustrates trading gain effects (average annual growth rates due to trading gains in 1970–2012) and value-added shares of the mining sector in 1970 and 2012 in selected Asian economies. It indicates that large trade gainers typically have dominant mining sectors, petroleum and natural gas in particular. Providing resource prices continuously go up, these countries continue to gain from the positive terms-of-trade effects.

However, what would happen if resource prices came down, or their natural reserves were depleted? Then the story of the Dutch disease might come in. Richness in natural resources may become a curse if they do not have competitive industries other than mining. Figure B7 shows that some of the trading gainers actively reduced their share of the mining sector over time, which could reflect the intention of developing industries other than mining. However, Figure 93 shows that labor productivity growth rates in these countries after 1990 remained low, or even negative. Even if they wanted to start industrialization, their high income and strong local currency would not easily allow them to develop a manufacturing sector or an internationally competitive service industry. Another concern is their heavy dependence on foreign workers, both skilled and unskilled.

On the other side of coin are the resource/energy-importing economies. Most of these suffered from negative trading gain effects, losing a part of their economic growth due to resource price hikes, particularly after 2000 (Table 17, p. 112). However, it has actually strengthened their competitiveness in manufacturing and other productive activities for the future.

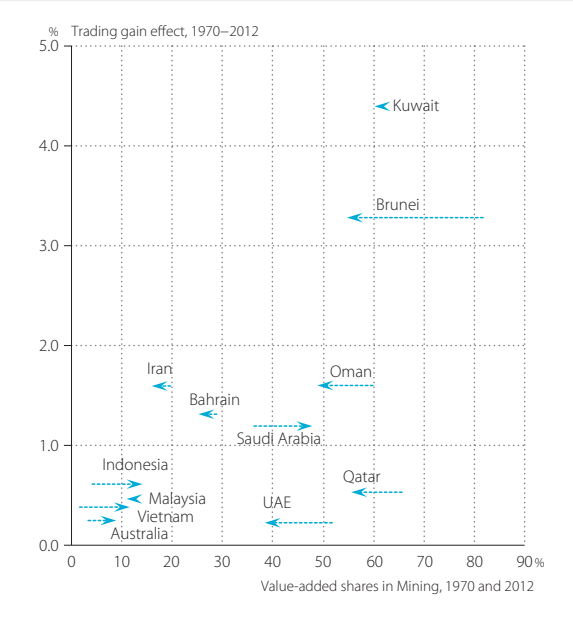



**Figure B7 Trading Gain Effect and Value-added Share in Mining Sector, 1970–2012**

Note: The starting years for some countries are different due to data availability during 1970–2012: Brunei (1989–) and Vietnam (1986–) for trading gain effect, Brunei (1974–), UAE (1972–), Bahrain (1975–), Malaysia (1987–), and Vietnam (1986–) for value-added share of mining sector.
Sources: Official national accounts in each country, including author adjustments.

## Box 8 Quarterly Economic Growth

Timely analysis of the current economic situation is beyond the scope of this Databook, which presents results based on annual data, with 2012 as the latest year covered. In the meantime, for an insight into the current economic growth, for example, one has to rely on countries' quarterly national accounts (QNA). Although they are more timely, the QNA are often less precise, and subject to frequent revisions as more reliable data become available in their normal estimation cycle. With this trade-off between timeliness and data quality in mind, the APO sees the complementary benefits of collating and presenting countries' QNA alongside its database of annual data. As a result, the APO and KEO have developed an Asian Quarterly Growth Map (AQGM) that provides an instinctive understanding of recent economic growth covering Asian countries. Readers can find it at the APO website (www.apo-tokyo.org/AQGM.html).

The AQGM visualizes the seasonally adjusted rates of quarterly economic growth at constant prices. It is worth noting there are three constant-price measures of quarterly growth. The first is the quarterly output compared with the same quarter in the previous year – also called the year-on-year quarterly growth. The second is quarterly output of the previous quarter, or the quarter-on-quarter growth rate. The third is the annualized quarter-on-quarter growth rate, which is also often used in economic analyses of the current economic situation. The first two measures are presented in the AQGM (with year-on-year growth displayed as a default).

The current version includes 22 Asian countries that publish QNA: China, Hong Kong, India, Indonesia, Iran, Japan, Korea, Malaysia, Mongolia, the Philippines, Qatar, the ROC, Singapore, Sri Lanka, Thailand, Vietnam, Armenia, Cyprus, Georgia, Israel, Jordan, and Turkey. For the purpose of international comparisons, the current version includes 51 non-Asian countries, based on data available from the OECD.Stat and independent publications by the respective statistical offices in those countries. The AQGM is updated at least once per month to reflect revisions and capture newly available data. Based on the AQGM, Figure B8.2 presents year-on-year quarterly GDP growth, as well as available quarter-on-quarter GDP growth for Asian countries, the US, and EU15 from 2012Q1 to 2014Q1.

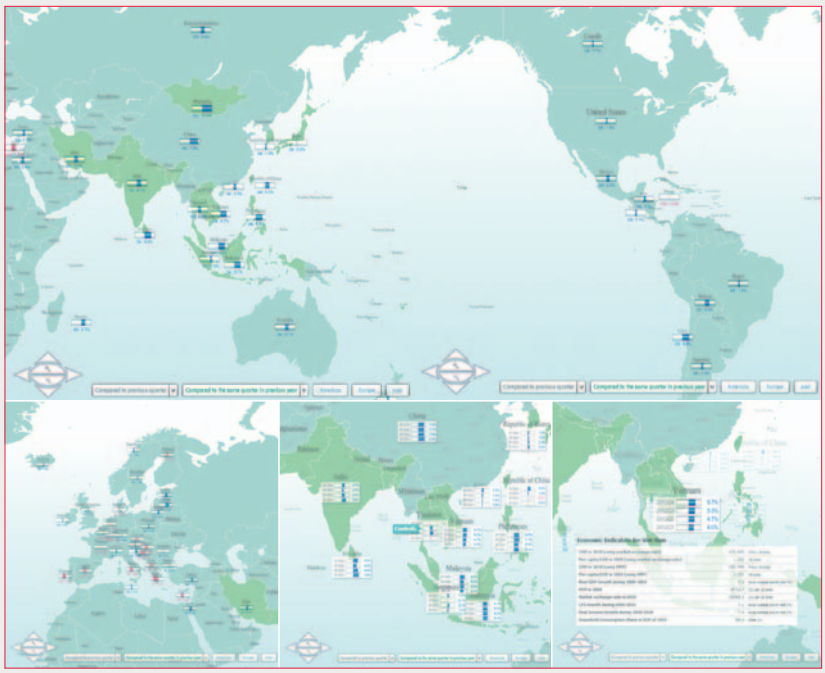


**Figure B8.1 Views of Quarterly Economic Growth in Asian Countries by the AQGM**

Source: Asian Quarterly Growth Map, June 2014.

continued on next page >

> continued from previous page

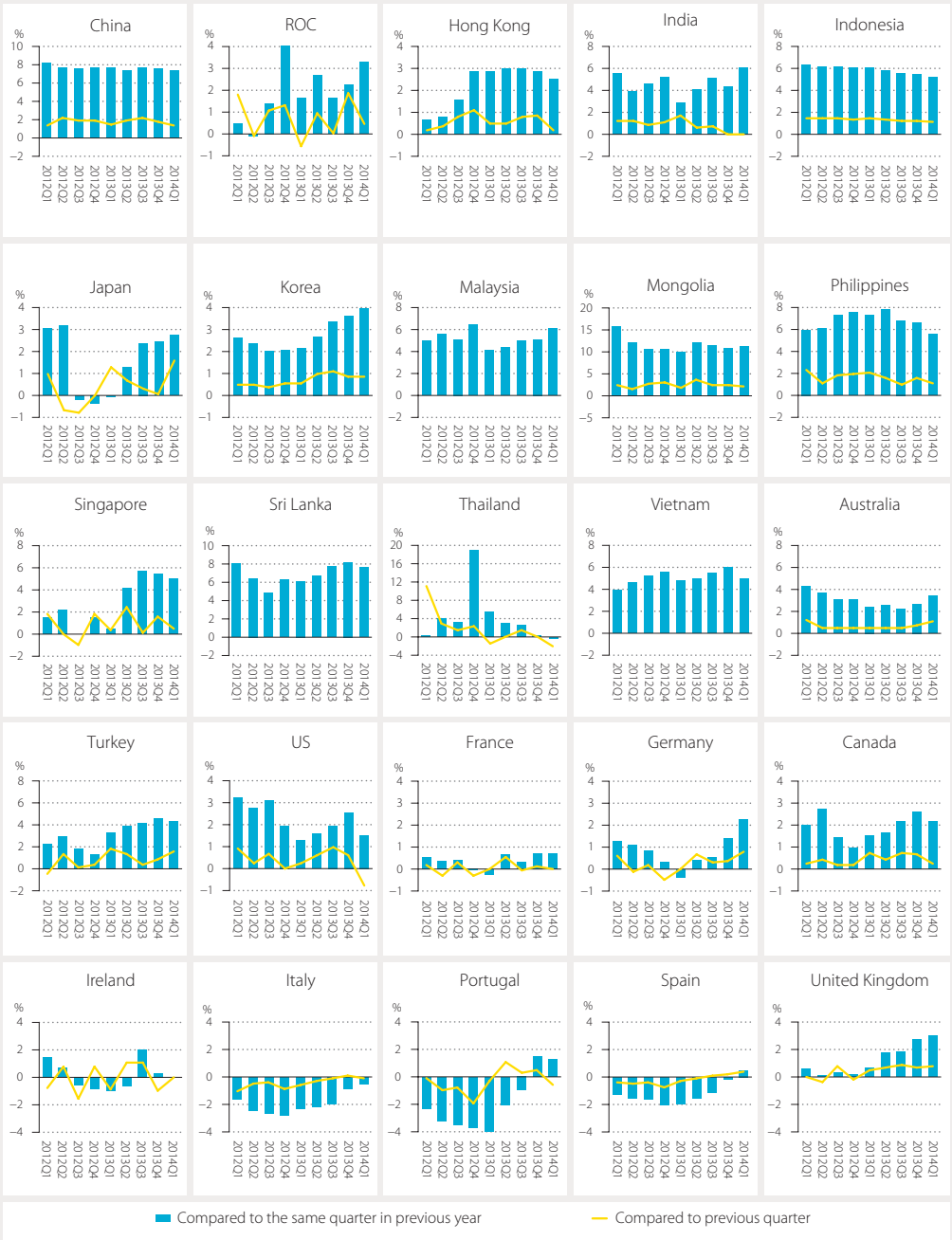



**Figure B8.2 Quarterly Economic Growth in Asian Countries, 2012Q1 – 2014Q1**

Source: Asian Quarterly Growth Map, June 2014.

# Appendix

## A.1 GDP Harmonization

This edition incorporates some significant revisions to the national accounts. Observing new developments for upgrading of statistics systems in Asian economies, Pakistan and Korea newly published their national accounts based on the 2008 SNA in April 2013 and March 2014, respectively, following Malaysia and Hong Kong, who published the 2008 SNA based national accounts in 2012, and the Philippines, who published its new national accounts based on the 1993 SNA, incorporating some elements of the 2008 SNA. While there are movements towards upgrading the SNA, Indonesia has still not fully introduced the 1993 SNA. The different statuses of SNA adaptions among member economies are responsible for the huge variations of data definitions and coverage in national accounts, calling for data harmonization to better perform comparative productivity analyses. This Databook project tries to reconcile the national accounts variations that are based on the different concepts and definitions to provide harmonized estimates for international comparison. The APO Productivity Database 2014 largely follows the concepts and definitions of the 1993 SNA, thus its GDP includes software investment and final consumption of financial intermediation services indirectly measured (FISIM) and excludes the expenditures for research and development. In addition to these adjustments, some extra adjustments are necessary to harmonize the estimates of GDP. Procedures for all these adjustments are explained below.

### *1) FISIM*

FISIM is an indirect measure of the value of financial intermediation services provided, but for which financial institutions do not charge explicitly (United Nations, 1993: para. 6.124). It represents a significant part of the income of the finance sector. The 1993 SNA recommends that FISIM should be allocated to users (to individual industries and final demands). This is in contrast to the 1968 SNA, where the imputed banking services were allocated exclusively to the business sector. The common practice was to create a notional industry that buys the entire service as an intermediate expense and generates an equivalent negative value added. As such, the imputed banking services have no impact on GDP. Therefore, the 1993 SNA recommendation, if fully implemented, will impact on industry GDP and the overall GDP for the total economy (by the part of FISIM allocated to final demands).

Among the 20 APO member economies, six countries – Bangladesh, Cambodia, Indonesia, the Lao PDR, Nepal, and Sri Lanka – do not allocate FISIM to final demands in their official national accounts, as a result of them still not following the 1993 SNA recommendation. Thus, the GDP values in these countries are smaller than others by definition. In addition, even in the countries whose national accounts follow the 1993 SNA's recommendation on FISIM, the available data sometimes does not cover the whole periods of our observations. To harmonize the GDP concept among countries and over periods, final demands of FISIM are estimated for those countries in the APO Productivity Database, using available estimates of value added in Imputed Bank Service Charge (IBSC) or financial intermediation (in instances where IBSC data is not available). The ratios of value added of IBSC or financial intermediation on FISIM allocated to final demand are assumed to be identical with the average ratios observed in the countries in which data is available. Figure 94 describes the countries and methods to adjust FISIM. As described, in instances where both value added data are not available, the trend of the FISIM share on GDP is applied to extrapolate past estimates (although the impacts on GDP are minor).

Figure 95 plots per capita GDP levels in 2012 and the FISIM share in GDP in the 2000–2012 (including both of the original estimates in the official national accounts and our estimates). In countries where GDPs are adjusted, the proportions by which author adjustments for FISIM increases GDP stand at 0.9–1.4% for Brunei, Indonesia, Nepal, and Pakistan and less than 0.5% GDP in others.

## *2) Software*

The 1993 SNA also recommends the capitalization of intangible assets, which changes not only the size of GDP but also the size of capital input. One intangible asset is computer software, which includes pre-packaged software, custom software, and own-account software. Among APO member economies, only nine have capitalized all three types of software. Another three countries exclude own-account software in their capitalization, in one country only pre-packaged software is capitalized, and in one country only custom software is capitalized. For the APO Productivity Database, tentative adjustments have been made to harmonize data to include all software.

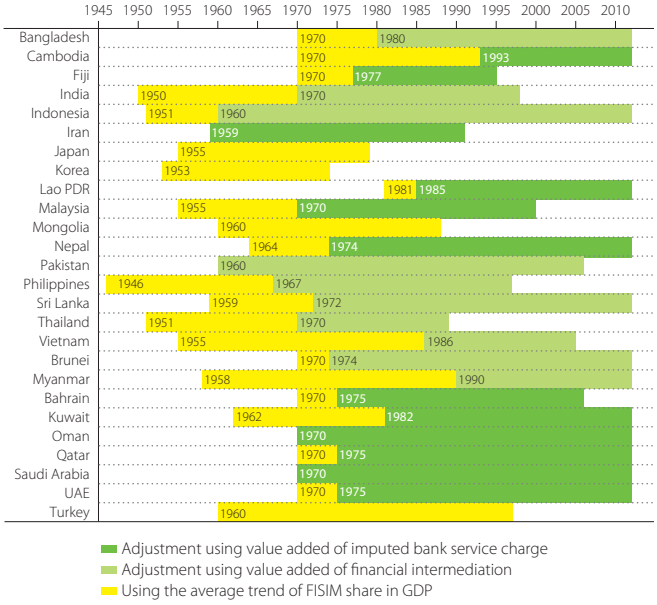



**Figure 94 Adjustment of FISIM**

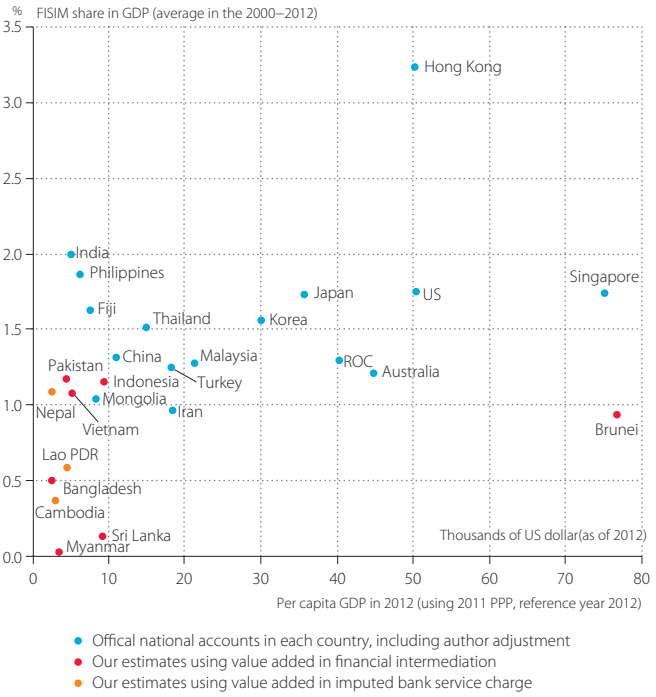



**Figure 95 FISIM Share in GDP in the 2000–2012**

Sources: Official national accounts in each country and author estimates.

Among the countries studied, the data for software investment is available for the ROC, Japan, Korea, Mongolia, the Philippines, Singapore, Thailand, and China. To harmonize data, a country's GDP is adjusted to include software investment (through its software industry) by using the ratio between software investment and GDP (software ratio) and the tangible GFCF to GDP ratio (GFCF ratio). Data from the OECD Productivity Database (Schreyer, Bignon, and Dupont, 2003) and the APO Productivity Database suggest an inverse relationship between these two ratios (Figure 96). Countries with a low GFCF ratio tend to be those with high per capita GDP, and the observed data suggest that IT tends to play a more important role in these countries than in less developed countries. Furthermore, it is observed from the OECD and APO software data that the software ratio has been gradually increasing over the past 25 years.

The Databook applies the inverse relationship between these two ratios observed from the OECD countries and national accounts in Asian non-OECD countries to estimate the software ratio in 2006 for those APO member economies that do not capitalize software investment. The estimated ratios for individual countries in 2006 gradually taper off as one move back in time. However, there is an exception. Countries at the very early stage of economic growth are found to have a GFCF ratio as low as countries with high per capita GDP, but for a different reason. The low GFCF ratio is explained by the fact that these countries have not experienced economic development yet, and in turn this does not imply an important role for software investment. In this report, Cambodia, the Lao PDR, and Nepal are regarded as countries at the very early stage of economic development, and are assigned Vietnam's software ratio accordingly, which is the lowest of all APO member economies.

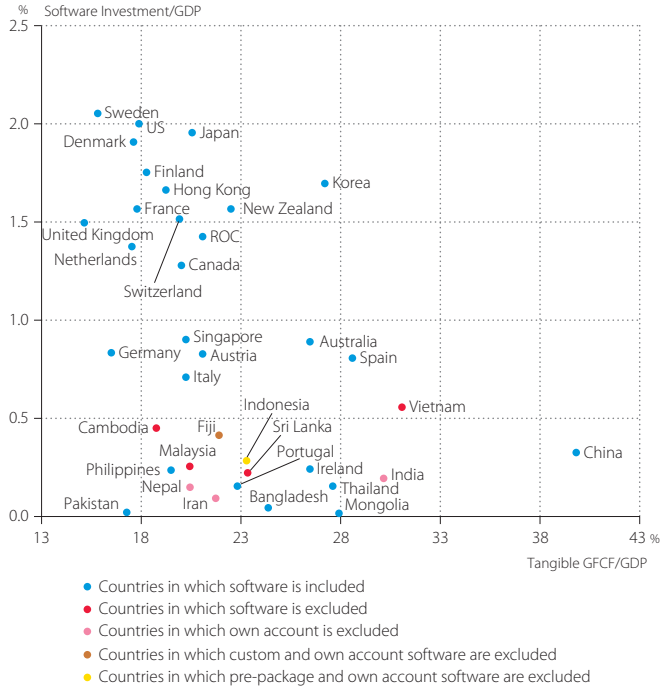



**Figure 96 Software Investment Ratio and GFCF Ratio to GDP, 2005**

Sources: OECD Productivity Database and author estimates.

Another problem arises from partial software capitalization. There are three types of software: prepackaged software, custom software, and own-account software. Countries may have capitalized one or two types of software, but software investment data is often not available separately. The Databook attempt's to adjust for the varied level of capitalization across countries by adding the type of software not capitalized to countries' GDP.

### *3) Valuables*

Valuables are defined as "goods of considerable value that are not used primarily for purposes of production or consumption but are held as stores of value over time" (United Nations, 1993: para. 10.7). They are held under the expectation that their prices will not deteriorate and will rise in the long run. Valuables consist of precious stones and metals such as diamonds; art-works such as paintings and sculptures; and other valuables such as jewelry made from stones and metals. In a small number of countries, such as, India, Iran, Mongolia, Pakistan, and Vietnam, net acquisitions of valuables are recorded as a part of gross capital formation. For example, the SNA in India has included it since 1999, accounting for 1.4% of GDP for India on average during 1999–2012. The current decision is to harmonize the data by excluding net acquisition of valuables from GDP in the APO Productivity Database 2014.

### *4) GDP at basic prices*

GDP can be valued using different price concepts: factor cost, basic prices, and market prices. If the price concept is not standardized across countries, it will interfere with the international comparisons. All the countries covered in this Databook officially report GDP at market prices (or at purchasers'

prices), but this is not true for GDP at factor cost and GDP at basic prices. International comparisons in Chapter 3 (on economic scale and growth) and Chapter 4 (on final demand) are based on GDP at market prices. However, by valuing output and input at the prices that producers actually pay and receive, GDP at basic prices is a more appropriate measure of countries' output than GDP at market prices for international comparisons of TFP and industry performance as it is a measure from the producers' perspective. Hence, Chapter 5 on whole-economy productivity performance is based on GDP at basic prices, including our estimates.

These concepts of GDP differ in the treatment of indirect tax and subsidies (and import duties). The difference between GDP at basic prices and GDP at market prices is "taxes on products" minus "subsidies on products." "Taxes on products" are the indirect taxes payable on goods and services mainly when they are produced, sold, and imported, and "subsidies on products" are subsidies payable on goods and services mainly when they are produced, sold, and imported. Since GDP at basic prices is available for some economies, such as Hong Kong, India, Korea, Mongolia, Nepal, Singapore, and Sri Lanka, a GDP at basic prices, needs to be constructed for all other countries. In order to obtain GDP at basic prices, "taxes on products" and "duties on imports" are subtracted from GDP at market prices, which is available for all the countries studied, and "subsidies on products" is added. The main data sources for estimating "taxes on products" and "subsidies on products" are tax data in national accounts, the IMF's Government Finance Statistics, and the input-output tables in each country.

Readers should bear these caveats in mind in interpreting the results in Chapter 6, since the definition of GDP by industry differs among countries due to data availability. GDP is valued at factor cost for Fiji, and Pakistan, at basic prices for Cambodia, Hong Kong, India, Korea, the Lao PDR, Mongolia, Nepal, and Singapore, at producers' prices for Iran, the ROC, and the Philippines, and at market prices for Bangladesh, Indonesia, Japan, Malaysia, Sri Lanka, Thailand, and Vietnam. In this sense, APO industry data should be treated as a work in progress as it is difficult to advise on data uncertainty. These issues will be developed and examined in the future.

## A.2 Capital Stock

At present, half of APO member economies publish estimates of capital stocks in their systems of national accounts. Even where estimates are available, users must be mindful of differences in methodologies and assumptions used to estimate capital stock, and a large diversity in the treatment of quality adjustment in price statistics among countries. In the APO Productivity Database 2014, a harmonized methodology has been applied in estimating capital stock and capital services, covering 18 Asian economies: Bangladesh, China, the ROC, Fiji, Hong Kong, India, Indonesia, Iran, Japan, Korea, Malaysia, Mongolia, Pakistan, the Philippines, Singapore, Sri Lanka, Thailand, and Vietnam, and the US as a reference country.

Quality changes in the aggregate measure of capital input can originate from two kinds of sources, namely the composition change by type of asset, and the quality change in each type of asset. To take the composition change of assets into account, the current database classifies ten types of assets (shown in Table 18). For countries in which detailed investment data is not available from national accounts, the ten types of investment data are estimated based on the benchmark input–output tables and our estimates of the commodity flow data of domestic production and export/import of assets. The input-output tables and supply and use tables are listed in Table 19. The starting years for estimating capital stock based on the perpetual inventory method is 1901 for the US, 1951 for the ROC, 1952 for China, 1953 for Korea, 1955 for Japan, 1960 for Singapore, 1961 for Hong Kong, and 1970 for other countries.

**Table 18 Asset Classification and Parameters in Hyperbolic Function**

| | $T$ | $\beta$ |
|---|---|---|
| 1. IT hardware | 7 | 0.50 |
| 2. communications equipment | 15 | 0.50 |
| 3. transportation equipment | 15 | 0.50 |
| 4. other machinery and equipment | 15 | 0.50 |
| 5. residential buildings | 30 | 0.75 |
| 6. non-residential buildings | 30 | 0.75 |
| 7. other construction | 40 | 0.75 |
| 8. cultivated assets | 10 | 0.50 |
| 9. computer software | 3 | 0.50 |
| 10. other intangible assets | 7 | 0.50 |

Source: APO Productivity Database 2014.01.

It is well known that prices of constant-quality IT capital have been falling rapidly. For cross-country comparisons, it has been noted that there is great diversity in the treatment of quality adjustment in price statistics among countries. Cross-country comparisons will be significantly biased if some countries adjust their deflators for quality change while others do not. Price harmonization is sometimes used in an attempt to control for methodological differences in the compilation of price indexes, under the assumption that individual countries' price data fails to capture quality improvements. Assuming that the relative price of IT to non-IT capital in the countries compared is set equal to the IT to non-IT prices relative in the reference country, the harmonized price is formulated as: $\Delta \ln \tilde{P}_{IT}^{X} = \Delta \ln P_{nIT}^{X} + (\Delta \ln P_{IT}^{ref} - \Delta \ln P_{nIT}^{ref})$, where the superscript $X$ denotes the country included in the comparisons, $P_{IT}$ is the price of IT capital, and $P_{nIT}$ is the price of non-IT capital. The price of IT capital in country $X$, $\tilde{P}_{IT}^{X}$, is computed by the observed prices $P_{IT}^{ref}$ and $P_{nIT}^{ref}$ in the reference country and

**Table 19 Input-Output Tables and Supply and Use Tables**

| Input–Output Tables and Supply and Use Tables | |
|---|---|
| ROC | Benchmark (1981, 1984, 1986, 1989, 1991, 1994, 1996, 1999, 2001, 2004, 2006) Annual (2006–2012) |
| Fiji | 1972, 1982, 2005 |
| India | 1993/1994, 1998/1999, 2003/2004, 2006/2007 |
| Indonesia | 1971, 1975, 1980, 1985, 1990, 1995, 2000, 2005 |
| Iran | 1999, 2001 |
| Japan | 1960, 1965, 1970, 1975, 1980, 1985, 1990, 1995, 2000, 2005 |
| Korea | Benchmark (1960, 1963, 1966, 1970, 1975, 1980, 1985, 1990, 1995, 2000, 2005, 2010) Updated (1973, 1978, 1983, 1986-1988, 1993, 1998, 2003, 2006–2011) |
| Malaysia | 1978, 1983, 1987, 1991, 2000, 2005 |
| Mongolia | 1970, 1977, 1983, 1987, 2000, 2005 |
| Pakistan | 1975/1976, 1984/1985, 1989/1990, 1990/1991 |
| Philippines | 1969, 1975, 1985, 1988, 1990, 1995, 2000 |
| Singapore | 1973, 1978, 1983, 1988, 2000, 2005, 2007 |
| Sri Lanka | 2006 |
| Thailand | 1975, 1980, 1985, 1990, 1995, 1998, 2000, 2005 |
| Vietnam | 1996, 2000, 2007 |
| China | 1987, 1992, 1997, 2002, 2007 |
| Brunei | 2005 |
| Turkey | 1973, 1979, 1985, 1990, 1998, 2002 |

$P^{X}_{niT}$ in *X*. Schreyer (2002) and Schreyer, Bignon, and Dupont (2003) applied price harmonization to OECD capital services, with the US as a reference country, since the possible error due to using a harmonized price index would be smaller than the bias arising from comparing capital services based on national deflators.

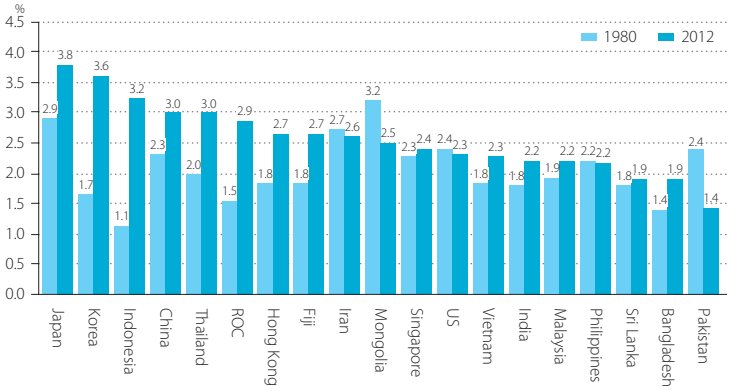



**Figure 97 Capital-Output Ratio, 1980 and 2012**
——Ratio of the beginning-of-period net capital stock to GDP at current prices

Source: APO Productivity Database 2014.01.

In this Databook, the same price harmonization method is applied to adjust the quality improvement for IT hardware and communications equipment in countries where the appropriate quality-adjusted price data is not available, with Japan's prices as a reference country. A similar procedure was applied in cases where the prices for some assets were not available, to estimate missing data based on the relative price of these assets to total GFCF. In measuring capital services, this Databook largely follows the framework of the OECD Productivity Database (see Schreyer, Bignon, and Dupont, ibid.). The OECD assumes the truncated normal distribution as profiles for asset discarding (retirement) and the hyperbolic distribution as profiles for asset decaying. The age-efficiency profile is defined as a combined distribution of discard and decay of assets. The age-efficiency profile in each asset is based on the two parameters in the hyperbolic function: $T$ (average service life) and $\beta$ ($-\infty<\beta\leq 1$). The hyperbolic function becomes one-hoss shay (no decay until $T$) when $\beta=1$ and linear when $\beta=0$. These two parameters are set, as shown in Table 18. The estimates of productive capital stock by type of asset are used in measuring capital services (see Appendix 3).

Figure 97 presents the estimated capital-output ratio (stock coefficient) that is defined by the ratio of the beginning-of-period net capital stock (all types of produced fixed assets owned by private and public institutions) to the basic-price GDP at current prices. Japan has the highest capital-output ratio among Asian countries, at 3.8. However, the ratio may not work well for cross-country comparisons since the price differential between that for GDP and fixed assets in each country is not accounted for. Compared to the 1980 level in each country, all Asian countries except Mongolia, Pakistan, and Iran have an increasing trend of capital-output ratio, unlike the ratio in the US, which is stable.

## A.3 Rate of Return and Capital Services

In the analysis of production and productivity, capital service provides an appropriate concept of capital as a factor of production. The fundamental assumption in measuring capital services is proportionality between the (productive) capital stock and capital services in each type of asset. Thus, the growth rates of capital services can differ from that of capital stock only at the aggregate level. For aggregating different types of capital, the user costs of capital by type of asset should be estimated.

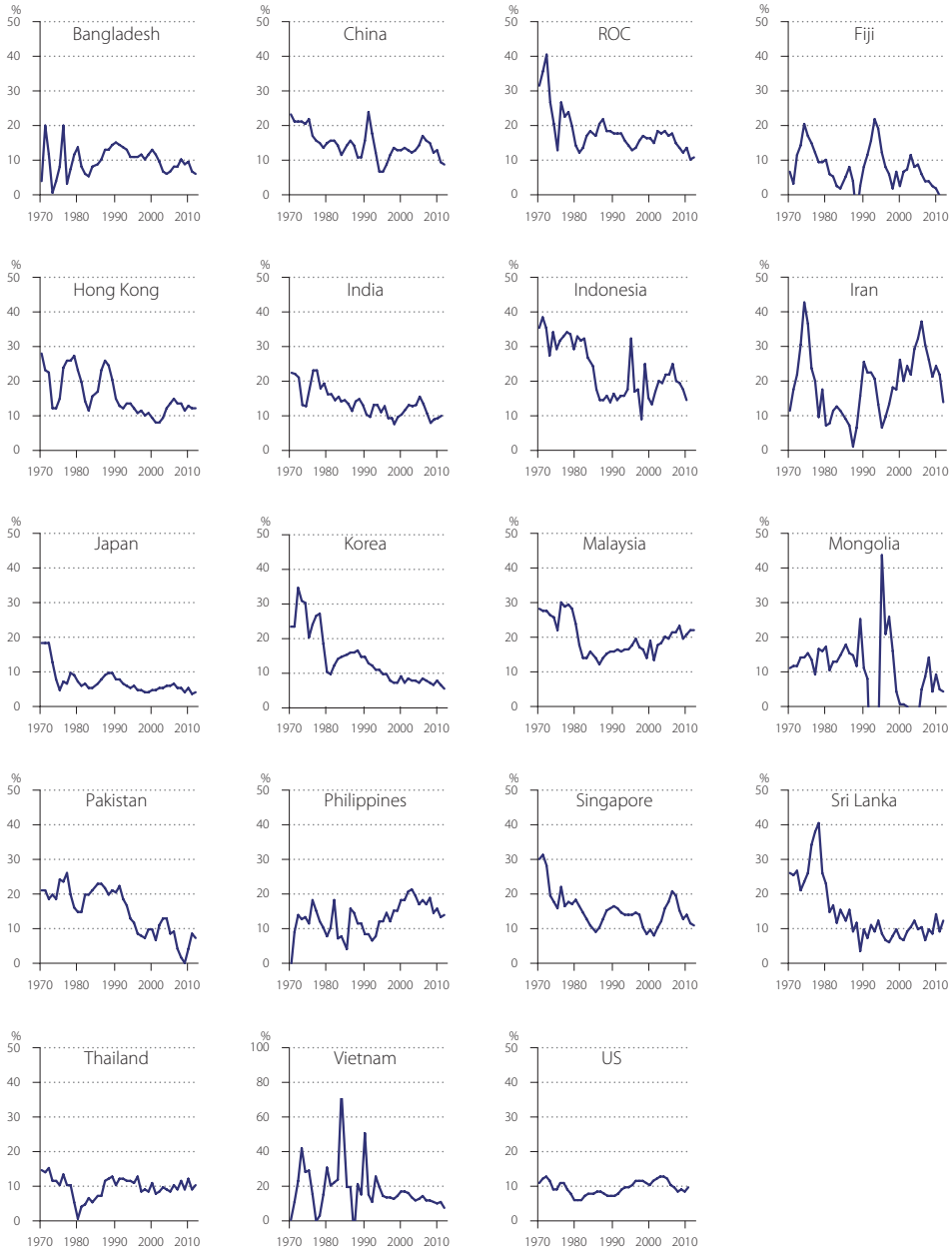



**Figure 98 Ex Post Real Rate of Return in Asia, 1970–2012**

Source: APO Productivity Database 2014.01.

This Appendix outlines the methodology of the user cost of capital estimation and presents the estimated results of endogenous rate of return for Asian countries in the APO Productivity Database 2014.

The user cost of capital of a new asset (with type of asset denoted as $k$ of the period $t$), $u^k_{t,0}$ , is defined as $q^k_{t-1,0}\{r_t + (1+\zeta^k_t)\,\delta^k_{P,t,0} - \zeta^k_t\}$, where $r_t$, $\delta^k_{P,t,0}$, and $q^k_{t,0}$ are the expected nominal rate of return, cross-section depreciation rate, and asset price, respectively. The asset-specific inflation rate $\zeta^k_t$ is defined as $(q^k_{t,0} / q^k_{t-1,0} - 1)$. The OECD assumes the country-specific *ex ante* real rate of return $r^*$ that is constant for the whole period, and defines the nominal rate of return as $r_t = (1 + r^*)(1 + \rho_t) - 1$, where $\rho_t$ represents the expected overall inflation rate, defined by a five-year centered moving average of the rate of change of the CPI (see Schreyer, Bignon, and Dupont, 2003).

One of the main difficulties in applying the *ex ante* approach for measuring user cost of capital is obtaining proper estimates for real rates of return, which can differ considerably among countries and over time. On the other hand, the *ex post* approach originated by Jorgenson and Griliches (1967) allows an estimation based on observed data. Assuming constant returns to scale and competitive markets, capital compensation can be derived from the summation of the capital service cost $V^k_t$ for each asset, which is defined as the product of the user cost of capital and the productive capital stock (i.e., $V_t = \Sigma_k V^k_t = \Sigma_k u^k_{t,0} S^k_t$). Based on this identity and the n-equations of user cost of capital, the n+1 variables of $u^k_{t,0}$ and $r_t$ are simultaneously determined, using the observed capital compensation $V_t$ as the total sum of $V^k_t$ that is not observable in each asset. Note that the depreciation rate $\delta^k_{P,t,0}$ is not independent of the estimated $r_t$.

The estimated results of the *ex post* real rate of return based on $r^* = (1 + r_t) / (1 + \rho_t) - 1$ for 18 Asian countries and the US are shown in Figure 98. Although there are large fluctuations in countries like Thailand, Mongolia, and Vietnam, many Asian countries may exhibit decreasing trends in the (endogenous) real rate of return, while the US holds a stable rate of around 10%. Table 20 presents the five-year-averages of the estimated rates for *ex post* real rate of return during 1970–2012. In 2005–2012, the real rate of return ranged from 5.1% for Japan to 20.2% in Indonesia and 26.0 for Iran. Using these *ex post* estimates, the aggregate capital services are measured in this report. The difference caused by the *ex ante* and *ex post* approaches may provide a modest difference in the growth measure of capital services, regardless of the substantial differences in the rates of return and capital compensations (Nomura, 2004).

**Table 20 Average Ex Post Real Rate of Return in Asia**

| | 1970–1974 | 1975–1979 | 1980–1984 | 1985–1989 | 1990–1994 | 1995–1999 | 2000–2004 | 2005–2012 |
|---|---|---|---|---|---|---|---|---|
| Bangladesh | 7.9 | 10.0 | 8.0 | 11.9 | 13.3 | 11.2 | 9.3 | 8.0 |
| China | 21.5 | 16.6 | 14.3 | 13.3 | 15.1 | 10.8 | 12.9 | 13.1 |
| ROC | 30.7 | 20.9 | 15.1 | 19.3 | 16.6 | 15.0 | 17.1 | 13.7 |
| Fiji | 11.3 | 12.5 | 5.0 | 2.6 | 15.3 | 7.0 | 7.2 | 3.1 |
| Hong Kong | 19.5 | 23.4 | 16.9 | 22.0 | 13.4 | 11.0 | 9.4 | 13.0 |
| India | 18.3 | 20.3 | 15.3 | 13.7 | 11.9 | 10.0 | 11.6 | 11.2 |
| Indonesia | 34.3 | 32.3 | 30.8 | 17.3 | 15.3 | 18.7 | 18.2 | 20.2 |
| Iran | 24.9 | 21.7 | 10.1 | 7.9 | 21.0 | 13.2 | 24.3 | 26.0 |
| Japan | 15.0 | 7.4 | 6.2 | 8.4 | 6.8 | 4.7 | 5.1 | 5.1 |
| Korea | 28.2 | 23.0 | 12.1 | 15.5 | 12.3 | 8.4 | 8.0 | 7.0 |
| Malaysia | 27.1 | 27.6 | 17.0 | 14.3 | 16.0 | 16.8 | 17.6 | 21.2 |
| Mongolia | 12.3 | 14.0 | 13.6 | 16.8 | –5.5 | 22.0 | –1.0 | 5.7 |
| Pakistan | 19.7 | 21.8 | 17.9 | 21.6 | 18.0 | 9.0 | 10.7 | 5.5 |
| Philippines | 9.6 | 13.6 | 10.4 | 11.6 | 8.8 | 13.8 | 19.9 | 16.3 |
| Singapore | 25.3 | 17.7 | 14.5 | 12.6 | 15.0 | 12.3 | 11.1 | 15.3 |
| Sri Lanka | 24.5 | 32.9 | 16.3 | 10.3 | 9.8 | 7.8 | 9.1 | 10.1 |
| Thailand | 13.4 | 9.9 | 4.3 | 10.1 | 11.4 | 10.0 | 9.1 | 10.1 |
| Veitnam | 20.7 | 12.6 | 34.4 | 13.5 | 24.3 | 13.6 | 15.1 | 11.2 |
| US | 11.3 | 9.5 | 6.4 | 7.9 | 8.2 | 10.9 | 11.4 | 10.0 |

Unit: Percentage
Source: APO Productivity Database 2014.01.

## A.4 Hours Worked

Labor volume can be measured in three measurement units: number of persons in employment, number of filled jobs, and hours actually worked. Given the variations in working patterns and employment legislation both over time and across countries, hours worked, if accurately measured, offers the most time-consistent and somewhat internationally comparable unit measuring the volume in each of different types of labor. This is the primary underlying reason for the importance of choosing hours actually worked in productivity analysis, but in reality, due to the difficulty in accurately estimating average hours actually worked, it is not always available or comparable across countries. The large variety of data sources, definitions, and methodologies available in estimating these labor market variables often leads to a fragmentation of labor market statistics of an individual country concerned, dubious data quality, and incomparability across countries. Here follows an attempt to outline some of these intricate measuring issues.

Data on labor volume comes from two main statistical surveys on establishment and household, with respective strengths and weaknesses. Establishment surveys are surveys of firms with stratified sample frames by the size of establishments. The concentration of total employment in a relatively small number of establishments means that this sampling strategy is cost effective in delivering high precision labor market estimates with fairly small sampling error. Questionnaires are designed to be close to the concepts used in company administration. This has both strengths and weaknesses. On the one hand, data collected is of high quality and accuracy. On the other hand, changes in legislation and regulation could be a source of instability to the definitions, and in turn of the data collected. Furthermore data that companies do not collect for administrative purpose, such as unpaid hours and worker characteristics, are unavailable. This greatly limits the varieties of labor market data that can be collected through establishments. Employment as measured is necessarily based on jobs rather than on persons employed, as persons holding multiple jobs with different establishments cannot be identified and will be counted more than once. Information on hours is on paid hours rather than hours actually worked. Certain categories of employment, most notably the self-employed, are not covered. Sometimes small firms, informal employment or the public sector are also excluded. As a result of these limitations, labor market data from establishment surveys often requires a raft of adjustments for omissions and definition modifications during the compilation process.

Household-based labor force surveys (LFS), in contrast, have full coverage of the economy, although they sometimes incorporate age or geographic exclusions and may have imperfect coverage of the armed forces and other institutional households. Nonetheless, they provide valuable data on certain employment groups such as the self-employed and unpaid family workers, and on the rate of multiple job holding. Employment status in LFS is independently determined and is not subject to the criteria used in company records. Most countries follow the International Labour Organization (ILO) definitions. As LFS' are surveys from the socio-economic perspective, they also provide rich data on worker characteristics that are relevant to productivity analysis. The major weakness of the LFS, however, is data precision. By relying on the recollection of the respondents, their response also depends on perception. Response errors could, therefore, arise from confusion of concepts and imprecise recollection of the respondents concerning work patterns and pay during the reference week. Another source of errors originates from proxy response, which relies on the proxy's perception and knowledge of another household's member. A high level of proxy responses could, therefore, reduce the reliability of data collected.

The common practice of statistical offices has been to combine information from both establishment and household surveys, with a view to making use of the most reliable aspects of each of the surveys.

This seems to be the most promising avenue forward in improving the quality and consistency of data on labor input. However, statistical offices could still differ a great deal in their methodologies, especially in estimating the annual average hours worked per job/per person, depending on their starting points, namely LFS data or enterprise data. All these have to be taken into account in international comparisons of productivity.

In productivity analysis, ideally, labor volume should be quality adjusted in order to reflect workforce heterogeneity, as recommended in the SNA 2008. To adjust total hours worked for quality would require information on worker characteristics so as to distinguish the workforce into different types, which are then weighed by their marginal productivity and approximated by their respective shares of total compensation. Deriving a quality adjusted labor input (QALI) measure is a data-demanding exercise. Even if LFS provides the required information, researchers often run into the consistency issues discussed above, as well as sample size problems as they break down the workforce into fine categories. See Nomura and Amano (2012) as an exercise in this for Singapore.

The APO Productivity Database 2014 defines labor inputs as the simple sum of hours worked. Hours worked are defined in this Databook as the economy-wide hours worked by employees, the self-employed, and contributing family workers. Japanese and US's national accounts publish estimates of the total hours worked. Other Asian countries do not publish hours worked in their national accounts. For these countries the procedure of constructing economy-wide annual hours worked consists of two steps; for many Asian countries first, an average weekly hours worked is obtained and the number of workers collated from official statistics, such as a labor force survey. The data we used is listed in Table 21. Multiplying the average hours worked by the number of workers gives economy-wide averages of weekly hours worked; second, the number of weeks worked is obtained, by counting the number of national holidays in each country. Multiplying economy-wide average weekly hours worked by the number of

**Table 21 Sources of Labor Data**

| | Sources of Labor Data |
|---|---|
| Bangladesh | Labor Force Survey, Population Census |
| Cambodia | Socio-Economic Survey, Labor Force Survey |
| ROC | Yearbook of Manpower Survey Statistics in Taiwan Area, Taiwan Statistical Data Book |
| Fiji | Annual Employment Survey, Population Census, Estimates by FIBOS (Fiji Islands Bureau of Statistics), Labor Force Survey |
| Hong Kong | Data download from Census and Statistics Department of Hong Kong Statistics |
| India | Census of India, Employment and Unemployment Survey |
| Indonesia | Labor Force Situation in Indonesia |
| Iran | Population Census, Labor Force Survey |
| Japan | Labor Force Survey, National Accounts |
| Korea | Census on Basic Characteristics of Establishment, Economically Active Population Survey, Monthly Labor Survey |
| Lao PDR | Population Census, ADB Key Indicators for Asia and the Pacific |
| Malaysia | Economic Report Various issues, Malaysia Economic Statistics-Time Series, Labor Force Survey Report |
| Mongolia | Mongolian Statistical Yearbook |
| Nepal | Population Census |
| Pakistan | Labor Force Survey, Pakistan Statistical Yearbook, Pakistan Economic Survey |
| Philippines | Labor Force Survey, Philippines Statistical Yearbook |
| Singapore | Labor Force Survey, Singapore Yearbook of Manpower Statistics |
| Sri Lanka | Central Bank of Sri Lanka Annual Report, Labor Force Survey |
| Thailand | Labor Force Survey |
| Vietnam | Estimates by General Statistics Office, Labor Force and Employment Survey |

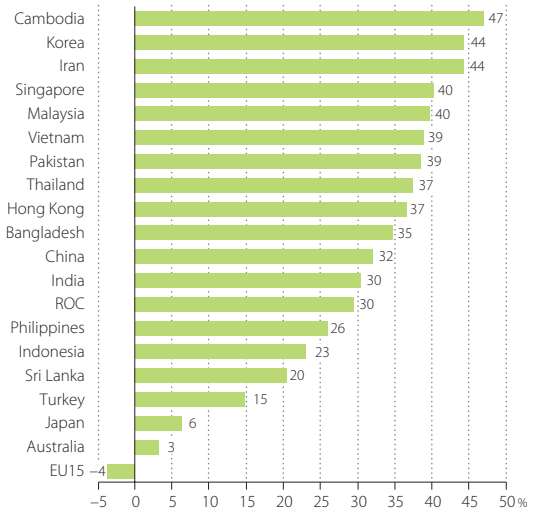



**Figure 99 Average Annual Hours Worked Per Worker Relative to the US, 2000–2012**

Sources: Official national accounts and labor force survey in each country, including author adjustments.

weeks worked gives economy-wide annual hours worked. For Fiji, the Lao PDR, Mongolia, and Nepal, total hours worked are not estimated due to data constraint.

Figure 99 presents a cross-country comparison of average annual hours worked per worker for 2000–2012, relative to the level of the US. It indicates that workers in Asian countries tend to work much longer hours than those in the US and Europe. In many of the countries sampled, the difference in annual hours worked per person relative to the US is more than 20% of the US level. Prolonged working hours are observed in Asian countries regardless of their stage of development, spanning low-income countries such as Bangladesh and Cambodia to high-income countries such as the ROC and Singapore. An exception is Japan. Workers in Japan are likely to work much shorter hours than those in other Asian countries. However, compared with EU15, hours worked by workers in Japan is still about 10% longer.



## A.5 Other Data

For China, multiple data sources have been used; GDP for the whole economy, industry GDP, final demands, employment, and income data are taken from *China Statistical Yearbook* and *China National Income 1952–1995*; time-series data of GFCF during 1952–2012 at current and constant prices are constructed at KEO; the main references for GFCF construction are drawn from *Statistics on Investment in Fixed Assets of China 1950–2000, China Statistical Yearbook*, and *1987, 1992, 1997, 2002, and 2007 Input–Output Tables of China*; and multiple data sources for manufacturing, electrics, and trade data from *China's Customs Statistics* are also utilized.[106]

The data source for EU15 and EU27 is the OECD.Stat (http://stats.oecd.org/). The data for the US, Australia, and Turkey are taken from the website of the US Bureau of Economic Analysis (http://www.bea.gov), the Australian Bureau of Statistics (http://www.abs.gov.au/), and the Turkish Statistical Institute (http://www.turkstat.gov.tr), respectively.

The exchange rates used in this edition are adjusted rates, called the Analysis of Main Aggregate (UNSD database) rates, in the UNSD National Accounts Main Aggregate Database. The AMA rates coincide with IMF rates except for some periods in countries with official fixed exchange rates and high inflation, when there could be a serious disparity between real GDP growth and growth converted to US dollars based on IMF rates. In such cases, the AMA adjusts the IMF-based rates by multiplying the growth rate of the GDP deflator relative to the US.

Tax data of member economies are supplemented by the IMF's Government Finance Statistics. From its tax revenue data, "taxes on goods and services" and "taxes on imports" are used for calculating taxes on products. From its expenditure data, "subsidies" are taken. Data taken from Government Finance Statistics play a key role in adjusting GDP at market prices to GDP at basic prices. The data for energy consumptions and CO2 emissions is based on IEA's *CO2 Emissions from Fuel Combustion, Energy Balances of OECD Countries,* and *Energy Balances of non-OECD Countries.*

106: Holz (2006) provides a useful reference on Chinese official statistics.

## A.6 Industry Classification

The concordance between the industry classification used in Chapter 6 and the International Standard Industry Classification of All Economic Activities (ISIC), Rev. 3, is shown in the following table.

### Table 22 Industry Classification

| | ISIC Rev.3 | Databook 1st | Databook 2nd | |
|---|---|---|---|---|
| A - Agriculture, hunting, and forestry | 01 | 1 | | Agriculture, hunting, and related service activities |
| | 02 | 1 | | Forestry, logging, and related service activities |
| B - Fishing | 05 | 1 | | Fishing, operation of fish hatcheries, and fish farms; service activities incidental to fishing |
| C - Mining and quarrying | 10 | 2 | | Mining of coal and lignite; extraction of peat |
| | 11 | 2 | | Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction excluding surveying |
| | 12 | 2 | | Mining of uranium and thorium ores |
| | 13 | 2 | | Mining of metal ores |
| | 14 | 2 | | Other mining and quarrying |
| D - Manufacturing | 15 | 3 | 3.1 | Manufacture of food products and beverages |
| | 16 | 3 | 3.1 | Manufacture of tobacco products |
| | 17 | 3 | 3.2 | Manufacture of textiles |
| | 18 | 3 | 3.2 | Manufacture of wearing apparel; dressing and dyeing of fur |
| | 19 | 3 | 3.2 | Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness, and footwear |
| | 20 | 3 | 3.3 | Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials |
| | 21 | 3 | 3.4 | Manufacture of paper and paper products |
| | 22 | 3 | 3.4 | Publishing, printing, and reproduction of recorded media |
| | 23 | 3 | 3.5 | Manufacture of coke, refined petroleum products, and nuclear fuel |
| | 24 | 3 | 3.5 | Manufacture of chemicals and chemical products |
| | 25 | 3 | 3.5 | Manufacture of rubber and plastics products |
| | 26 | 3 | 3.6 | Manufacture of other non-metallic mineral products |
| | 27 | 3 | 3.7 | Manufacture of basic metals |
| | 28 | 3 | 3.8 | Manufacture of fabricated metal products, except machinery and equipment |
| | 29 | 3 | 3.8 | Manufacture of machinery and equipment n.e.c. |
| | 30 | 3 | 3.8 | Manufacture of office, accounting, and computing machinery |
| | 31 | 3 | 3.8 | Manufacture of electrical machinery and apparatus n.e.c. |
| | 32 | 3 | 3.8 | Manufacture of radio, television, and communication equipment and apparatus |
| | 33 | 3 | 3.8 | Manufacture of medical, precision, and optical instruments, watches, and clocks |
| | 34 | 3 | 3.8 | Manufacture of motor vehicles, trailers, and semi-trailers |
| | 35 | 3 | 3.8 | Manufacture of other transport equipment |
| | 36 | 3 | 3.9 | Manufacture of furniture; manufacturing n.e.c. |
| | 37 | 3 | 3.9 | Recycling |
| E - Electricity, gas, and water supply | 40 | 4 | | Electricity, gas, steam, and hot water supply |
| | 41 | 4 | | Collection, purification, and distribution of water |
| F - Construction | 45 | 5 | | Construction |
| G - Wholesale and retail trade; repair of motor vehicles, motorcycles, and personal and household goods | 50 | 6 | | Sale, maintenance, and repair of motor vehicles and motorcycles; retail sale of automotive fuel |
| | 51 | 6 | | Wholesale trade and commission trade, except of motor vehicles and motorcycles |
| | 52 | 6 | | Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods |
| H - Hotels and restaurants | 55 | 6 | | Hotels and restaurants |
| I - Transport, storage, and communications | 60 | 7 | | Land transport; transport via pipelines |
| | 61 | 7 | | Water transport |
| | 62 | 7 | | Air transport |
| | 63 | 7 | | Supporting and auxiliary transport activities; activities of travel agencies |
| | 64 | 7 | | Post and telecommunications |
| J - Financial intermediation | 65 | 8 | | Financial intermediation, except insurance and pension funding |
| | 66 | 8 | | Insurance and pension funding, except compulsory social security |
| | 67 | 8 | | Activities auxiliary to financial intermediation |
| K - Real estate, renting, and business activities | 70 | 8 | | Real estate activities |
| | 71 | 8 | | Renting of machinery and equipment without operator and of personal and household goods |
| | 72 | 8 | | Computer and related activities |
| | 73 | 8 | | Research and development |
| | 74 | 8 | | Other business activities |
| L - Public administration and defence; compulsory social security | 75 | 9 | | Public administration and defence; compulsory social security |
| M - Education | 80 | 9 | | Education |
| N - Health and social work | 85 | 9 | | Health and social work |
| O - Other community, social, and personal service activities | 90 | 9 | | Sewage and refuse disposal, sanitation, and similar activities |
| | 91 | 9 | | Activities of membership organizations n.e.c. |
| | 92 | 9 | | Recreational, cultural, and sporting activities |
| | 93 | 9 | | Other service activities |
| P - Private households with employed persons | 95 | 9 | | Private households with employed persons |
| Q - Extra-territorial organizations and bodies | 99 | 9 | | Extra-territorial organizations and bodies |

Note: "n.e.c." represents "not elsewhere classified."

# References


**Ando, Mitsuyo and Fukunari Kimura** (2005) "The Formation of International Production and Distribution Networks in East Asia," in Takatoshi Ito and Andrew K. Rose (eds.) *International Trade in East Asia* (NBER-East Asia Seminar on Economics, Volume 14), Chicago: The University of Chicago Press, pp. 177–213.

**Baier, Scott L., Gerald P. Dwyer, and Robert Tamura** (2006) "How Important Are Capital and Total Factor Productivity for Economic Growth?" *Economic Inquiry* 44(1), pp. 23–49.

**Baldwin, Richard** (2011) "21st Century Regionalism: Filling the Gap between 21st Century Trade and 20th Century Trade Rules," *Centre for Economic Policy Research Policy Insight*, No. 56, May.

**Bosworth, Barry P.** (2005) "Economic Growth in Thailand: The Macroeconomic Context," paper presented to World Bank project on investment climate, firm competitiveness and growth in Thailand.

**Bosworth, Barry P. and Susan M. Collins** (2008) "Accounting for Growth: Comparing China and India," *Journal of Economic Perspective* 22(1), pp. 45–66.

**Caselli, Francesco** (2005) "Accounting for Cross-Country Income Differences," in P. Aghion and S. N. Durlauf (eds.) *Handbook of Economic Growth*, Amsterdam: North Holland, pp. 679–741.

**Cororaton, Caesar B.** (2002) "Total Factor Productivity in the Philippines," Discussion Paper Series 2002–01, Philippine Institute for Development Studies, Makati.

**Department of Statistics Malaysia** (2013) *National Accounts Capital Stock Statistics 2005–2012*, December.

**Diewert, W. Erwin and Denis Lawrence** (2006) "Measuring the Contributions of Productivity and Terms of Trade to Australia's Economic Welfare," report by Meyrick and Associates to Australian Government Productivity Commission, Canberra.

**Diewert, W. Erwin and Catherine J. Morrison** (1986) "Adjusting Outputs and Productivity Indexes for Changes in the Terms of Trade," *Economic Journal* 96(3), pp. 659–679.

**Diewert, W. Erwin, Hideyuki Mizobuchi, and Koji Nomura** (2005) "On Measuring Japan's Productivity, 1995–2003," Department of Economics Discussion Paper Series No. 05–22, December, Vancouver: University of British Columbia.

**Economist Intelligence Unit** (2010) "Country Report: Myanmar, January 2010," available at http://www.eiu.com/.

**Eichengreen, B., Donghyun Park and Kwanho Shin** (2011) "When Fast Growing Economies Slow Down: International Evidence and Implications for China," NBER Working Paper Series 16919.

**Elms, Deborah K. and Patrick Low, eds.** (2013) *Global Value Chains in a Changing World*, Geneva: The World Trade Organisation.

**Eurostat-OECD** (2012) *Eurostat-OECD Methodological Manual on Purchasing Power Parities, 2012 edition*, Eurostat Methodologies and Working Papers, European Union/OECD.

**Fei, J. C. H and G. Ranis** (1964) *Development of the Labor Surplus Economy: Theory and Policy*, Richard D. Irwin, Homewood Illinois.

**Gollin, Douglas, Stephen L. Parente, and Richard Rogerson** (2004) "Farm Work, Home Work and International Productivity Differences," *Review of Economic Dynamics* 7, pp. 827–850.

**Holz, Carsten A.** (2006) "Measuring Chinese Productivity Growth, 1952–2005," mimeo, Social Science Division, Hong Kong University of Science and Technology.

**IMF** (2013) *World Economic Outlook*, April, Washington D.C., International Monetary Fund.

**Jones, Ronald W. and Henryk Kierzkowski** (1990) "The Role of Services in Production and International Trade: A Theoretical Framework," in Ronald W. Jones and Anne O. Krueger (eds.) *The Political Economy of International Trade: Essays in Honor of Robert E. Baldwin*, Oxford: Basil Blackwell, pp. 31–48.

**Jorgenson, Dale W. and Zvi Griliches** (1967) "The Explanation of Productivity Change," *Review of Economic Studies* 34(3), pp. 249–283.

**Jorgenson, Dale W. and Koji Nomura** (2005) "The Industry Origins of Japanese Economic Growth," *Journal of Japanese and International Economies* 19 (December), pp. 482–542.

**Jorgenson, Dale W. and Koji Nomura** (2007) "The Industry Origins of the U.S.-Japan Productivity Gap," *Economic Systems Research* 19 (September), pp. 315–341.

**Jorgenson, Dale W., Mun S. Ho, and Kevin J. Stiroh** (2005) *Information Technology and the American Growth Resurgence*, Cambridge, MA: MIT Press.

**Kohli, Ulrich** (2004) "Real GDP, Real Domestic Income and Terms of Trade Changes," *Journal of International Economics* 62(1), pp. 83–106.

**Kohli, Ulrich** (2006) "Real GDP, Real GDI, and Trading Gains: Canada, 1981–2005," *International Productivity Monitor* 13, pp. 46–56.

**Lewis, W. Arthur** (1954) "Economic Development with Unlimited Supplies of Labour," *The Manchester School*, 22(2), pp. 139–191.

**Maddison, Angus** (1998) *Chinese Economic Performance in the Long Run*, Paris: OECD Development Centre.
**Nomura, Koji** (2004) *Measurement of Capital and Productivity in Japan*, Tokyo: Keio University Press (in Japanese).
**Nomura, Koji and Tomomichi Amano** (2012) "Labor Productivity and Quality Change in Singapore: Achievements in 1974-2011 and Prospects for the Next Two Decades," KEO Discussion Paper, No.129.
**OECD** (2001) *Measuring Productivity- OECD Manual*, Paris: OECD.
**OECD** (2009) *Measuring Capital- OECD Manual*, 2nd edition, Paris: OECD.
**OECD** (2013) *OECD Compendium of Productivity Indicators 2013*, November.
**Ohkawa, Kazushi, Nobukiyo Takamatsu, and Yuzo Yamamoto** (1974) Estimates of Long-Term Economic Statistics of Japan since 1868 Vol. 1, National Income, Tokyo: Toyo Keizai Shinposha (in Japanese).
**Park, Yung Chul and Kwanho Shin** (2009) "Economic Integration and Changes in the Business Cycle in East Asia: Is the Region Decoupling from the Rest of the World?" *Asian Economic Papers* 8(1), pp. 107–140.
**Schreyer, Paul** (2002) "Computer Price Indices and International Growth and Productivity Comparisons," *Review of Income and Wealth* 48(1), pp. 15–33.
**Schreyer, Paul, Pierre-Emmanuel Bignon, and Julien Dupont** (2003) "OECD Capital Services Estimates: Methodology and a First Set of Results," OECD Statistics Working Paper 2003/6, Paris: OECD.
**Solow, Robert** (1957), "Technical Change and the Aggregate Production Function," *Review of Economics and Statistics* 39(3), pp. 312–320.
**United Nations** (1993) *System of National Accounts 1993*, New York: United Nations.
**United Nations** (2008) International Standard Industrial Classification of all Economic Activities, Revision 4, Department of Economic and Social Affairs Statistics Division, Statistical Paper series M No.4/Rev.
**United Nations** (2009) *System of National Accounts 2008*, New York: United Nations.
**United Nations** (2013) *World Population Prospects: The 2012 Revision*.
**Van der Eng, Pierre** (2008) "Capital Formation and Capital Stock in Indonesia, 1950–2007," Working Papers in Trade and Development 2008/24, Australian National University, Canberra.
**Van der Eng, Pierre** (2009) "Total Factor Productivity and Economic Growth in Indonesia," Working Papers in Trade and Development 2009/01, Australian National University, Canberra.
**Vu, Khuong Minh** (2013) *The Dynamics of Economic Growth: Policy Insights from Comparative Analysis in Asia*, Edward Elgar.
**Warr, Peter** (2006) "Productivity Growth in Thailand and Indonesia: How Agriculture Contributes to Economic Growth," Working Paper in Economics and Development Studies 2006/06, Padjadjaran University, Bandung.
**World Bank** (2013) *World Development Indicators 2013*, Washington, DC: World Bank.
**World Bank** (2014) *Purchasing Power Parities and Real Expenditures of World Economies: Summary of Results and Findings of the 2011 International Comparison Program*, Washington DC: World Bank.
**Zhang, Jun and Zhu Tian** (2013) "Poor Chinese Consumption Data Creates Savings Myth," *World Economics* 14(2), April.

ASIAN PRODUCTIVITY ORGANIZATION

ISBN 978-92-833-2456-0 (Paperback)
ISBN 978-92-833-2457-7 (PDF)