WORLD TRADE ORGANIZATION

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Trade patterns and global value chains in East Asia:

From trade in goods to trade in tasks

World Trade Organization

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The Institute of Developing Economies (IDE) conducts research on economic, political and societal issues in developing economies to support Japan's expansion of harmonious trade and investment and provision of international economic cooperation focused on developing economies.

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Disclaimer

Throughout this report, the Hong Kong Special Administrative Region of China, the Republic of Korea and the Separate Customs Territory of Taiwan, Penghu, Kinmen and Matsu are referred to as Hong Kong (China), Korea, Rep. of (in some figures), and Chinese Taipei, respectively.

Note on geographical coverage

East Asia in this publication covers China, Hong Kong (China), Indonesia, Japan, the Republic of Korea, Macao (China), Malaysia, the Philippines, Singapore, Chinese Taipei, Thailand and Viet Nam. India is also included in the study. Depending on data availability, the country coverage can vary across chapters. See Annex 1 for details on the composition of geographical and economic groupings used in the publication.

Statistical note

Trade data sourced from statistical frameworks such as the balance of payments (BOP), customs or input-output tables do not necessarily match each other due to differences in concepts.

Foreword

This book is the result of cooperation between IDE-JETRO and the WTO in analysing a fundamental change that has been taking place in the structure of international trade. This change is referred to in various ways: vertical specialization, production sharing, trade in tasks, or supply chain trade, to cite just a few. What these all indicate is that much of trade these days comprises components or intermediate goods and services that pass from economy to economy before becoming part of a final traded product.

This change has many implications for the way we understand trade policy. The distinction between "them" and "us" that has traditionally defined our way of thinking about imports and exports is increasingly outmoded. Products are no longer "made in Japan", or "made in France"; they are truly "made in the world". This new reality has profound implications on several counts. In particular, it redefines the nature of trade relations that are now characterized by a much closer inter-relationship.

In order to understand fully the true nature of these new trading interactions, and the actual contribution of trade to national economies, we need to promote a conceptual and statistical shift in the way trade is most commonly perceived in policy debates. The present research builds on complementary programmes developed separately at IDE-JETRO, with the construction of international input-output matrices, and at WTO, with the measurement of trade in value added. By combining the expertise and data available in both organizations, this book illustrates how the conjunction of technical, institutional and political changes in East Asia in the past 30 years has led to the emergence of new production and trade networks.

The report makes it clear that business opportunities in developing countries have not only been linked to changes in the global manufacturing model, spurred by the United States and Japan, but have also been stimulated by governments in developing countries. These governments have invested massively to provide the necessary transportation and telecommunication infrastructure, while facilitating trade through various institutional and administrative improvements. The Asian success story was the result of a close partnership between private and public sectors, the latter facilitating the work of the former. Building these industrial relationships also paved the way for the emergence of deeper regional integration.

Besides analysing the new trading relations from international and regional perspectives, the book also provides interesting findings on the impact of international trade on domestic economies. The role of trade in generating employment opportunities is reviewed, and shows, using the emblematic case of China, how an export-led development strategy, initially focused on a few industrial coastal zones, was able to progressively include the rest of the economy.

East Asia has been at the heart of the new model governing global manufacturing and international trade. It provides a natural case study to explore the contours of this new territory. But the relevance of the study transcends the regional dimension, and we hope that analysts and policy makers from other regions, especially in the developing world, will read these results with interest and adapt them to their own national and regional contexts.

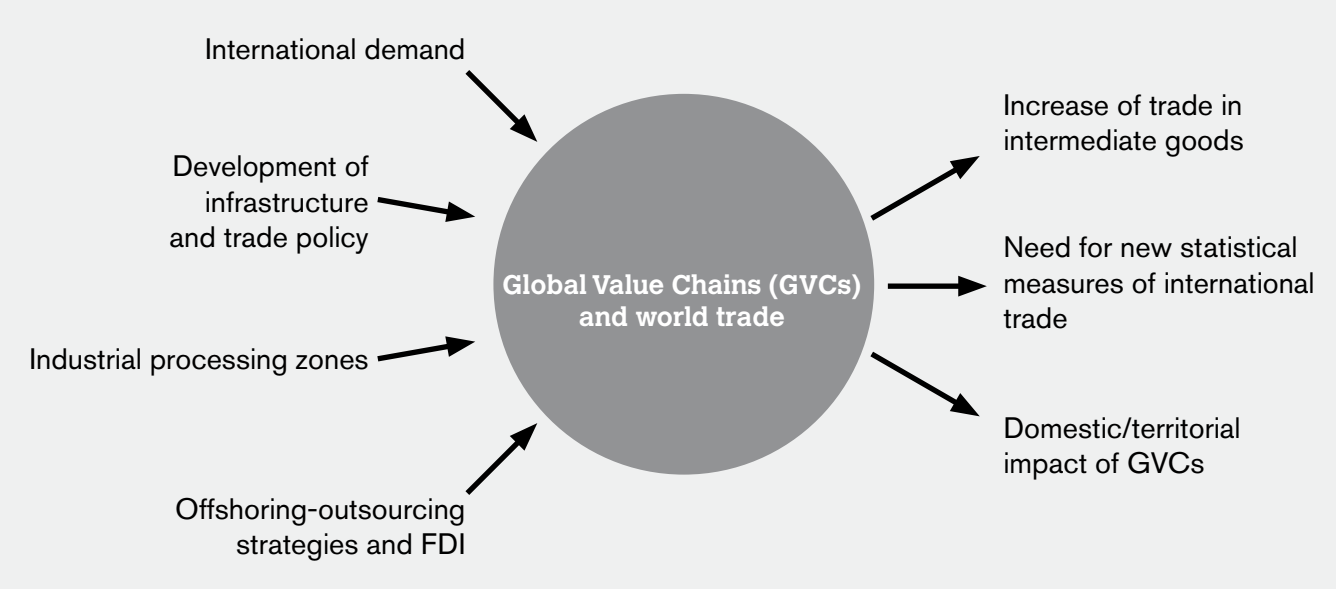
Pascal Lamy
WTO Director-General

Takashi Shiraishi
IDE-JETRO President

Introduction

The geographical fragmentation of production has created a new trade reality. Often referred to as global value chains or vertical specialization, this fragmentation deepens the interdependency of trade relations and has many implications for how we understand trade policy. This book sheds light on the nature of this interdependency, and the contribution of trade to national economies. It illustrates the conjunction of technical, institutional and political changes that led to the emergence of production and trade networks in East Asia, including their impact on trade patterns.

As shown in the diagram, the rise of global value chains results from the conjunction of several factors. It started with a change in the consumption models of industrialized economies, which found a supply potential in some developing countries. The book also shows how this development approach, initially centred on a few leading economies that had adopted an export-led industrialization strategy, enabled a larger number of regional partners to embark on an industrialization path that had deep implications for their domestic economies. This structural shift in the functioning of international trade requires, in turn, that the tools used to analyse its evolution, in particular trade statistics, be adapted.



The first chapter recalls that globalization has gone through several phases; as a matter of fact, the history of mankind is often closely related to the evolution of trade. In former times, when transportation was difficult, international trade was limited to the most expensive items. With the industrial revolution in the 19th century, mass production and improved transportation made international trade much easier, and most goods became tradable. More recently, a new phenomenon, "global manufacturing", is again boosting the volume and diversity of products being exchanged. But it is also changing the very nature of international trade. Global manufacturing is characterized by the geographical fragmentation of productive processes and the offshoring of industrial tasks.

The increasing fragmentation of value chains has led to an increase of trade flows in intermediate goods, especially in the manufacturing sector. In 2009, trade in intermediate goods was the most dynamic sector of international trade, representing more than 50 per cent of non-fuel world merchandise trade. This trade in parts, components and accessories encourages the specialization of different economies, leading to a "trade in tasks" that adds value along the production chain. Specialization is no longer based on the overall balance of comparative advantage of countries in producing a final good, but on the comparative advantage of "tasks" that these countries complete at a specific step along the global value chain.

It would be wrong to attribute the emergence of international supply chains to changes in the productive sphere alone. Supply responds to demand, and the emergence of "Factory Asia" primarily reflects the rise of mass marketing in the West and, in particular, changes in the consumption structure of the US market. In turn, this demand-supply relationship between the United States and Asia has led to Asian economies being structured in accordance with their respective comparative advantages. Over time, economic roles within East Asia have changed, leading to a regional clustering of supply chains based on close industrial interconnections. This industrial interconnection has paved the way for closer regional integration, facilitating trade within the supply chains.

The second chapter discusses the process of outsourcing and offshoring, showing the special importance of export processing zones (EPZ) in the international fragmentation of global manufacturing networks. Many developing countries have based their export-led strategies on the creation of these dedicated industrial zones. As a result, EPZs account for more than 20 per cent of total exports of developing economies. But manufacturing is only a part of the global supply chain story, and services, including transport, communications and other business services, are also key components of these global production networks.

Chapter III is devoted to the business and infrastructure services necessary for the smooth operation of global value chains. Logistics services, which support the functioning of supply chains and the delivery of final goods to wholesaling or retailing sectors, are crucial elements of these production processes. In this context, Hong Kong (China) and Singapore have become core distribution and logistics hubs in Asian production and trade networks. As part of their overall business strategy, enterprises may also outsource some of their non-core business functions abroad. India and the Philippines have become major offshore service providers, mainly in information technology (IT) and business process outsourcing (BPO). Upgrading infrastructure and support services allowed Asian countries to lower the cost of doing business and increase the international competitiveness of their domestic firms. Programmes were also introduced to facilitate trade and improve trade-related domestic regulations and procedures. While remaining competitive by world standards, if the cost to import and export at the national border has increased in most countries - mainly due to higher fuel prices - the time needed to process trade formalities has generally dropped.

Tariffs, another important part of international transaction costs, are reviewed in the fourth chapter. Asian economies have been lowering their applied tariffs, and some economies are hardly levying any duties at all on their imports. Tariffs on agricultural products, however, remain high compared to tariffs on industrial goods. Asia's dominance in trade of semi-processed products is also reflected in its tariff structures, with relatively little tariff escalation. In particular, tariffs on semi-processed products are lower than on raw materials or processed products. This flat structure of tariff schedules reflects low effective protection at industry level, something to be expected when firms participate actively in international supply chains. Nevertheless, the reduction in the use of tariffs has not been accompanied by a similar reduction in the use of non-tariff measures.

Chapter V is dedicated to foreign direct investment (FDI), which has played a big role in the expansion of trade in intermediate goods. Asia's share of total FDI inflows doubled between 1985 and 1995 and has continued to increase. China emerged as the most attractive destination for FDI flows in the Asia sub-region, but its share is declining, while India is now absorbing more investment. Whereas these two very large economies naturally attract large volumes of investment, FDI in fact represents a higher share of GDP in smaller economies such as Hong Kong (China), Singapore or Viet Nam. Although the link between trade and FDI is ambivalent, as a large share goes to non-tradable service sectors, FDI is an essential part of the offshoring strategies of multinational companies, boosting intra-firm trade in the process. While some types of FDI may substitute cross-border transactions, the level of merchandise exports mirrors the increasing level of FDI inflows in most leading Asian economies. Similarly, the increased FDI flows to the tertiary sector are also related to the development of services that support and complement global value chains.

While the previous chapters described the economic and institutional context in which global value chains developed, Chapter VI analyses more closely the diversity and complementarity of the Asian regional production system. Using a set of international input-output tables constructed by IDE-JETRO, the analysis reveals a dialectical relationship characterized by significant structural diversity on the one hand and a high degree of complementarity on the other one. This complementarity among Asian industries is both a cause for and a consequence of deepened economic interdependency between countries. The forces leading

to *de facto* economic integration were first observed in Japan, and then gradually shifted towards China. The chapter shows the growing role of China and the relative decline of the United States and Japan as production hubs. Other emerging East Asian economies have also significantly increased their degree of integration into the regional production system, contributing to strengthening economic interdependency in the Asia-US region.

The diversity and complementarity of the regional production system also fosters specialization when it comes to trade in tasks. Reflecting their particular roles in global value chains, some countries, like Japan or the Republic of Korea, specialize in the export of products involving high- or medium-skilled labour, while others, such as China or Viet Nam, focus on low-skilled, labour-intensive activities. When considering the totality of the value chain, from conception to production and consumption, developed economies like the United States tend to create employment at both ends of the qualification spectrum, from highly-skilled engineers and professionals to low-skilled retail workers; however, low-skilled manufacturing tasks are outsourced. The net balance of employment is also clearly influenced by the overall macroeconomic situation of each economy; net job creation attributable to trade is much higher in export-led surplus countries than in inward-oriented ones, especially when the latter run structural trade deficits.

An examination of the historical evolution of production networks in the region, which is the purpose of Chapter VII, shows how Asian economies have become interconnected with each other and with the US market. In 1985, there were only four key players in the region: Indonesia, Japan, Malaysia and Singapore. In the 1990s, the Republic of Korea, Chinese Taipei and Thailand also emerged as important links in the production network. Japan was extending its supply chains, while outsourcing from the United States was also strongly entering the picture. After 2000, the emergence of China altered the regional network, and by 2005, the network's centre of gravity had clearly shifted there. The intermediate goods imported by China come through relatively long and complex supply chains, characterized by a high degree of fragmentation and sophistication. The competitiveness of Chinese exports is not only attributable to its low production costs, but also to the complex intermediate goods imported from other countries, be they from Asia or the rest of the world.

Chapter VIII is dedicated to the mapping of trade in intermediate goods, which constitutes the "blood stream" that irrigates global and regional supply chains. Trade in intermediate goods now dominates world trade in non-fuel merchandise. While Europe is still the biggest trader in intermediate goods, Asia has been rapidly closing the gap, and is now a close second. While intermediate goods constitute more than 60 per cent of Asia's total imports, Asia tends to export more final goods composed of the imported intermediate ones. This regional characteristic, inherent in the region's role as "Factory Asia", is not equally displayed by each country. Some economies, like China, India and Viet Nam, have distinctly higher shares of intermediate goods in their imports than in their exports, while the opposite is true for the Republic of Korea, Japan and Chinese Taipei. Not only has trade in intermediate goods increased, but these goods are also increasingly complex.

Some trade analysts have argued that the change from trade in goods to trade in tasks implied by the operation of global value chains is comparable to a paradigm shift in the analysis of international trade. Because new concepts also involve new measurements, Chapter IX explores some of the changes required to complement existing statistical indicators. The complexity of productive and commercial relationships has blurred the relevance of a series of macroeconomic indicators, such as bilateral trade balances. The concept of "country of origin" is becoming increasingly difficult to apply to manufactured goods, as the various operations that comprise them, from the design of a product to the making of its components, their assembly and related marketing, are spread across the world. Nowadays, products are more "made in the world" than "made in" a specific country. One way of taking into account the fragmentation of value chains and providing a decomposition of gross exports by domestic and foreign origin is by measuring the value added imbedded in exports.

Measuring trade in value added uses both trade statistics and international input-output tables, such as those developed by IDE-JETRO, to separate the domestic content of an export from the cost of the imported components. This methodology offers a new perspective for trade analysts, as it dramatically re-evaluates the importance of some economies as "countries of origin". The result is that the absolute value of some bilateral trade imbalances is reduced, notably that of China and the United States, while overall global balances remain untouched.

Vertical specialization, an indicator compiled through input-output tables, allows for an assessment of the foreign content included in exports and hence the trade occurring within international production chains. The level and growth of vertical specialization do not only vary substantially among the Asian economies but also within sectors.

Finally, Chapter X demonstrates, using China as an example, how an export-led development strategy can trickle down to the rest of the domestic economy. In 2010, China became the second-largest economy in the world, surpassing Japan in terms of nominal gross domestic product. This was the result of the rapid economic growth which followed the launch of the Reform and Open-door policy in 1978. The coastal regions of China enjoyed particularly strong growth as a result of preferential development policies heavily orientated towards exports. However, their success has led to significant regional disparities. A territorial rebalancing has been under way since the early 2000s, and the centre of gravity of development has shifted to the western regions and the North East. The next challenge for China is to reduce the regional income inequalities and move from an export-dependent economy to a balanced system based more on domestic demand.

A glossary and a number of technical annexes at the end of the publication provide additional information on the terms and technical points developed in the different chapters.

I. From mass demand to global supply chains

- Production and trade evolve in parallel, from craftsmanship and local markets, to global value chains and international “trade in tasks”.
- The emergence of “Factory Asia” reflects changing demand for more product variety in the US market.
- Over time, the respective economic roles within East Asia have changed, leading to a regional clustering of supply chains based on close industrial interconnections.

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A. From trade in goods to trade in tasks: The rise of global value chains

Since ancient times, international trade has allowed consumers to purchase products that are not produced locally. Production can be separated from consumption, often by great distances. The notion is summed up in the famous example of English 18th century economist David Ricardo about Portuguese wine being traded for English cloth. Countries did not need to grow grapes to enjoy wine, he noted. Thanks to trade, they could "transform" the cloth they produced into wine.

Before the development of mechanized transport, such as railways and steam ships, international trade was reserved for the most expensive commodities, like spices or silk. With mechanization, land and sea transport became easier and more reliable, allowing production and consumption to be more geographically dissociated. The 19th century industrial revolution saw also the rise of large industries, with workers performing specialized tasks and progressively supplanting traditional craftsmen. While craftsmen worked close to their customers, usually in the same town, the industrial revolution created large industrial agglomerations able to serve national markets thanks to a new network of railways and intercity roads (see Figure 1).

The key to higher industrial productivity was to concentrate the various tasks involved under a single roof. By specializing in one or a small number of tasks, each worker could focus his/her energy and thereby perform more efficiently. But without proximity, it would have been impossible to coordinate the efforts of the various workers, or to combine their inputs into a single product. Thus, production remained largely enclosed within national borders and trade patterns reflected the respective productive specializations. As World Trade Organization (WTO) Director-General Pascal Lamy has noted: "In the 19th century, when Ricardo developed what was to become the foundations of international trade theory, countries exported what they produced. In fact, the industrial revolution took root in countries that had coal mines and iron ore. A Portuguese entrepreneur importing a steam engine from England would know that everything, from the steel of the wheels to the boiler pressure gauge, came from the United Kingdom."[1]

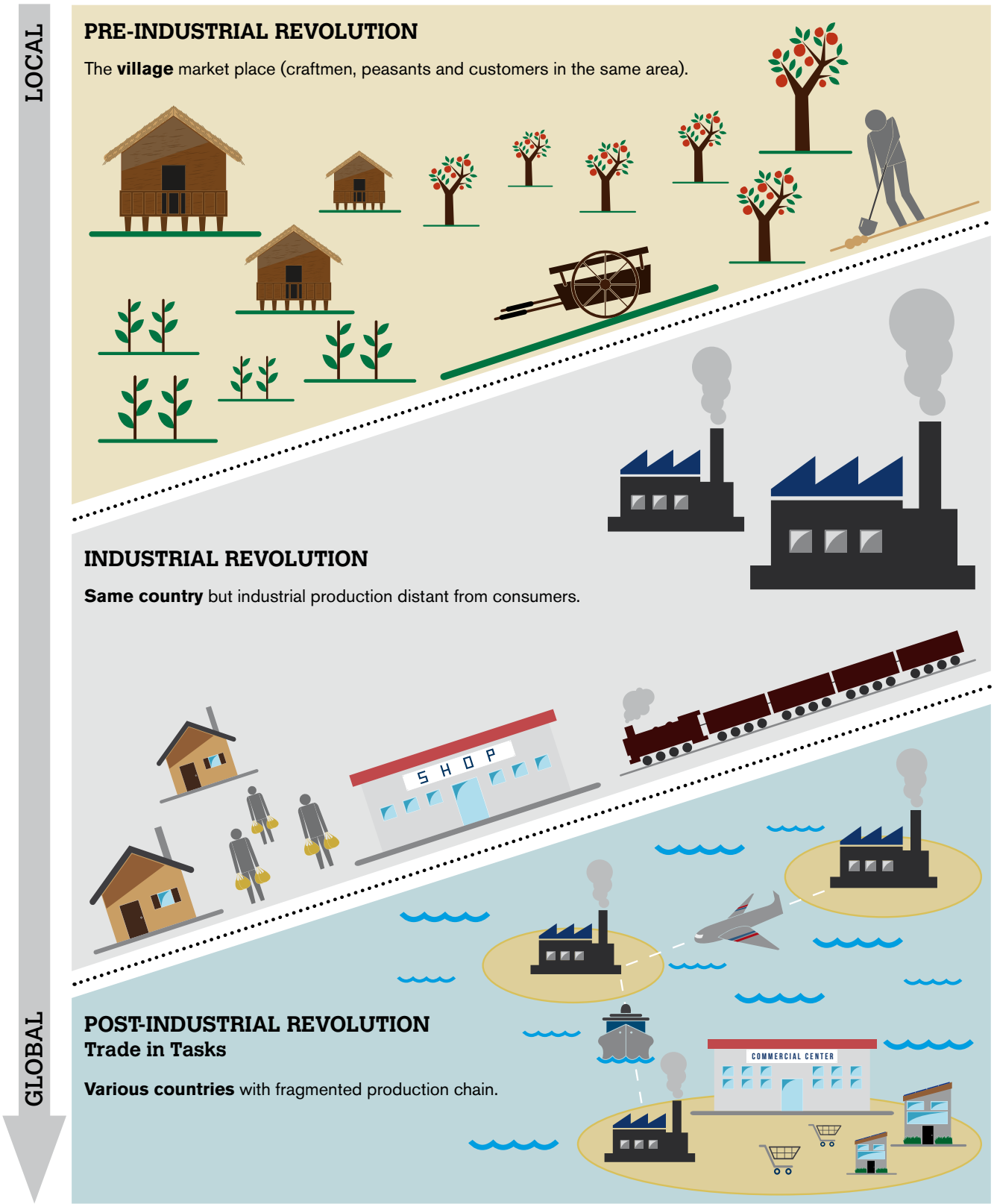
Another industrial quantum leap took place in the 1990s, thanks to the information technology (IT) revolution and the conjunction of a series of political and institutional breakthroughs. Together these facilitated the internationalization of industrial processes, opening the way to what became global manufacturing. Cheaper and faster intercontinental communication allowed far-flung businesses and production centres to coordinate more easily, leading to the unbundling of the production process and its international fragmentation. The US author Thomas Friedman has described these trends as forces that have "flattened" the world. Among them are the birth of the Internet, the development of workflow software, "in-forming" and advances in digital, mobile, personal and virtual communication technologies.

On the institutional side, tariff cuts and multilateral agreements boosted trade. For example, trade in intermediary products, the backbone of geographically fragmented supply chains, was facilitated by international accords, such as the WTO Information Technology Agreement (ITA)[2] on computers, semi-conductors and a host of related goods. Asia also benefitted from regional trade pacts, including those established under the Association of Southeast Asian Nations (ASEAN) and the Asia Pacific Economic Cooperation forum (APEC).

The integrated factory floor, which had dominated manufacturing since the 19th century, has been replaced with a network of individual suppliers specializing in specific services or phases of production. In this second great unbundling, as defined by Richard Baldwin of the Graduate Institute of International Studies in Geneva, production is "sliced and diced" into separate fragments that can be spread around the globe.[3] Princeton University economists Gene Grossman and Esteban Rossi-Hansberg[4] have called this new paradigm "trade in tasks". Countries no longer export exclusively finished products, but tend to specialize in specific stages of the production process. These various steps to obtain finished products can be associated through the notion of a "value chain", which refers to the entire sequence of productive (i.e. value-added) activities,[5] from the conception of a product to its manufacturing and commercialization. The possibility of slicing up and optimizing value chain activities among multiple companies and various geographical locations has even spawned a broader term - the "global value chain" (GVC). With specialization in specific tasks and their close integration into a highly coordinated business model, these chains of related activities result in the

Figure 1

From local to global production and markets



Source: WTO Secretariat.

creation of more "added value" than the sum of the value of the constituent parts and processes. This does not only apply to manufacturing, but also to distribution and retail sales, which have also undergone profound changes and exhibit similar ranges of complexity and interdependence. Today's most integrated value chains combine two interlinked business models: a demand chain and a supply chain (see Box 1).

A supply chain comprises not only various business functions, but also a number of firms specialized in different productive tasks (see Figure 2). Hence, the efficiency of the entire industrial chain depends highly on the way companies are interconnected. This brings in the concept of "vertical integration", which describes the degree to which a company owns its upstream suppliers and downstream buyers. For most of the 20th century, vertical integration was conducted domestically. But since the late 1990s, it has been increasingly internationalized, leading to the concept of vertical specialization (see Box 2).

Box 1. Value chains and supply chains

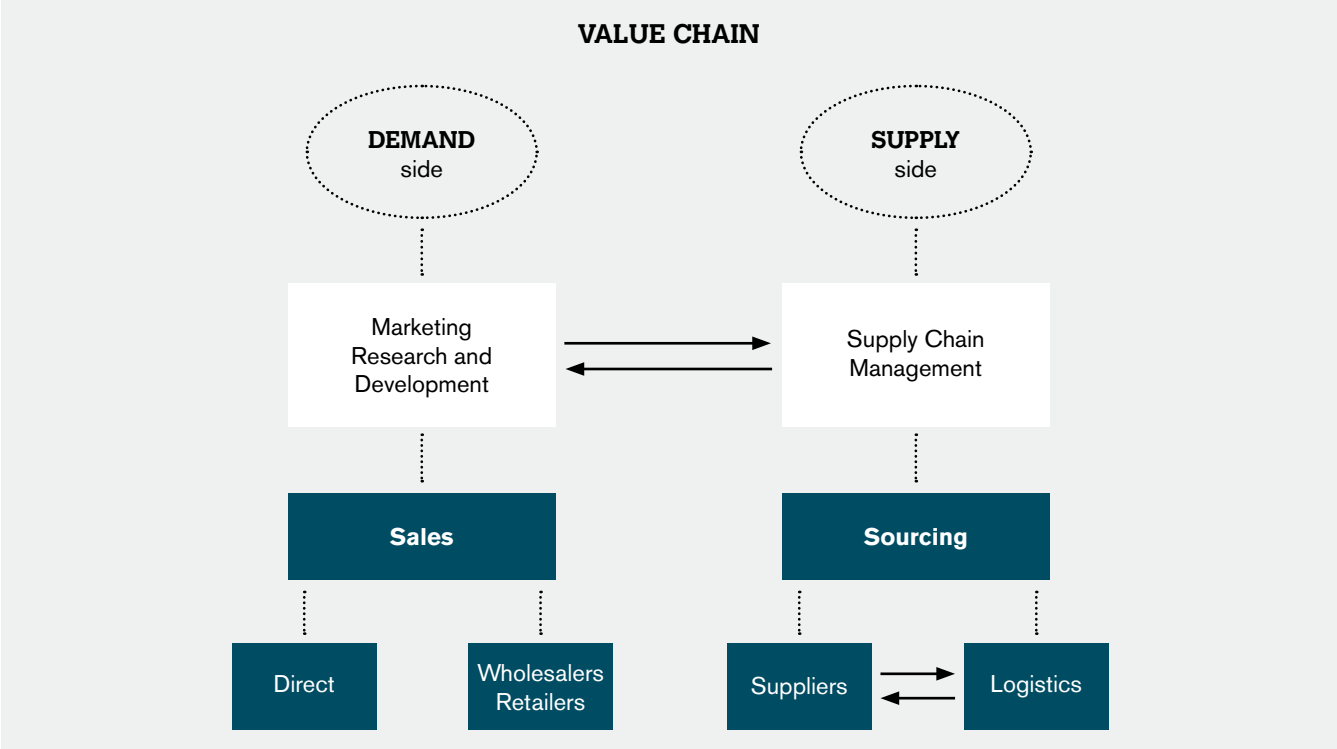
The value chain analysis is a concept derived from business management. One of its earliest exponents was Michael Porter of Harvard Business School.[6] In these chains, core activities are organized as separate but coordinated phases. Each phase or task is organized to create and optimize a specific aspect of the global chain (value driver). Thanks to their international nature, global value chains are able to benefit from the respective comparative advantages of various countries. Firms slice their demand and supply chains into parts, varying the final products and their price according to consumers' tastes and socio-economic characteristics. At the same time, they standardize the production of parts as much as possible, so that work can be distributed with maximum efficiency among the different suppliers.

The electronics industry, one of the world's most important goods-producing sectors, is a very representative example of this concomitant differentiation/standardization process. Customers can customize their appliance (for example, a personal computer), which will be assembled accordingly, using hard disks or other hardware components that are standardized to the point of being interchangeable "almost-commodities", although they have been made by numerous international suppliers.

The notion of "supply chain" relates to that of "value chain", but is more closely connected to industry and engineering. The Council of Supply Chain Management Professionals (CSCMP) defines the supply chain as follows: "All activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers." Coordinating the timely operation of industrial networks is a complex exercise, involving the provision of logistic services and supported by advanced information and decision systems (see Chapter III on Infrastructure services).

Figure 2

Schematic presentation of a value chain



Source: WTO Secretariat.

Box 2. About the verticality of production and trade

Basically, vertical integration is a synonym for corporate ownership and control. One of the pioneers was Henry Ford, who sought to minimize costs and industrial risks by acquiring various firms involved in the production process of his cars. This business model was adopted by other large companies with the emergence of mass production in the early 20th century. The aim was to incorporate into a single industrial structure the production of raw materials, the machines needed for their transformation, and transportation to and from the factories. Vertical integration was at the core of Japan's industrialization, with conglomerates known as "Zaibatsu" containing holding companies controlling banks and industrial subsidiaries.

Vertical integration is about corporate strategy and relates to the "make" or "buy" decision[7] companies invariably face. While outsourcing is an example of the "buy" approach (act of purchasing from an external supplier), vertical integration involves an "insourcing" or "make" option (choice of producing an item or keeping a specific activity internally). Reduced operational costs and better coordination of the supply chain are the key benefits sought by vertically integrated enterprises.

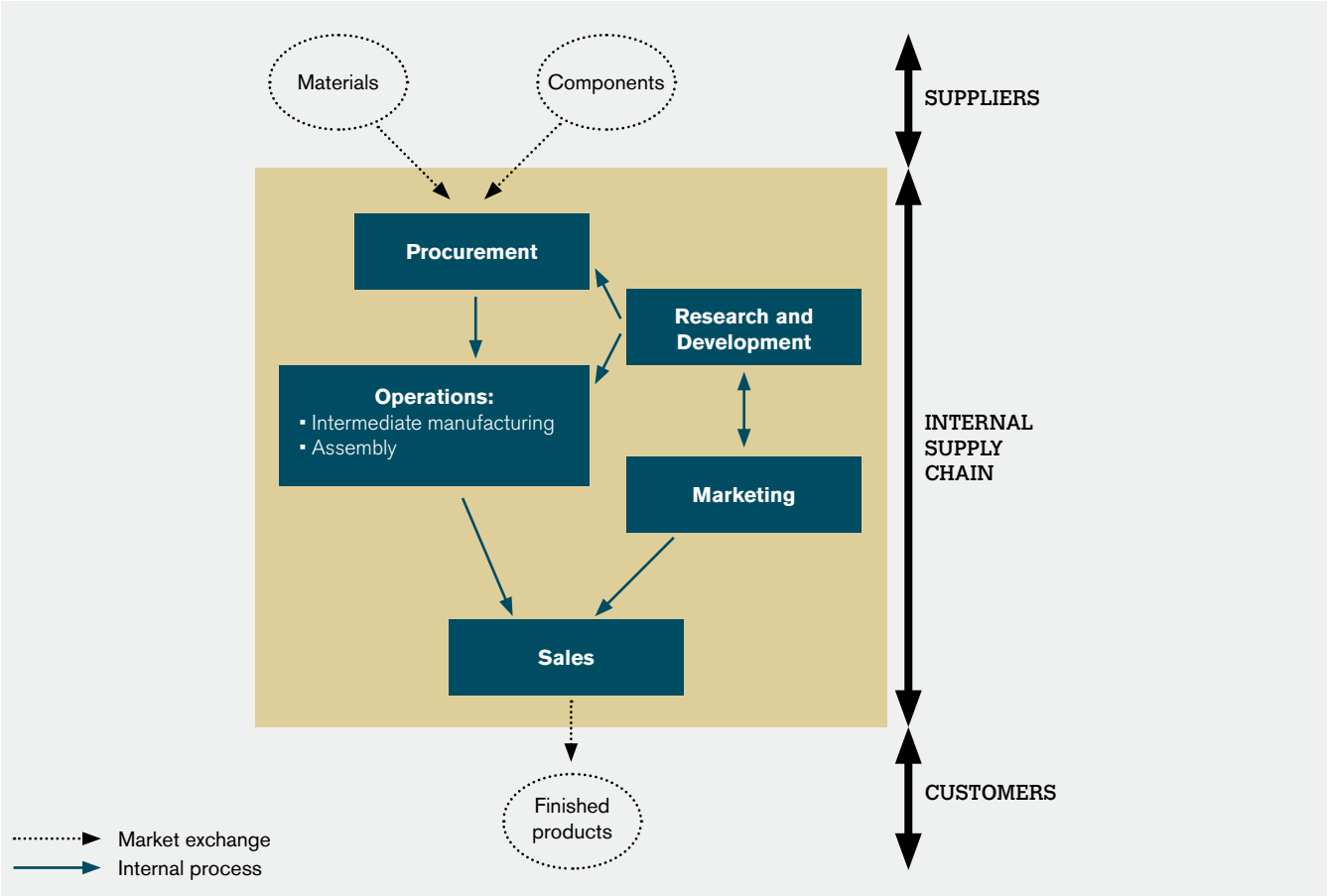
Vertical integration can be achieved not only through direct ownership, but also by means of contractual relationships (at "arm's length") with suppliers.

In Figure 3 below, the orange zone highlights the different functions that have been gathered within the same company. All corresponding activities are controlled and managed internally. The assembly operation may be executed by a secondary company owned by the main firm, or by one contractually dependent upon it; however, they both act as one unique entity within the supply chain.

While *vertical integration* relates to structural linkages between industrial firms and key business processes, the concept of *vertical specialization*, as developed by Hummels et al. (2001), outlines the degree of specialization of the different economies involved in the international production chain. It is characterized and measured as the import content (in goods and services) embodied in exported goods (see Chapter IX for more details).

Figure 3

An example of vertical integration



Source: WTO Secretariat.

B. The emergence of "Factory Asia": When supply meets demand

The emergence of "Factory Asia" reflects the coming together of demand for both massive and customized manufacturing emanating from the US market, with an adequate supply potential in Asia. This process started with the appearance of mass consumption and mass marketing in the United States in the 1960s, and reached a climax in the 2000s with a period of sustained household consumption and the accession of some Asian economies (e.g. China, Chinese Taipei) as members to the WTO.

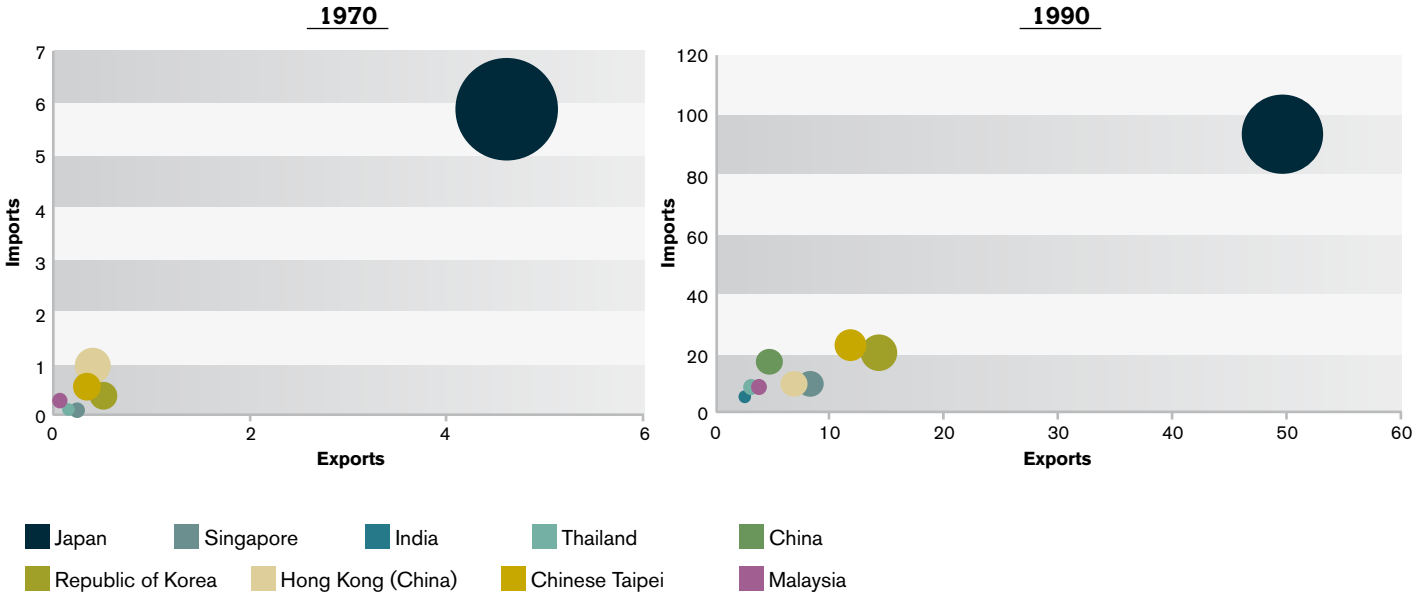
The process of "factory-less" industries started in niche markets, with firms focusing on developing their branding and marketing comparative advantages, while outsourcing production to external suppliers, initially within the country, but increasingly also using foreign suppliers. For example, Nike, a major sportswear and equipment supplier based in the United States, started its operations in the 1960s distributing athletic shoes from Japan before launching its own line of footwear, manufactured mostly in Asia.

Demand-driven supply chains are not limited to brand-focused firms. They extend to most areas of retail business. Large retailers in the United States or in the European Union (EU) operate as wide-ranging value chain managers, deciding on the range, price and quality to be produced. They drive international chains of suppliers, who receive from the retailers their production standards, delivery times and costs.

Over time, the geographical distribution of trade between the United States and its main Asian partners changed. In the 1970s, Japan dominated trade between Asia and the United States. With minor changes, the same pattern remained up to the early 1990s (see Figure 4).

Figure 4

Total US trade with selected Asian partners, 1970 and 1990 (in billions of US$)



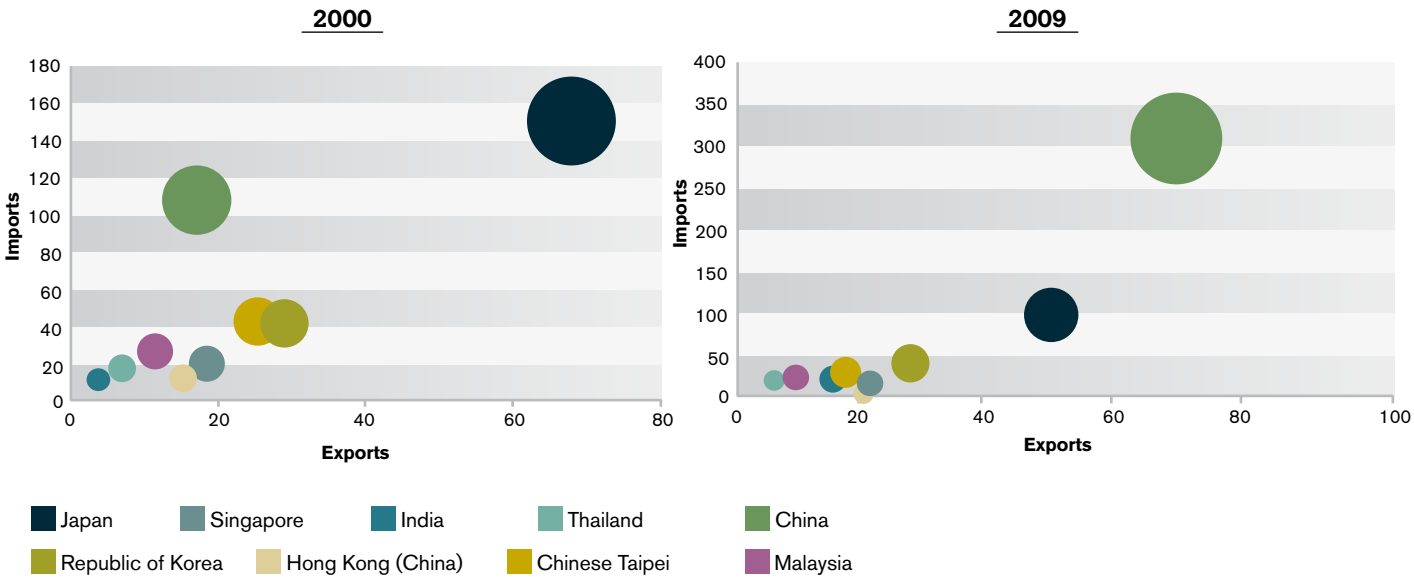
Note: The size of the bubbles represents the sum of US exports and imports to/from its Asian partner.

Source: Based on UN Comtrade Database.

The situation started to change with the emergence of China. First China emerged from the other group of Asian economies as a challenger to Japan, and then, in the late 2000s, it overtook Japan to become the main US trading partner (see Figure 5). Interestingly enough, China, as a partner, rose first as a major source of imports, while it remained a relatively minor export market for the United States, smaller than the Republic of Korea or Chinese Taipei. But during the 2000s, it also became a major US export market, while Japan receded into a distant second place.

Figure 5

Total US trade with selected Asian partners, 2000 and 2009 (in billions of US$)



Note: The size of the bubbles represents the sum of US exports and imports to/from its Asian partner.

Source: Based on UN Comtrade Database.

The rise of China to become the main trading partner of the United States is not independent of the relative decline of Japan and other partners like Chinese Taipei or the Republic of Korea. An increasing share of supply chains producing for the US market relocated to China, inter alia because of lower costs and the more favourable trade environment that were a consequence of China's accession to the WTO in 2001. In other words, the emergence of China as the leading partner redistributed Asian trade with the United States. But it did not create an additional source of trade imbalance for the United States, which had been suffering from a structural deficit in merchandise trade since the mid-1970s. As a matter of fact, Asia's contribution to the overall US trade deficit with the rest of the world has been decreasing, representing only half in the 2000s, compared with over three-quarters in the 1970s (see Table 1).

The redistribution of trade among Asian trading partners of the United States is typical of the surge in international and regional supply chains, with part of the production initially located in Japan or in other economies transferring to China. Usually, it has been the last stage of the supply chain, the assembly of the final products, which has relocated to China, with the production of the core components remaining within the original country. So, while customs statistics showed China to be the principal country of origin for US imports, most of the content of the products, and their economic value, was still originating in the traditional Asian partners of the 1980s, and even from within the United States itself. As will be seen in Chapter IX, the actual geographical origin of traded goods can be assessed more realistically through a trade in "value added" approach.

In addition, the increasing fragmentation of value chains also led to an increase of trade flows in intermediate goods among Asian partners, especially in the manufacturing sector. In 2009, trade in intermediate goods was the most dynamic sector of international trade, representing more than 50 per cent of non-fuel world merchandise trade and 64 per cent of the total imports of the Asian region (see Chapter VIII for more details).

Table 1

Merchandise trade balance of the United States vis-à-vis the world and Asia (average, in billions of US$ and percentage)

	1970s	1980s	1990s	2000s
World (value)	-11	-111	-186	-670
Asia (value)	-8	-67	-133	-341
Asia (share in %)	76	60	72	51

Source: Based on UN Comtrade Database.

C. Growing vertical specialization in Asia and regional clustering of tasks

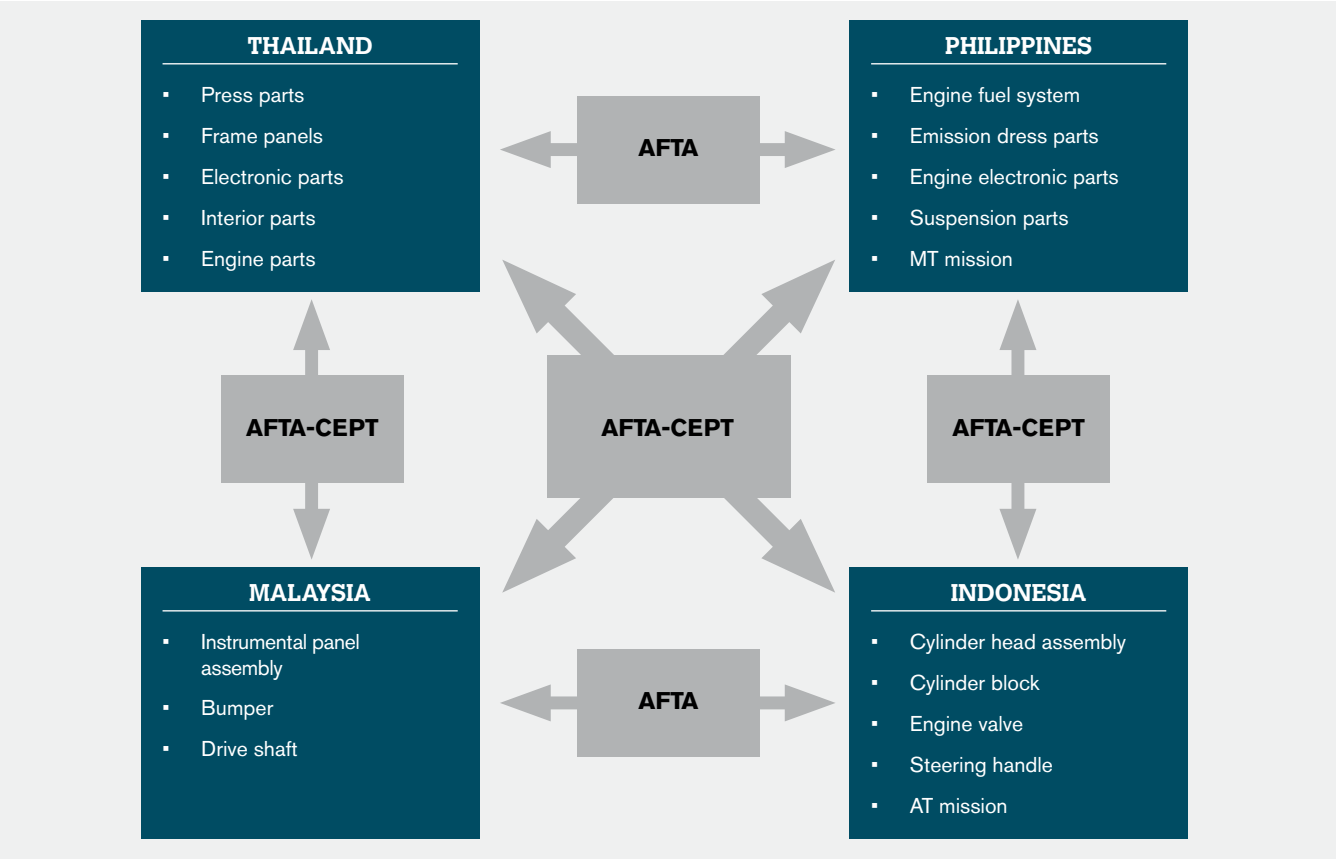
When investing in East Asia, international firms pursue two different types of objective. Some respond to the logic of trade in tasks and geographical fragmentation by staging production along a global supply chain (vertical specialization). Others produce the same type of goods that they do at home, with a view to entering the Asian market using the "build-where-you-sell" strategy (horizontal diversification of production). Consumer electronics correspond more to the vertical specialization pattern, where lead firms, selling branded products in final markets, place orders for key components with suppliers and have them assembled in a third, low-cost, country.[8] The automobile industry is a typical example of horizontal diversification; a Toyota car produced in Thailand may differ only slightly from the same model built in Japan.[9]

The division between the two types of investment is not clear-cut, and many foreign affiliates operating in East Asia have progressively adopted the characteristics of both vertical and horizontal multinationals.[10] Vertical specialization started first. In the 1970s, according to Sturgeon and Kawakami (2010), US semi-conductor firms, whose production was very labour intensive, located assembly plants in East and South-East Asia, and Japanese companies located low-cost transistor radio production in Chinese Taipei and in Hong Kong (China). As household income in developing Asia rose, so did foreign direct investment for horizontal diversification. In 2001, only 40 per cent of Japanese companies' overseas production in Asia went to local consumers. Now the proportion is 62 per cent and growing as export-oriented industries based in low-cost Asian countries build a domestic market and related consumption capacity.

Both horizontal and vertical production patterns can coexist, and the flexibility in sourcing components from various countries, while exporting the resulting final goods, is closely linked to trade policies. As shown in Figure 6, Japanese automobile assemblers procure key parts from four ASEAN countries, taking advantage of the ASEAN Free Trade Area (AFTA).

Figure 6

Complementary parts supply system of an automobile assembler in ASEAN



Note: the ASEAN Free Trade Area - Common Effective Preferential Tariff (AFTA-CEPT) is a cooperative arrangement among ASEAN member states to reduce intra-regional tariffs and remove non-tariff barriers.

Source: Hiratsuka (2010).

Endnotes

[1] Inaugural speech to the conference on "Globalization of the Industrial Production Chains and Measuring International Trade in Value Added" at the Senate in Paris on 15 October 2010.

[2] The Ministerial Declaration on Trade in Information Technology Products (ITA) was concluded at the WTO Singapore Ministerial Conference in December 1996. The ITA eliminates duties on IT products covered by the Agreement. Developing country participants were granted additional time to implement their commitments for some products.

[3] See Baldwin (2006).

[4] Grossman and Rossi-Hansberg (2006).

[5] Sturgeon (2001).

[6] Porter (1985).

[7] The "make-or-buy" decision process was extensively developed by Williamson (1991).

[8] The classical example is the iPod, designed and developed by a US firm and "made in China" out of US or Korean components and licences which constitute most of the factory cost of the appliance.

[9] "Leaving home: Japan's big companies are shipping production abroad", The Economist, 18 Nov 2010.

[10] See Hiratsuka (2010).

II. Organization of the global production process

- Outsourcing and offshoring are at the origin of global production networks.
- Export processing zones account for some 20 per cent of total merchandise exports of developing economies.
- Hong Kong (China) and Singapore are core distribution and logistics hubs in Asian production and trade networks.
- India and the Philippines emerged as major providers of offshore services in IT and business process outsourcing (BPO).

Contents

A. Outsourcing and offshoring: Firms go beyond national boundaries

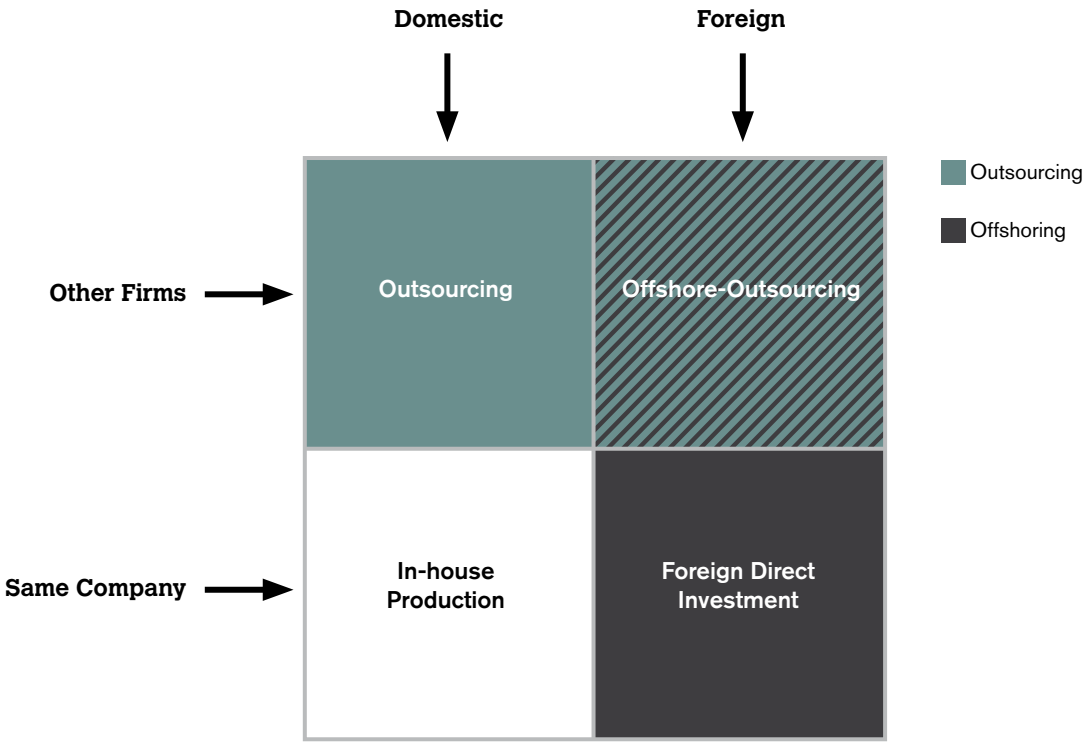
As production becomes increasingly complex and fragmented, specialization on core activities and outsourcing have become inevitable. As part of their overall business strategy, enterprises may outsource one or more of their productive activities, either within the country or abroad (offshoring). A reliable and conducive international trading environment ensures the unhindered and efficient flow of investment, goods and services among nations. Through successive negotiations under GATT/WTO, trade barriers have been significantly reduced or eliminated (see Chapter IV on tariff policies) and a stable, rules-based trading system has guaranteed and encouraged firms to engage internationally with confidence. The availability of efficient and affordable logistics, transport and communication services supports this global production system.

Offshore sourcing or cross-border production arrangements may take place between enterprises that are either related (multinationals enterprises (MNEs) and their affiliates) or that have no formal relationship in ownership (see Figure 1). In the latter case, enterprises may enter into contractual agreements or establish joint ventures. The fragmentation of the production process has also created business opportunities for small and medium-sized enterprises (SMEs).

Intra-firm trade is important for global manufacturing activities involving either partly or wholly-owned affiliates. Data on intra-firm trade are not systematically collected and only a handful of countries report information gathered from firm surveys. The available information indicates, however, that this trade is quite substantial. In 2008, for example, merchandise exports of US MNEs to their foreign affiliates represented 18 per cent of the country's total exports. Imports of MNEs from their foreign affiliates accounted for 13 per cent of the total US merchandise imports.[1]

Figure 1

Typology of outsourcing and offshoring strategies



Source: WTO Secretariat.

B. Processing zones in developing countries: Where global manufacturing takes place

Enterprises that outsource are usually located in advanced economies, while their corresponding counterparts are often in developing economies. In many countries, most of the processing and assembling activities take place in earmarked areas with special administrative and regulatory status to promote trade and investment. Although these areas can have different names in different countries, the most widely used term is "export processing zone" (EPZ). As defined by the International Labour Organization (ILO), EPZs are "industrial zones with special incentives set up to attract foreign investors, in which imported materials undergo some degree of processing before being re-exported".[2] They have become all-embracing. Again according to ILO, EPZs "have evolved from initial assembly and simple processing activities to include high tech and science parks, finance zones, logistics centres and even tourist resorts".[3] Many developing economies consider EPZs to be an integral part of their export-led growth strategies. In 2006, the latest year for which estimates are available, 3,500 EPZs were operating in 130 countries, providing work for 66 million people (see Table 1).

Table 1

Estimates of the development of export processing zones

	1975	1986	1997	2002	2006
Number of countries with EPZs	25	47	93	116	130
Number of EPZs or similar type of Zones	79	176	845	3000	3500
Employment (millions of workers)	...	...	22.5	43	66
of which:					
China	...	...	18	30	40
Other countries with data available	0.8	1.9	4.5	13	26

Source: Boyenge (2007).

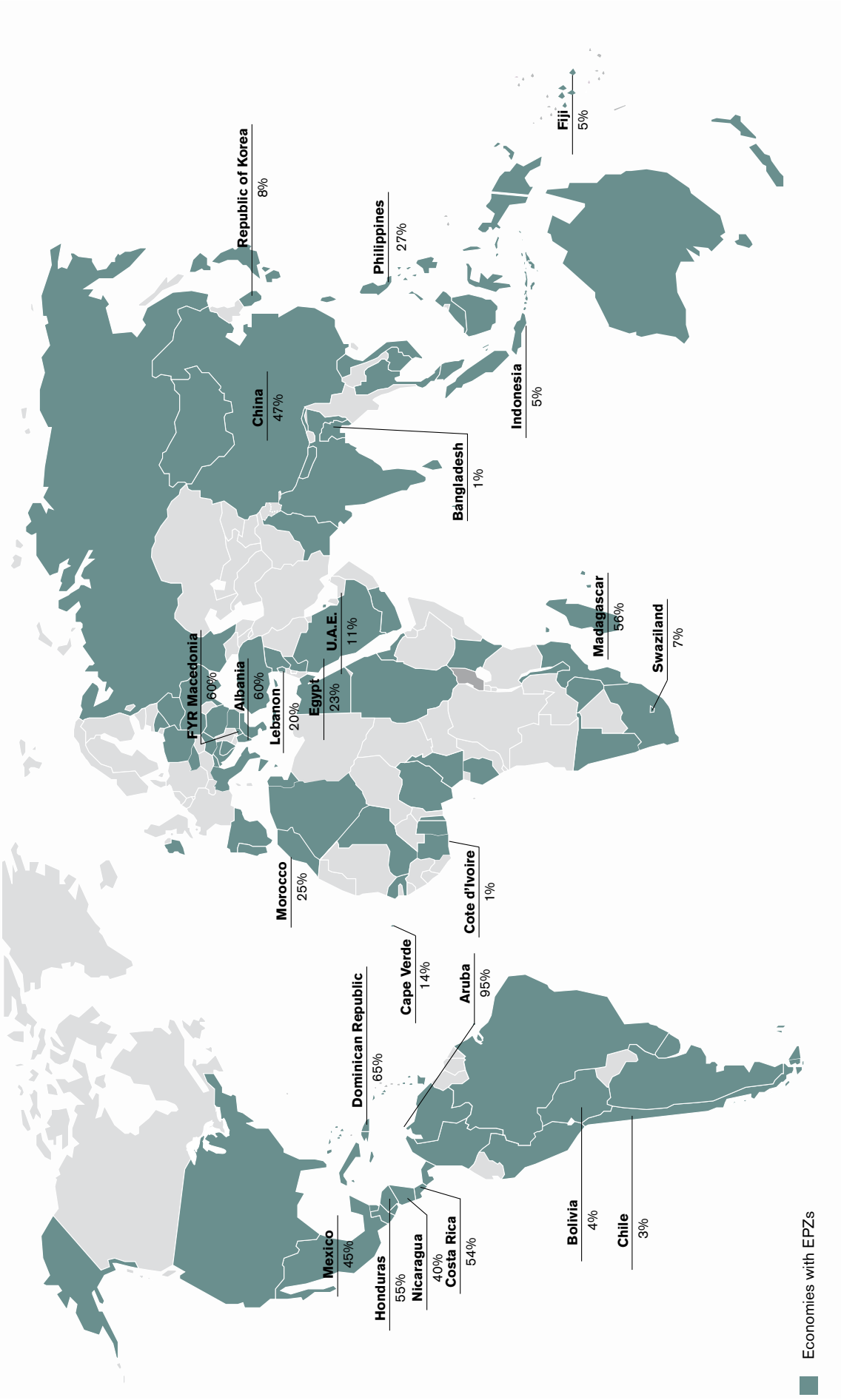
The earliest EPZ was European, the Shannon Free Zone of Ireland, which was established in 1959. The first Asian EPZ, the Kandla EPZ, was set up in India in 1965. In the 1960s, Chinese Taipei attracted foreign firms to invest in the assembly of semi-conductors, and in 1970, the Republic of Korea included EPZs in its export-led growth strategy. In subsequent years EPZs and similar zones mushroomed in the Philippines, Malaysia, Sri Lanka, Thailand, Bangladesh and Pakistan, to name but a few. In the early 1980s, following its decision to vigorously pursue an export-oriented policy and attract foreign investment, China established five special economic zones (SEZs), which effectively saw it join the global economic community.

Outside Asia, EPZs have also become very important for South and Central America and the Caribbean region. In Africa, a number of countries have embarked on policies of opening up their economies to foreign investors through EPZs (see Figure 2).

Based on balance of payments (BOP) statistics, it is estimated that about one-fifth of developing economies' exports come from EPZs, while the share on the import side is some 13 per cent (see Figure 3). Over the 2000-2008 period, China accounted for about 67 per cent of all reported exports from inward processing – goods imported duty-free for subsequent processing and re-export – while Mexico represented another 18 per cent.

Figure 2

Economies with export processing zones and shares of goods for processing in exports, 2006 or most recent year (percentage)



Sources: ILO and WTO Secretariat.

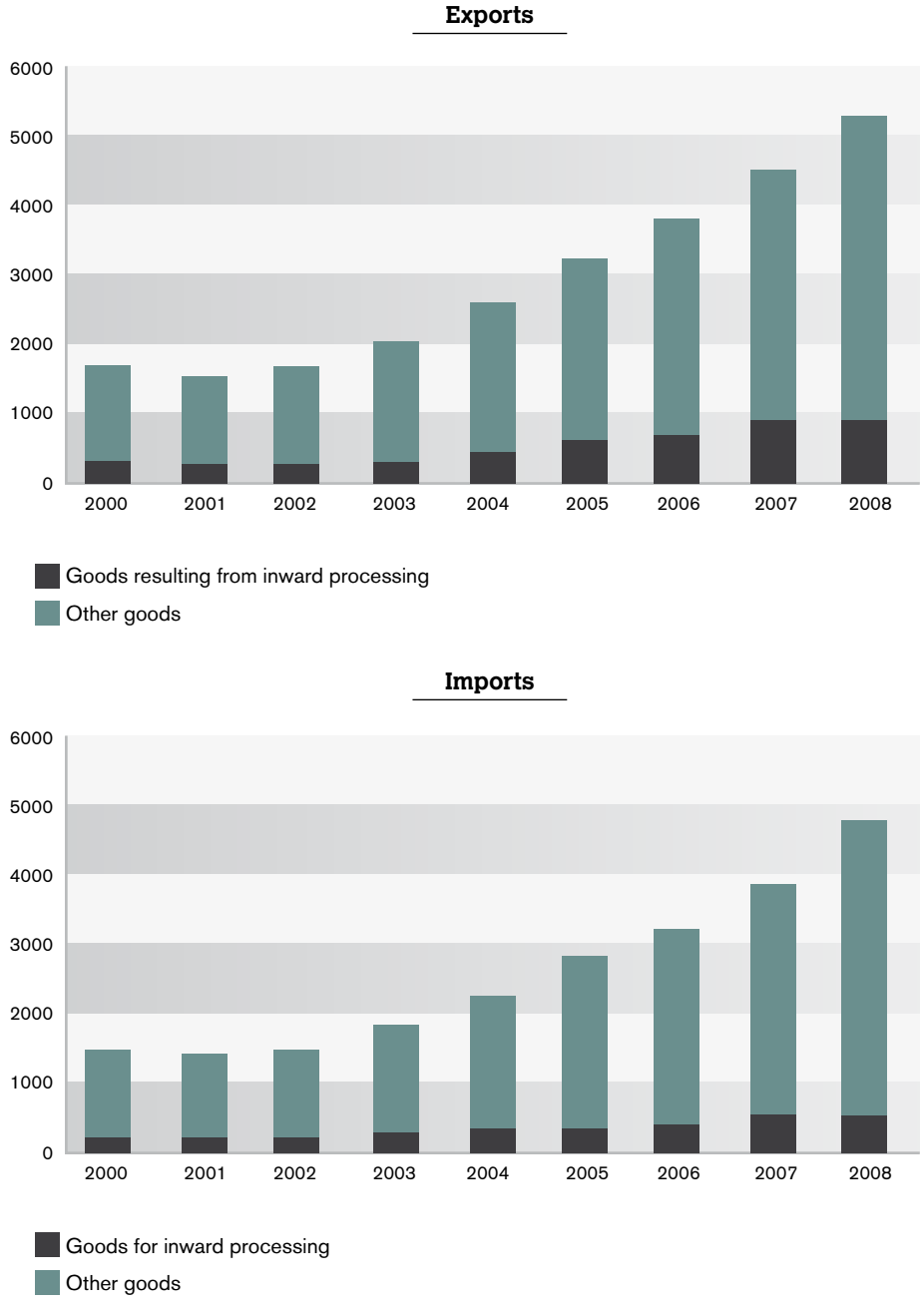
China's customs trade figures show that in 2009 nearly half of its exports originated from processing zones while one-third of its imports were bound to such zones. Around two-thirds of China's processing trade was undertaken by foreign owned enterprises.

As a result of such strong export-oriented activities in its EPZs, China became the world's leading exporter of manufactured products in 2008, and the leader in total merchandise exports in 2009.

Currently, a considerable part of the exports of many developing economies originate in EPZs (see Figure 2). The overall impact on their economies is substantial, with the resulting value added (approximately the difference between the value of the exports of processed products and the cost of the imports of intermediate inputs) equalling some 30 to 35 per cent of the exported products.

Figure 3

Goods for inward processing in developing economies' total exports and imports, 2000-2008 (in billions of US$)



Sources: IMF balance of payments statistics and WTO estimates.

C. Business process outsourcing and computer services

Offshore outsourcing is not confined to the manufacturing sector. Outsourced service activities range from simple back and front office routines to more complex research and development (R&D) work. Data processing, call centres, virtual assistance, legal support (legal transcription, drafting contracts, legal representation, etc), medical support (medical transcription, interpreting x-rays, etc), finance and accounting, software and applications development and R&D are all activities that enterprises can assign to foreign firms. All these activities are designated as business process outsourcing (BPO) or information technology-enabled services (ITES).

Of the Asian developing economies, it is India and the Philippines that are benefiting increasingly from offshored computer and IT-enabled business services. It is estimated that India earned US$ 36.4 billion during the 2008-09 financial year from computer and ITES/BPO services.[4] This is equivalent to 34 per cent of the total commercial services India exported in this period. Computer services alone generated US$ 26.6 billion, while BPO services brought in US$ 8.4 billion. In the Philippines, the ITES/BPO industry, which is predominantly composed of call centre services (accounting for nearly 70 per cent of related exports), is estimated to have grown by 46 per cent annually between 2004 and 2008.[5] According to the Business Process Association of the Philippines (BPAP), the BPO industry is estimated to have earned US$ 7.3 billion in revenue and provided 442,164 jobs.

D. Logistics services and distribution: The unique role of Hong Kong (China) and Singapore

Following changes in the organization of production (i.e. outsourcing/offshoring), enterprises have become increasingly dependent on logistics services. Logistics services include core elements such as cargo handling, storage and warehousing, transport agency services and related freight logistics services as well as non-core services such as packaging and supply-chain consulting.

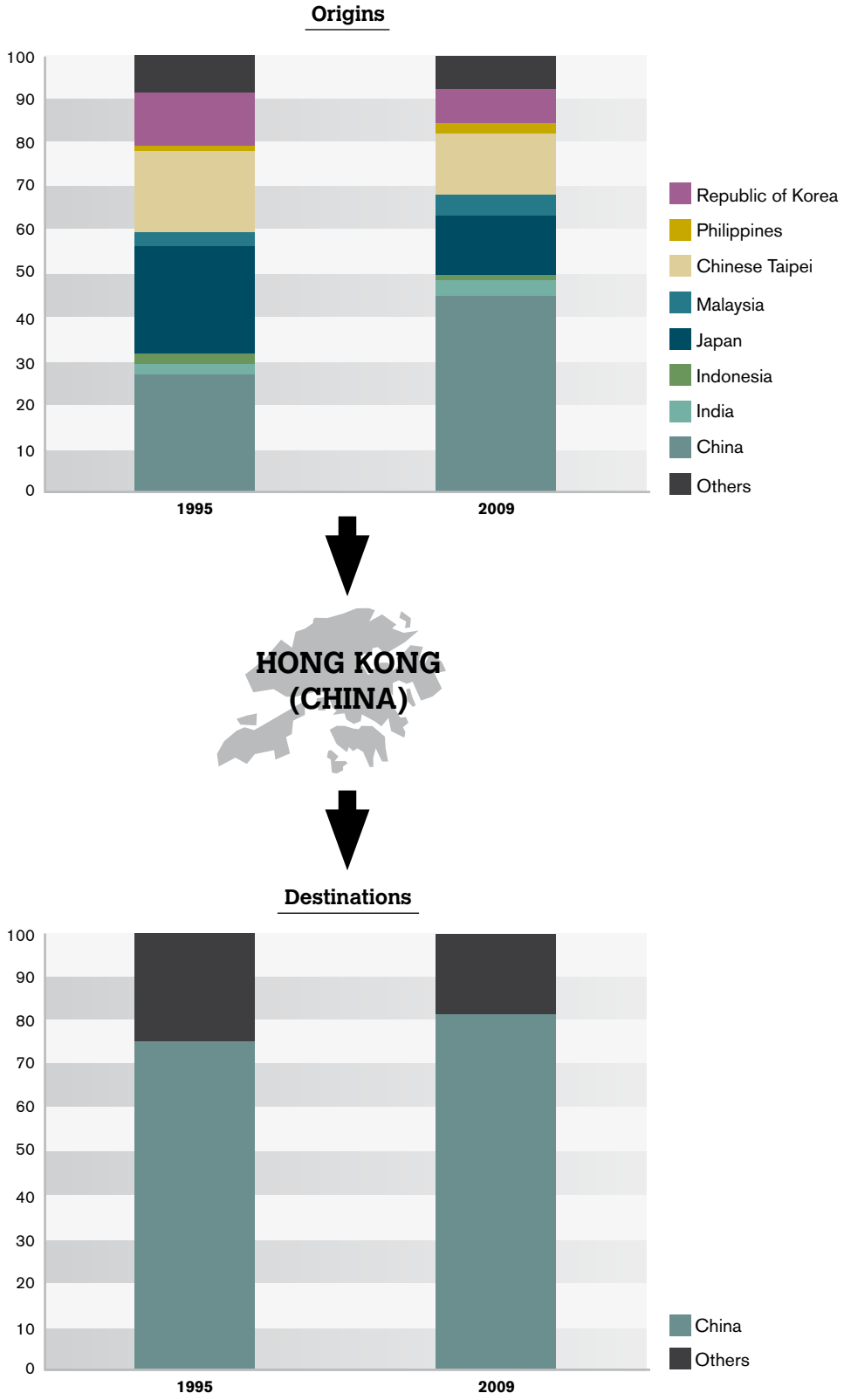
Due to their excellent infrastructure and connectivity, Hong Kong (China) and Singapore play core roles in the global supply chain by offering logistics and entrepôt services. This is in addition to their productive capacity. Trading companies in Hong Kong (China) and Singapore match buyers and sellers in different markets. Besides this intermediation activity, companies in Singapore and Hong Kong (China) also perform specialized services (such as quality control or simple manufacturing or processing, like sorting or packaging). This activity has enabled Hong Kong (China) to become the world's leading re-export specialist. In 2009, re-exports represented 95 per cent of Hong Kong's (China) total exports, or US$ 313 billion. In Singapore as well, re-exports are fast gaining in importance. The share of re-exports in total exports rose from 34 per cent in 1990 to 49 per cent in 2009. The combined re-exports of Hong Kong (China) and Singapore represented 11 per cent of Asia's total merchandise trade in 2009.

Numerous foreign affiliates in Hong Kong (China) and Singapore serve as regional headquarters in the East Asian region, providing a wide range of business services (business coordination, sourcing of raw and semi-finished components, technical support, financing, marketing, etc.) to their subsidiaries throughout the region.

The share of intermediate goods in the total re-exports of Hong Kong (China) has risen significantly in recent years, from 48 per cent in 2000 to 58 per cent in 2008. This increase reflects the importance of commercial exchanges between regional production networks. While the origin of imports is relatively diversified, re-exports from Hong Kong (China) are mainly bound for China (43 per cent of re-exports in raw materials and manufactures) (see Figure 4). Taking advantage of its proximity to the coastal provinces, Hong Kong (China) has also shifted its manufacturing tasks to the mainland by re-exporting an increasing share of intermediate inputs for outward processing. Chinese Taipei, with a share of 16 per cent, is also a major market for re-exports of intermediate goods from Hong Kong (China).

Figure 4

Hong Kong's (China) imports and re-exports of intermediate goods, by origin and destination (percentage)



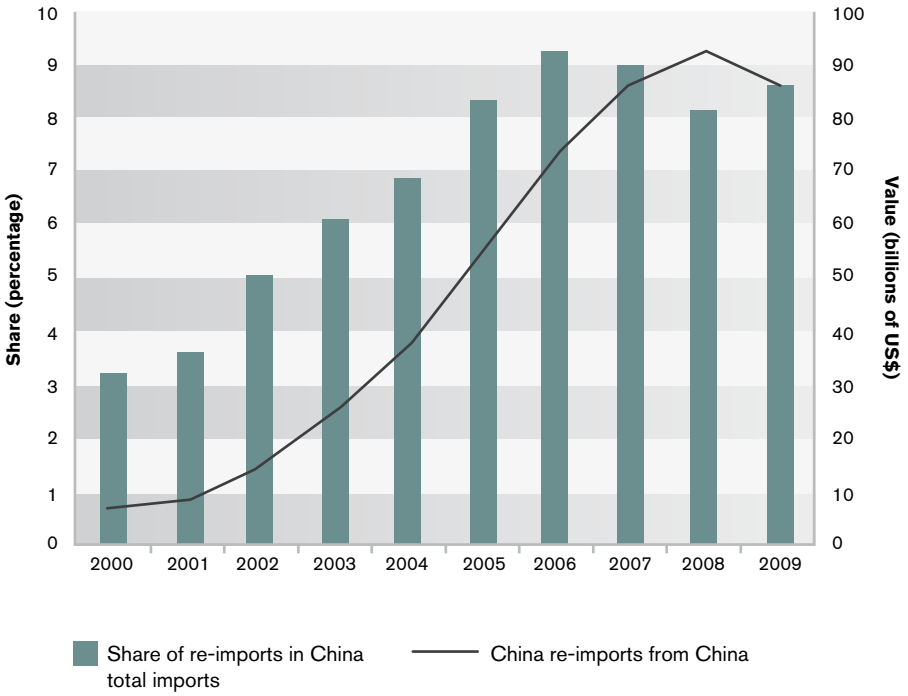
Source: Based on UN Comtrade Database.

Hong Kong (China) also plays a prominent part in the Chinese supply chain system by facilitating the transhipment of Chinese intermediate goods from one Chinese location to another, principally from one EPZ to another.

This is done through a round trip flow known as re-imports, "goods imported in the same state as previously exported".[6] Many Chinese EPZs find that it costs less and saves time to transport products through Hong Kong (China) because of its advanced logistics and infrastructure capacity. The EPZs can also benefit from tax rebates when goods are exported after processing and from preferential tax regimes when intermediate goods are imported for processing. China is by far the world's major re-importer. Its re-imports have risen more than 12 times since 2000 and are becoming a significant component of its trade (see Figure 5). They represented almost 9 per cent of its total merchandise imports in 2009.

Figure 5

Re-imports of China



Source: Based on UN Comtrade Database.

Endnotes

[1] See Barefoot and Mataloni, (2010).

[2] See http://www.ilo.org/public/english/dialogue/sector/themes/epz/epzs.htm/.

[3] Ibid.

[4] See Reserve Bank of India (2008-2009)

[5] See Business Process Association of the Philippines (2010).

[6] See International Merchandise Trade Statistics: Concepts and Definitions 2010 (2010).

III. Infrastructure services in global value chains

- Innovation and development in infrastructure services facilitate the smooth functioning of the global value chain system.
- Container port traffic in Asia has escalated, with China leading, followed by Singapore, Hong Kong (China) and Japan.
- India, the Philippines and Indonesia showed the highest increases in information and communication technology (ICT) expenditure.
- The trading environment that exporters and importers face within their own countries impacts on the cost and timeliness of international trade. Asian economies are more competitive.

Contents

A. Infrastructure services: A condition for global value chains

Adequate infrastructure services at a reasonable cost are a precondition for the development of global value chains. Infrastructure services include transportation, telecommunications, finance and insurance.[1] Transportation services cover sea, land and air, as well as supporting and auxiliary services. Telecommunications services encompass the electronic transmission of information, including business network services and Internet access. Financial services deal with financial intermediation, with auxiliary services provided by banks and stock exchanges, and with services provided by factoring, credit card and other enterprises.

Innovations in infrastructure services have paved the way for improvements in international transport, enabling economies to increase their engagement in the global value chain process. A dramatic increase in the average size of merchant ships after the 1950s transformed bulk freighters, with ships growing from an average of less than 20,000 deadweight tonnes (dwts) in 1960 to about 45,000 dwts in the early 1990s.[2] Maritime transport also underwent a qualitative revolution with the invention in the mid 1950s of the container by an American former truck driver, Malcom McLean. As a result of such changes, the time needed to move goods around the world shrank, as did the cost. Freight rates are estimated to have declined by 65 per cent between the 1950s and 1990s.

The quality of infrastructure services is increasingly seen as a determinant of the trade performance of developing economies and an important factor in global value chains. The following sections focus principally on two international modes of transport (sea and air); however, the importance of land-based modes (rail and road) should not be overlooked, as they provide the link between factories and main ports but also remain the main modes of transport, particularly but not solely within Europe and North America. In 2008, for example, road and rail accounted for 45.9 per cent and 10.8 per cent respectively of total goods transported within the 27 countries of the European Union, while intra-maritime transport accounted for 36.6 per cent.[3]

B. Merchant fleet and containerization: Key determinants of world trade

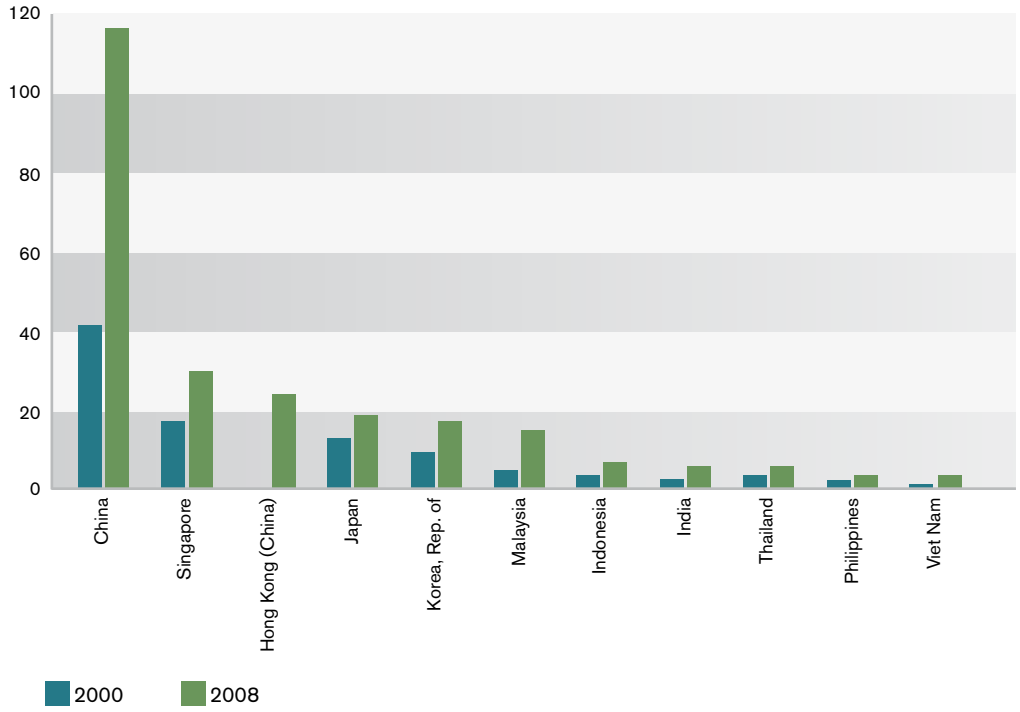
International trade and the shipping industry have long moved in tandem. Despite competition from other modes of transport, seaborne trade continues to increase, aided by the growing efficiency of shipping. According to Maritime International Secretariat Services (Marisec), approximately 90 per cent of world trade in terms of volume is carried by the international shipping industry. Marisec calculates that there are around 50,000 merchant ships trading internationally, transporting every kind of cargo. The world fleet is registered in over 150 nations and manned by over a million seafarers.[4]

The development of maritime transportation cannot be dissociated from containerization, a simple idea that changed the landscape of international trade. The idea of taking the body of a tractor-trailer and using this same container from origin to destination changed not only international transportation, but also the outlook, management and organization of international trade and global production. It is estimated that 100 million containers cross the oceans each year, carrying most of world trade. In the words of author and economist Marc Levinson, before the existence of containerization "transporting goods was so expensive that it did not pay to ship many things halfway across the country, much less halfway around the world."[5] Containerization, by introducing standardization, automation, inter-modality, traceability, and security from loss and damage, has radically contributed to the development of the global supply chain production system. Intermediate goods move faster to manufacturers and final goods reach customers quickly, safely and securely.

In 2009, of the top 10 leading world ports in terms of container traffic, five were located in China, with one each in Hong Kong (China), the Republic of Korea and Singapore.[6] In 2008, these four economies represented 38 per cent of the world's container port traffic. Figure 1 illustrates the increase in container port traffic in all the selected economies of the Asian region.[7] China in particular has registered a remarkable average annual growth of 14 per cent during the 2000-2008 period. The five economies with the most container port traffic, i.e. China, Hong Kong (China), Japan, the Republic of Korea and Singapore, are also the five that have traded the highest volumes of intermediate goods among the Asian economies.

Figure 1

Container port traffic (in millions of twenty-foot equivalent units (TEUs))



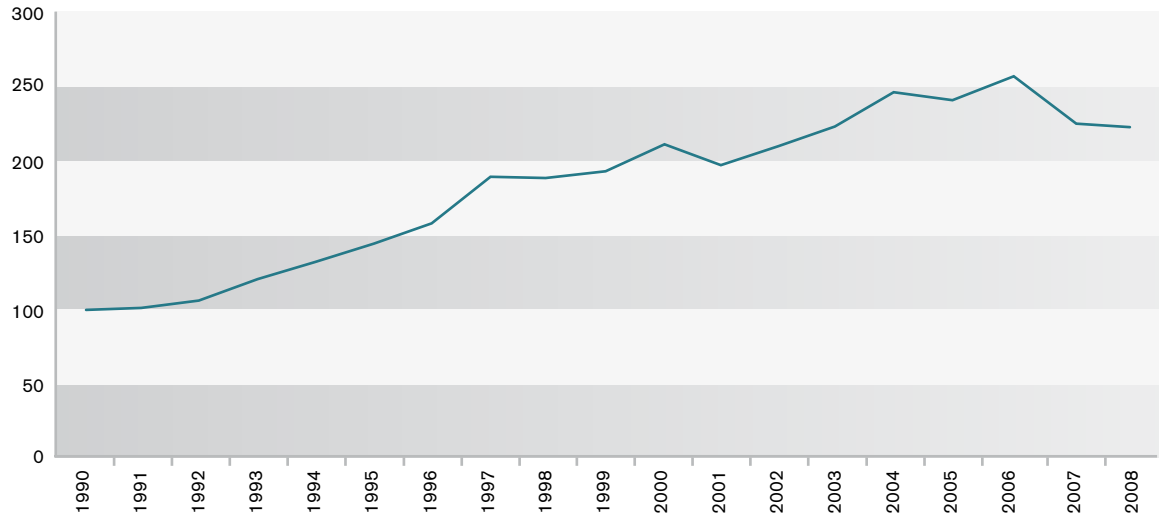
Source: World Bank, World Development Indicators Database.

C. Air transport: The solution for time-sensitive international trade and production

When international supply chains operate according to "just-in-time" strategies, they are very sensitive to all monetary and non-monetary transaction costs. Consequently, the quality and competitiveness of transport services are critical for making decisions on the mode of transport. As the weight-to-value ratio of international trade declines, and trade in components increases, the global air cargo industry has come to play a key role in the transportation of both intermediate goods and final products. Air transportation is a viable alternative for high-value and low-volume as well as time sensitive products. According to the International Air Transport Association (IATA), 35 per cent of world merchandise trade in value is transported by air, earning the industry some US$ 60 billion in revenue.[8] Between 1990 and 2008, world air transport volume more than doubled (see Figure 2), from 56 billion tonnes-km to almost 125 billion tonnes-km. During the same period, China's share in world air freight transport soared from 1 per cent to 9 per cent.

Figure 2

World air transport (freight), 1990-2008 (Index, 1990=100)



Source: World Bank, World Development Indicators Database.

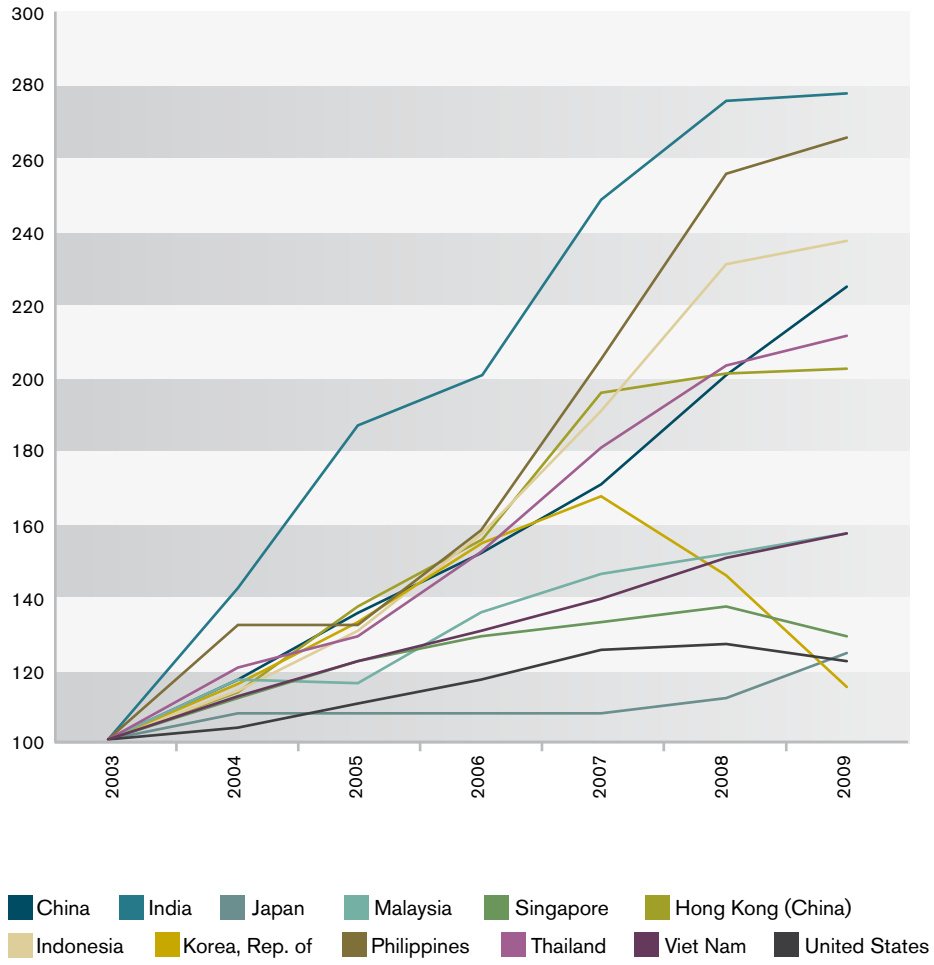
D. Information and communication technology (ICT)

Instant access to information for decision makers, e-commerce for consumers, logistics management and communication between the numerous stakeholders in the global value chain all depend on the availability and level of development of information and communication technology (ICT). Communication infrastructure is therefore one of the basic conditions for the growth and sustainability of global value chains and production networks. Access to market information aids international transparency and paves the way for international integration. Advances in ICT (from telex, to fax and to the Internet) enable faster reactions and speed up the whole logistical Internet process.

Figure 3 shows the development of ICT expenditure over the period 2003 to 2009. For China, Hong Kong (China), India, Indonesia, the Philippines and Thailand, expenditure more than doubled, while for the other economies, it still grew, but more slowly. However, it should be noted that economies such as the Republic of Korea, Malaysia, Singapore and the United States had already attained higher levels of ICT expenditure by 2003.

Figure 3

ICT expenditure (current US$) of selected Asian economies and the United States (Index, 2003=100)



Note: as the index is based on current dollars, the seemingly poor performance of the Republic of Korea in 2008 and 2009 is mainly due to the depreciation of the Won.

Source: World Bank, World Development Indicators Database.

E. Cost and time to trade at the border

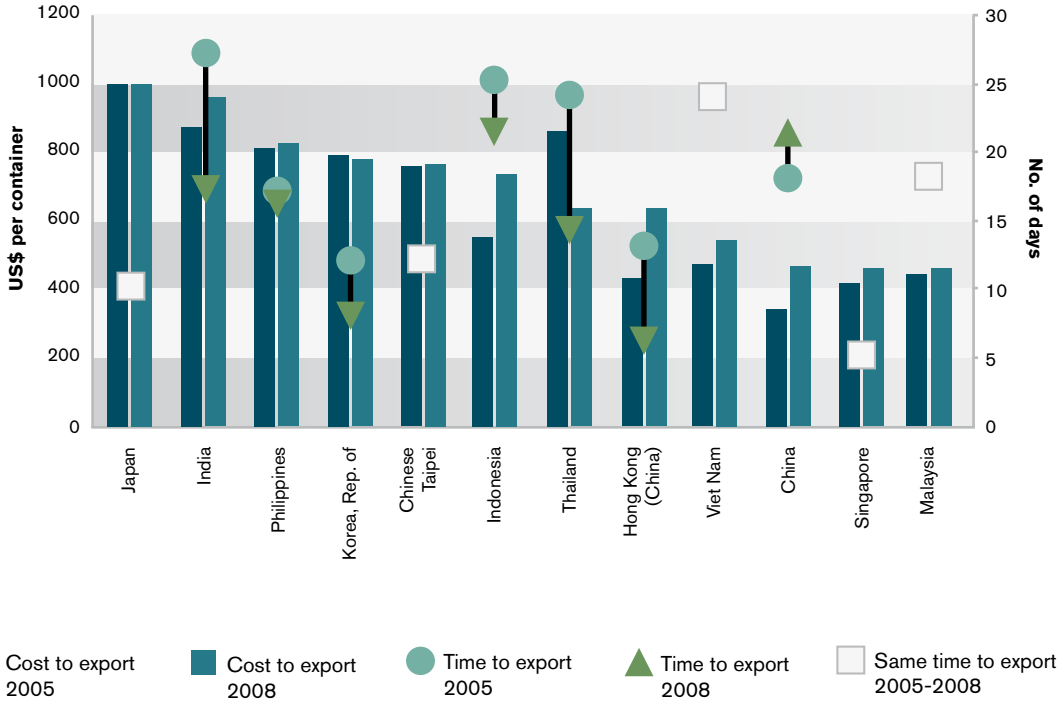
The ability of enterprises and of economies to join the global supply chain is heavily affected by the efficiency of border processes and customs practices. The trading environment that exporters face within their own countries can have a huge impact on their competitiveness. Domestic regulations and trade-related bureaucracy are among the cost factors that determine whether an enterprise can meet external demand in a competitive and timely fashion. The World Bank's Doing Business Database[9] identifies the documents required and the time and costs involved in exporting and importing, and ranks countries on the ease of trading across borders.

In its 2010 ranking of 183 economies, Singapore and Hong Kong (China) appear in first and second place respectively, both in terms of the ease of doing business in general and in trading across borders in particular. On cost[10] to export criteria, Malaysia, Singapore and China are the lowest-cost economies. On the import side, Singapore and Malaysia are the least costly, with China in fourth place, behind the United Arab Emirates. China receives a good ranking despite a modest performance in time to export (21 days) and import (24 days), compared to Singapore's 5 and 4 days, respectively.

Figure 4 shows the evolution of cost and time to export at the border in 2005 and 2008.[11] Cost to export increased slightly for almost all countries in the sample, with the notable exception of Thailand, for which it fell by some 26 per cent. Time to export declined for all countries with the exception of China (where it rose by three days); the biggest decreases were in Thailand, India and Hong Kong (China) (a reduction of 10, 10 and seven days, respectively). Bigger trade volumes could explain the rise in China's time to export. Larger trade volumes could increase congestion and lessen the efficiency of trade infrastructure, leading to a positive estimated effect of time costs on trade. As an example of the latter, when trade volumes surged in China in 2003, the wait time at Shanghai's port expanded by two days on average.[12]

Figure 4

Cost to export and time to export, 2005 and 2008

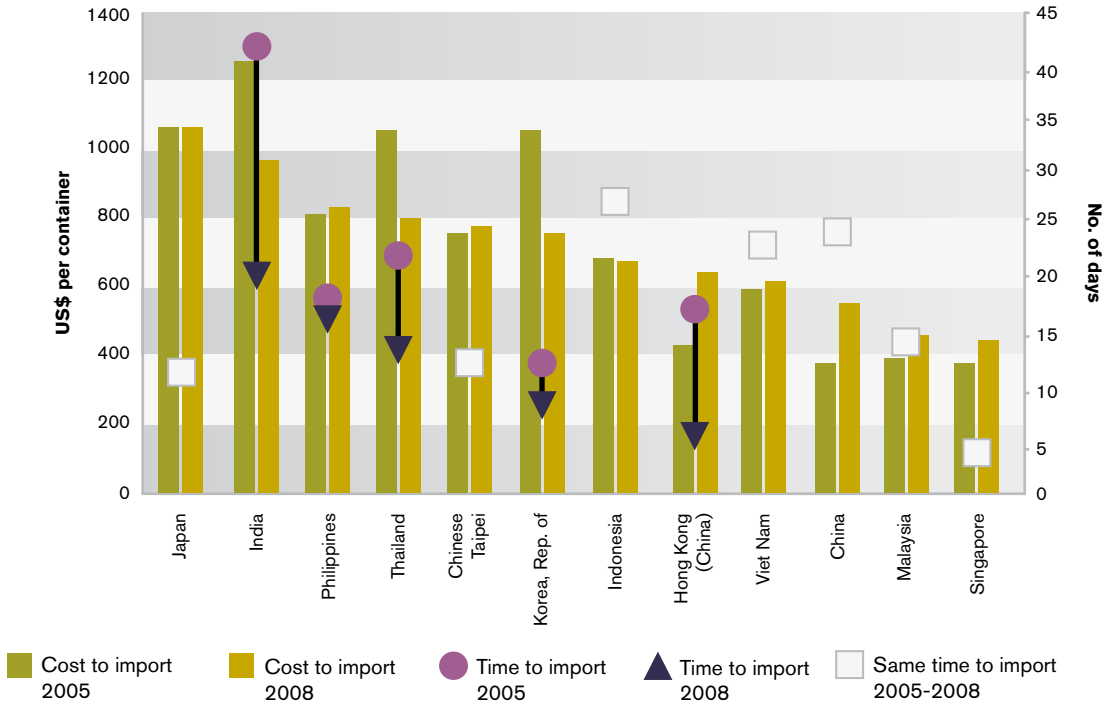


Source: World Bank, Doing Business Database.

Figure 5 shows the cost and time it takes to import at the border. The cost to import has increased for most of the economies in the sample, i.e. China, Hong Kong (China), Malaysia, the Philippines, Singapore, Chinese Taipei and Viet Nam. India, Indonesia, the Republic of Korea and Thailand, however, have managed to reduce the cost of importing goods. Time to import has either remained steady or decreased for all countries in the sample. A spectacular 70 per cent drop is registered for Hong Kong (China); other significant decreases occurred for India and Thailand (down 50 per cent and 40 per cent respectively).

Figure 5

Cost to import and time to import, 2005 and 2008



Source: World Bank, Doing Business Database.

Endnotes

[1] See the WTO country profiles on infrastructure services at http://stat.wto.org/ServiceProfile/.

[2] See WTO (2010b).

[3] See European Union (2010).

[4] See http://www.marisec.org/shippingfacts/worldtrade/.

[5] Levinson (2006).

[6] See http://www.internationaltransportforum.org/.

[7] "Port container traffic measures the flow of containers from land to sea transport modes, and vice versa, in twenty-foot equivalent units (TEUs), a standard-size container. Data refer to coastal shipping as well as international journeys. Transshipment traffic is counted as two lifts at the intermediate port (once to off-load and again as an outbound lift) and includes empty units." (World Bank, World Development Indicators Database).

[8] See http://www.iata.org/.

[9] See World Bank, Doing Business Database (http://www.doingbusiness.org/).

[10] "Cost measures the fees levied on a 20-foot container in U.S. dollars. All the fees associated with completing the procedures to export or import the goods are included. These include costs for documents, administrative fees for customs clearance and technical controls, customs broker fees, terminal handling charges and inland transport. The cost does not include customs tariffs and duties or costs related to ocean transport. Only official costs are recorded." See World Bank, Doing Business Database (http://www.doingbusiness.org/).

[11] For a detailed overview on the compilation of the World Bank "Doing Business" indicators on time and cost to trade, see World Bank, Doing Business Database (http://www.doingbusiness.org/).

[12] See Djankov et al. (2006).

IV. The evolution of tariff policies

- Asian economies have relatively low applied tariffs on imports, and they are still decreasing.
- Some Asian economies, e.g. Hong Kong (China) and Macao (China), are fully duty free.
- Trade in Asia is dominated by semi-processed products, which have the lowest applied tariffs.
- Low tariffs belie real trade liberalization because of non-tariff measures.

Contents

A. An overview of Asia's tariff commitments to the WTO

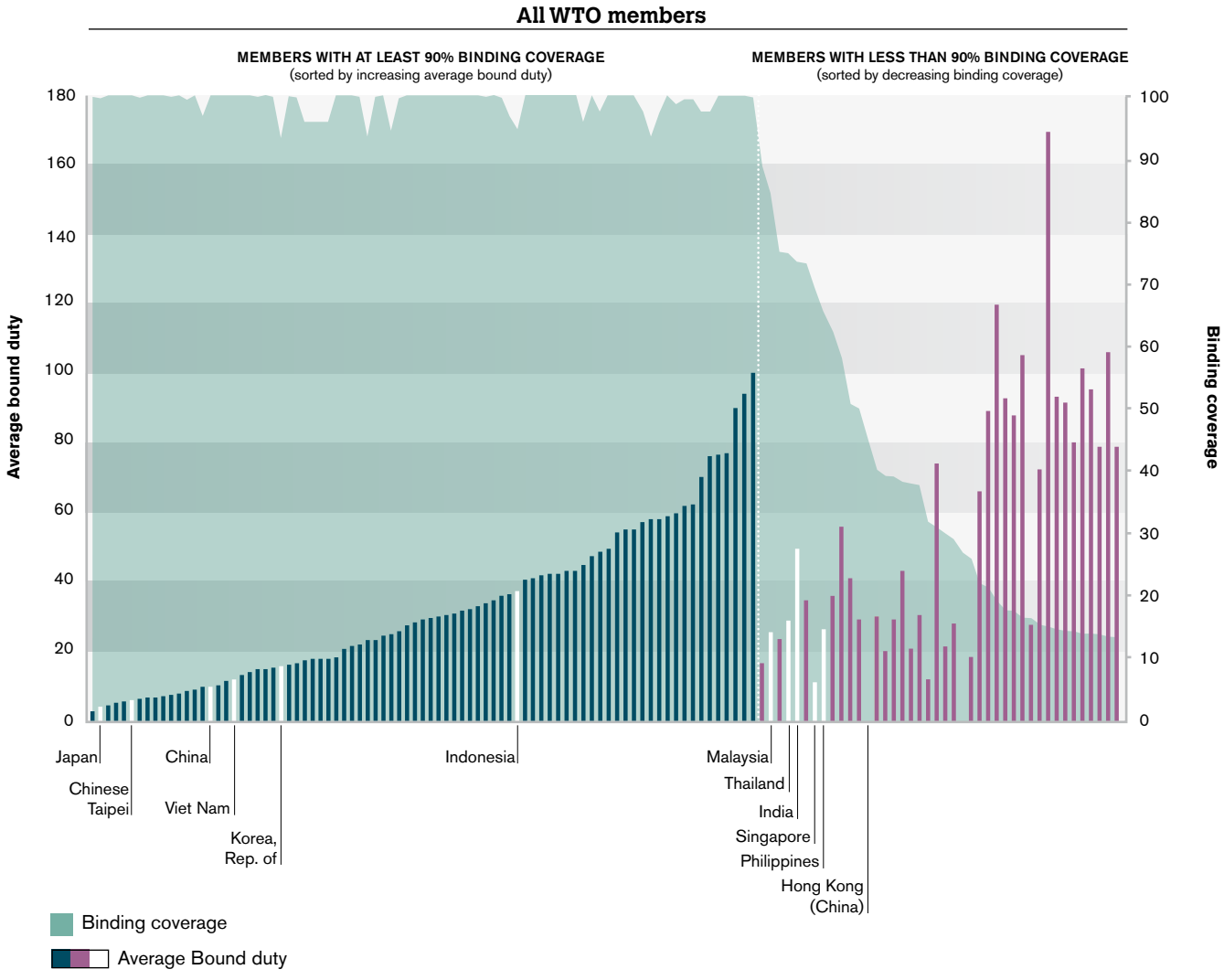
As we saw in the previous chapter, the lowering of transaction costs through better infrastructure has been key to promoting global value chains in Asia. Another key element in facilitating trade is lower tariffs, or duties. At the WTO, a major focus of free trade negotiations has been market access, or tariff, issues. Specifically, the negotiations aim to reduce the tariff ceilings to which members are formally committed, known as their "bound" levels, and so increase the transparency of trade relations.

A WTO member's tariff commitment to the WTO lays down the maximum duty that it can impose on specific imports (bound duty) and the number, or percentage, of products that it has formally agreed to bind (binding coverage). Out of the 153 WTO Members, 111 have "bound" – set maximum tariffs – for at least 90 per cent of their products. In Asia, Japan and Chinese Taipei both have almost full binding coverage and low bound duty levels. It is also worth mentioning that only in Asia are there two economies that are duty free on bound products, even if the binding coverage is much less than 90 per cent. These are Hong Kong (China) and Macao (China).

Figure 1 gives an overall picture of tariff commitments on goods in terms of binding coverage and bound duty levels for all WTO members (the European Union is represented as one). The vertical left axis represents the member's average bound duty level, while the vertical right axis shows the corresponding binding coverage represented by the shaded area. But while bound rates are the rates to which members are formally committed under WTO agreements, in practice they often apply lower levels of duty. These actual levels are called "applied" tariffs.

Figure 1

Bound duty commitments of WTO members (percentage)



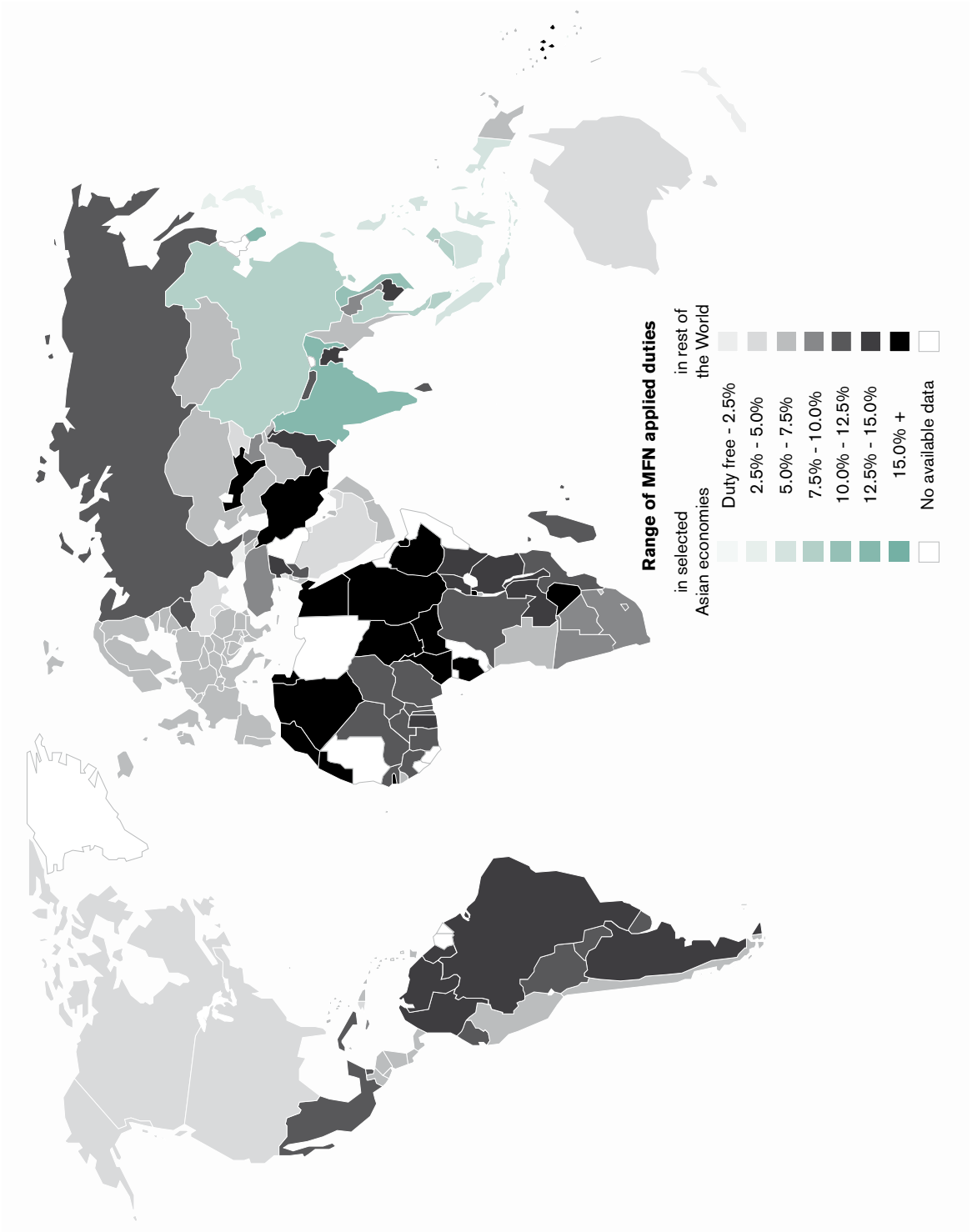
Source: WTO (2010a).

B. Applied tariffs in Asia are low and still decreasing

In the Asian region, applied tariffs under the WTO's most favoured nations (MFN) principle are generally low, mostly in the 5-10 per cent range (see Figure 2 for MFN applied tariff levels). The MFN principle guards against discrimination by ensuring that all WTO member states benefit from the best tariff terms that any member is prepared to offer. India and the Republic of Korea deviate slightly from this pattern of low applied tariffs, with rates of 12.9 per cent and 12.1 per cent, respectively. But India has been cutting its applied tariffs, with average rates down 19.5 percentage points in 2009 compared to 2001 levels.

Figure 2

Latest applied duties in the world (percentage)

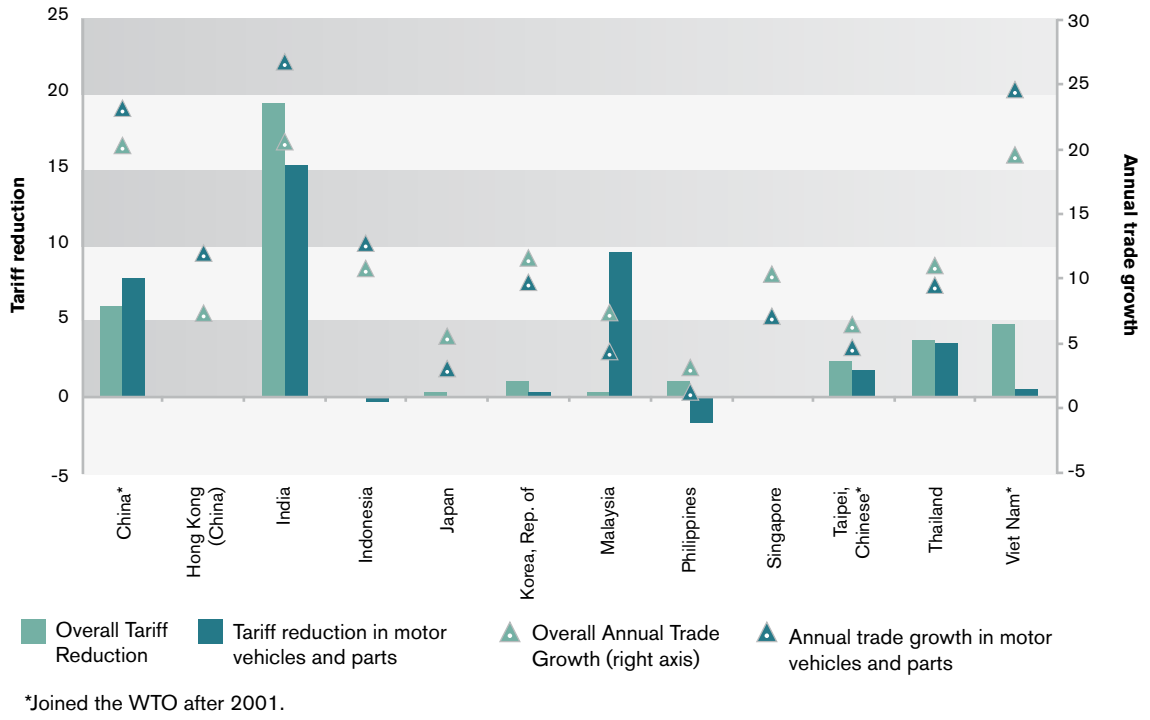


Source: WTO (2010a).

Figure 3 shows that major Asian traders have significantly reduced their applied tariffs. China, India and Viet Nam, the countries which lowered overall tariffs the most, relative to 2001, have also seen the highest annual rates of trade growth. Some countries, like Indonesia and the Philippines, have registered a slight increase in tariffs. But while they are core actors in regional value chains dealing with motor vehicles and parts, their applied tariffs in 2001 were already relatively low. The rate was 6.3 per cent for Indonesia and 4.8 per cent for the Philippines, compared to 16.9 per cent for China and 25.7 per cent for India. Even Malaysia's rate was 18.6 per cent.

Figure 3

Applied MFN tariff reduction and annual trade growth in selected Asian economies, 2001-2009 (percentage)

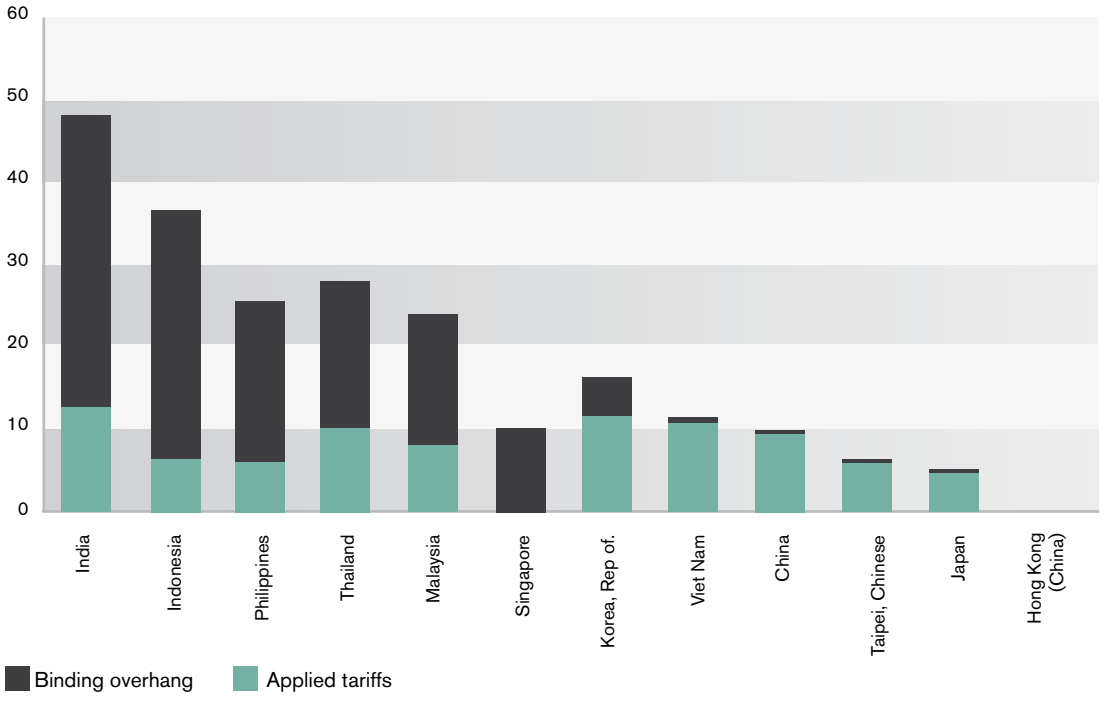


*Joined the WTO after 2001.

Sources: WTO, Integrated Database; UN Comtrade Database.

Figure 4

Binding overhang in 2009 for selected Asian economies (percentage)



Source: WTO (2010a).

Bound tariffs serve to protect export-oriented enterprises against unexpected tariff surges. Many Asian members have formally high tariff commitments, but as we have seen, their actual applied MFN rates are much lower (see Figure 4). The 10 members of the Association of Southeast Asian Nations (ASEAN), which joined the multilateral trading system during the Uruguay Round, and India, have the highest binding overhangs (the overhang is the gap between applied and bound rates).

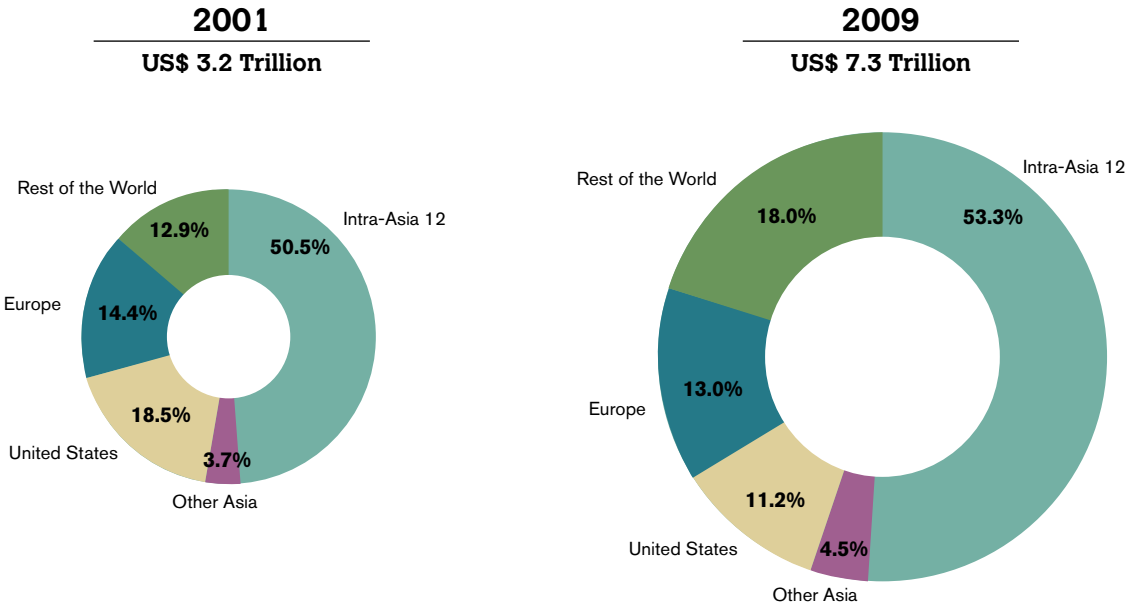
C. Regional trade agreements accentuate the growth of Asian trade

Asia is a highly integrated trading bloc, with buoyant intra-regional commerce (58 per cent of its trade in 2009, see Figure 5). Furthermore, it has diversified its extra-regional markets to reach beyond its traditional partners, the European Union and the United States. The share of extra-regional trade excluding the European Union and the United States has increased from 12.9 per cent in 2001 to 18 per cent in 2009.

The numerous regional trading agreements (RTAs) among Asian economies have contributed to regional integration. The ASEAN Free Trade Area (AFTA) is an almost completely duty-free zone. Under AFTA's Common Effective Preferential Tariff (CEPT), five ASEAN states – Indonesia, Malaysia, the Philippines, Singapore and Thailand – started in 2010 to offer duty-free access on more than 99 per cent of traded products (tariff lines). Viet Nam's target date for zero CEPT tariffs is 2015. ASEAN countries also have free trade agreements with China, India, Japan and the Republic of Korea, among others, which are all in the implementation phase. Most Asian countries are parties to at least one RTA. Singapore is party to 18 RTAs on goods. Indonesia, Malaysia, the Philippines, Thailand and Viet Nam are parties to at least six more RTAs in addition to the AFTA (see Figure 6).

Figure 5

Asia's merchandise trade by region (percentage)

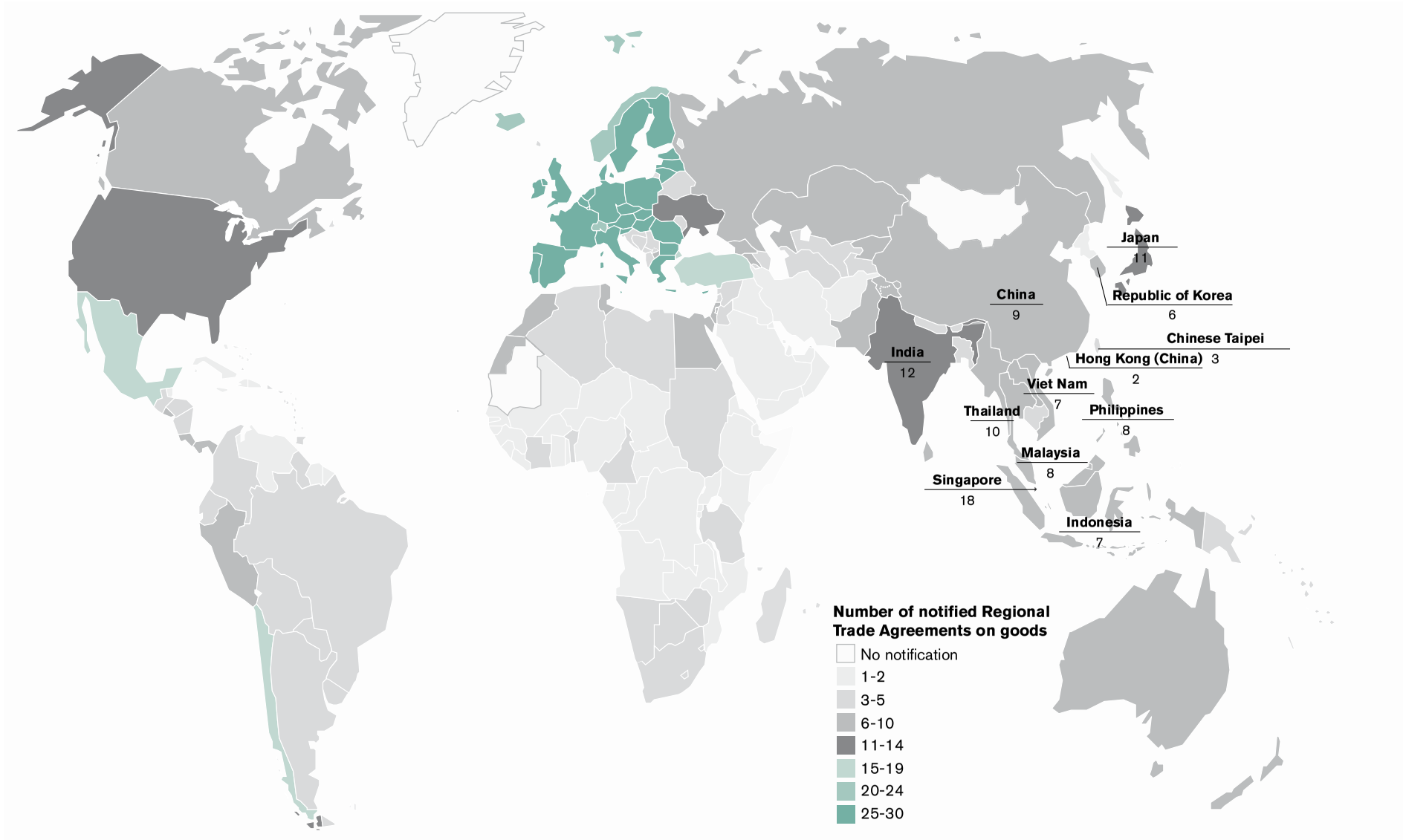


Note: "Intra-Asia 12" comprises China, Hong Kong (China), India, Indonesia, Japan, the Republic of Korea, Malaysia, the Philippines, Singapore, Chinese Taipei, Thailand and Viet Nam.

Source: UN Comtrade Database.

Figure 6

Regional Trade Agreements in goods notified to the GATT/WTO and in force by country/territory (number)



Source: WTO, Regional Trade Agreements Database.

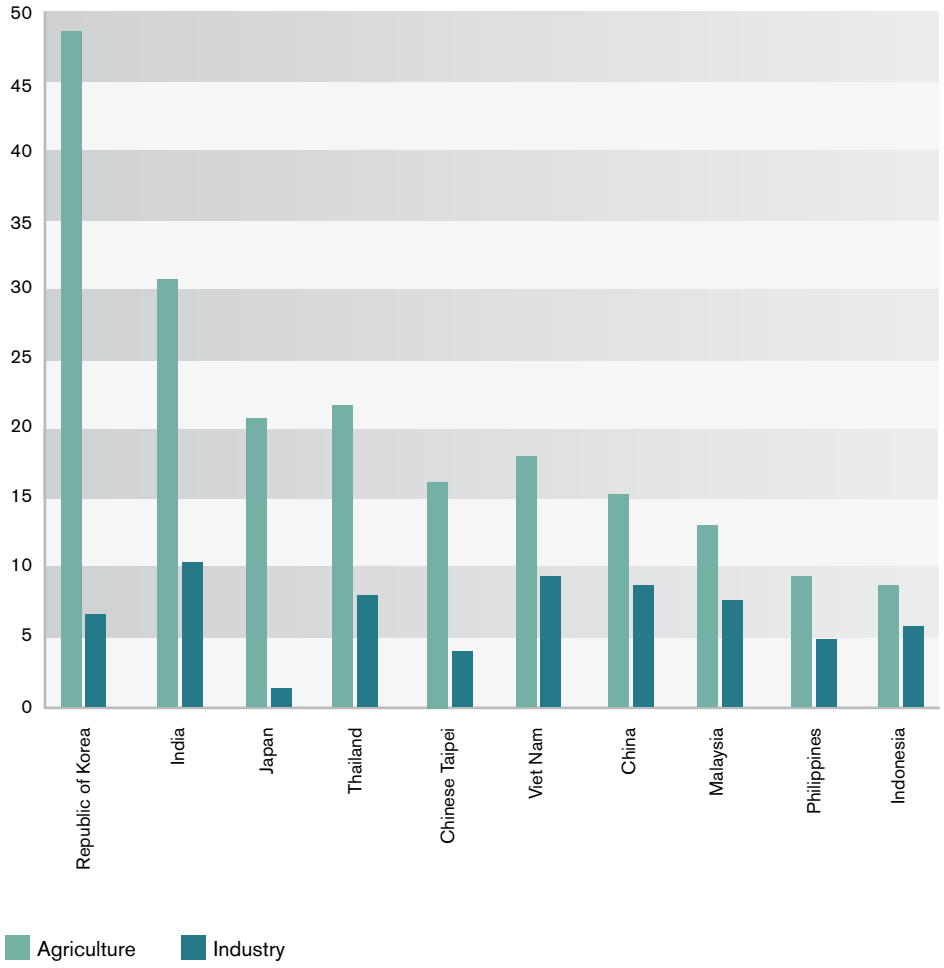
D. Tariffs in Asia vary significantly among sectors

Industrial tariffs[1] are lower in Asian countries than agricultural ones (see Figure 7). Agriculture tariffs in India and the Republic of Korea are among the 10 highest in the world, with the latter's tariff for agricultural products being more than seven times the average tariff for industrial products. While Japan's industrial products tariff is relatively low, its duties on agricultural imports are comparable to those of Asian developing countries.

The dominating position of semi-processed products in Asian trade is reflected in the tariffs that countries in the region impose. Tariffs on semi-processed products are low compared to either raw materials or processed products. In the cases of the Republic of Korea and Thailand, tariffs on semi processed products are less than one-third of those for raw materials. As for agricultural products, duties on raw materials remain high in most Asian economies (see Figure 8). But there is little evidence of tariff escalation, the practice of imposing higher tariffs the more processing is involved in the imported product.

Figure 7

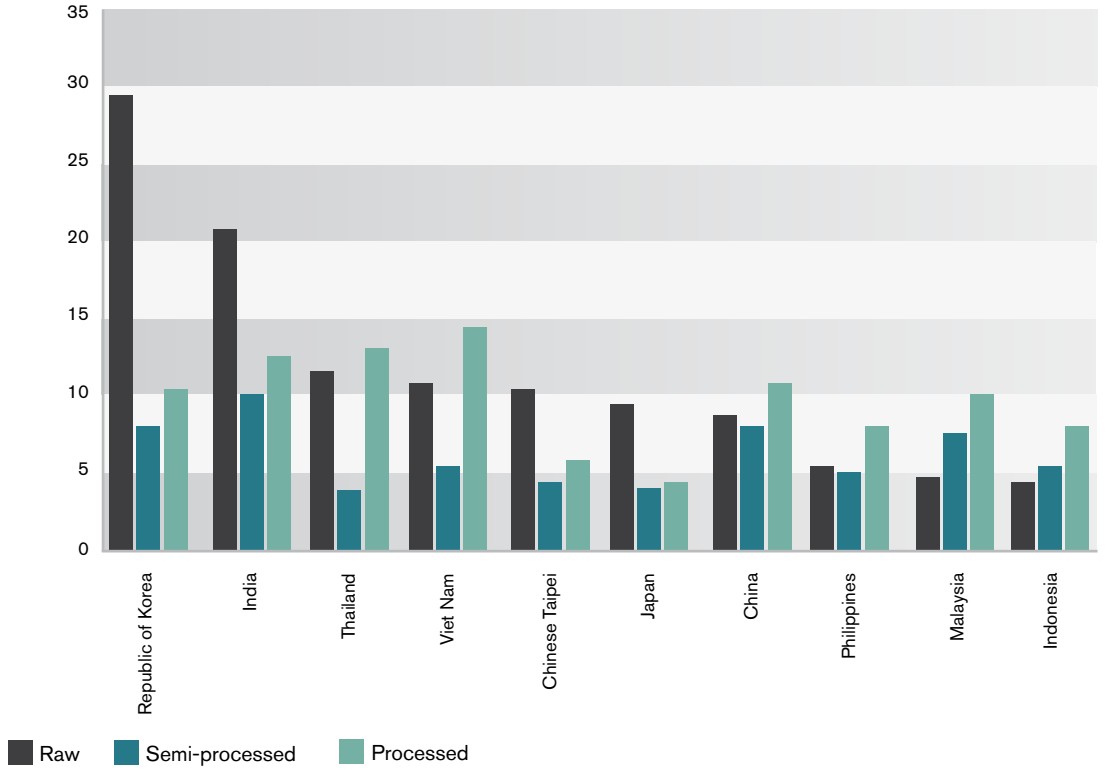
Agriculture vs. industrial tariffs in Asia, 2009 (percentage)



Source: WTO (2010a).

Figure 8

Tariff escalation in selected Asian economies, 2009 (percentage)



Source: WTO, Integrated Database.

E. Effective protection rates become highly "ineffective" in global supply chains

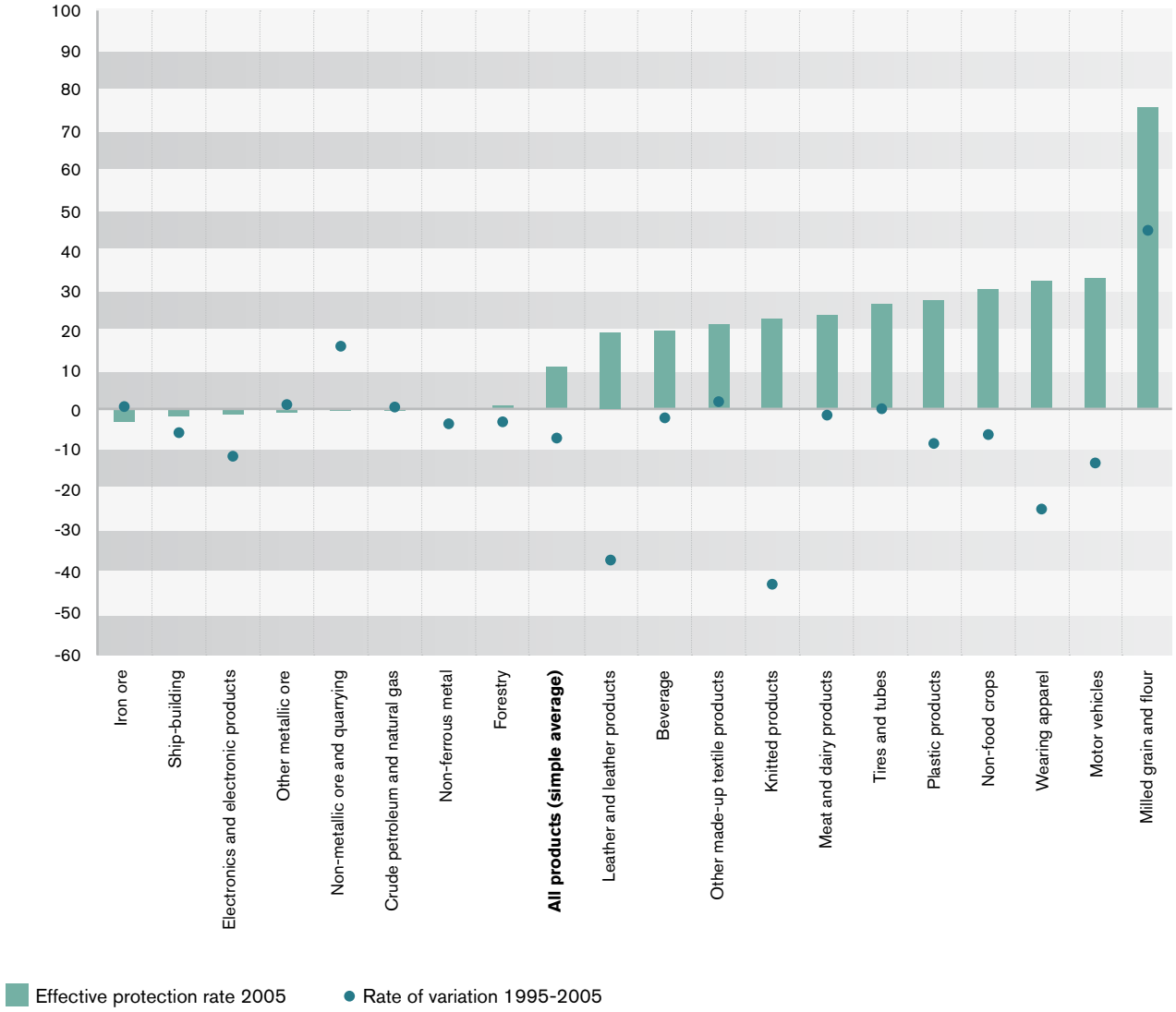
Closely related to the issue of tariff escalation is the notion of effective protection. When tariff escalation is steep, all firms that produce finished products will benefit from high protection. They will be able to sell dear and buy cheap. On the other hand, firms selling intermediate goods will scarcely benefit from high tariff protection, and will have to pay high duties for any processed goods they need to import. In the latter case, their effective protection rate (EPR) will be low. It may even be negative if the duty paid on the inputs is higher than any nominal protection received on the output.

Effective protection becomes highly "ineffective" when countries participate in international supply chains because an increasing volume of traded industrial output is made of intermediate goods (see Chapter VIII). Effective protection, computed for each industry according to its input-output structure, and the corresponding tariffs, has been decreasing over time in East Asia and the United States. But some sectors, like textiles and clothing, automobiles, and some food industries, still benefit from high levels of effective protection (see Figure 9). However, according to 2005 data, negative protection is now relatively rare, unlike in previous decades. Overall, the trend towards lower applied tariffs has been instrumental in reducing negative protection.

There is a tendency for highly protected sectors to see their effective protection rate reduced over time. The rate of correlation between the level of EPR in 1995 and the variation between 1995 and 2005 is negative and relatively large (-0.7) across all sectors and countries, indicating a tendency towards a more neutral, flatter tariff structure.

Figure 9

Effective protection rate (percentage) in 2005 and changes 1995-2005, United States and selected Asian economies



Note: Simple average of effective protection rates calculated for 10 countries.

Source: Elaborated on the basis of IDE-JETRO and WTO data.

F. Non-tariff measures mitigate the benefits of low tariffs

While tariffs have generally been falling, the trend towards further trade liberalization is being mitigated by increased use of what are termed non-tariff measures (NTMs). These are administrative instruments that can address legitimate public policy concerns but may limit imports. They can cover anything from licensing and quantitative controls to health and phytosanitary measures. Governments resort to NTMs for a variety of reasons, sometimes using them as trade policy tools. In 2007, a multi-agency support team of experts[2] on non-tariff measures proposed the following definition of NTMs: "Non-tariff measures (NTMs) are policy measures, other than ordinary customs tariffs, that can potentially have an economic effect on international trade in goods, changing quantities traded, or prices or both."

Table 1 gives an overview of the types of NTMs commonly used. The principles of transparency and non-discrimination are for the most part the only benchmarks by which NTMs and other trade policies are evaluated under WTO jurisdiction. Hence, the statistics on dispute settlement in Table 1 relate more to the issue of whether the NTMs or any other trade regulating instruments abide by WTO principles rather than to the "legitimacy" of these trade instruments per se.

Table 1

Common Non-Tariff Measures practiced and dispute settlement cases involving selected WTO Members

	NON-TARIFF MEASURES			DISPUTE SETTLEMENT
WTO member	Licensing, prohibition and quantity controls	Technical measures including santary and phytosanitary measures	Price control of which antidumping	Number of requests for consultation in disputes where member is complainant/respondent
China	√	√	√	7/20
Hong Kong (China)	√	√		1/0
India	√	√	√	19/20
Indonesia	√	√	√	5/4
Japan	√	√	√	14/15
Republic of Korea	√	√	√	14/14
Malaysia	√	√	√	1/1
Philippines	√	√	√	5/6
Singapore	√	√		1/0
Chinese Taipei	√	√	√	3/0
Thailand	√	√	√	13/3
Viet Nam	√	√		1/0

Sources: Martinez et al. (2009); WTO Trade Profiles (2010).

Endnotes

[1] Refers to the non-agricultural sector, based on the WTO definition which includes any product not in Annex 1 of the WTO Agreement on Agriculture (see www.wto.org/agriculture).

[2] Multi-Agency Support Team (MAST), organized by UNCTAD and made up of experts from several organizations dealing with substantive analysis of non-tariff measures.

V. Foreign direct investment

- Asia doubled its share of total FDI inflows from 1985 to 1995. In 2008, the share was still nearly twice as high as in the mid-1980s.
- China has emerged as an attractive destination for FDI flows, but its share is declining, while that of India is rising.
- Merchandise exports mirror increasing FDI inflows in most leading Asian economies.
- FDI inflows to Asia are shifting from the manufacturing sector to services.

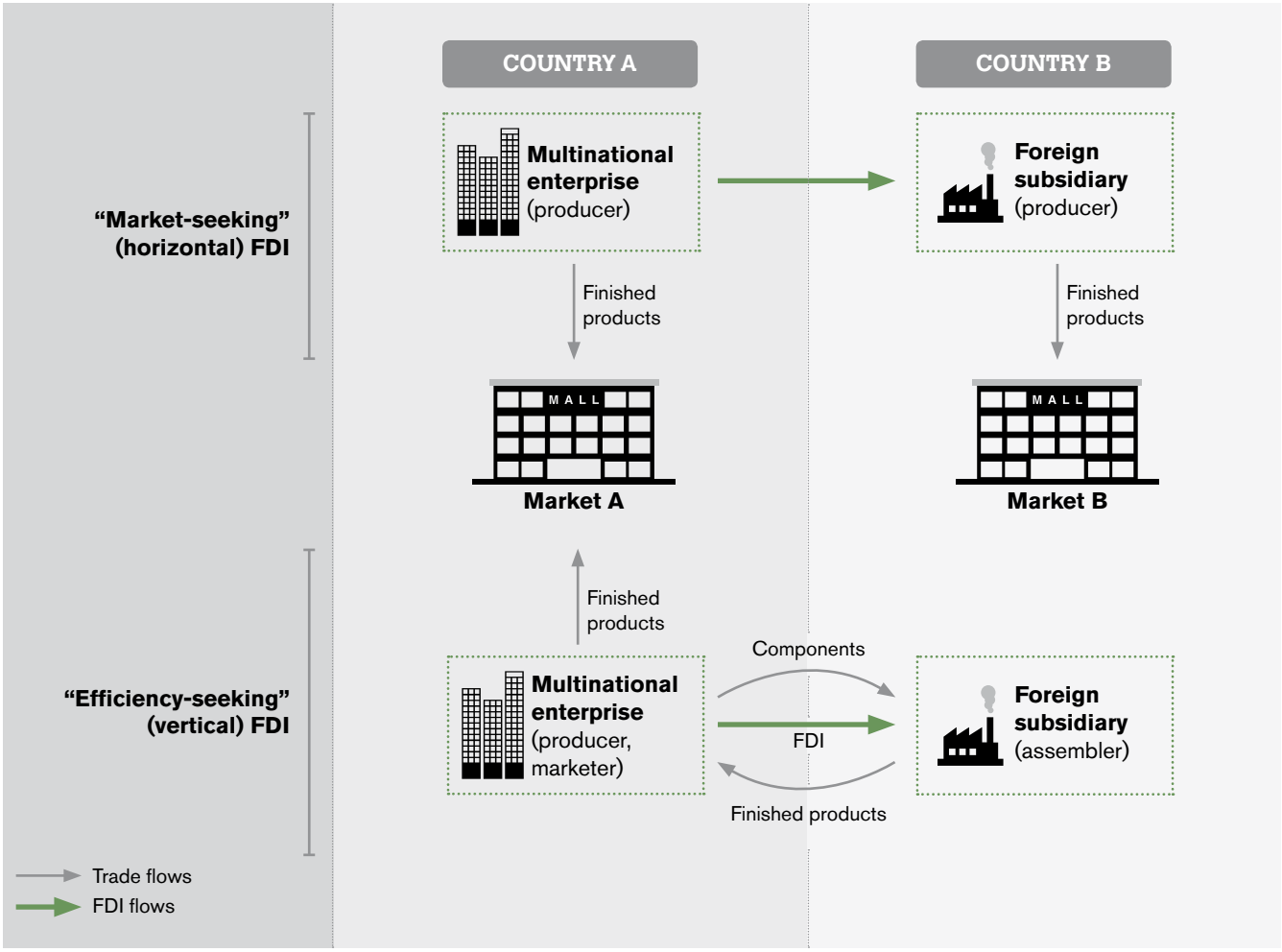
Contents

A. The situation at a glance

Foreign direct investment (FDI) contributes to the structural and geographical diversification of multinational enterprises. Its principal aims are to "slice up" the production process and seize the comparative advantages particular to each participant in the supply chain ("efficiency-seeking FDI"), but also to gain access to foreign markets and sell directly to clients ("market-seeking FDI") (Figure 1). The impact on international trade flows is *a priori* ambivalent as some investments will boost exchanges (in particular in intermediate goods), while others will reduce it ("build-where-you-sell", see Chapter I). But FDI has been instrumental in the shift to international production networks, and economies that have experienced the largest FDI inflows have also seen the largest expansion in merchandise exports.[1] The fragmentation of production presents producers in developing countries with a golden opportunity to widen their export markets. Indeed, developing economies make up three of the top six destinations for FDI flows, with China moving up to become the second largest FDI recipient in 2009,[2] behind the United States.

Figure 1

Complementarity versus substitution between trade and FDI

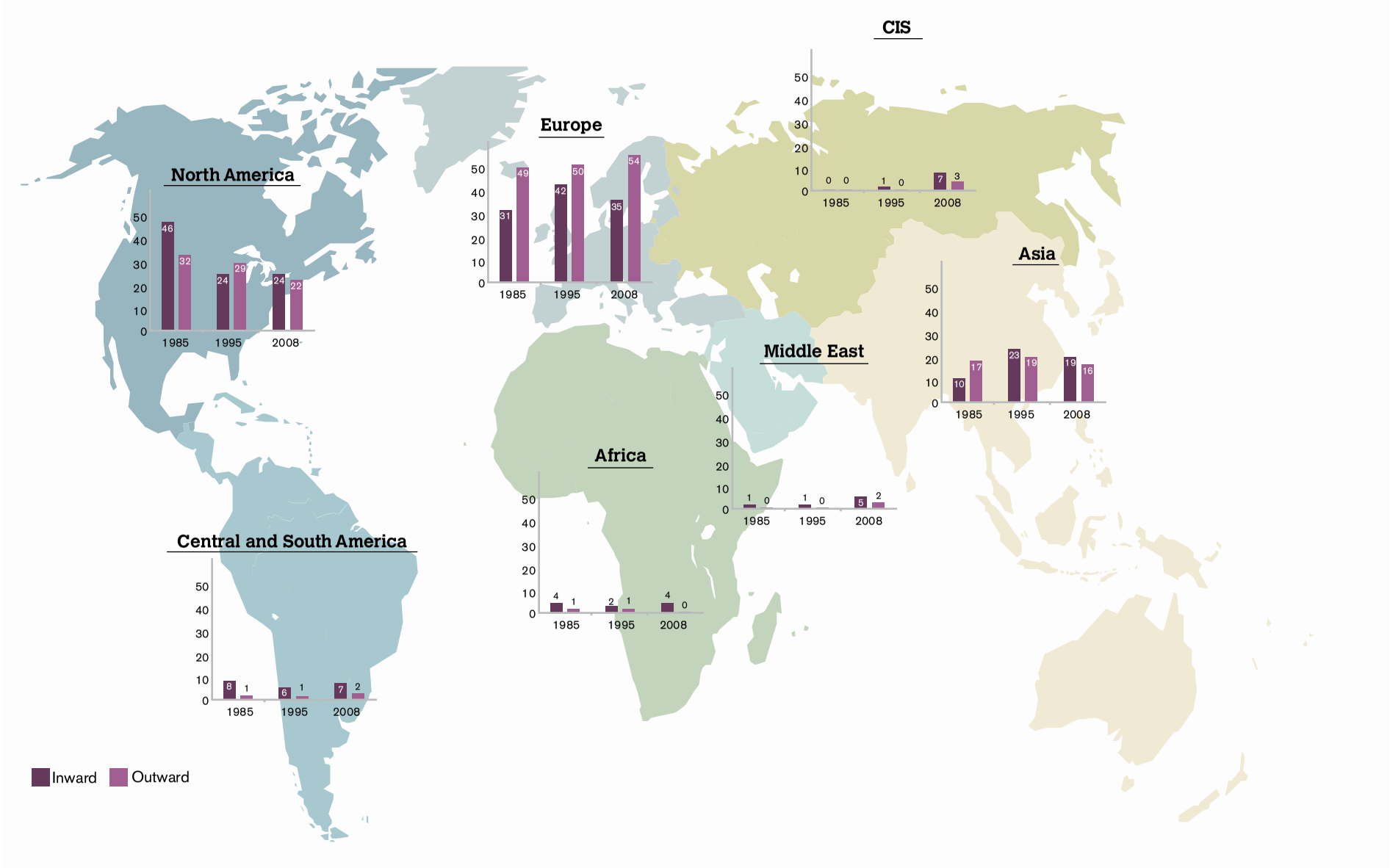


Source: WTO Secretariat.

FDI flows to Asia have leapt since the mid-1980s when they were just some US$ 5 billion a year. In 1990, these flows reached US$ 23 billion and by 2008 they had multiplied to US$ 307 billion, despite some large declines during and after the 1997-98 Asian financial crisis.[3] Asia's share of worldwide FDI inflows doubled between 1985 and 1995 – from 10 to 19 per cent – and has remained at that high level ever since (see Figure 2). At the same time, Asia's share in the exports of intermediate goods climbed from 26 per cent in 1995 to 35 per cent in 2009.

Figure 2

Regional share of FDI inward and outward flows in world – 1985, 1995 and 2008 (percentage)

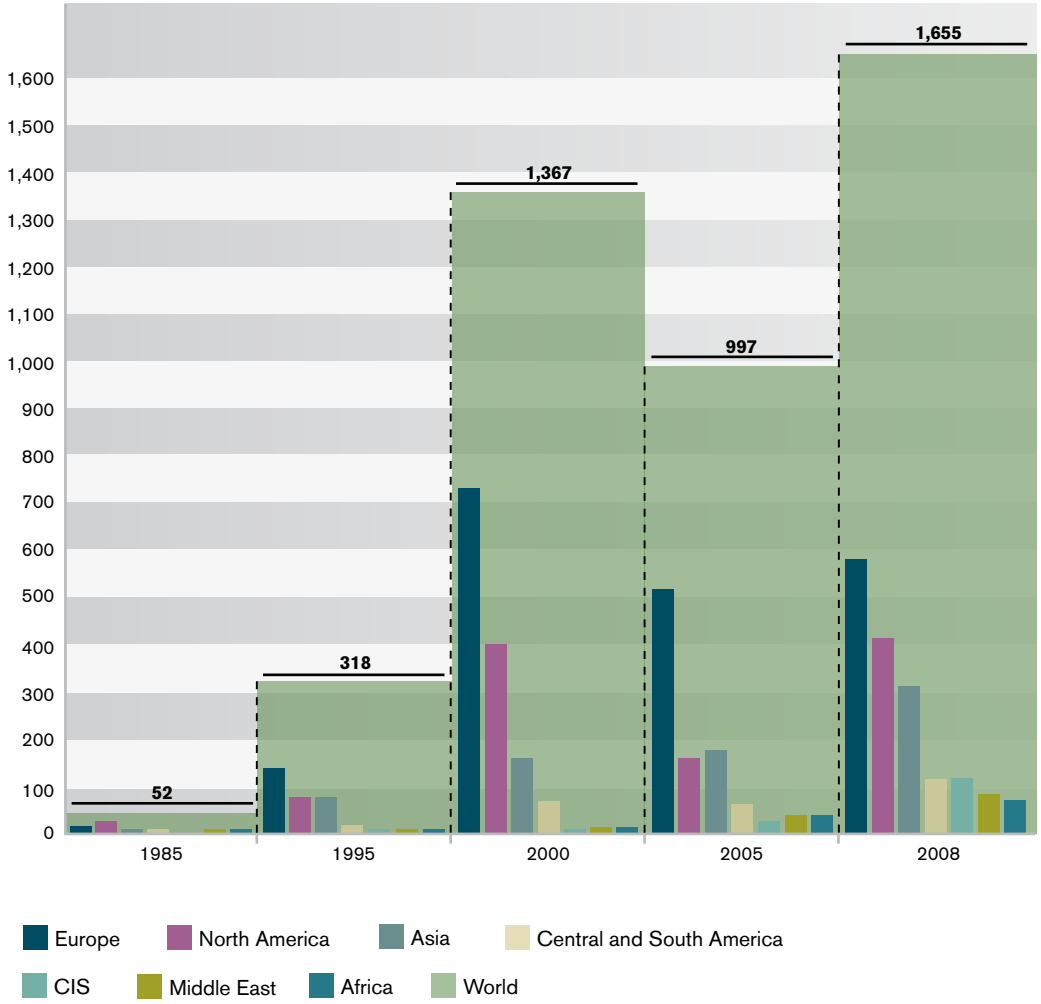


Source: UNCTAD Stat Database.

Figure 3 shows the evolution of the regional breakdown in value terms. Europe's FDI inflows still tower over the rest of the world, but Asia has become increasingly attractive, surpassing North America in 2005, a year in which the latter suffered a sharp decline.

Figure 3

FDI inflows by region and world level (in billions of US$)



Source: UNCTAD Stat Database.

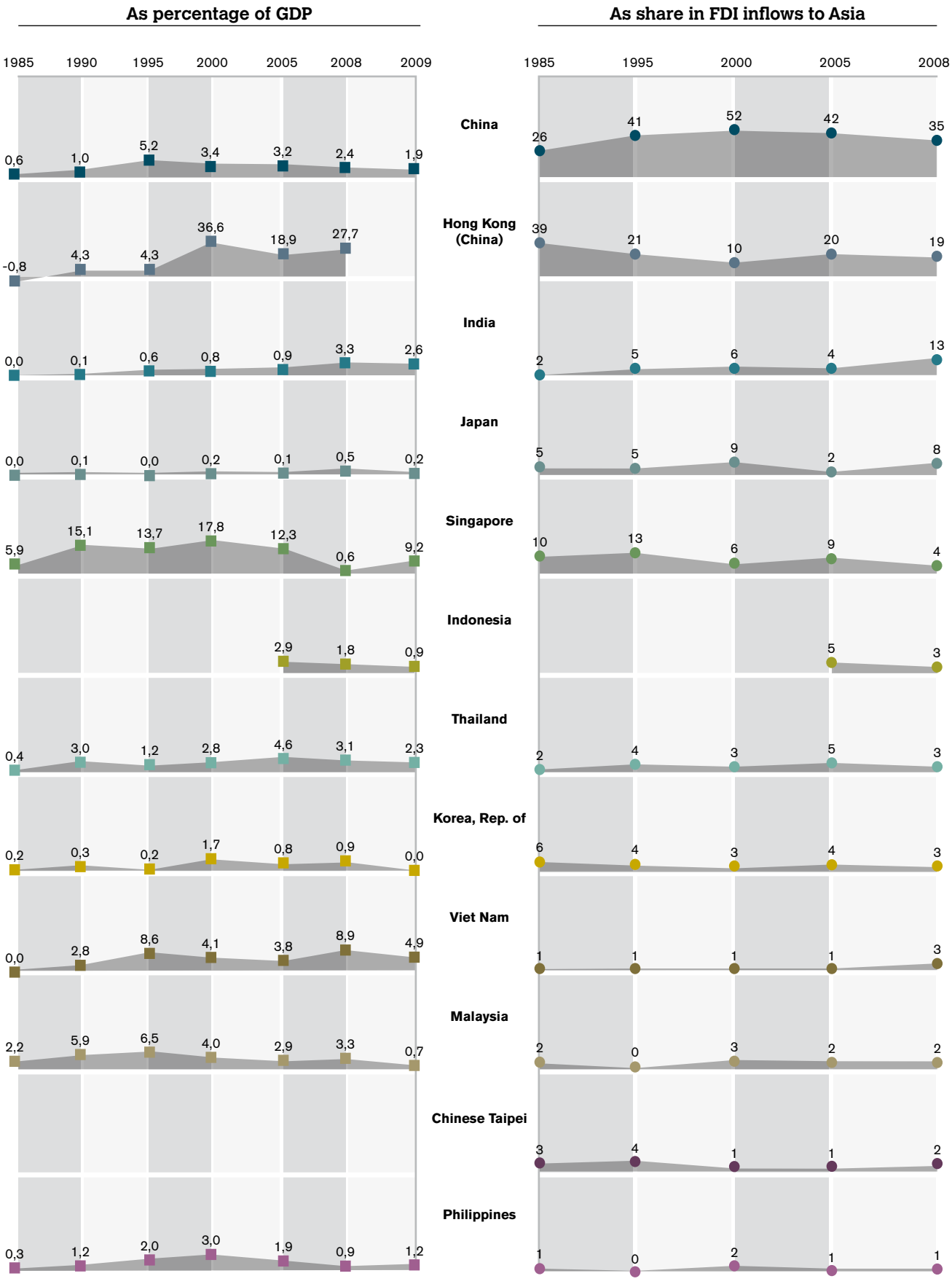
B. A key factor in Asia's trade growth

When measured in relation with the country's gross domestic product (GDP), China's FDI inflows peaked in 1995. Its share of overall Asian FDI has declined, while others, such as India and Viet Nam, have become increasingly important destinations. Nevertheless, in terms of the levels of FDI, China and Hong Kong (China) still absorb the largest amounts in the region (see Figures 4 and 5).

Figure 5 shows the level of merchandise exports and FDI inflows in 1985, 1995 and 2008. As already mentioned, there is not always a direct positive relationship between FDI and exports. But it is interesting to note the difference between mature industrial economies, such as Japan in 1995, and an emerging economy such as China in 2008. Japan, as a large mature economy, dominated exports in 1995, but ranked relatively low on inward FDI flows. China, on the other hand, is dominant for both exports and FDI flows in 2008. Interestingly enough, India in 2008 is in the same situation China was in 1995, with relatively low exports but high FDI inflows.

Figure 4

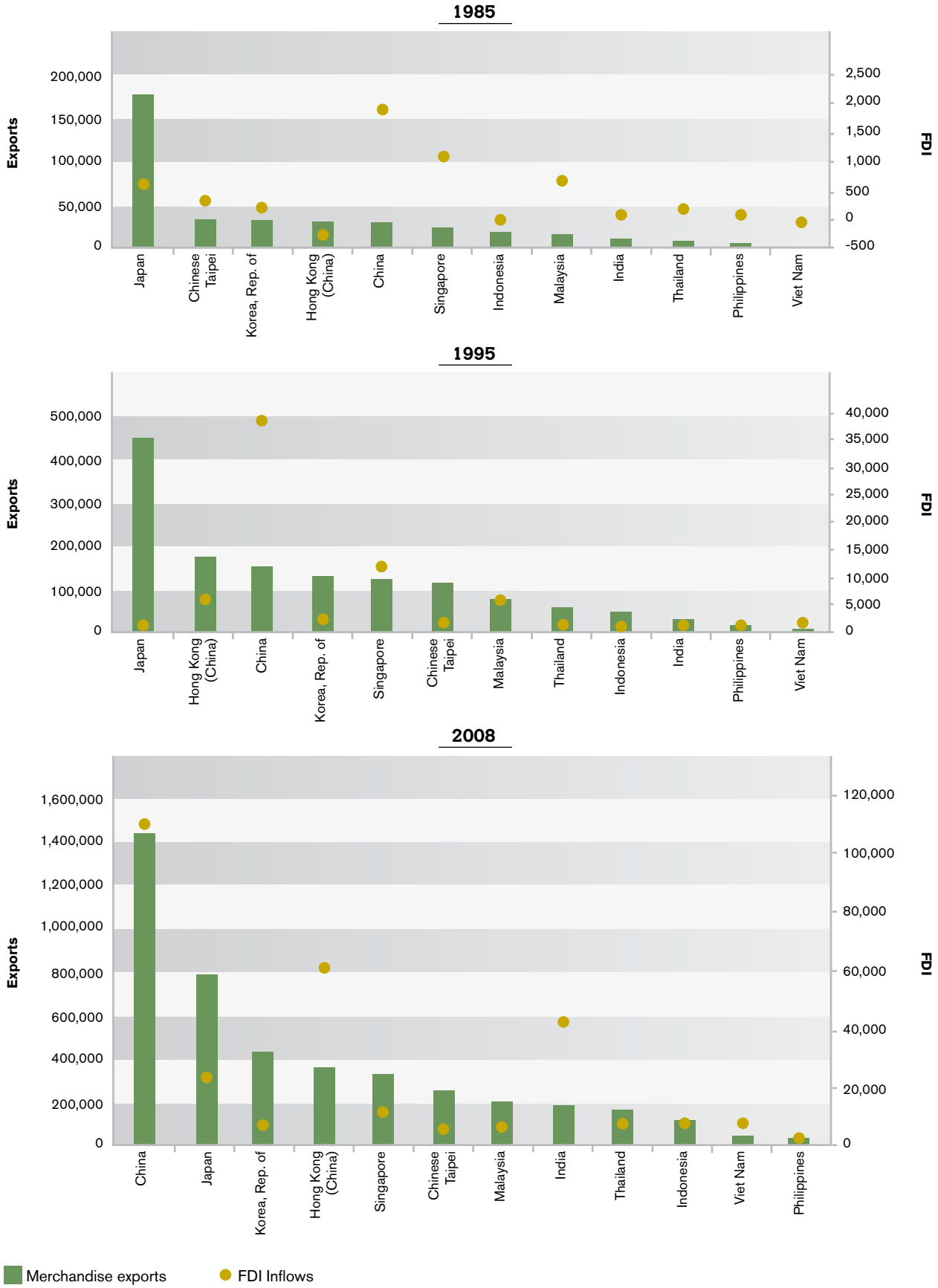
FDI inflows received by selected Asian economies (percentage of GDP and economies' shares in Asia)



Sources: UNCTAD Stat Database and World Bank, World Development Indicators Database.

Figure 5

FDI inflows and merchandise exports to/of selected Asian economies – 1985, 1995 and 2008 (in millions of US$)



Sources: ITC Investment Map and WTO Secretariat.

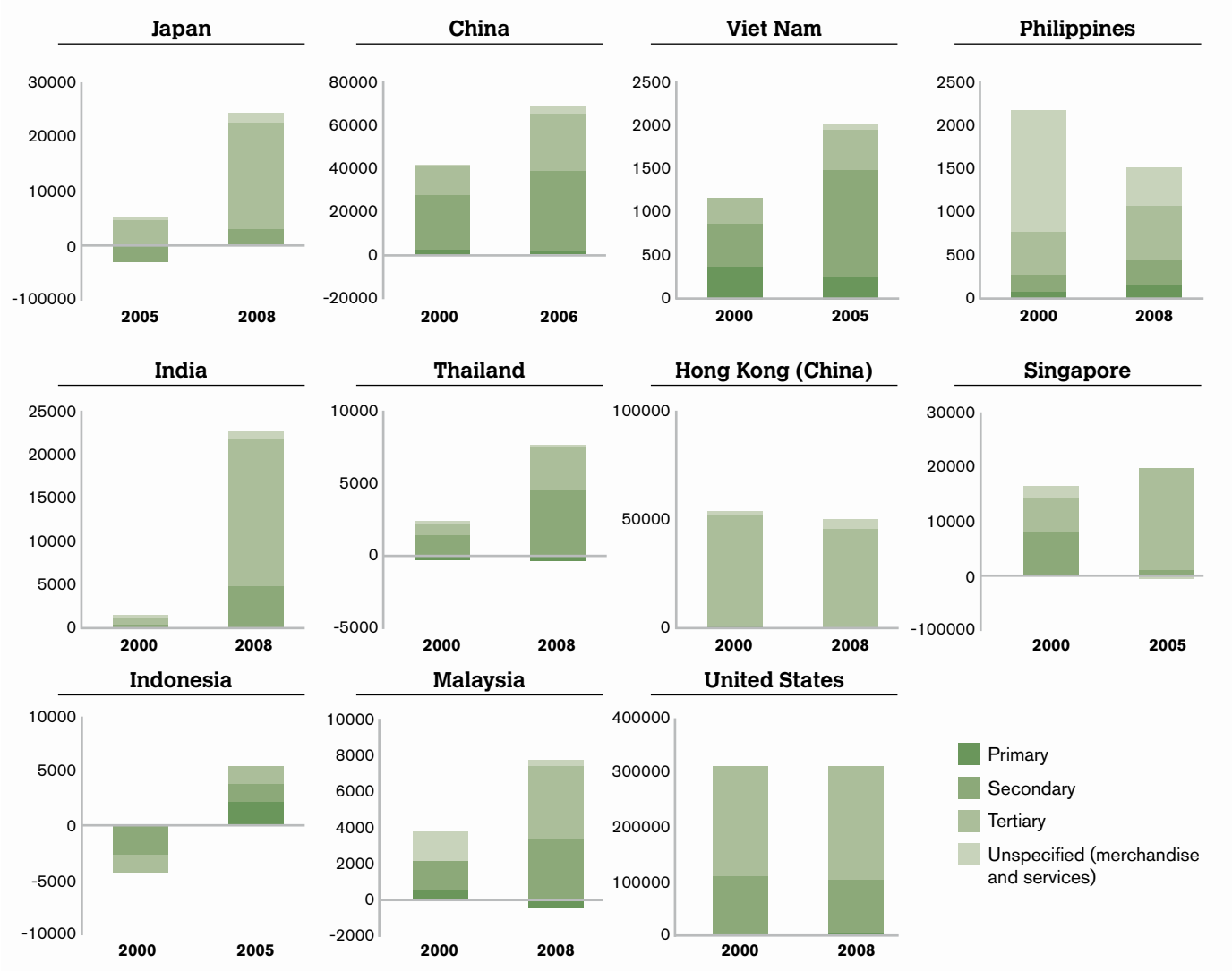
C. Foreign direct investment: From manufacturing to services

Increasingly, companies are offshoring not only manufacturing but also parts of their business functions, such as accounting or similar activities. Multinational companies are often the driving force behind this trend, which is reflected in a shift in FDI flows from the so-called secondary (mainly construction and manufacturing) to the tertiary (services) sector.

A large part of FDI flows to China, Malaysia, Thailand and Viet Nam still go to the secondary sector. Malaysia and Viet Nam are in fact exceptions to the general region-wide trend of shifting to the tertiary sector: both have witnessed surges reflecting the consolidation of Malaysia's role in global value chains, or the relatively recent insertion of Viet Nam. On the other hand, although Singapore was receiving US$ 8.2 billion of FDI inflows to the manufacturing sector in 2000, these slumped to US$ 1.5 billion in 2005. During the same period, FDI flows to the tertiary sector increased from US$ 7.4 billion to US$ 18.9 billion. A similar trend was observed in India, where investments to the tertiary sector increased from US$ 0.8 billion in 2000 to US$ 16.7 billion in 2008 (see Figure 6).

Figure 6

FDI inward flows by sector (in millions of US$)



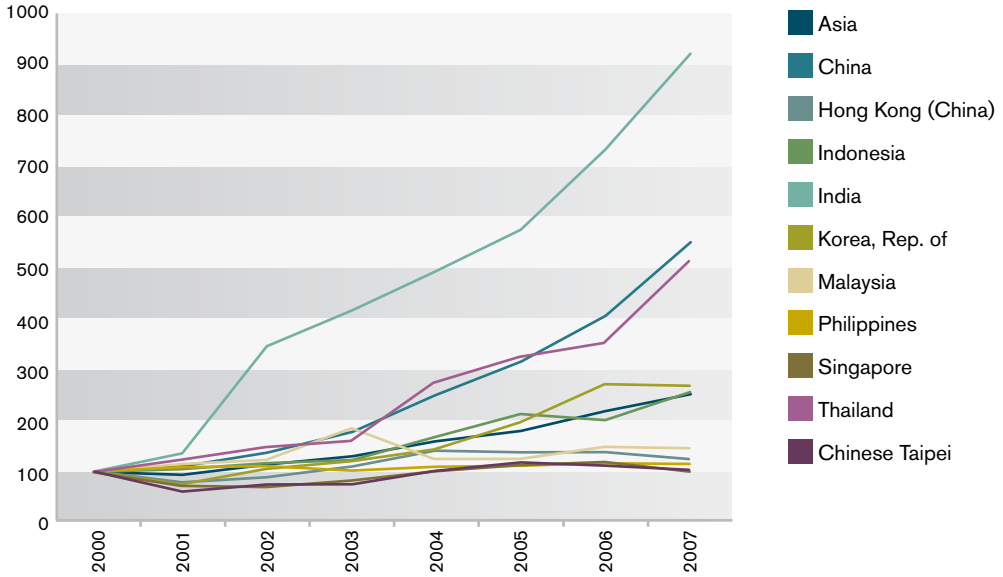
Source: ITC Investment Map.

D. Investing abroad: Turnover of Japanese and US foreign affiliates in Asia on the rise

The relationship between multinational firms and their partners abroad can range from simple joint ventures or contractual arrangements to acquiring shares, taking a controlling stake or launching a full takeover. So called "green field" FDI refers to cases where the affiliate is built from scratch, rather than by taking control of an existing company. Because FDI implies a long-term commitment and high financial stakes, it is a complex decision-making process which involves not only economic considerations, but also institutional, political and cultural ones. More than 50 per cent of affiliates controlled by Japanese companies are located in Asia. Their turnover grew steadily throughout the 2000s (see Figure 7).

Figure 7

Turnover of Japan's majority-owned affiliates in manufacturing, 2000-2007 (Index, 2000=100)

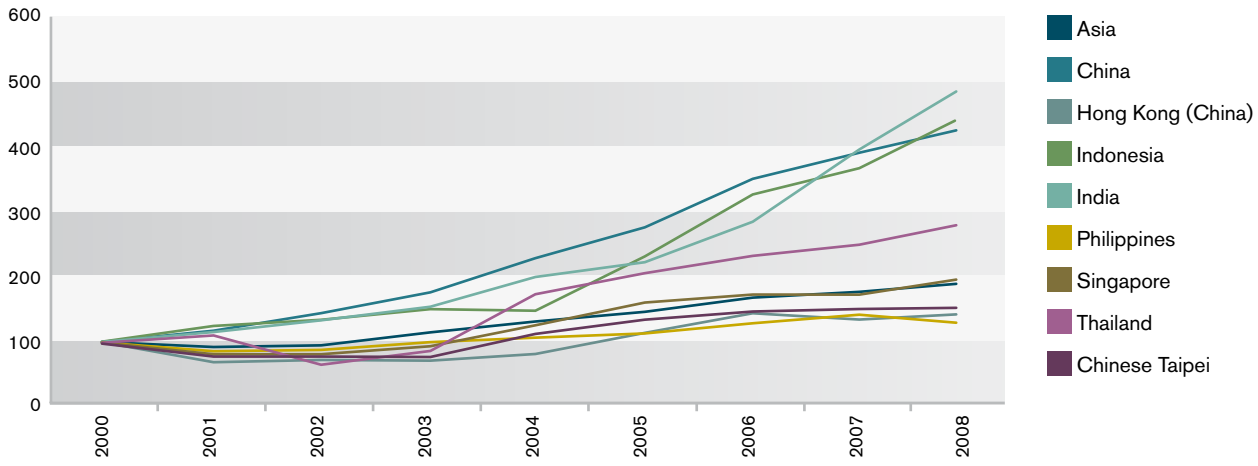


Source: OECD.Stat Database.

Study of majority-owned affiliates of US companies shows that US companies were particularly active in China, India and Indonesia, where turnover grew fastest (see Figure 8).

Figure 8

Turnover of US majority-owned affiliates in manufacturing, 2000-2007 (Index, 2000=100)



Source: OECD.Stat Database.

Endnotes

[1] See Broadman (2005), Chapter 7.

[2] UNCTAD, World Investment Report.

[3] UNCTAD, FDI database.

VI. Integrated diversity: The production system and employment in the Asia-US region

- Structural diversity and a high degree of complementarity are characteristic features of production systems in the Asia-US region.
- The complementarity of production systems is both a cause and an outcome of deepening economic interdependency among countries. The forces for regional integration were first centred on Japan, and gradually shifted to China.
- Global value chains translate into “trade in tasks”, with partners specializing in specific skills according to their comparative advantages. This creates new trade and job opportunities, the net balance of which depends on the labour intensity of the products and the overall trade balance of each economy.

Contents

A. Structural diversity and complementarity of the Asia-US region

As shown in the previous chapter, global value chains foster the parallel development of trade and foreign direct investment. Industrial clusters created by supply chains tend to grow up around specific tasks and business functions. The process is cumulative and, in time, modifies the production system of an economy.

The last few decades have been marked by a series of major events that have moulded the current landscape of Asia's production systems. The Plaza Agreement in 1985, for example, led to a sharp appreciation of the yen against the US dollar. This made domestic production relatively expensive for Japanese manufacturers and thus drove them to a massive relocation of production bases in neighbouring Asian countries. This movement was reinforced a decade later by the Asian currency crisis of 1997, which forced some emerging economies in East Asia to stop pegging their currencies to the US dollar due to a shortage of foreign reserves. The consequent shift to floating exchange rates resulted in an immediate depreciation of their currencies against the yen and the US dollar.

The accession of China to the WTO in 2001, and that of Chinese Taipei in 2002, accelerated the reorganisation of regional production systems. China was extremely successful in promoting its exports, notably in the case of the special economic zones along its coastal areas (see Chapters II and X). This encouraged a massive inflow of foreign capital and made the country internationally recognized as "the factory of the world".

This dynamic reorganisation of the production system has opened up a number of development paths for Asian countries. Figure 1 compares the industrial profiles of nine East Asian economies for 1985 (the green line) and 2005 (the black line). Each chart in the diagram presents an economy's degree of specialization in 24 aggregated industrial sectors. The degree of specialization is attained by measuring the extent to which an industry's share of an economy deviates from the regional average (see the technical notes). It is apparent from the charts that the degree and form of specialization differ significantly between countries, revealing sharp industrial diversity and heterogeneity in the region.[1]

The degree of economic diversity among countries is further illustrated by Box 1 and Figures 2, 3 and 4, which are known as "skyline charts".

Comparing the chart of the United States with that of China, the difference is apparent. The US skyline is much flatter, showing very little over- or underproduction of the economy. Also, the output share of the service sector is remarkably large. These observations are rather straightforward illustrations of two famous classical statements: Leontief's proposition on the structure of development, and the Law of Petty-Clark. Wassily Leontief, the founder of input-output economics, believed that the maturity of an economy can be observed in the form of a flat skyline, where full self-sufficiency is achieved without too much reliance on foreign markets for demand and supply of products.[2] The Law of Petty-Clark, on the other hand, states that when the per capita income of an economy rises, the share of its industrial output shifts from primary to secondary, and then from secondary to tertiary industries. In this respect, the US economy certainly falls under the category of a "matured and advanced" industrial structure, while China's does not reflect the same development path.

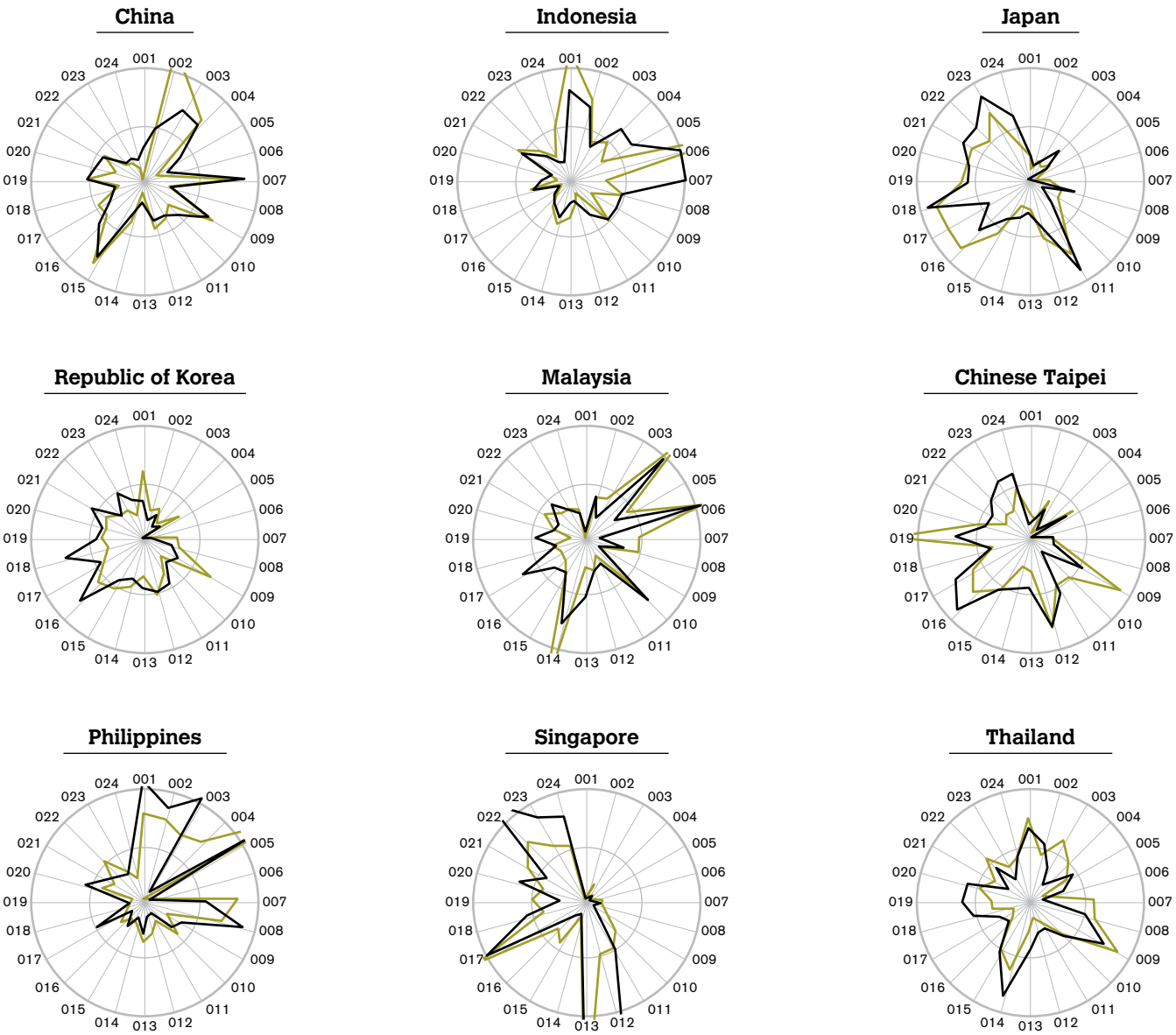
Japan, another advanced economy in the region, exhibits a similar pattern to that of the United States, although the predominance of the service sector is less salient. Japan's skyline also features some "humps" over manufacturing sectors, which point to a surplus vis-à-vis domestic production requirements. Indonesia's skyline has a prominent standalone skyscraper in the primary industry, which is the crude petroleum and natural gas sector (006).

The Republic of Korea, Singapore and Chinese Taipei, which belong to the newly industrialised economies (NIEs), and Malaysia, the Philippines and Thailand, to be grouped as the emerging ASEAN economies, all exhibit a similar pattern, with highly overshooting production surpluses in the computer and electronic equipment sector (018). Comparing the two groups, the emerging ASEAN economies slightly lag in terms of Petty-Clark's development scenario, even though the production surplus of their electronic equipment industries significantly surpasses that of the NIEs.

Despite a high degree of diversity among individual countries, the Asia-US region as a single economic entity presents quite a balanced and complete profile. Figure 4 illustrates this point. The skyline is very flat, and stays close to the self-sufficient benchmark for the whole range of industries (with some surplus in the manufacturing sectors). Even though each of the constituent economies of the region is quite heterogeneous, the Asia-US region exhibits a high level of self-sufficiency, revealing the strongly complementary nature of the region's production systems.[3]

Figure 1

Industrial specialization of selected Asian countries, 1985 and 2005 (index)



001	Rice (paddy)	013	Petroleum and petro products
002	Other agricultural products	014	Rubber products
003	Livestock and poultry	015	Non-metallic mineral products
004	Forestry	016	Metals and metal products
005	Fishery	017	Machinery
006	Crude petroleum and natural gas	018	Transport equipment
007	Other mining	019	Other manufacturing products
008	Food, beverage and tobacco	020	Electricity, gas and water supply
009	Textile, leather, and the products thereof	021	Construction
010	Wooden furniture and other wooden products	022	Trade and transport
011	Pulp, paper and printing	023	Other services
012	Chemical products	024	Public administration

Source: The Asian International Input-Output Tables, 1985 and 2005 (preliminary), IDE-JETRO.

Box 1. The skyline chart

The skyline chart is a useful tool for analysing a domestic economy's self-sufficiency and industrial structure. Each of the buildings/towers in a skyline corresponds to one particular industry in the economy, and the shape of the building is determined by two factors: the width represents the output share of the industry, and the height represents its self-sufficiency ratio.

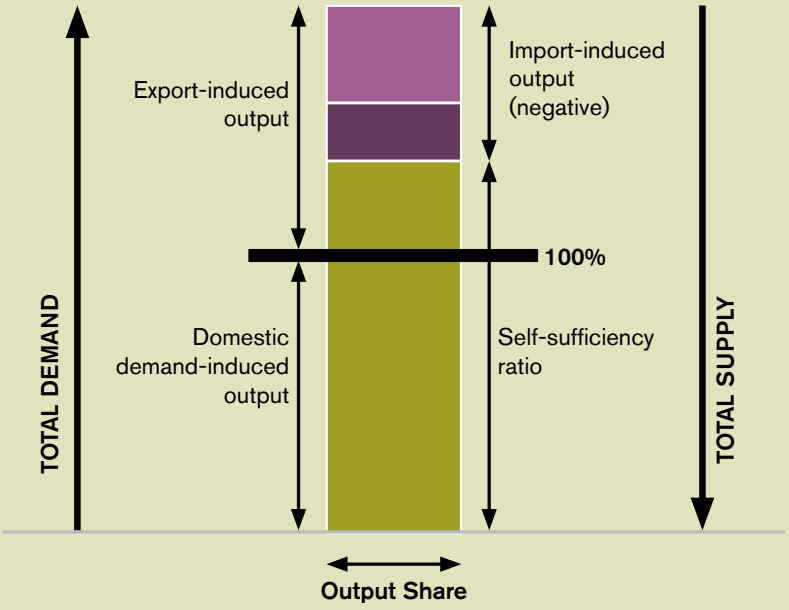
For the sake of simplicity, let us take just one "building" in a skyline chart, corresponding to a particular industry in the economy (see Figure 2 below). The demand structure is considered first. The total demand for a product is either induced by domestic demand such as consumption and investment, or by foreign demand in terms of export. From the bottom of the building, the amount of output induced by domestic demand is taken to be 100%. On top of this, the building gains extra height from the amount of output induced by export demand, as a percentage of this basic structure.

The economy would be self-sufficient if it could satisfy all of the induced demand by its own domestic production, but this is not the case in reality. If domestic output is in short supply, the economy has to import products from overseas. This is indicated by adding two floors to the building. The top floor shows the amount of domestic output saved or displaced by imports. The bottom floor, therefore, indicates the self-sufficiency ratio of the industry.

Note that Figure 2 has three tiers. The top two correspond to the breakdown of the effects of imports from the Asia-US region (in light purple) and imports from outside the region (in dark purple), respectively.

Figure 2

The skyline chart



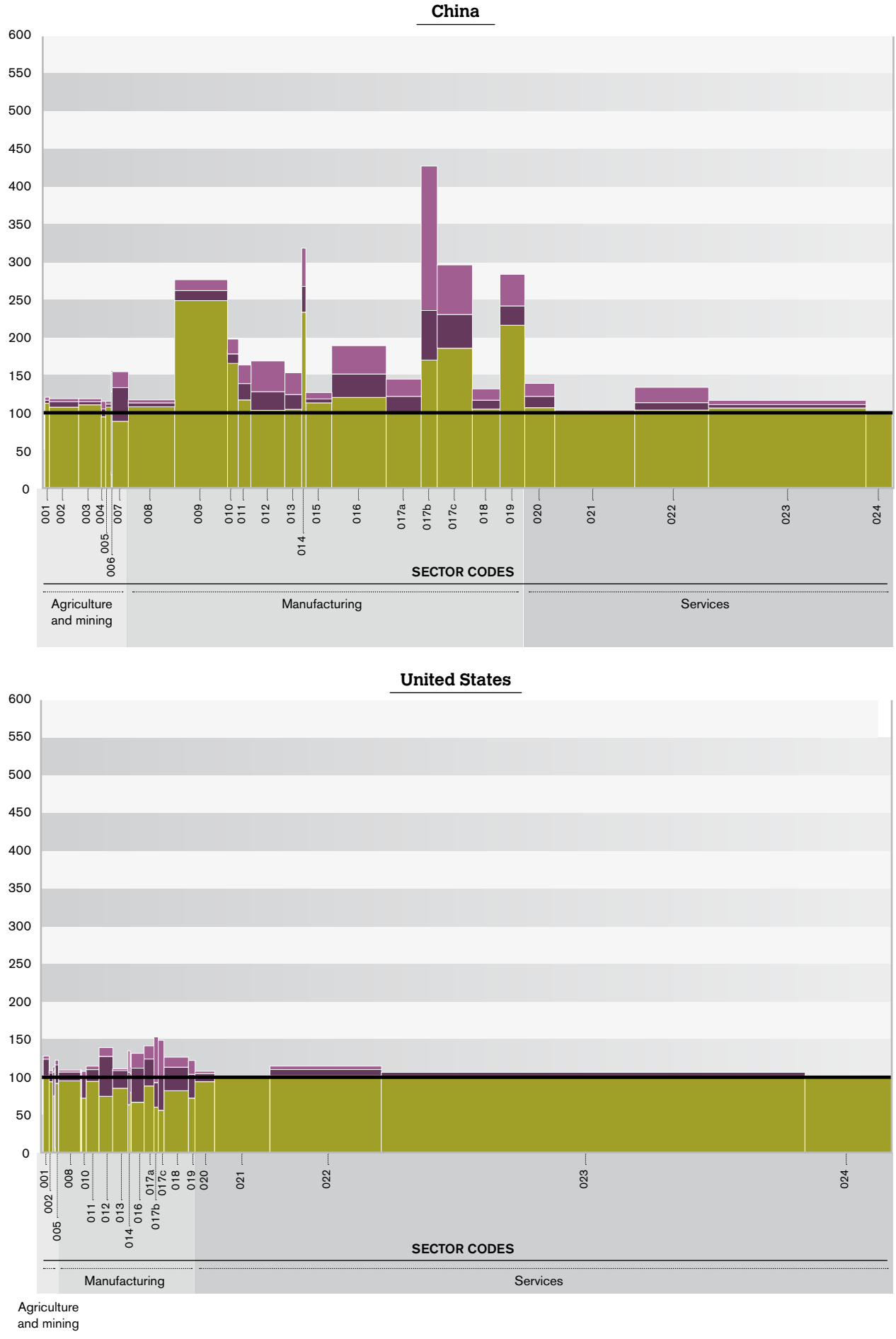
Source: IDE-JETRO.

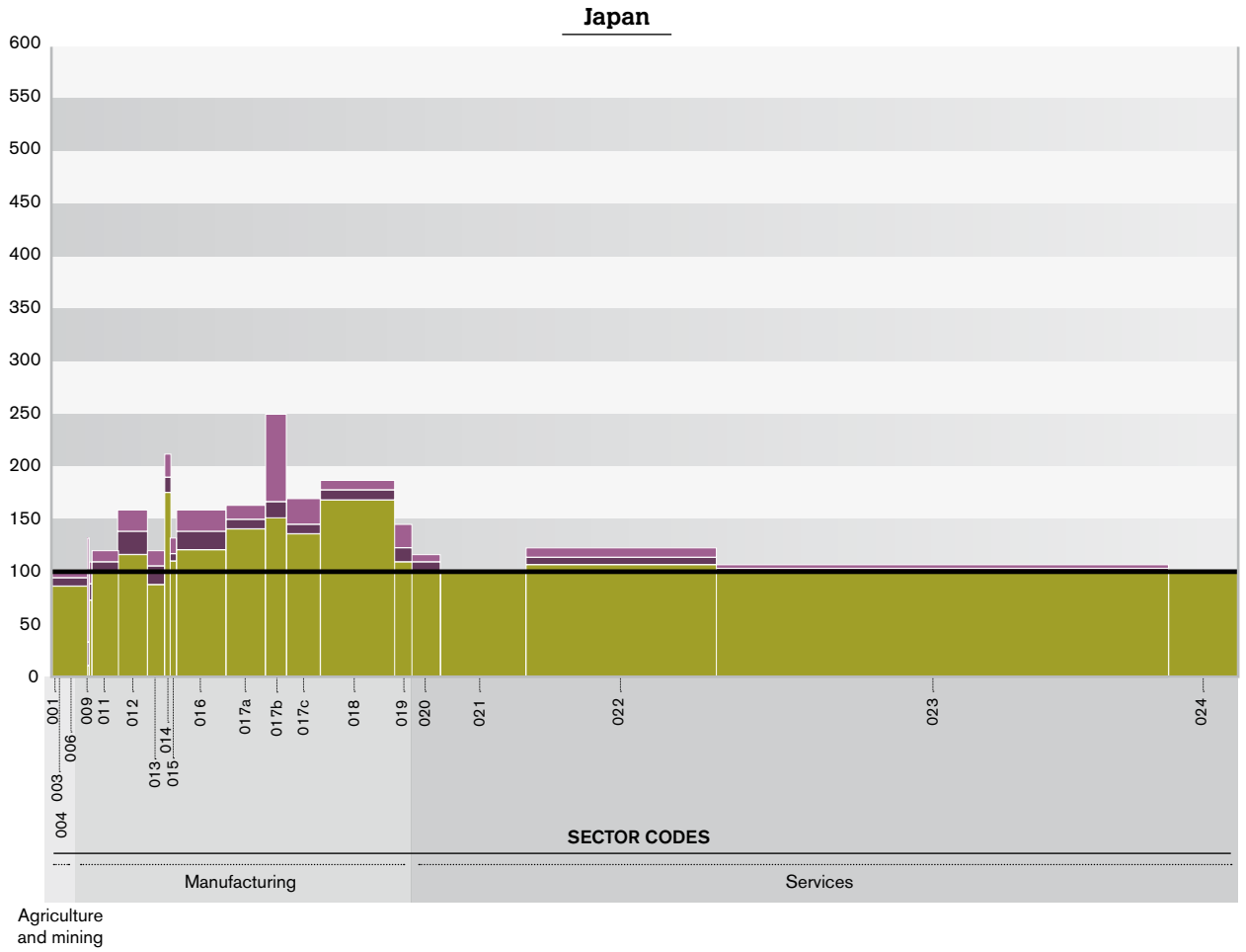
Self-sufficiency ratio | Import from outside the region | Import from the region

001	Rice (paddy)	014	Rubber products
002	Other agricultural products	015	Non-metallic mineral products
003	Livestock and poultry	016	Metals and metal products
004	Forestry	017a	Industry machinery
005	Fishery	017b	Computers and electronic equipment
006	Crude petroleum and natural gas	017c	Other electrical equipment
007	Other mining	018	Transport equipment
008	Food, beverage and tobacco	019	Other manufacturing products
009	Textile, leather, and the products thereof	020	Electricity, gas, and water supply
010	Wooden furniture and other wooden products	021	Construction
011	Pulp, paper and printing	022	Trade and transport
012	Chemical products	023	Other services
013	Petroleum and petro products	024	Public administration

Figure 3

The skyline charts of the countries in the Asia-US region, 2005

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SECTOR CODES
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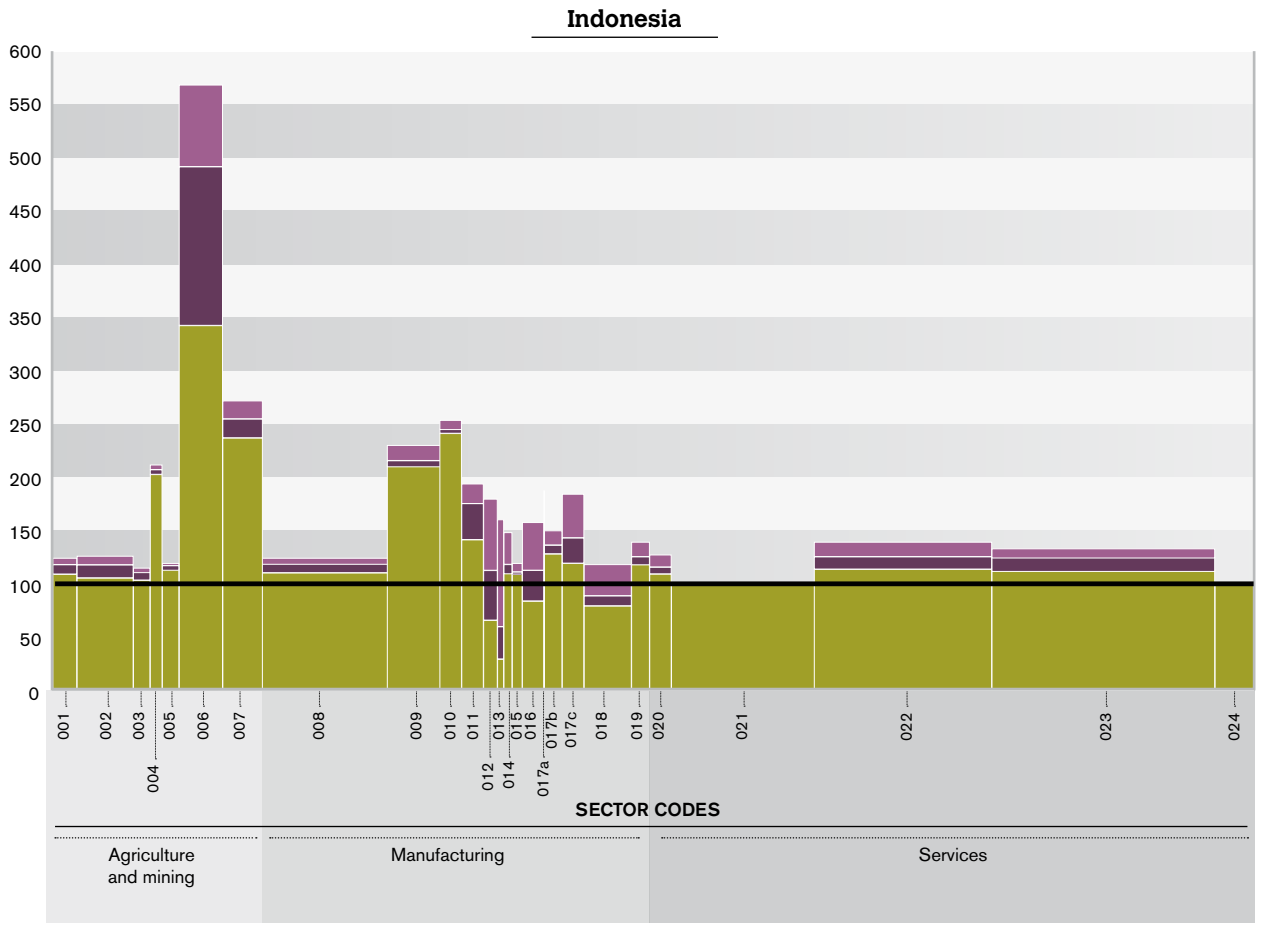
Services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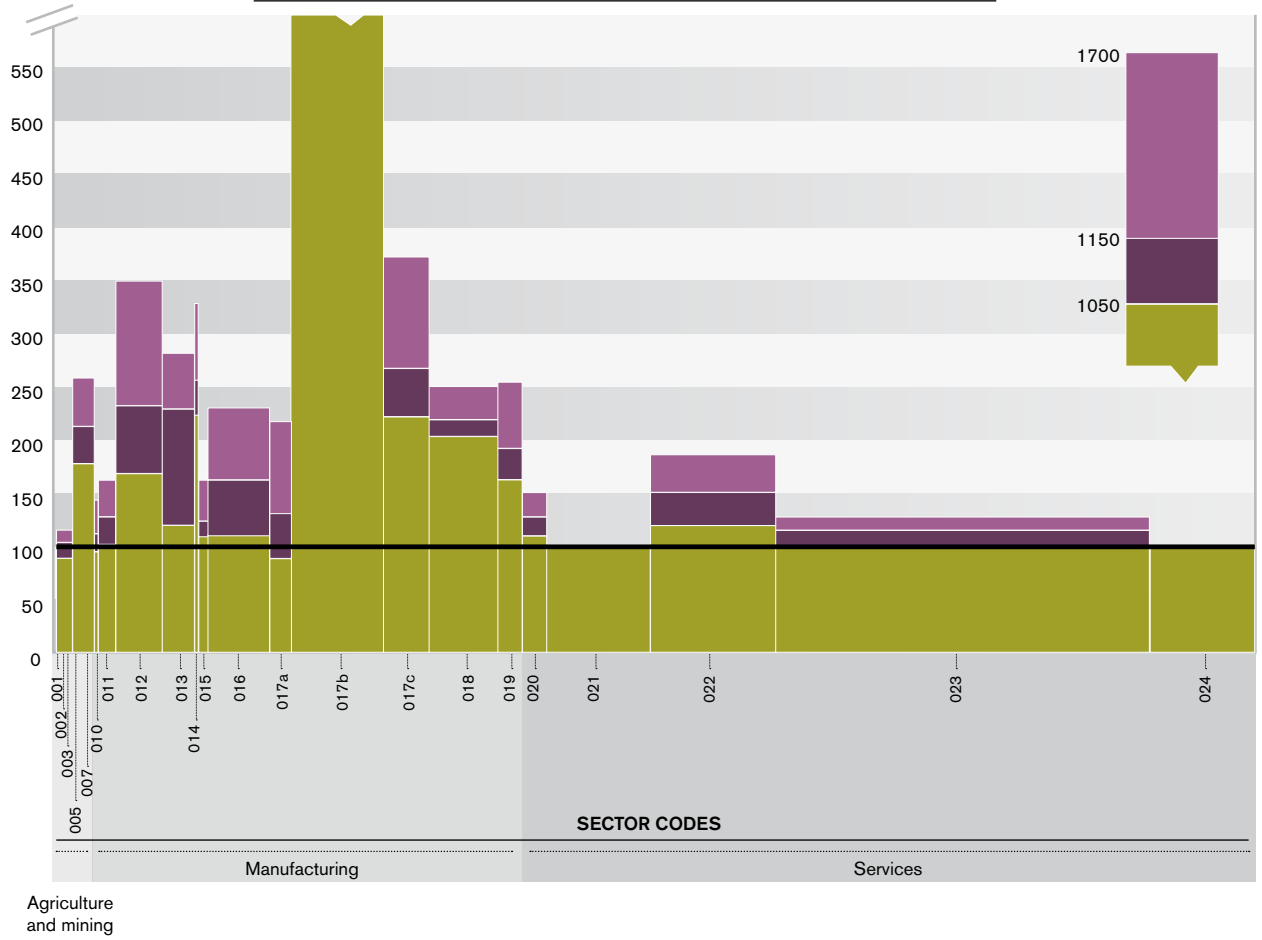
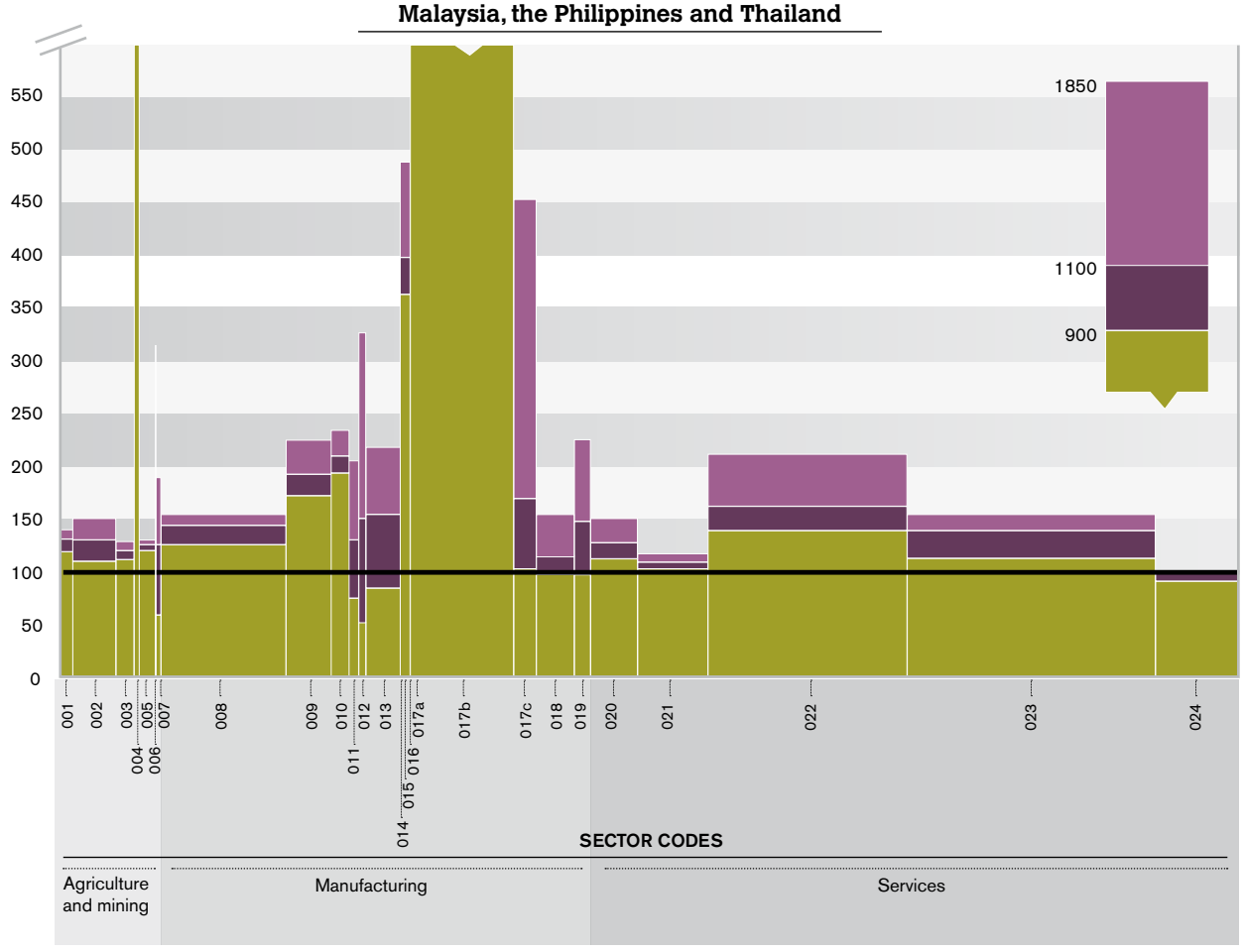
The Republic of Korea, Chinese Taipei and Singapore



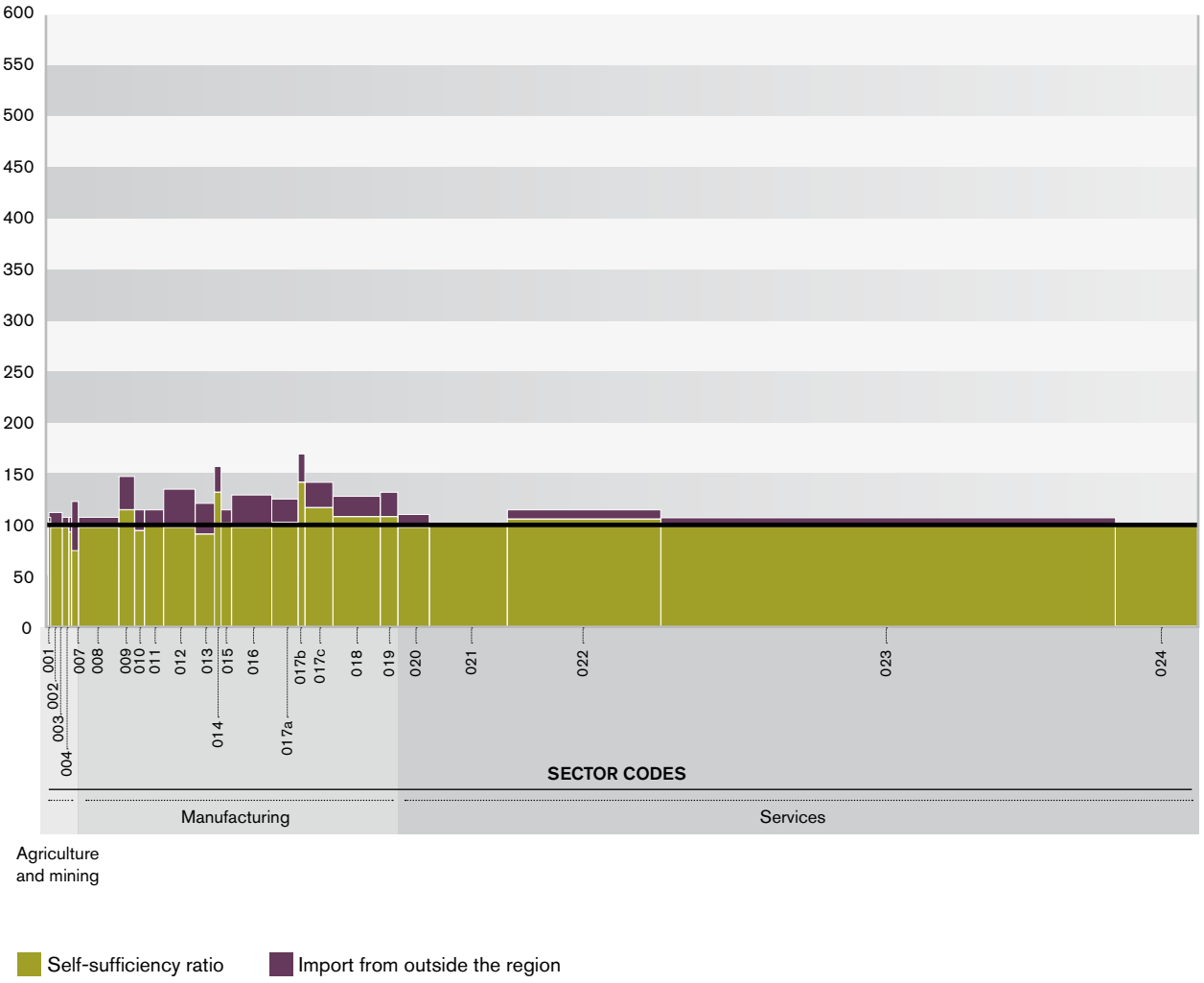
Malaysia, the Philippines and Thailand



Source: The Asian International Input-Output Table, 2005 (preliminary), IDE-JETRO.

Figure 4

The skyline chart of the whole Asia-US region

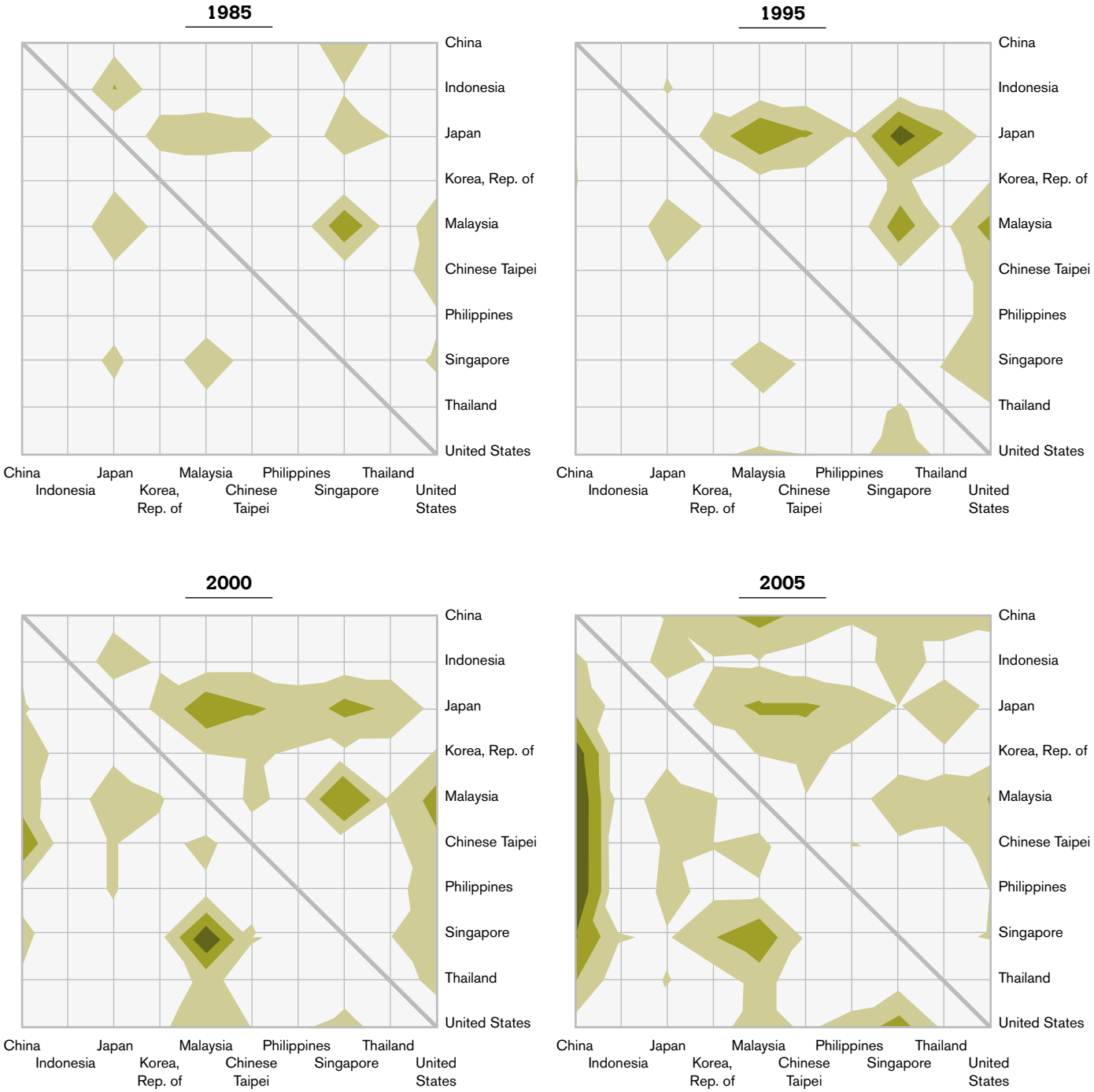


Source: The Asian International Input-Output Table, 2005 (preliminary), IDE-JETRO.

The complementarity of Asian production systems is both a cause and a result of the deepening economic interdependency between countries. Figure 5 traces the development of cross-border supply networks for intermediate products over the last two decades. The diagrams are contour maps drawn according to the "strength" of linkages, or interconnectedness, between countries, as defined by a simple average of forward and backward linkages across industries (see the technical notes for further description). In 1985, it can be seen that the cross-national linkages were quite weak and sporadic. From the 1990s onwards, however, the linkages started to develop around Japan. By 2005, they had spread further and captured most of the region, becoming especially intense around China.

Figure 5

Development of cross-national production linkages, 1985-2005



Sources: The Asian International Input-Output Tables, 1985, 1995, 2000 and 2005 (preliminary), IDE-JETRO.

B. The impact of international trade on employment

Deepening economic interdependency has significant implications for the employment structure of the region. Job opportunities travel across borders as countries engage in international trade, and the relationship between trade and employment is always at the heart of debates over the issue of globalization.

International trade affects employment in both macroeconomic and microeconomic ways. The number of jobs associated with trade is determined by overall trade balances, with a positive balance favouring a net increase in demand for labour. But demand for labour is also affected by the structure of trade. Net exports of services, for example, are more labour-intensive than those of mining. The composition of the labour force depends on the comparative advantage of each economy in global value chains; some economies focus on tasks requiring high-skilled employees, such as research and development (R&D), while others specialize in low-skilled mass production.

The Asian International Input-Output Table, when connected to the labour statistics of each individual country, can be extended to analysing the impact of international trade on employment. Table 1 presents matrices of the cross-border transfer of employment opportunities among the countries of the region for 2000 and 2005 (see the technical notes for the calculation method). The table gives the simulated number of jobs generated in each country (shown in the left column), by the final demand of its trade partners (shown in the top row).

The findings provide strong evidence for the benefits of international trade because of the numerous job opportunities considered to have been generated through countries' engagement in regional trade. Also, the simulated numbers significantly increased over time for most countries, reflecting the deepening interdependency of regional employment.

Table 1

Cross-border transfer of employment opportunities, 2000 and 2005 (thousands of persons)

2000	China	Indonesia	Japan	Korea, Rep. of	Malaysia	Chinese Taipei	Philippines	Singapore	Thailand	United States	Total
China		911	18,817	3,406	916	1,425	362	839	992	28,509	**56,177**
Indonesia	1,138		3,733	702	612	591	244	525	399	5,406	**13,350**
Japan	420	66		264	112	285	63	94	123	1,816	**3,244**
Korea, Rep. of	340	32	373		30	88	31	25	29	736	**1,685**
Malaysia	201	47	569	109		111	50	260	84	1,051	**2,484**
Chinese Taipei	373	22	318	59	42		25	21	38	722	**1,620**
Philippines	314	30	1,506	228	127	213		52	98	2,780	**5,348**
Singapore	33	8	43	18	31	20	14		16	146	**328**
Thailand	473	149	1,539	182	278	243	123	247		2,516	**5,751**
United States	250	38	822	237	69	214	45	65	61		**1,801**
Total	**3,543**	**1,303**	**27,720**	**5,206**	**2,221**	**3,190**	**956**	**2,128**	**1,839**	**43,682**	**91,787**

2005	China	Indonesia	Japan	Korea, Rep. of	Malaysia	Chinese Taipei	Philippines	Singapore	Thailand	United States	Total
China		1,943	23,266	5,521	1,055	2,617	481	844	2,032	51,542	**89,301**
Indonesia	1,795		3,032	746	610	417	166	686	508	4,422	**12,382**
Japan	1,003	110		425	62	349	57	46	204	1,754	**4,009**
Korea, Rep. of	727	44	330		20	71	18	12	45	599	**1,866**
Malaysia	1,030	170	776	221		156	62	185	300	2,044	**4,944**
Chinese Taipei	818	31	308	83	32		33	13	55	593	**1,966**
Philippines	1,565	107	1,249	282	101	204		34	238	1,606	**5,385**
Singapore	82	59	69	58	27	15	12		23	110	**456**
Thailand	1,203	422	1,568	246	249	213	94	122		2,418	**6,536**
United States	406	56	661	245	40	147	48	69	82		**1,753**
Total	**8,629**	**2,942**	**31,258**	**7,827**	**2,195**	**4,189**	**973**	**2,010**	**3,486**	**65,089**	**128,598**

Sources: The Asian International Input-Output Tables, 2000 and 2005 (preliminary), IDE-JETRO.

Table 2 shows disaggregated results for each industrial sector in 2005. The simulated number for the agricultural sector is remarkably large, yet the result requires care in its interpretation. Full engagement of workforce is relatively rare in rural areas where agricultural industries predominate (the presence of "disguised unemployment"), and it may thereby overstate the impact on employment creation of primary industries.

Service sectors are generally considered labour-intensive. Within the service sector, the share of trade and transport is more or less the same for most countries. But there is significant variation in the "other services" section, reflecting differences in the sort of businesses categorized under this heading.

Table 2

Cross-border transfer of employment opportunities by industrial sector, 2005 (thousands of persons and percentage)

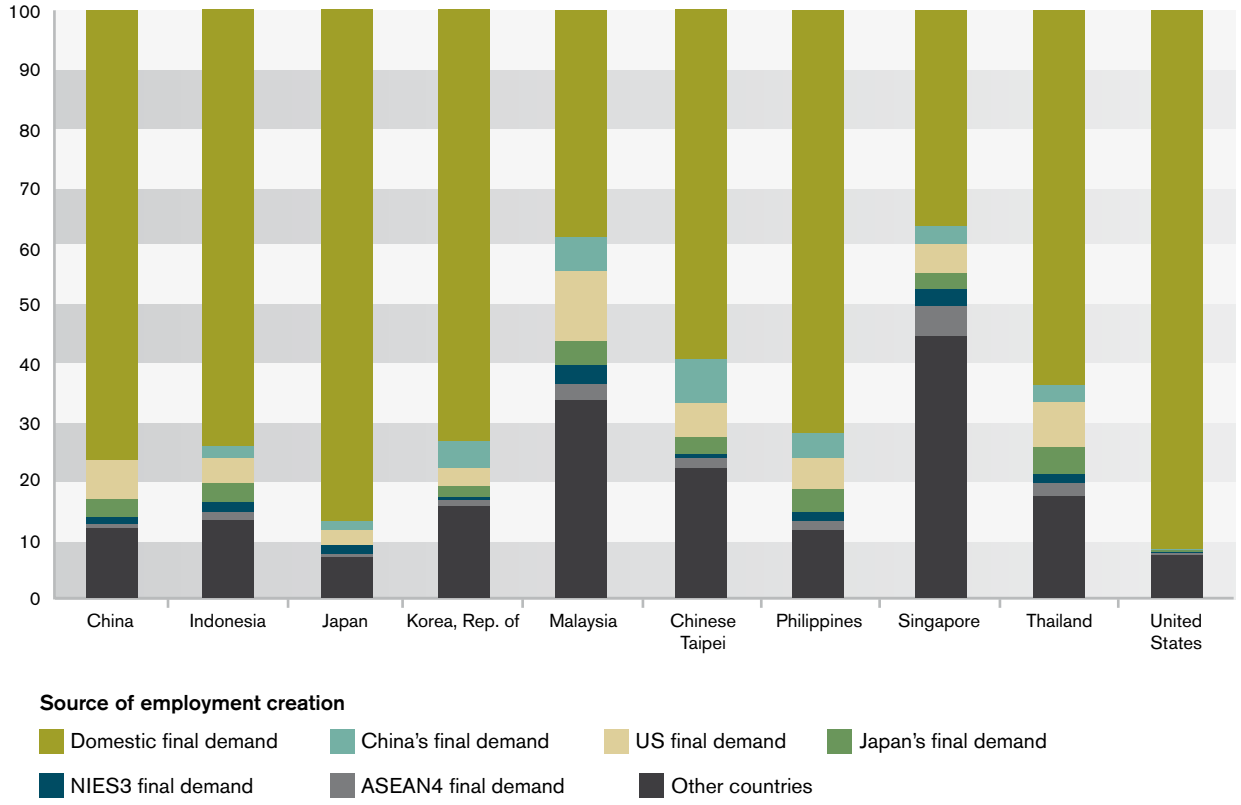
2005	Agriculture, forestry and fishery	Mining	Manufacturing	Electricity, gas and water supply	Construction	Trade and transport	Other services	Total
China	**30,607** 34.3%	**2,017** 2.3%	**25,952** 29.1%	**976** 1.1%	**256** 0.3%	**20,644** 23.1%	**8,849** 9.9%	**89,301** 100.0%
Indonesia	**5,382** 43.5%	**369** 3.0%	**1,967** 15.9%	**18** 0.1%	**54** 0.4%	**3,441** 27.8%	**1,151** 9.3%	**12,382** 100.0%
Japan	**451** 11.2%	**3** 0.1%	**1,722** 42.9%	**18** 0.5%	**43** 1.1%	**1,119** 27.9%	**653** 16.3%	**4,009** 100.0%
Korea, Rep. of	**253** 13.6%	**6** 0.3%	**793** 42.5%	**7** 0.4%	**5** 0.3%	**521** 27.9%	**280** 15.0%	**1,866** 100.0%
Malaysia	**925** 18.7%	**28** 0.6%	**1,640** 33.2%	**15** 0.3%	**93** 1.9%	**1,748** 35.4%	**495** 10.0%	**4,944** 100.0%
Chinese Taipei	**126** 6.4%	**2** 0.1%	**1,173** 59.7%	**8** 0.4%	**16** 0.8%	**322** 16.4%	**318** 16.2%	**1,966** 100.0%
Philippines	**1,982** 36.8%	**39** 0.7%	**1,161** 21.6%	**28** 0.5%	**183** 3.4%	**1,626** 30.2%	**367** 6.8%	**5,385** 100.0%
Singapore	**7** 1.5%	**0** 0.00%	**267** 58.6%	**1** 0.3%	**2** 0.5%	**45** 9.9%	**133** 29.2%	**456** 100.0%
Thailand	**3,600** 55.1%	**14** 0.2%	**1,507** 23.1%	**11** 0.2%	**8** 0.1%	**808** 12.4%	**587** 9.0%	**6,536** 100.0%
United States	**110** 6.3%	**20** 1.1%	**675** 38.5%	**17** 1.0%	**16** 0.9%	**395** 22.5%	**519** 29.6%	**1,753** 100.0%
Total	**43,443** 33.8%	**2,499** 1.9%	**36,858** 28.7%	**1,099** 0.9%	**678** 0.5%	**30,669** 23.8%	**13,352** 10.4%	**128,598** 100.0%

Source: The Asian International Input-Output Table, 2005 (preliminary), IDE-JETRO.

Figure 6 illustrates the contribution made to employment creation by both domestic and cross-border sources of demand. As can be seen, foreign final demand is quite important for job creation in many East Asian countries. Particularly salient are the cases of Malaysia and Singapore, followed by Chinese Taipei and Thailand. In contrast, the United States and Japan, even allowing for the size of their economies, are far more domestically oriented. The figures refer to a pre-crisis year (2005), when global imbalances were growing. The post-crisis rebalancing of this macroeconomic distortion should contribute to the establishment of a sustainable production system in the Asia-US region.

Figure 6

Contribution to employment creation, by source of demand, 2005 (percentage)



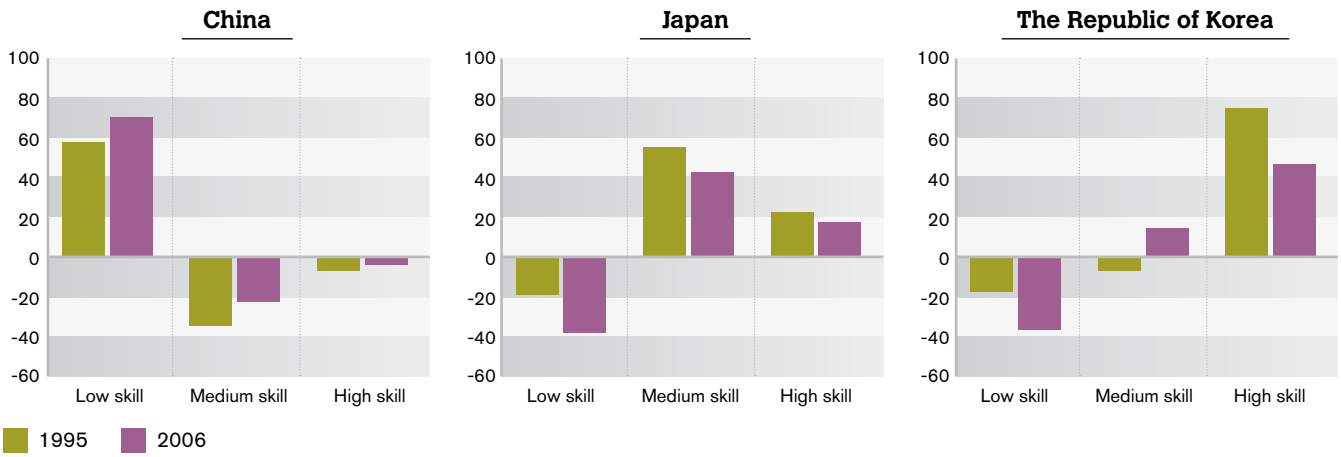
Source: The Asian International Input-Output Table, 2005 (preliminary), IDE-JETRO.

Production techniques differ from country to country, according to comparative advantages. Developed economies tend to become vertically specialized in highly-skilled tasks. Specialization can also lead to the production of different varieties of broadly similar products. Work done by the economist Peter K. Schott indicates, for example, that high-wage economies produce and export better quality products than their low-cost competitors. This greater variety of similar products offered by trade contributes to the final consumers' welfare by offering a choice of price and quality.

The relative contribution of different labour skills embedded in exports can be identified by pairing international input-output data with other economic and labour surveys. The results presented in Figure 7 are derived from preliminary data obtained by the World Input-Output Database (WIOD) project. They contrast the labour composition in net trade of three East Asian countries (China, Japan and the Republic of Korea), which represent different stages of economic development. China specializes in low-skill jobs, and this specialization has increased since 1995, reflecting the particular role the economy plays in East Asian supply chains (as well as higher wages paid to unskilled factory workers). Japan, in contrast, has specialized in export activities that are intensive in medium- and high-skilled labour. The Republic of Korea, which had adopted an approach halfway between the two, has recently moved closer to the Japanese pattern.

Figure 7

Labour content of net trade by skill level, China, Japan and the Republic Korea, 1995-2006 (percentage)



Note: Percentage of the total value of the domestic labour cost embedded in traded products. Net trade represents exports minus imports.

Source: Adapted from M. Timmer (unpublished) on the basis of preliminary results from the WIOD project (www.wiod.org).

Similar results are observed in case studies of the global value chains of a specific product. Using the iPod as an example of global manufacturing, Linden, Dedrick and Kraemer (2009) estimate that this product and its components created about 41,000 jobs worldwide in 2006, of which about 27,000 were outside the United States and 14,000 within it (including retail). The jobs located outside the United States were mostly in low-wage manufacturing. The employment generated within the United States was more evenly divided between high-wage engineers and managers (over 6,000 professional and engineering jobs) and low-wage retail and non-professional workers (close to 8,000, although these jobs are not dependent on the cross-border organization of the supply chains).

Endnotes

[1] However, the level of heterogeneity, as defined by the industrial average of Coefficients of Variation, has decreased over time, from 45.8 in 1985 to 41.7 in 2005, showing some convergence in industrial profiles among countries in the last two decades.

[2] See Leontief (1986).

[3] The issue is fully discussed in Ozaki (2004) for the case of the EU, and in Washizu (2008) for the case of East Asia. The work here in this chapter is just to confirm the findings of these previous studies by using more recent data.

VII. An evolutionary perspective on production networks in the Asia-US region

- In the last two decades, the regional production network of the Asia-US region has been strengthened by a number of key players, while showing a gradual shift of weight towards China.

- The supply chains in East Asia are characterized by a high degree of fragmentation and sophistication, incorporating substantial amounts of value-added from the countries involved.

- The growing presence of China and a relative decline of the United States and Japan can be seen in the international distribution of value added and the emergence of a “tri-polar trade” structure.

Contents

A. Evolution of regional production networks

The last few decades have witnessed the rapid development of vertical production networks within the Asia-US region. Production processes are fragmented into several stages and countries specialize in each production stage according to their own comparative advantages.

For World Bank economist Nihal Pitigala, East Asia's emerging economies have benefited considerably from the development of vertical production networks. These networks have enabled them to join at the production stage that best corresponds to their level of technology, with the result that they have enjoyed rapid trade and output growth.

In order to investigate the backdrop to the rapid development of vertical production networks, cross-border supply chains in the Asia-US region will be evaluated from the perspective of the "strength" and "length" of their linkages. Figure 1 describes the evolution of regional networks over the last two decades. Arrows represent selected supply chains among the countries of the region, with the direction of the arrows corresponding to the flow of intermediate products. Each arrow has two features: thickness and length. The thickness indicates the strength of linkages between industries, while the length, as measured against the rings in the background, indicates the level of technological fragmentation of that particular supply chain (see Appendix 2 for the visualization method.)

In 1985, there were only four key players in the region: Indonesia (I), Japan (J), Malaysia (M) and Singapore (S). The basic structure of the production network was that Japan built up supply chains from resource-rich countries like Indonesia and Malaysia. In this initial phase of regional development, Japan drew on a substantial amount of productive resources (natural resources) from neighbouring countries to feed to its domestic industries.

By 1990 the number of key players had increased. In addition to the four countries already mentioned, Japan had extended its supply chains for intermediate products to the Republic of Korea (K), Chinese Taipei (N) and Thailand (T). While still relying on the productive resources of Indonesia and Malaysia, Japan started to supply products to other East Asian countries, especially to the newly industrialized economies (NIEs). This is the phase when the relocation of Japanese production bases to neighbouring countries, triggered by the Plaza Agreement in 1985, was accelerating. It saw the building of strong linkages between core parts' suppliers in Japan and their foreign subsidiaries.

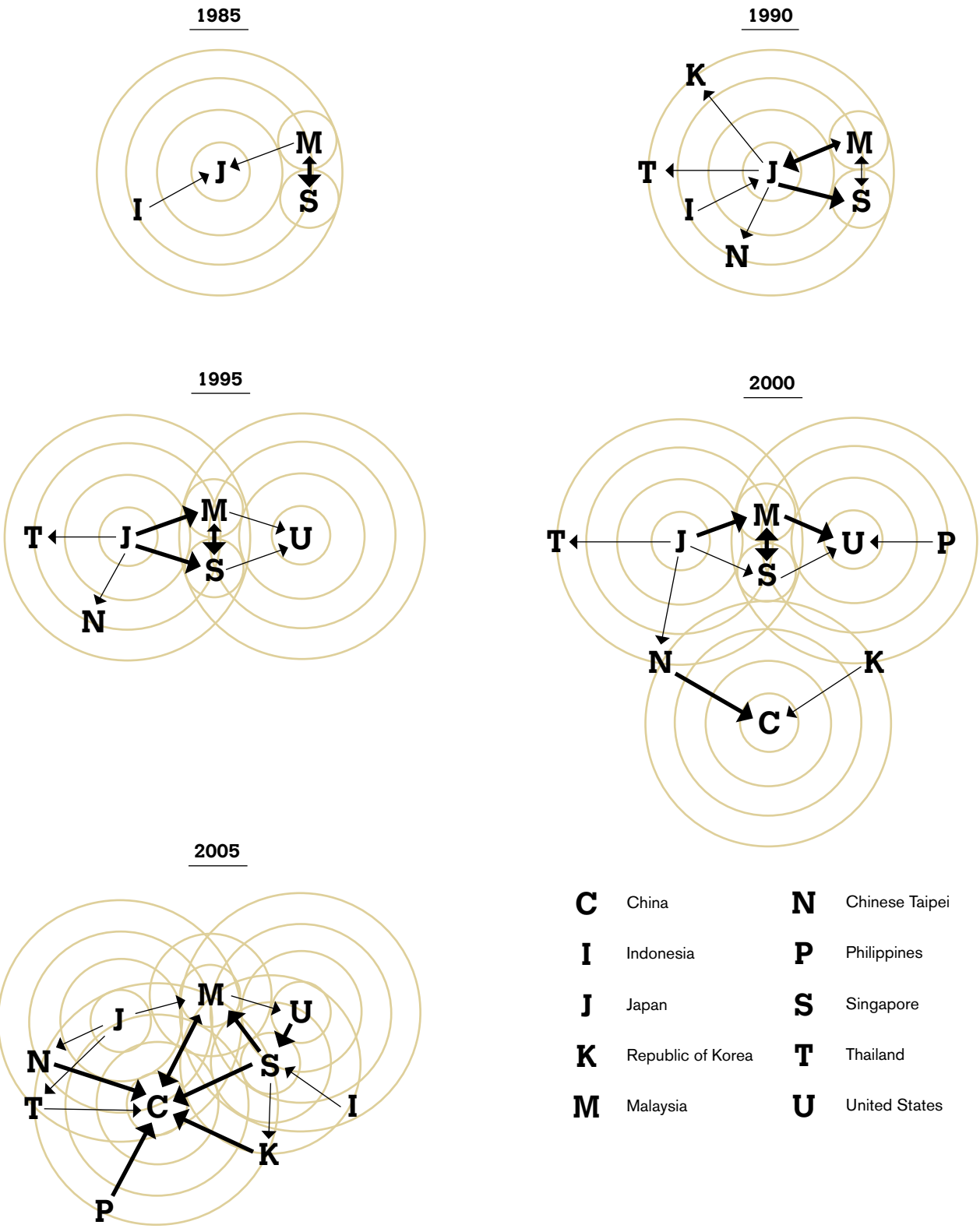
Then in 1995, the United States (U) came into the picture. It drew on two key supply chains originating in Japan, one via Malaysia and the other via Singapore. These two countries came to bridge the supply chains between East Asia and the United States. Also to be noted is the length of the arrows between Malaysia and Singapore. Compared to others, their shortness indicates that the supply chains involve fewer production stages, suggesting that the degree of processing is relatively low. The product flows between these countries are considered to be distributional rather than value adding.

In 2000, on the eve of its accession to the WTO, China began to emerge as the third economic giant. The country entered the arena with strong production linkages to the Republic of Korea and Chinese Taipei. It then gained access to Japanese supply chains through the latter. The United States also brought a new supply chain from the Philippines (P), and thus the basic structure of the tri-polar production network in the Asia-US region was completed.[1]

The regional production networks thereafter showed dramatic development. By 2005, the centre of the network had completely shifted to China, pushing the United States and Japan to the periphery. China became the core market for intermediate products, from which final consumption goods were produced for export to the United States and to European countries. Also of note is the nature of the supply chains that China develops with others. The notable length of the arrows surrounding China indicates that the supply chains towards China are characterized by a high degree of fragmentation and sophistication, incorporating substantial amounts of value-added from each country involved. The competitiveness of Chinese exports, therefore, is not only attributable to its cheap labour force, but also stems from the sophisticated intermediate products it receives from other East Asian countries, as embedded in goods labelled "Made in China".[2]

Figure 1

Evolution of regional production networks, 1985-2005



Source: IDE-JETRO.

B. Cross-border transfer of value added in the Asia-US region

The evolution of regional production networks, as illustrated above, has created a distinctive structure for the Asian-US production system, understood as the "tri-polar trade through China" model. In this structure:

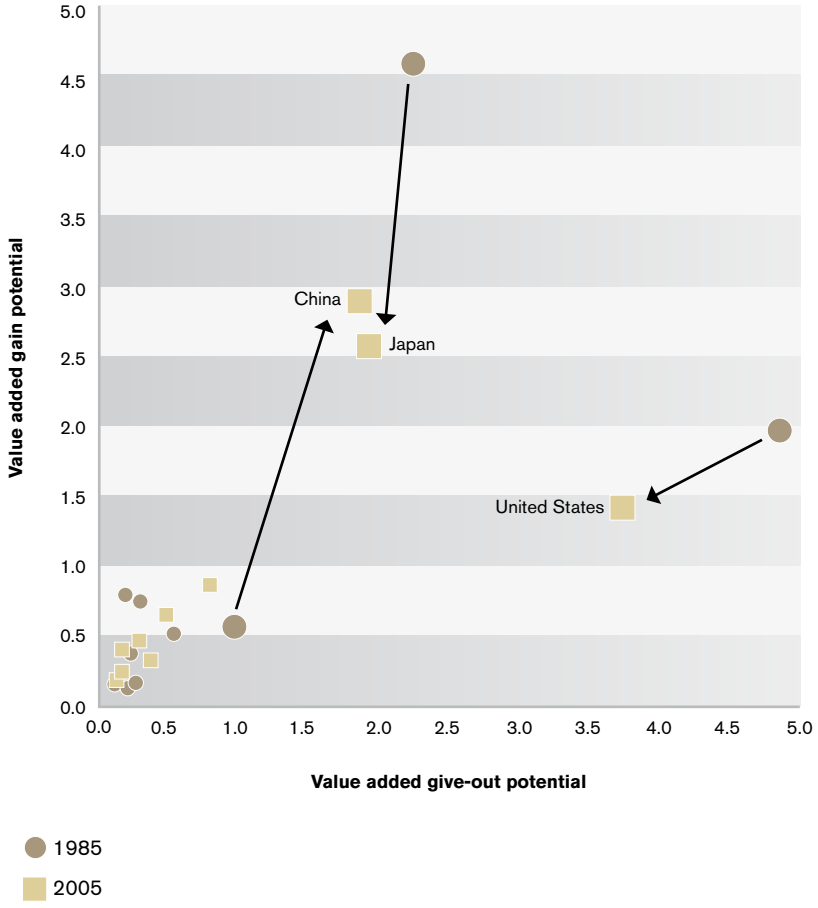
1. East Asian countries, except China, produce sophisticated parts and components and export them to China,
2. China assembles them into final products, and
3. these are further exported to the US market for consumption.

See chapter VIII (Section F) for more details on these trade interconnections.

The "tri-polar trade through China" system has significantly enhanced China's presence in the region, as demonstrated in Figure 2. The figure shows cross-border transfers of value-added for the years 1985 and 2005 (see the technical notes for the calculation method). The vertical axis indicates the degree of value-added that each country is able to obtain from a given level of final demands of other countries in the region (the value-added gain potential). The horizontal axis shows the degree of value-added that each country can "give out" to others in the same fashion (the value-added give-out potential). It is apparent from the figure that China's presence has dramatically increased over the last two decades, while the influence of the United States and Japan shows a sharp decline.

Figure 2

Cross-border transfer of value added in the Asia-US region, 1985 and 2005

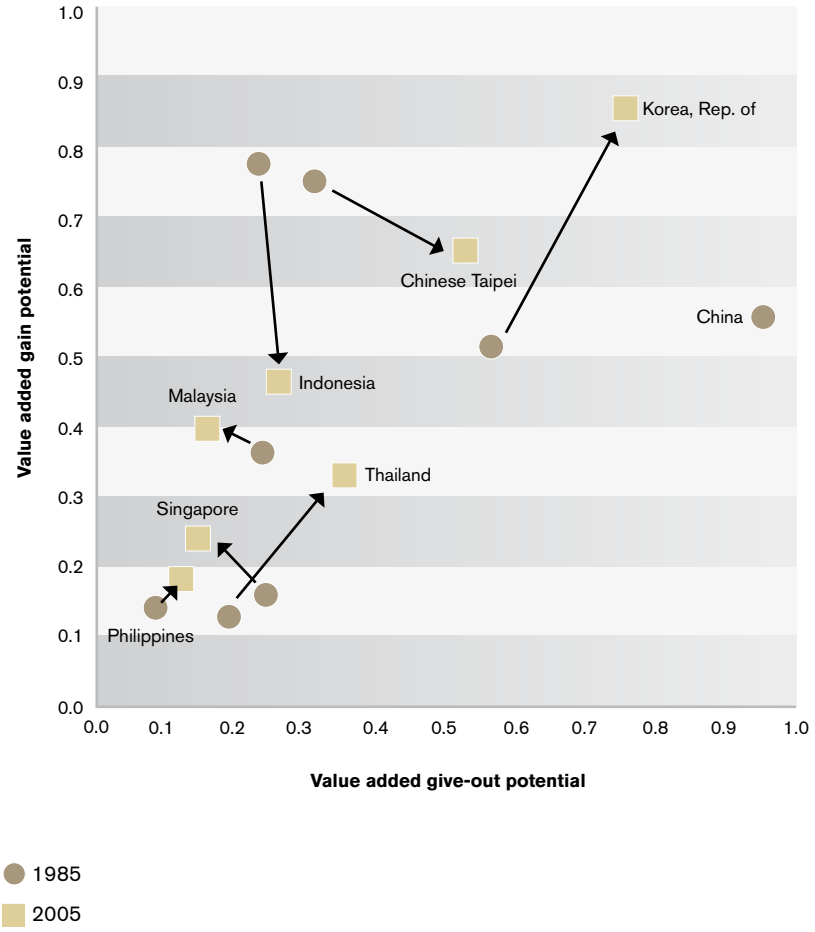


Sources: The Asian International Input-Output Tables, 1985 and 2005 (preliminary), IDE-JETRO.

Due to their relative size, other economies in the region are less significant in terms of shaping the structure of value-added distribution. Nevertheless, if we look more closely at the cluster by origin (Figure 3), it turns out that most of them have advanced in at least one of the two "potentials", indicating that they have become more involved in regional production networks over the decades. It is considered that these emerging economies, as a group, now have a significant influence on the distribution of regional value-added.

Figure 3

Cross-border transfer of value-added in the Asia-US region, 1985 and 2005, emerging economies



Sources: The Asian International Input-Output Tables, 1985 and 2005 (preliminary), IDE-JETRO.

Endnotes

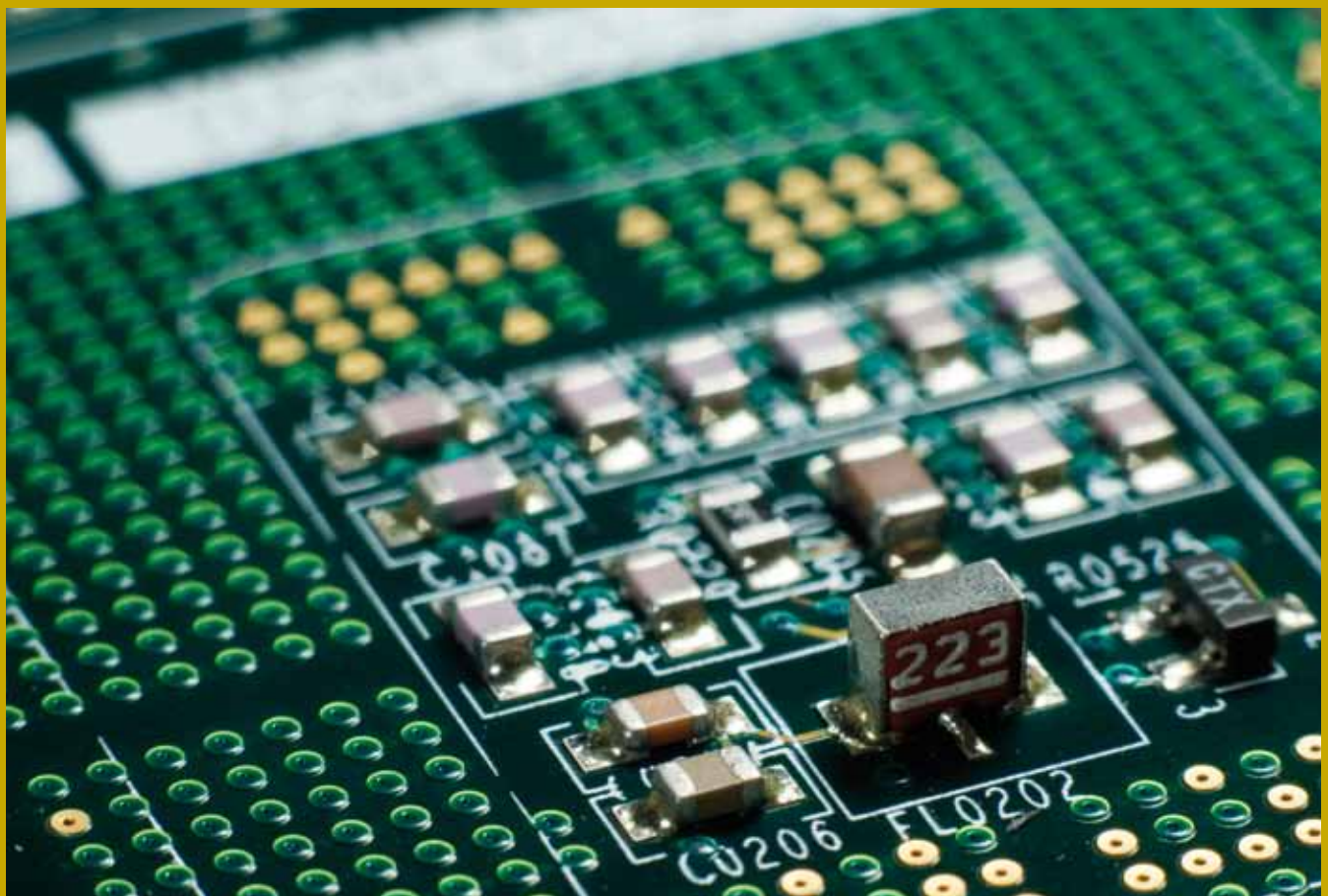
[1] Interestingly, none of the poles, i.e. the United States, Japan and China, shows a direct linkage to either of the others. Instead, they are mutually connected only through the supply chains of other East Asian countries. This feature persisted even in 2005.

[2] Chapter IX presents new measures of international trade aiming at identifying the origin of value-added embedded in the final products of supply chains.

VIII. Trade in intermediate goods

- Intermediate goods dominate world merchandise trade.
- Europe and Asia lead trade in intermediate goods. Regional supply chains involve huge intra-Asian imports of intermediate goods.
- “Tri-polar trade” between China, the United States and Japan sees the latter two export intermediates to China and get more and more final goods in return.
- Intermediate products traded by Asian economies are increasingly complex.

Contents



A. Trade in intermediates: An indicator for offshoring activities

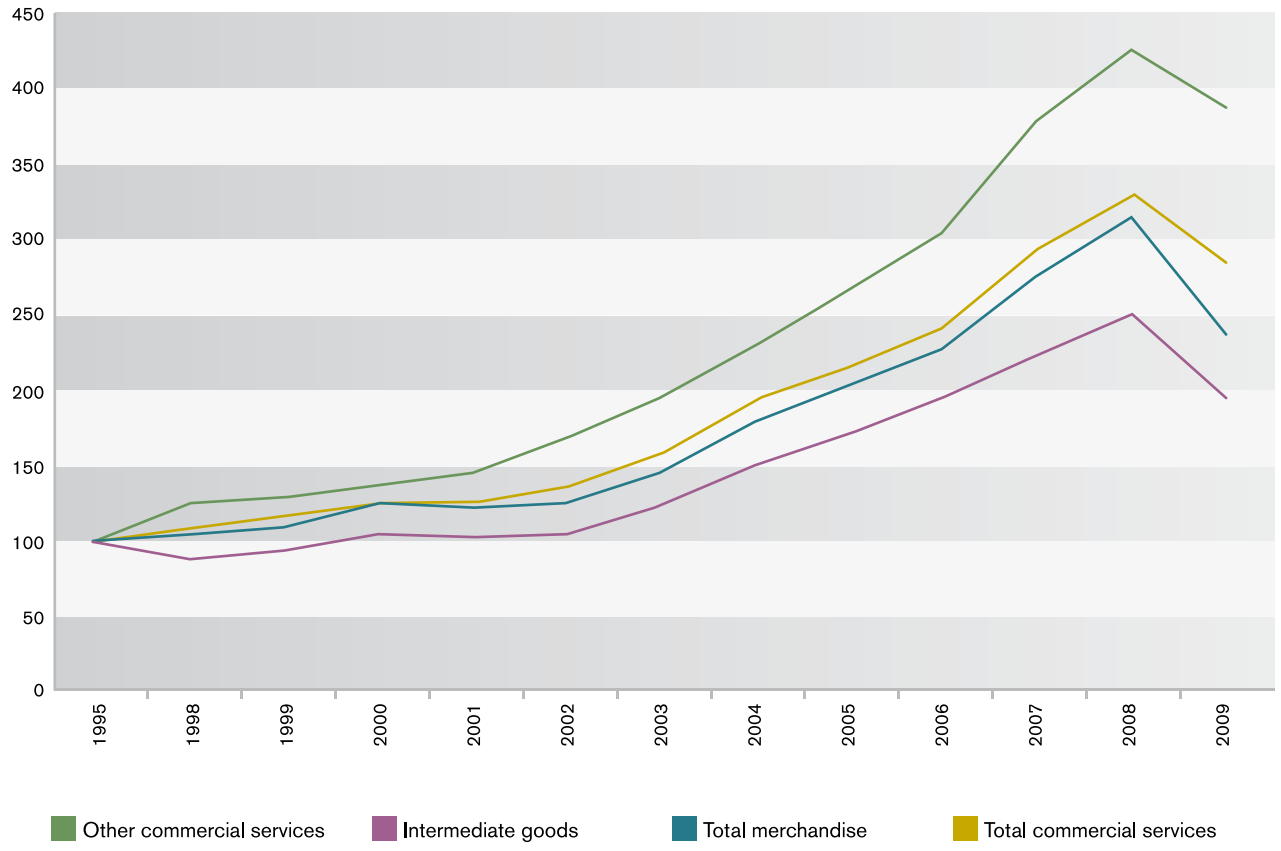
The growing international flows in intermediate goods[1] reflect the evolution of intra-industry trade, the impact of offshoring and the prominent role of networks of multinational enterprises (MNEs) in world trade. A common way to assess trade in intermediate goods is to use the United Nations' Broad Economic Categories (BEC) classification, which groups commodities by main end-use, principally distinguishing between consumption, capital and intermediate goods.

The definition and measurement of trade in "intermediate services" is much more complex and subject to limited data availability.[2] Currently no official trade classification enables precise differentiation between final and intermediate services. One way of assessing internationally-outsourced intermediate services is to consider trade in "other commercial services", which is a very broad aggregate including a number of business services that can be subject to offshoring. See, for example, Chapter II, Section C, on "Business process outsourcing and computer services".

Figure 1 illustrates the historical evolution of trade in intermediates along with that of total trade in merchandise and commercial services. It is apparent from the chart that trade in intermediate goods and services has significantly increased in the last 20 years. This reflects increased globalization and the development of offshoring activities ("slicing-up of the value-added chain"[3]) in the manufacturing and business services sectors, leading to the "trade in tasks" that has grown so markedly in recent years.

Figure 1

Trends in world trade in merchandise and commercial services, 1995-2009 (Index, 1995=100)



Note: Data are normalized at 100 in 1995.

Sources: UN Comtrade Database and WTO estimates.

B. Intermediate goods drive world trade

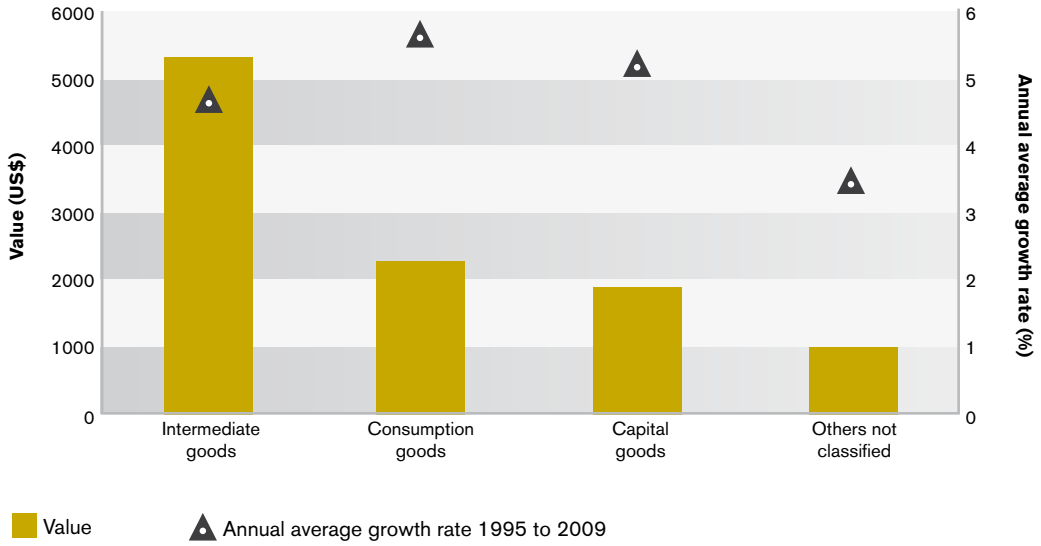
In 2009, world exports of intermediate goods exceeded the cumulated amounts recorded for consumption and capital goods (see Figure 2) and represented 51 per cent of non-fuel merchandise exports. World exports of intermediate goods nearly doubled between 1995 and 2009, from around US$ 2,774 to US$ 5,373 billion (see Figure 3), an annual average growth rate of 4.8 per cent.

A feature of world trade in intermediate goods is that its share of total trade has remained quite stable over the past 15 years. As a matter of fact, world exports in the three categories of goods – capital, consumption and intermediates – evolved at similar speeds between 1995 and 2009, in line with the overall growth of total merchandise trade. Intermediate goods are embedded in final goods and the values generated within the different intermediate trade flows are reflected in the subsequent flows of the final (consumer or capital) goods, hence the stability of shares and growth between the three categories.

The apparent contradiction with the growth of international supply chains is explained mainly by statistical effects of reporting intra-firm trade and trade in goods sent/received for processing, and the difficulty of distinguishing intermediate from final goods in some categories.[4]

Figure 2

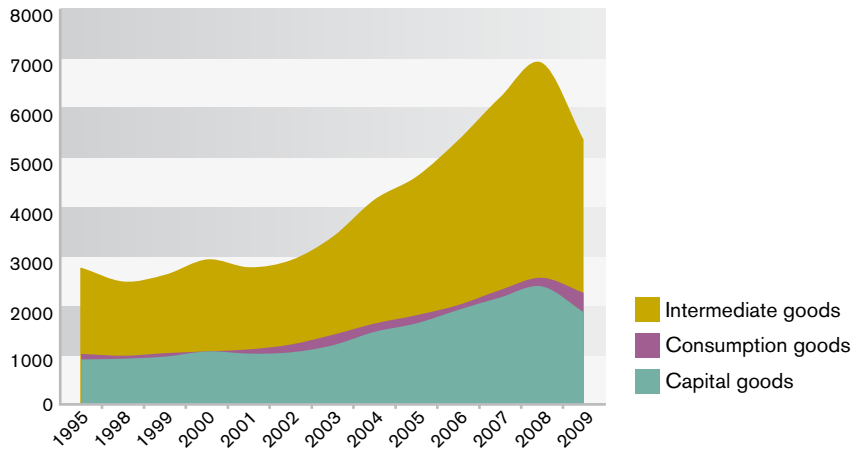
World non-fuel merchandise exports by type of good, 1995-2009 (in billions of US$ and percentage)



Sources: UN Comtrade Database and WTO estimates.

Figure 3

World non-fuel merchandise exports by type of good, 1995-2009 (in billions of US$)



Sources: UN Comtrade Database and WTO estimates.

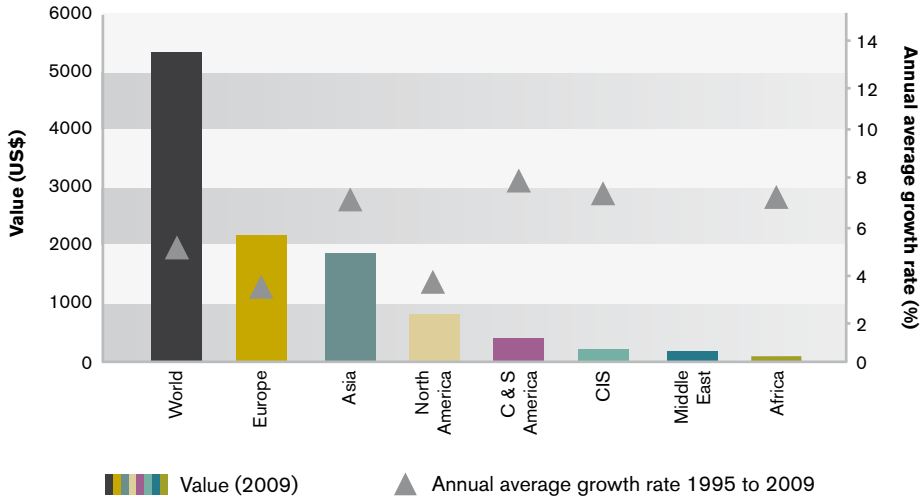
C. Europe and Asia lead trade in intermediate goods

In 2009, the production and export of intermediate inputs have been mainly concentrated in Europe, Asia and North America. Unlike those of Europe and North America, Asian exports of intermediate goods grew much faster (7.2 per cent) than the world average (4.8 per cent) between 1995 and 2009. Exports of intermediate goods from a few developing regions (Central and South America, Africa) and the Commonwealth of Independent States (CIS) economies grew much faster than those from Western economies (see Figure 4). The volume of trade in intermediate goods gives an indication of the level of integration of a region in production sharing. Although the overall value is still very low compared with Western economies, developing economies tend to join global supply chains at a sustained pace since it is a clear opportunity for them to enter international trade through production sharing.

The shares of North American and European exports of intermediate goods in world trade declined notably between 1995 and 2009 (see Figure 5), whereas Asia's increased by almost 10 percentage points, reaching 35 per cent of world exports of intermediate inputs in 2009. While North American and European economies tend to further diversify their trade in intermediates towards services, new international production capacity and related trade in manufacturing intermediates are increasingly originating in Asia as a result of industrial fragmentation in this region.

Figure 4

Regional Exports of intermediate goods, 1995-2009 (in billions of US$ and percentage)

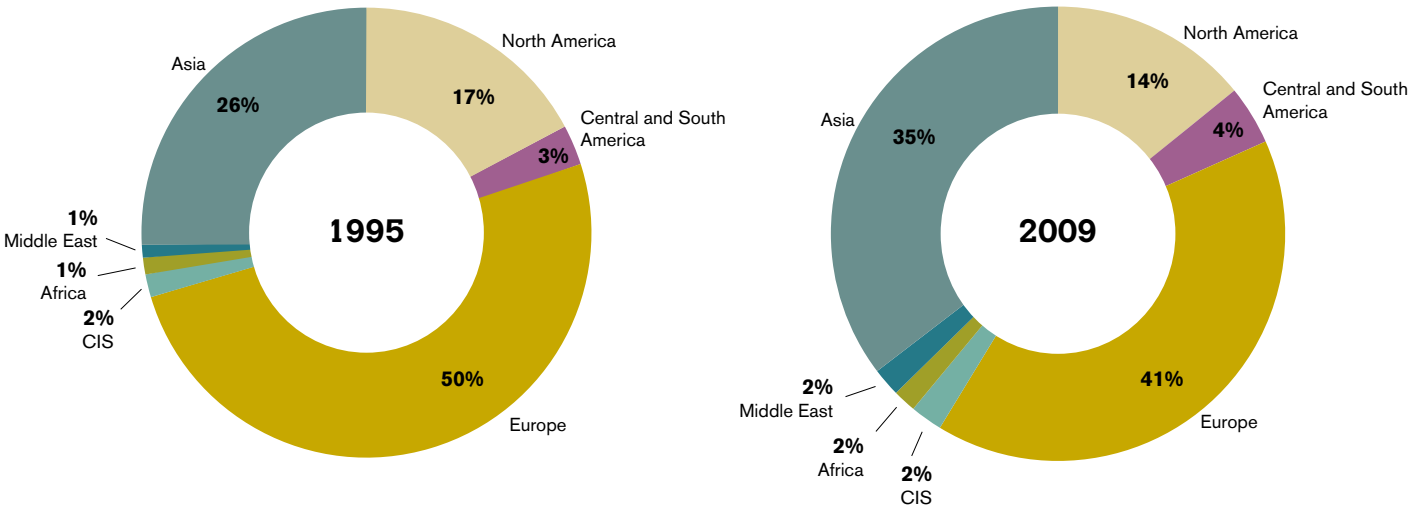


Note: No data is available for Middle East for 1995.

Sources: UN Comtrade Database and WTO estimates.

Figure 5

Regional shares in world exports of intermediate goods (percentage)



Sources: UN Comtrade Database and WTO estimates.

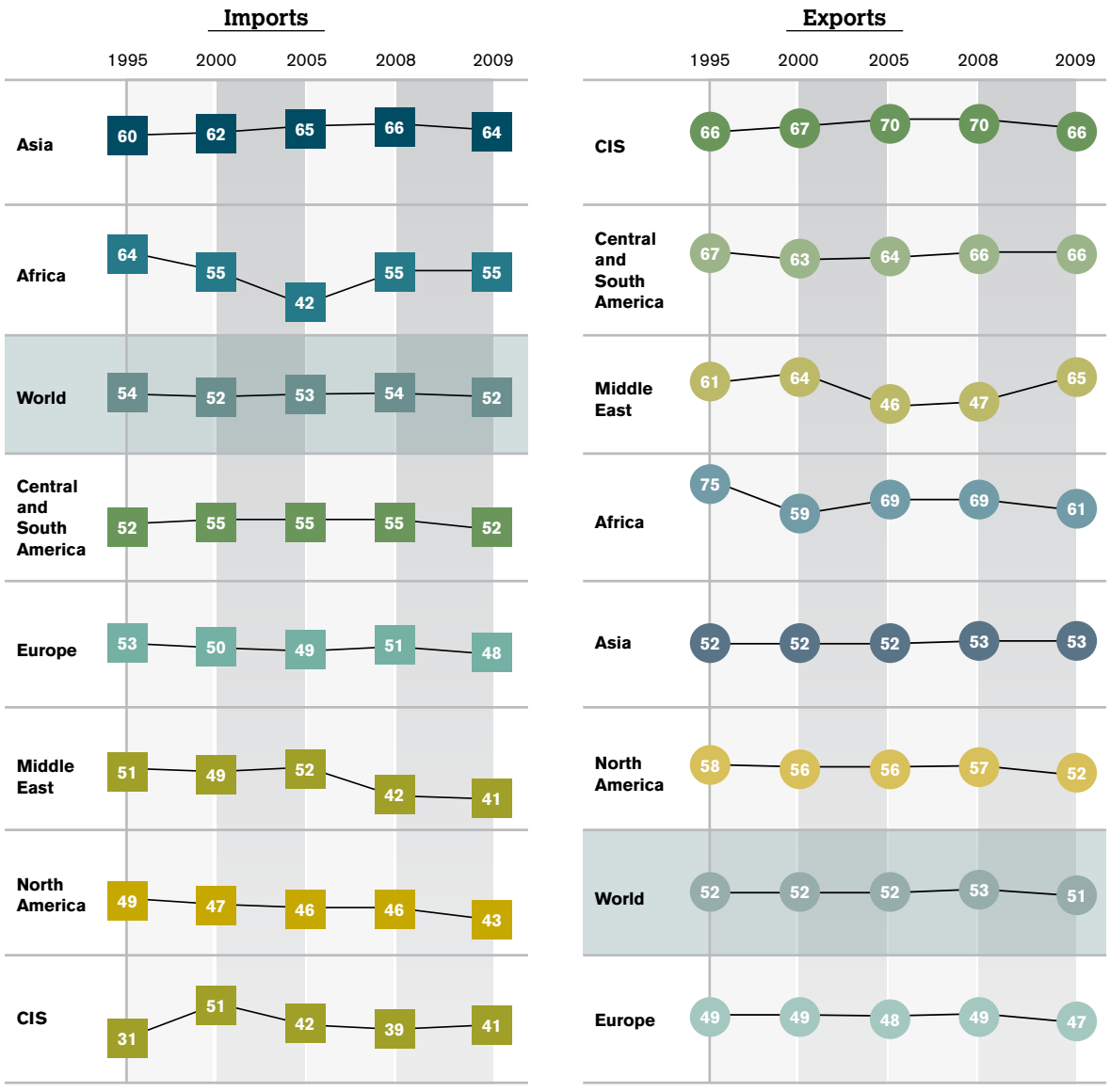
As shown in Figure 6, intermediate goods constitute more than 60 per cent of Asia's total imports. Asia is the world's key player in international production sharing, mainly in the processing and assembling of manufactured goods. However, the share of exports in intermediates is around 50 per cent as Asia tends to transform imported intermediate goods into final goods for export.

Figure 7 illustrates the magnitude of intra-regional imports of intermediate goods as well as of major inter-regional flows. At US$ 2,050 billion, Europe had the highest value of intra-regional imports in 2008. Intra-regional trade represented nearly half of its total imports of intermediate goods. Europe was followed by Asia, with US$ 1,479 billion. Intra-regional exchanges represented more than 64 per cent of Asia's imports of intermediate goods, which underllines the high intensity of production sharing in that part of the world.

Asia has not only developed its own industrial networks, it has also contributed to production chains linked to Western economies. Accordingly, the major inter-regional flows in intermediate goods involved Asia either as the origin (exporter) or as the destination (importer) of trade flows, essentially with its core partners North America and Europe. For instance, the highest inter-regional import flows of intermediate goods were observed between Europe and Asia (US$ 384 billion) and between North America and Asia (US$ 330 billion). Asia has been a major supplier of intermediate goods to North America. As a result, North America's intra-regional imports of intermediate goods (US$ 412 billion) were – with a share of 39 per cent of its total imports of this type of goods – of lower importance than for Asia and Europe.

Figure 6

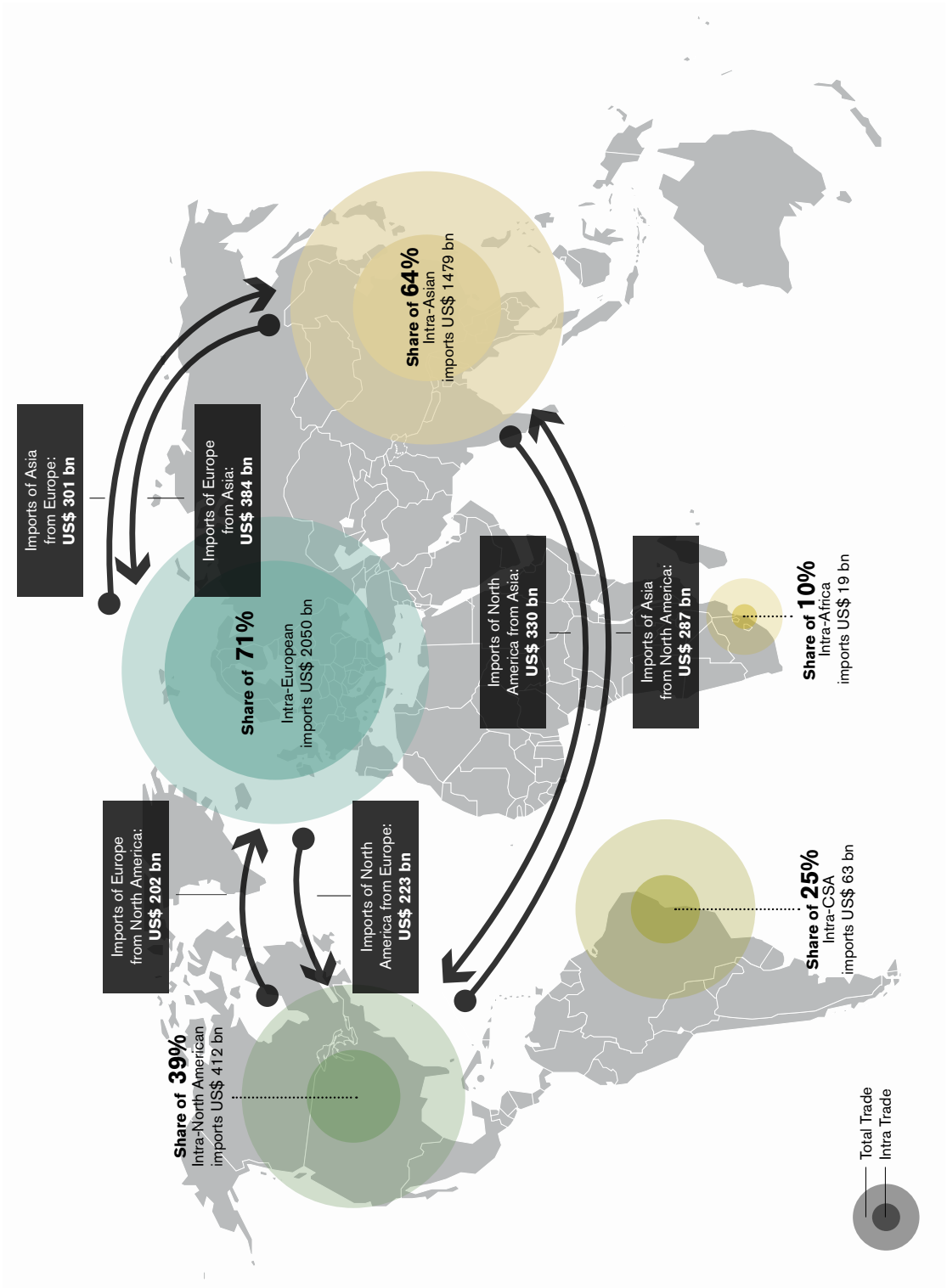
Shares of intermediate goods in total non-fuel exports and imports, 1995-2009



Sources: UN Comtrade Database and WTO estimates.

Figure 7

Intra-regional and major inter-regional imports of intermediate goods, 2008 (in billions of US$)



Sources: UN Comtrade Database and WTO estimates.

The level of imports of intermediate goods for Central and South America, Africa, and Australia and Oceania was low, especially for intra-regional exchanges – all with shares of below 30 per cent of total imports of intermediate goods. This reflects the fact that these regions are still newcomers to international production chains.

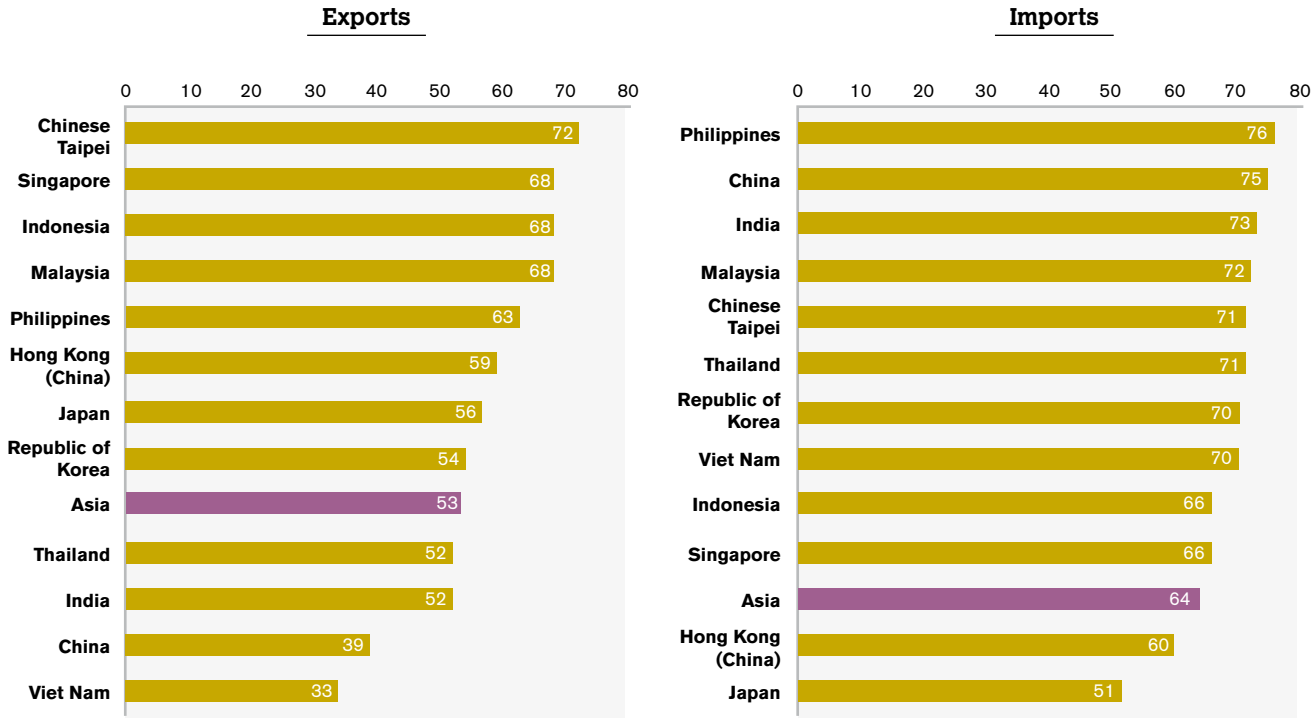
D. Asia imports more intermediate goods than it exports

In 2009, Asia imported more intermediate goods than it exported, showing its high level of engagement in world production chains. Asia's developing economies were the principal contributors to this outcome as advanced economies like Japan and the Republic of Korea exported more intermediate goods than they imported. China plays the role of assembler within the Asian region, its imports in intermediate goods accounting for more than 33 per cent of Asian imports of intermediates in 2009.

As a consequence, China's rankings – in terms of the share of intermediates in its total trade – are inverted for exports and imports (see Figure 8). Economies like India and Viet Nam also had markedly higher shares of intermediates in their imports than in their exports. The opposite was the case for Japan and Chinese Taipei. Chinese Taipei had the highest share of intermediate goods in its exports among the major Asian traders.[5]

Figure 8

Share of intermediate goods in total non-fuel trade of major Asian traders, 2009 or latest year available (percentage)



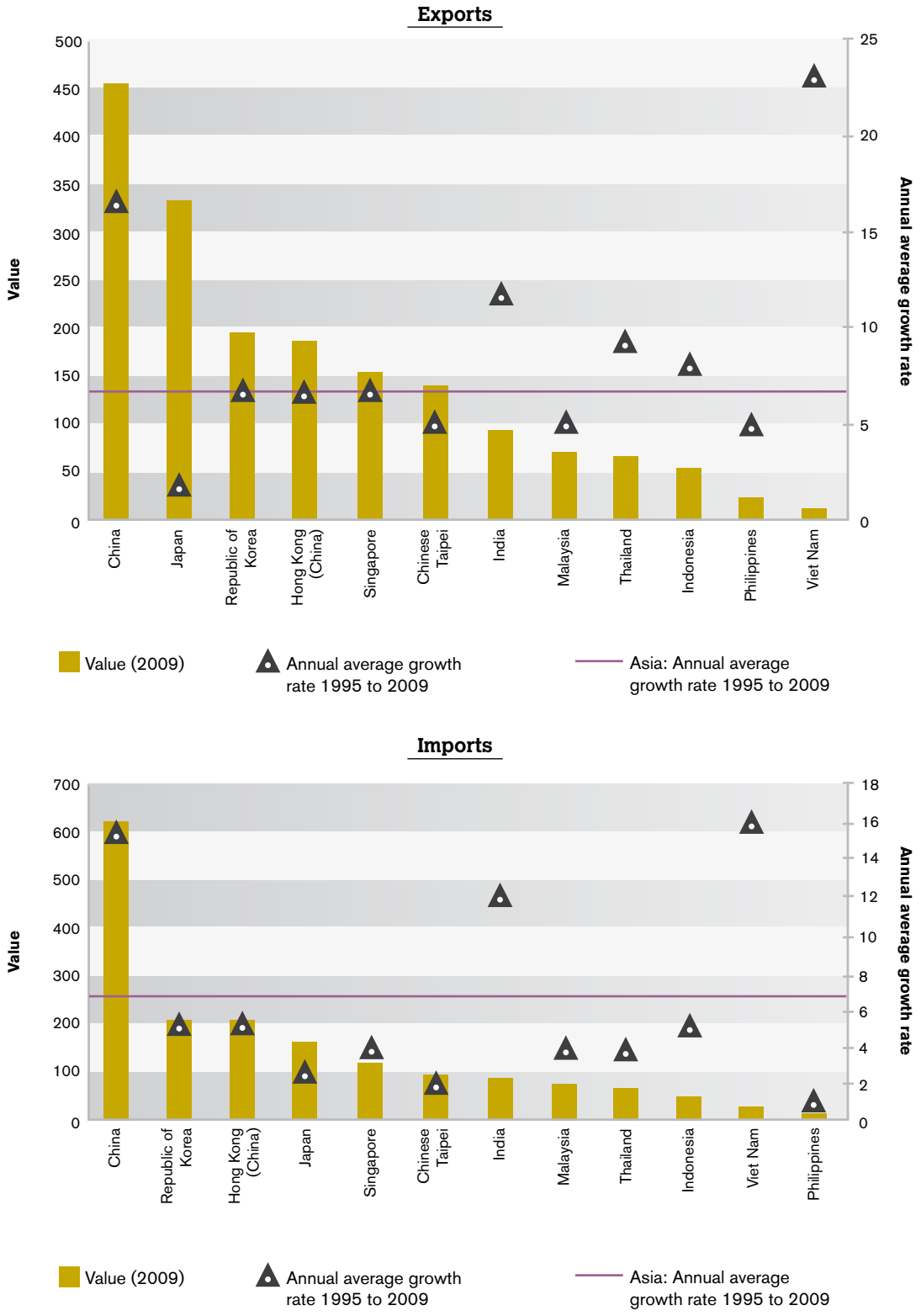
Sources: UN Comtrade Database and WTO estimates.

Figure 9 presents the level of trade in intermediate goods and average annual growth rates of the major Asian traders. Within the top five exporters (China, Japan, the Republic of Korea, Hong Kong (China) and Singapore), China grew the strongest. Its average growth rate of 17 per cent is significantly above the Asian average. Of all the economies shown, only Viet Nam's exports of intermediate goods grew at a faster speed during this period (23 per cent).

China was not only the top importer of intermediate goods in Asia, it was the largest in the world. This reflects the recent development of processing activities in China based on inputs from other Asian economies, as well as the development of a domestic industry. China, India and Viet Nam have been the most dynamic importers of intermediate goods within the last 15 years, with average growth rates of between 12 and 16 per cent, far beyond the regional average of 7 per cent.

Figure 9

Exports and imports of intermediate goods of major Asian traders, 1995-2009 (in billions of US$ and percentage)



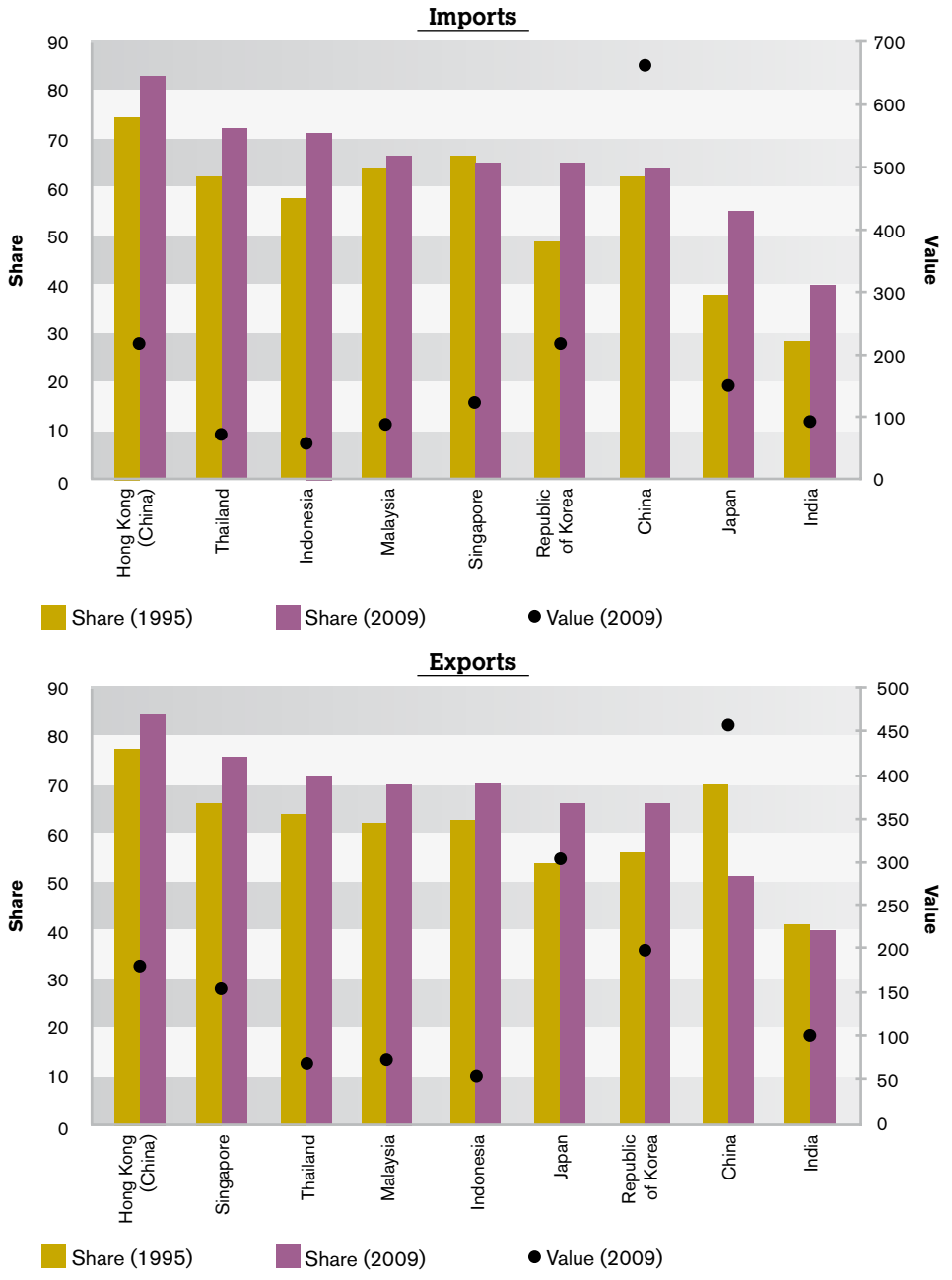
Sources: UN Comtrade Database and WTO estimates.

E. Intra-Asian trade in intermediate goods on the rise

Figure 10 shows that for most of the major Asian traders, the share of intra-regional imports of intermediate goods increased significantly between 1995 and 2009. In the case of Hong Kong (China), it was over 83 per cent for imports in 2009. For almost all economies, the intra-Asian part represented more than half of their trade in intermediate products, with the exception of India (40 per cent for both flows in 2009). The importance of the regional market remained more or less stable for China's imports. But it fell for its exports from 70 per cent in 1995 to 51 per cent in 2009. This is linked to China's growing integration in world markets (the growing global diversification of China's markets, both for final and intermediate goods) and the generally strong increase in China's trade volume. China's trade surplus is generally linked to processing trade activities[6] (see Chapter 2 on global production). As a result, it has positive trade balances with developed economies in processing trade, while the opposite is the case for most of its East-Asian partners. Also, India's intra-Asian share in total exports of intermediate goods remained quite stable (41 per cent in 1995, 40 per cent in 2009), while its share of imports increased.

Figure 10

Intra-Asian imports and exports of intermediate goods, value and shares in total trade, 1995 and 2009 (in billions of US$ and percentage)



Sources: UN Comtrade Database and WTO estimates.

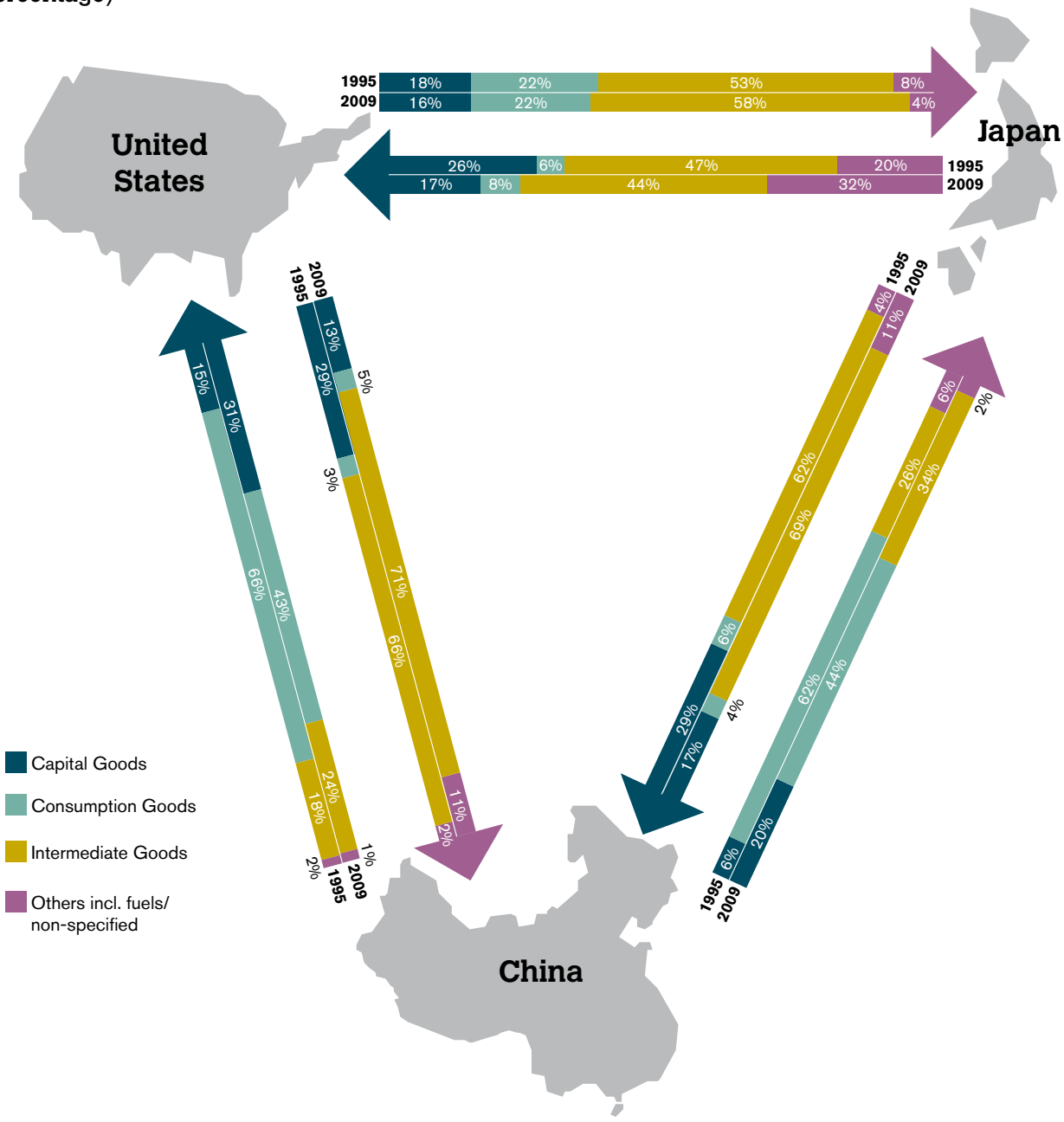
F. Bilateral trade in intermediate goods between China, Japan and the United States

In both 1995 and 2009, US exports to China consisted mainly of intermediate goods, while its imports were principally final goods, highlighting China's role as a manufacturer for the United States (see Figure 11). A shift within final goods from consumption towards capital goods can be observed in the import structure of the United States, vis-à-vis China. It is also noticeable for Japan.

At the same time, the share of capital goods in US exports to China decreased markedly (a phenomenon that is also due to the increasing use of offshoring by US MNEs), although in value terms they grew at an average 8 per cent per year. The situation between 1995 and 2009 is quite similar for bilateral Japan-China trade. The structure of trade between Japan and the United States remained quite stable for Japan's imports from the United States, while the share of capital goods in Japanese exports to the United States decreased between 1995 and 2009.

Figure 11

Bilateral trade flows between China, the United States and Japan, 1995 versus 2009, by type of good (percentage)



Source: UN Comtrade Database.

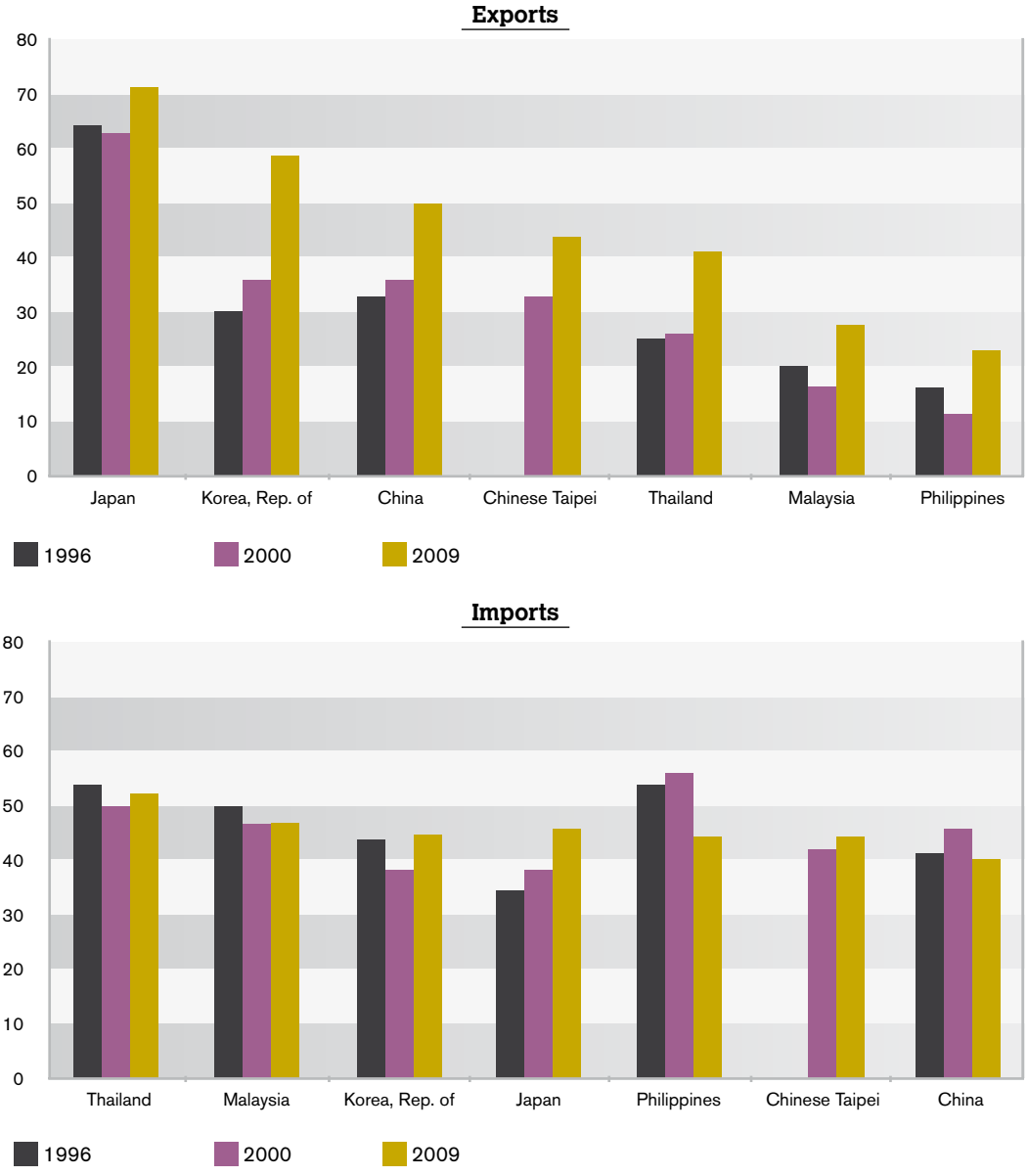
G. Towards more complex intermediate goods and concentrated trade

As shown in Figure 12, the share of complex[7] intermediary products in total exports of intermediate goods has increased significantly for all selected Asian traders since 1996, with a particularly sharp increase in 2009. Shares on the import side remained more stable over the years, with the noticeable exception of Japan where it grew continuously, reaching 46 per cent in 2009. Japan's high specialization in integrated circuits (see Figure 13) clearly impacts on its overall trade in the complex products category.

Figure 13 shows the top 10 intermediate products traded by China and Japan in 2009. Out of around 2,800 products present in this end-use category, the top 10 made up 26 per cent of China's exports and 39 per cent of its imports.

Figure 12

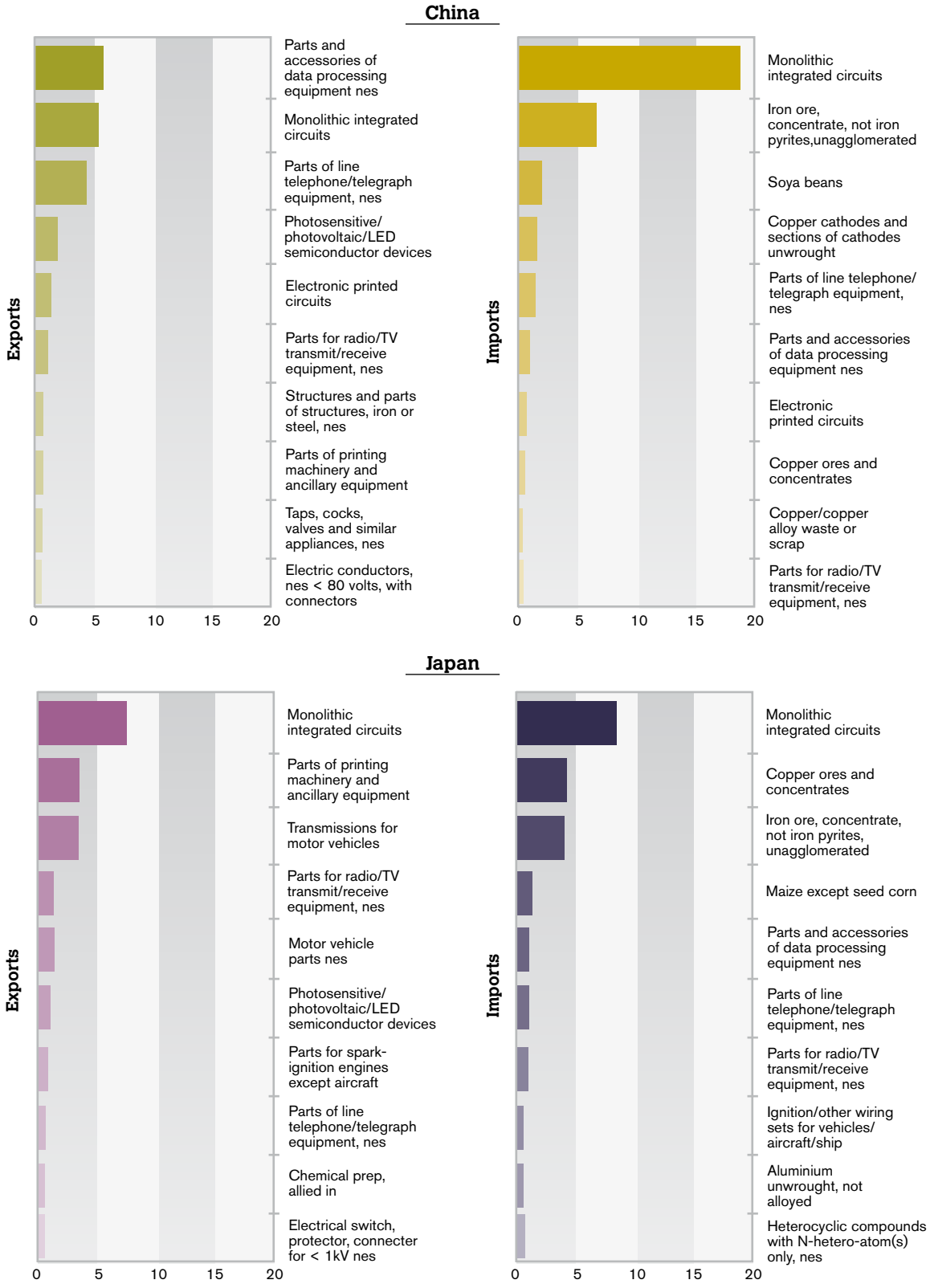
Share of high complexity intermediate goods in total exports/imports of intermediate goods (percentage)



Source: UN Comtrade Database.

Figure 13

Top 10 products in exports and imports of intermediate goods (shares in total exports/imports of intermediate goods, percentage), 2009



Source: UN Comtrade Database.

For Japan, too, the top 10 products took a high share of the total trade of intermediate goods, totalling 23 per cent for exports and 26 per cent for imports. For both flows, monolithic integrated circuits were the most-traded intermediate product of Japan – and were also China's largest import. Generally speaking, the IT and electronic sectors take a huge share of the most-traded intermediate goods in Asia.

Endnotes

[1] The definition for intermediate goods applied in this chapter includes all parts and accessories (BEC codes 42 and 53) as well as industrial primary and processed intermediate goods (BEC codes 111, 121, 21, 22). The "fuels and lubricants" category (BEC code 3) was excluded.

[2] See Miroudot et al. (2009).

[3] WTO (2008), p. 37.

[4] See Sturgeon and Gereffi (2009).

[5] The following twelve economies, referred to as "Major Asian traders", represented around 95 per cent of Asia's trade in intermediate goods in 2009: China, Hong Kong (China), India, Indonesia, Japan, the Republic of Korea, Malaysia, Philippines, Singapore, Chinese Taipei, Thailand and Viet Nam.

[6] See Xing (2011).

[7] For the definition of "product complexity" see Abdon et al. (2010).

IX. Vertical trade and trade in value added: Towards new measures of international trade

- The evolution of global supply chains and the related expansion of vertical trade call for the development of new measurements of international trade.
- Trade in value added takes into account the fragmentation of the value chains and provides a decomposition of gross exports by domestic and foreign origin.
- New perspectives for trade analysis can be explored through the value added approach.

Contents

A. Measuring trade from a different perspective

Global production chains have blurred the relevance of some conventional trade indicators, like bilateral trade balances, when products are "made in the world" rather than in a single country. The final product and the value added that goes into it come from different places (see Figure 1). The speed and depth of such changes have led to the need to revise statistical concepts and methods (national accounts, balance of payments, customs-based trade statistics) for measuring trade flows. At the same time, new approaches have been explored and developed to adapt traditional statistics and to better evaluate how economies fit into the new global economy.

Vertical trade is one of the new elements of international exchanges that require the application of innovative metrics. The production of final goods (ready for consumption) relies on successive production and trade steps in which countries that belong to a supply chain create goods and services and export them to other countries as inputs for further processing and (re-) export. The sequence ends once the final goods have reached their destination market.

Attributing the entire commercial value of an exported good to the last link of the chain – the economy exporting the final good – can lead to a statistical bias and to misunderstandings, which may alter trade analysis and have potential implications for trade policy and multilateral trade negotiations.

Box 1. The concept of "country of origin" in question

The concept of "country of origin", which is used for the compilation of customs-based merchandise trade statistics, has become partially obsolete as various operations leading to the production of final consumption goods – from design to manufacture of components and assembly – have spread across the world. As illustrated in the example of the Boeing 787 Dreamliner (see Figure 1), more and more products are effectively "made in the world", rather than made in a specific economy.

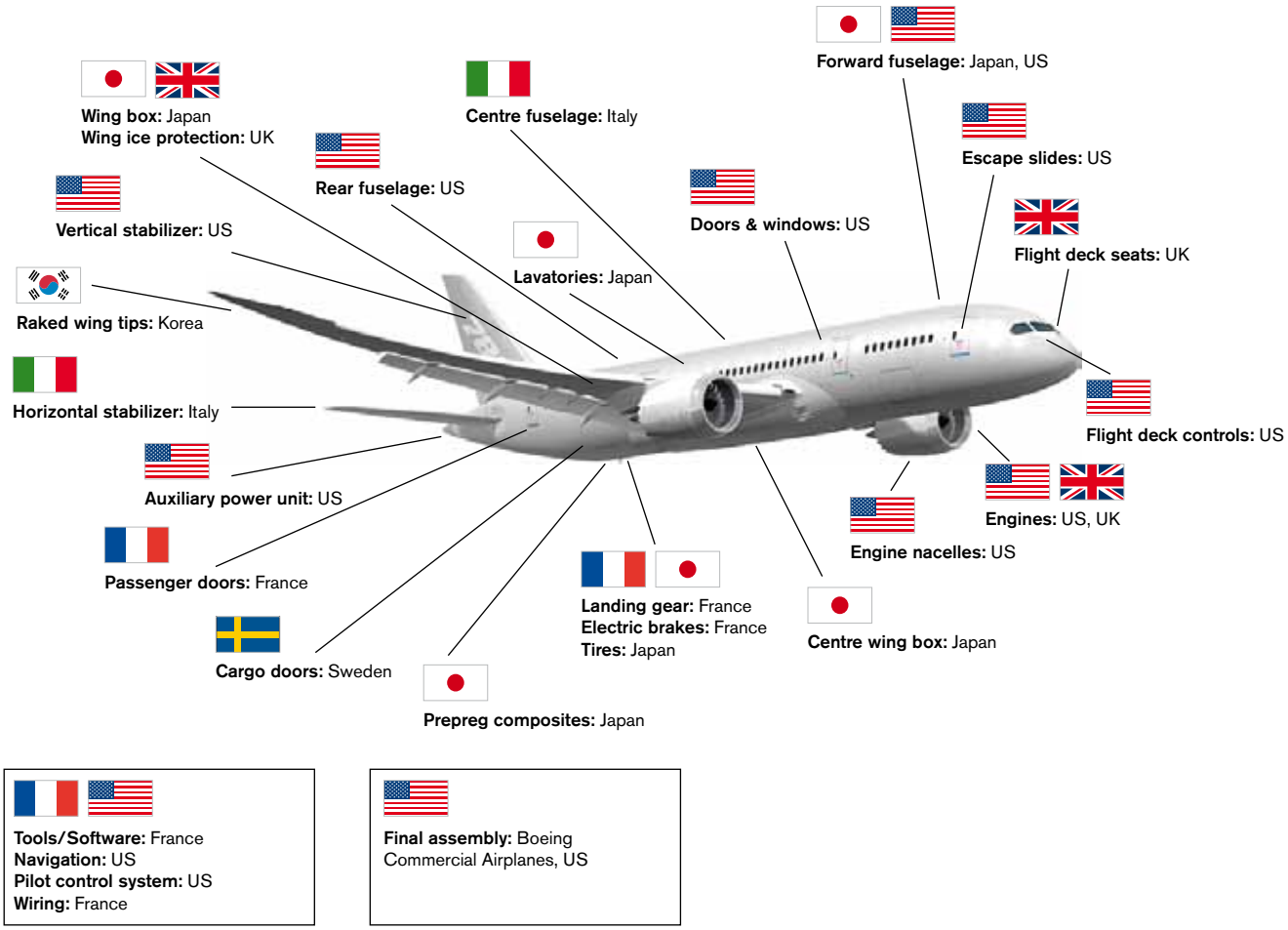
In order to deal with this difficulty, a set of criteria – the "rules of origin" – has been established by the WTO to determine where a product comes from. These rules are applied essentially to the implementation of trade policy instruments, such as antidumping and countervailing duties, origin marking and safeguard measures.

The rules applied to trade statistics to determine the most appropriate country of origin of a trade flow differ from those used for trade policy. When two or more countries take part in the production of a good, its origin can change whenever a "substantial transformation" of the product has been made, or when the product changes name, tariff code, character or use (for instance from a wheel to a car) during a manufacturing step. Due to the constraints to be met when implementing such criteria, the concepts and definitions applied to merchandise trade statistics[1] propose other types of partner country attribution, such as the "country of purchase", the "country of consignment" or the "country of shipment", which deviate from the actual manufacturing source of the product. The World Customs Organization (WCO) and the WTO are driving a process of harmonization of the definitions and criteria applied to rules of origin.

But in all cases, the full value of the product is assigned to one country. This does not reflect the geographical fragmentation of the production chain. A more recent methodological development, the "trade in value added" approach, can help circumvent the difficulty of assigning the country of origin faced by traditional trade statistics. This additional measure of international trade flows enables the domestic content embedded in exports to be assigned to each country that participated in the supply chain that led up to production of the final good.

Figure 1

The fragmentation of production: The example of the Boeing 787 Dreamliner



Source: Meng and Miroudot (2011).

B. The notion of value added in trade flows

Trade in value added takes into account the specificity of trade occurring between the different actors of a production chain. While traditional trade statistics record trade across borders on a gross basis, and might double- or even multi-count vertical trade flows, trade in value added estimates commercial flows on a net basis, at each step of the vertical trading chain. It allows the specificity of the new business model behind global manufacturing to be incorporated, complementing usual trade statistics, where trade in goods and services is progressively being substituted by "trade in tasks".

Addressing the domestic value added incorporated in exported goods can – inter alia – help economies:

- to identify the sources of international competitiveness and comparative advantages and to better reflect the actual contribution of the various industrial sectors in the production process of its exported goods
- to evaluate the actual impact of foreign trade on economic growth and employment
- to provide another angle for the examination of bilateral trade balances or regional transactions
- to question the economic relevance of some trade policy instruments, such as antidumping, which may affect national businesses and "damage the supply chains of globalized companies".[2]

Box 2. On the measurement of value added

The domestic content of a country's exports is often referred to as the value-added content of exports. In such cases, the value added of an exported good comprises the good's total value minus direct and indirect imported inputs, and includes all the domestic intermediate goods and services used for the production of the good. From a methodological point of view, this is not so different from the notion of sectoral value added derived from the system of national accounts, which corresponds to the final value of the output of an industry, net of the goods and services it purchased from other industries or imported for its production. The domestic content of any export will include the direct value added from the exporting industrial sector, plus the value added from other domestic sectors indirectly embedded during the production process. In addition, some correction can be done to measure the domestic content of imported inputs (re-imports).

Figure 2 illustrates a simplified vertical production chain involving three countries. The production sequence starts in Malaysia and in the United States with the manufacturing of car components (for example, body parts, tachometer) for export to Thailand, where the next production phase takes place. A Thai production unit combines the imported components with domestic parts and accessories into the final assembly of the car predestined for the US market. One of the characteristics of the car finally purchased in the United States is that it is composed of elements originating from various countries, including the United States. The specificity of trade occurring between the different actors of the chain leads to some questions:

Which is the share in the value of the car exported to the United States to be attributed to Thailand, the ultimate exporter in the chain, or indeed to US producers? What is the foreign content of Malaysian or Thai exports? The trade in value added approach addresses these questions.

The "value added" column in the diagram highlights the sources of domestic value added in each country involved in the chain. In this example, it is assumed that Malaysia and the United States produce car components from scratch, without using any foreign input. Thus, the value in the "vertical specialization" column, reflecting the amount of imported input in their respective exports to Thailand, is set to zero.

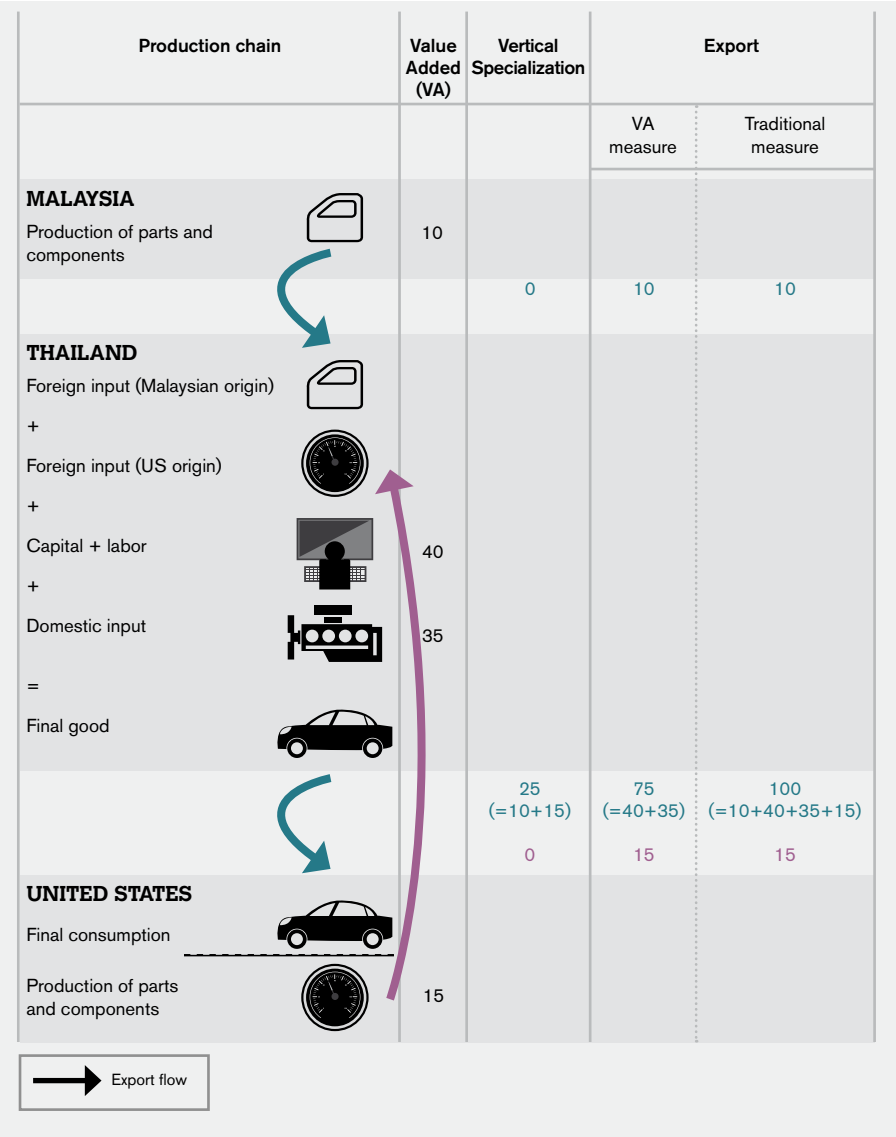
The value of Malaysia's and US exports to Thailand is the same whatever the valuation method applied (i.e. the value added or traditional method); however, this is not the case when evaluating Thailand's exports to the United States. According to traditional measurement, Thailand's exports to the United States amount to a value of 100, including the value added of parts and components imported from Malaysia and the United States itself. This demonstrates the double-counting issue observed with traditional trade statistics since the value of intermediate goods manufactured in Malaysia and in the United States are counted twice: once when the goods are exported from these countries to Thailand and again as components of the car exported from Thailand to the United States. For this reason, Thailand's exports to the United States are numerically overstated when one considers the whole production process. As shown in the example, measuring trade flows in value added terms overcomes this problem. The domestic value added of Thailand's exports to the United States amounts to 75 (see Figure 2, "VA measure" column), excluding the value of goods non-sourced from Thailand. Since value added is one of the components of gross exports, the estimate of trade in value added is necessarily equal or lower than the traditional value. In parallel, the level of vertical specialization for Thai exports is set to 25, gathering the values of all inputs imported to produce the car.

It would require an enormous amount of work to measure directly the different sources of added value for each product traded in the world. An indirect way of estimating vertical trade and trade in value added relies on input-output (I-O) tables or – preferably – their international counterparts, international input-output (II-O) tables. These combine national accounts and bilateral trade data on goods and services into a consistent framework. II-Os allow the value added contained in exports to be evaluated and decomposed into its foreign and domestic content (see Box 3).

The domestic content of exports corresponds to the accumulation of the value added incorporated in each of the various domestic sectors that contributed to the supply chain. The foreign content of exports, or import content of exports, serves as an estimate of the trade between countries involved in international production chains. It can be measured through the application of the vertical specialization (VS) formula, developed by Hummels et al. (2001), based on the use of II-Os. Thus, the impact of the fragmentation of production chains on international trade can be assessed by computing the vertical specialization phenomenon.

Figure 2

Measuring value added and vertical specialization through an international production chain: an illustrative example (hypothetical values and constellation)



Source: WTO Secretariat.

Box 3. The input-output tables, a statistical tool for the indirect measurement of trade in value added

Based on the old statistical concept of the "tableau économique", developed in the 18th century by François Quesnay, the input-output (I-O) tables represent a nation's economy in a matrix form, including international exchanges. The I-O model was further developed by Wassily Leontief in the middle of the 20th century.[3]

International input-output (II-O) tables enable the origin and the use of intermediate goods and services to be identified by country and sector.

I-O (or II-O) tables provide relevant assets for the analysis of trade verticality as they make clear the inter-sectoral nature of the modern production processes and their international connections. Thus, they take into account all backward linkages between countries and sectors present in the table, and they capture the value of imported inputs used directly and indirectly (at all stages of a country's production) in the manufacturing of exported goods. They can also trace the domestic content of imports, like the US parts embedded in the car imported into the United States from Thailand in Figure 2.

Although data limitations and methodological constraints exist, the I-O framework constitutes a relevant statistical tool to analyse trade from a different and complementary perspective in comparison to traditional trade statistics.

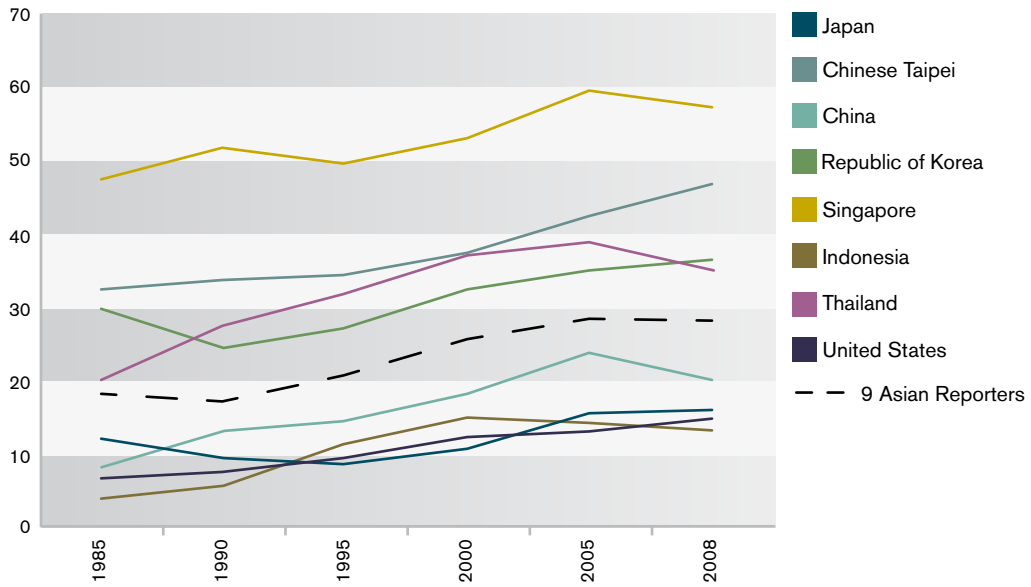
International statistical cooperation is being organized to improve the data coverage, availability and quality of II-Os,[4] which – in the coming years – will foster the development of such a tool for the study of trade and its link to other macroeconomic variables like employment and environmental factors.

C. Vertical specialization in East Asia and the United States

The following calculations are based on the IDE-JETRO Asian input-output (AIO) tables covering nine Asian countries (China, Indonesia, Japan, the Republic of Korea, Malaysia, the Philippines, Singapore, Chinese Taipei and Thailand) as well as the United States.

Figure 3

Historical evolution of the vertical specialization of selected Asian economies and the United States, 1985-2008 (percentage)



Note: The "Asia 9 reporters" aggregate includes Malaysia and the Philippines, not shown in this figure.

Source: The Asian international input-output table, IDE-JETRO.

The trade-weighted average share of vertical specialization (VS) of the nine countries, available in the AIO data set, increased by more than 47 per cent between 1985 and 2008, reaching 28 per cent in 2008 (see Figure 3). All countries' VS increased noticeably during that period. Indonesia and China's VS presented the highest growth; their shares of imported goods in exports have more than doubled (even tripled in the case of Indonesia) since 1985. These countries joined the regional production chains later than other countries, which is reflected in their low VS shares observed in 1985.

A few patterns of evolution can be observed:

- Singapore and Chinese Taipei presented shares of imported inputs in exports largely above the group's average. In 2008, 58 per cent of Singaporean exports were made up of imported content. Due to their high degree of specialization, mainly in logistics and high technology, these economies have always been central to Asian production networks (see Chapters II and VIII).
- High VS shares were observed for the Republic of Korea and Thailand. Since the 1980s, Thailand has become a regional manufacturing hub playing the role of an export-platform, specialized – inter alia – in the automotive industry and used by various foreign manufacturers (e.g. Toyota, Mazda and Ford).
- The VS rates noticed for Japan and Indonesia were far below the group's average. The evolution of Japan's VS has been similar to that of the United States. Their shares increased significantly between 1995 and 2008, most probably due to the expansion of offshoring and intra-firm activities carried out by Japanese and US MNEs. The low VS shares observed for these countries overall can be related to their economic size, which enables them to produce a large proportion of parts and components domestically (see Chapter VI for more information on respective production systems). Interestingly, the VS observed for Indonesia is close to that of the two developed economies, with only 13 per cent of imported content in its exports in 2008, a figure that has even slightly decreased

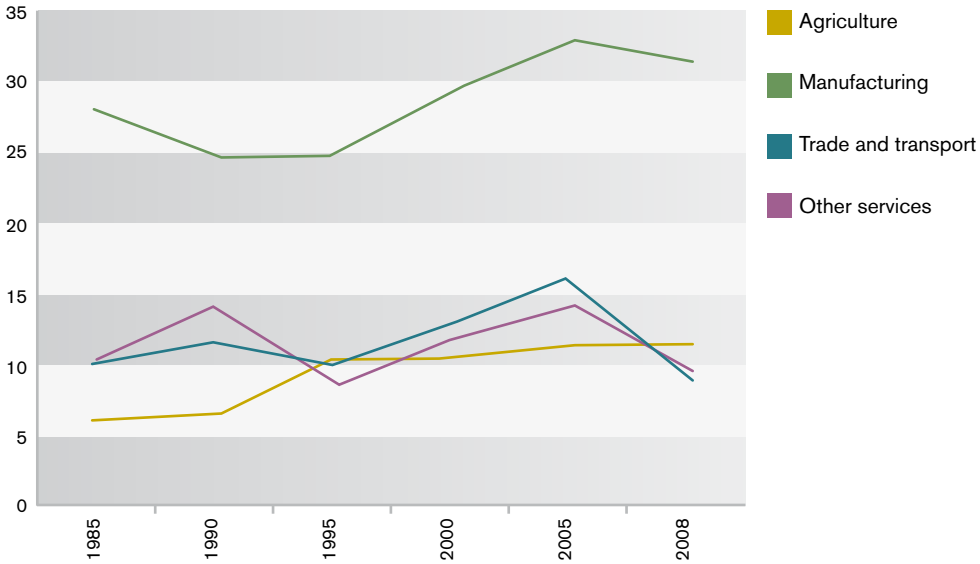
since 2000. The reason lies in Indonesia's export structure, which is essentially composed of primary products that do not require intensive use of foreign inputs (agricultural goods, fuels and mining accounted for 61 per cent of total exports in 2008).

- Economies with constantly rising rates of imported content during the period 1985-2008 were Chinese Taipei (from 32 to 47 per cent) and the United States (from 7 to 15 per cent).
- The estimates of China's import content of exports (19.7 per cent in 2008) appear to be excessively low. This is because standard II-Os, used for VS calculation, do not give specific treatment to processing zones' trade. For China, the share of exports from processing zones in total exports was more than 47 per cent in 2008. The import content of exports is obviously underestimated as China's export processing zones employ far more imported inputs than exports stemming from non-processing trade. In 2008, the import content of exports from Chinese processing zones has been estimated at 56 per cent. The revised estimate of China's vertical specialization, combining the two types of trade (processing and non-processing), amounts to 37 per cent instead of 19.7 per cent with standard AIO tables.[5]

In the Asian region, vertical specialization – similar to what is observed for trade in intermediate goods - is closely related to manufacturing activity (see Figures 4 and 5).

Figure 4

Historical share of vertical specialization of nine Asian main traders, by sector[6], 1985-2008 (percentage)



Source: The Asian international input-output table, IDE-JETRO.

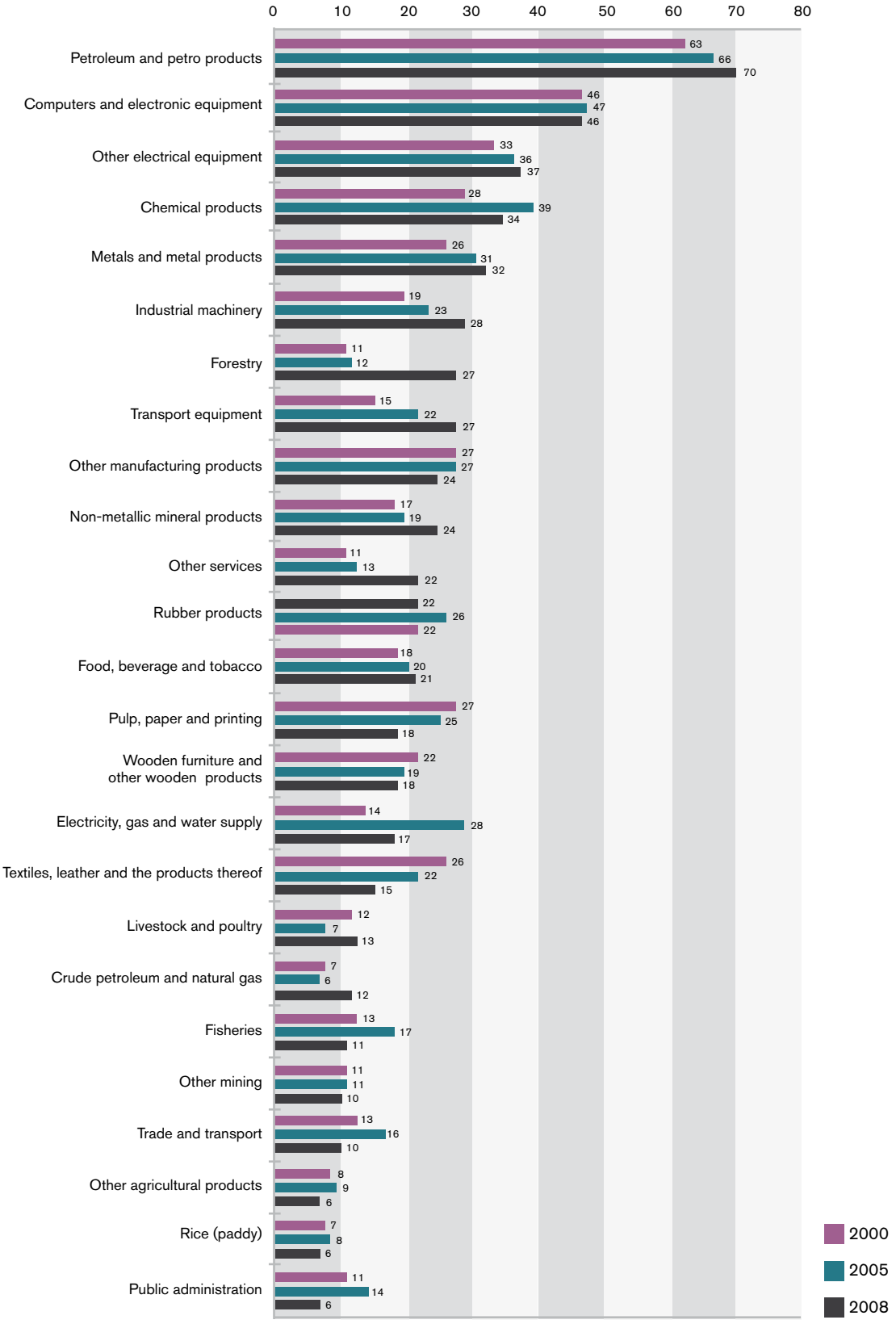
The high vertical specialization of "petroleum and petro products" (see Figure 5) shows that several major Asian economies, among which Japan (VS of 91 per cent in that sector in 2008) and the Republic of Korea (VS of 82 per cent in 2008), are net importers of oil-based primary and semi-finished products.

As shown within the presentation of trade in intermediate goods in Asia (see Chapter VIII), electronic parts and components are the most traded types of inputs within Asian supply chains. They are also amongst the most complex products. This is echoed here through the constantly high VS shares observed for "computers and electronic equipments" and "other electrical equipment". Logically, "transport equipment" and other manufacturing-related sectors present relatively high VS shares reflecting the high fragmentation of the manufacturing sector within East Asia; VS is above all a matter of the manufacturing industry.

The VS share of the "other services" sector for the nine East Asian economies, which includes a wide range of business services, more than doubled between 2000 and 2008, reaching 22.3 per cent in 2008. Such a sharp evolution denotes the increasing role of services in supply chains, notably in the areas of transport, communication and logistics (see Chapter II, on the particular roles of Hong Kong (China) and Singapore), and the link they establish between successive manufacturing operations.

Figure 5

Nine Asian traders' average share of vertical specialization, by sector*, 2000-2008 (percentage)



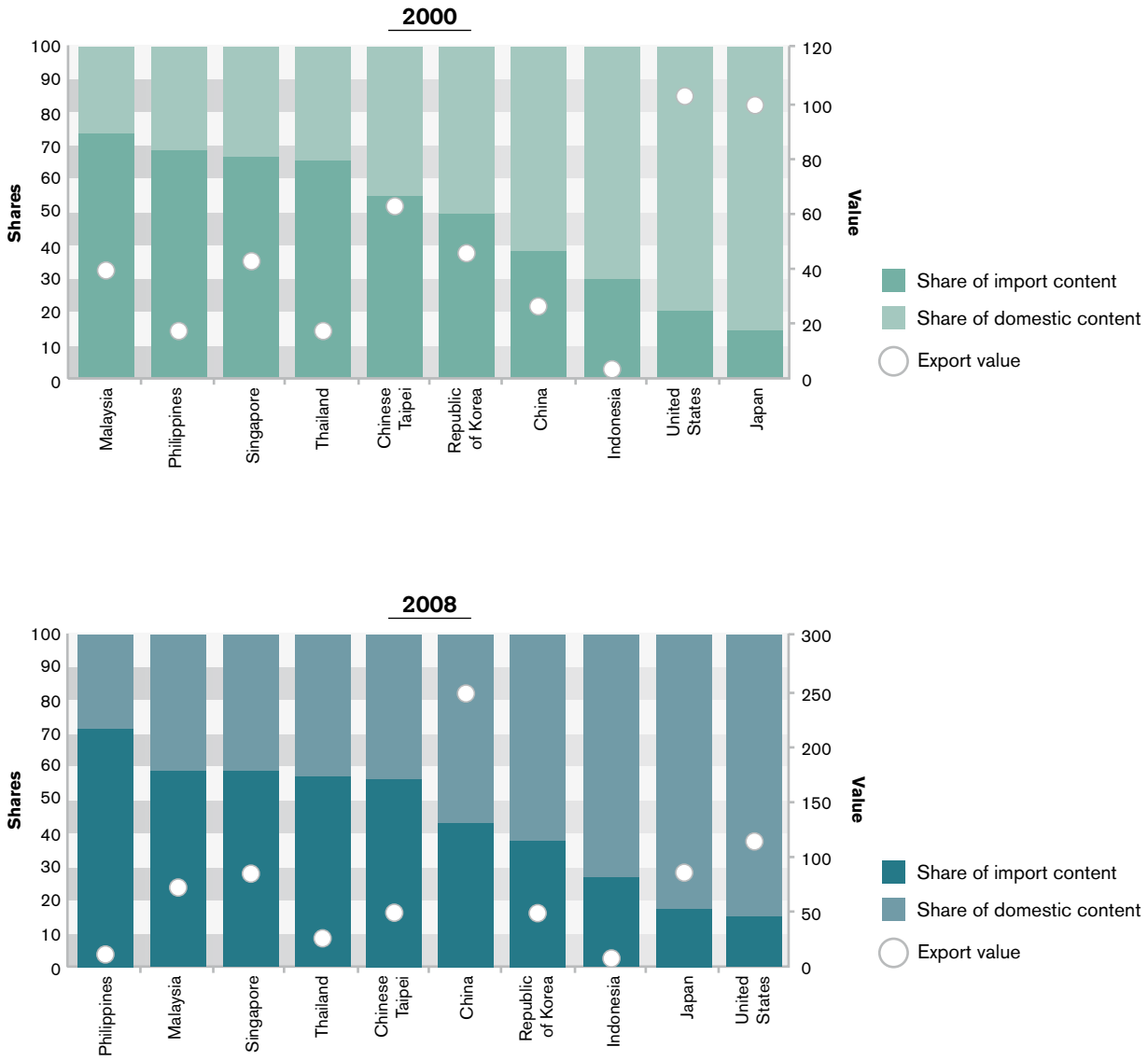
*The construction sector is not shown as data were not available for several countries.

Note: The nine Asian traders are China, Indonesia, Japan, the Republic of Korea, Malaysia, the Philippines, Singapore, Chinese Taipei and Thailand.

Source: The Asian international input-output table, IDE-JETRO.

Figure 6

Computers and electronic equipment:[7] Exports and their domestic and imported contents, 2000 and 2008 (in billions of US$ and percentage)

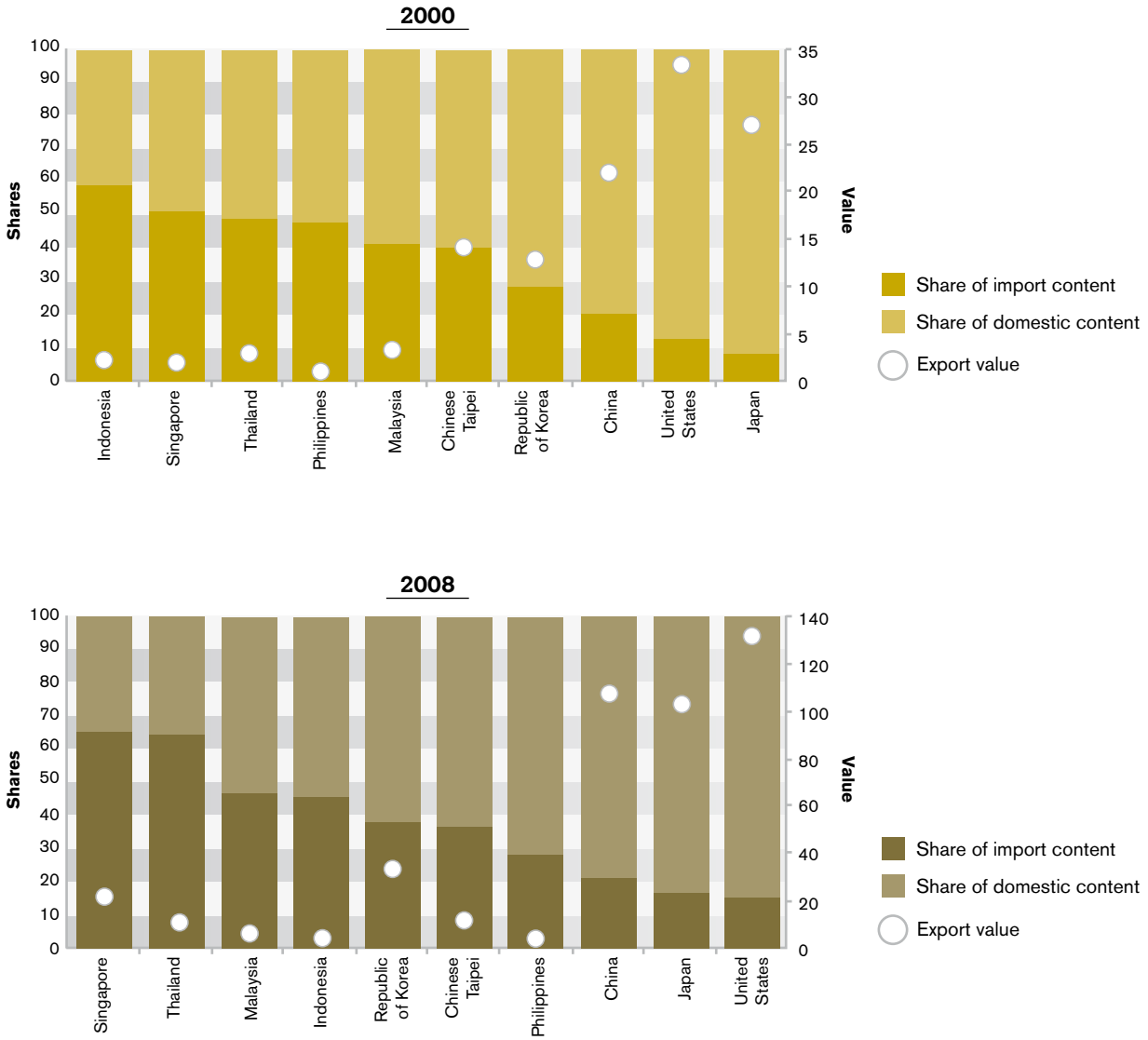


Source: The Asian international input-output table, IDE-JETRO, and WTO estimates.

As can be seen in Figure 6, the share of the domestic content of exports from Malaysia and Thailand grew significantly between 2000 and 2008, from 26 to 41 per cent in the case of Malaysia and from 35 to 42 per cent in the case of Thailand. This can, inter alia, be due to the increase of FDI towards these countries (see Chapter V) to produce locally parts and components used in regional production chains and technology transfers occurring within the outsourcing and offshoring strategies of MNEs. China's contribution to world exports of "computers and electronic equipment" increased considerably between 2000 and 2008. The composition of its exports, by domestic and foreign value, remained quite stable, with a slight increase of the import content in exported goods and services, from 38 to 44 per cent.

Figure 7

Industrial Machinery:[8] Exports and their domestic and imported contents, 2000 and 2008 (in billions of US$ and percentage)

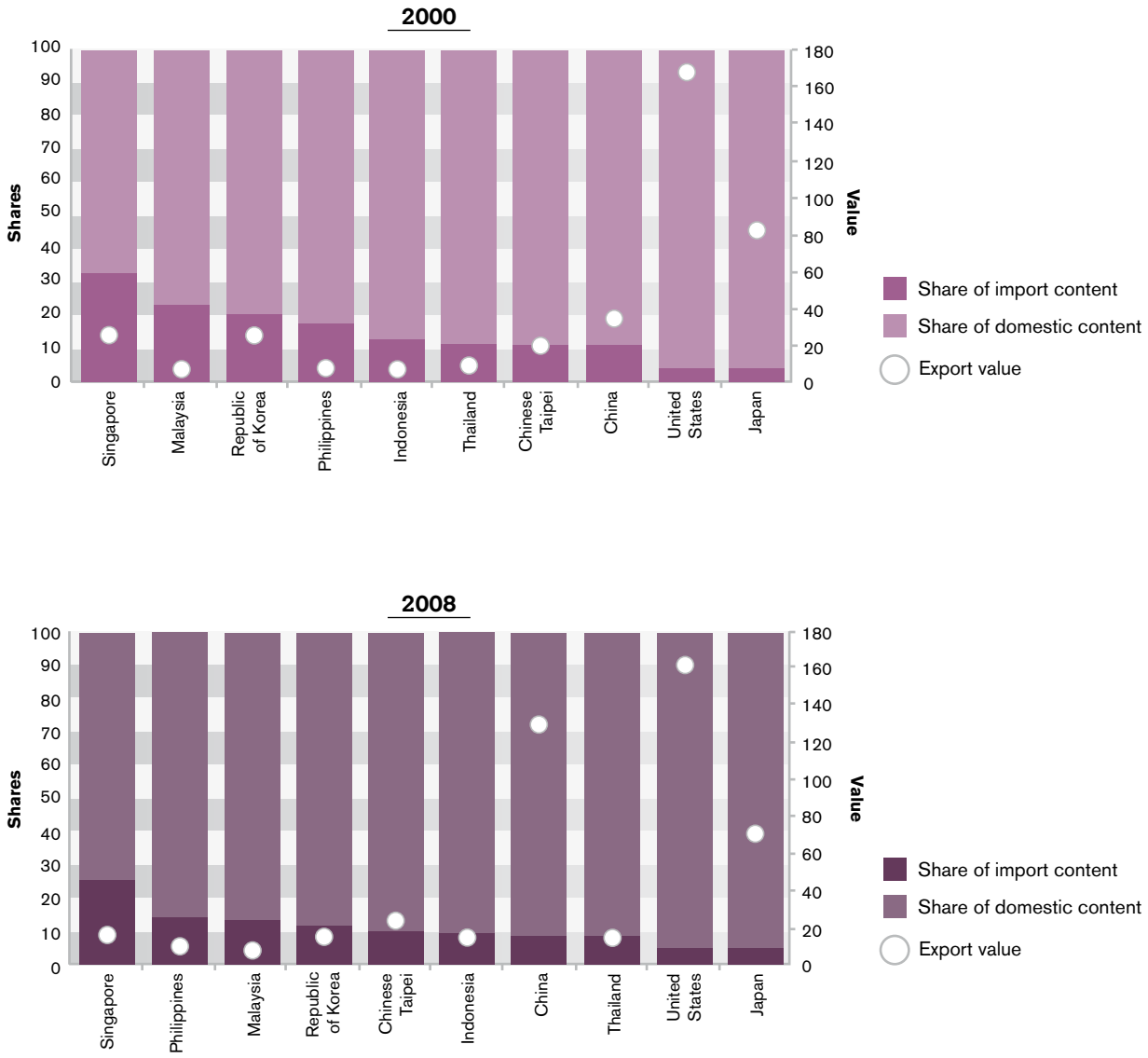


Source: The Asian international input-output table, IDE-JETRO, and WTO estimates.

Figure 7 outlines that the highest increase in the share of import content of exports between 2000 and 2008 was estimated for Japan (from 9 to 17 per cent, an increase of 90 per cent) – though from a low base in comparison to other economies shown. The domestic content shares increased for Indonesia and the Philippines, while the situation stayed quite stable for China. In 2008, the highest shares of import content were observed for Singapore, Thailand and Malaysia.

Figure 8

Trade and transport services: Exports and their domestic and imported contents, 2000 and 2008 (in billions of US$ and percentage)



Source: The Asian international input-output table, IDE-JETRO, and WTO estimates.

As shown in Figure 8, a particularity of the "trade and transport services" sector, noticeable for all the economies displayed, is the high fraction of domestic content in exports, which even increased significantly between 2000 and 2008. Trade (retail and wholesale) and transport-related services remain largely at national level. The production of services is much less organized within international supply chains than is the case for manufactured goods. Singapore's exports of "trade and transport services" showed the highest share of import content. China's exports in this sector more than tripled during the same period to accompany the growth of its output of manufactured goods with complementary services. For China, the share of imported content of exports was only 9 per cent in 2008 (down from 11 per cent in 2000), whereas the respective ratio remained quite stable for the United States at around 5 per cent in both years.

D. Using the value added approach to evaluate bilateral trade balances

In addition to providing another angle for trade analysis, the value added approach raises questions about the relevancy of bilateral trade balances evaluated through traditional statistics.

Bilateral trade balances, and more especially bilateral deficits, are given a prominent role in trade policy. The bilateral trade balance is expressed as the difference between an economy's exports and its imports with another economy. However, the goods exchanged between the two parties, particularly the manufactured ones, may result from international production chains and may have multiple geographical origins. Thus attributing the entire export or import value to the referred partner country is inadequate and affects the analytical relevance of the trade surplus or deficit observed between the two countries.

This can be illustrated with the common example of the US trade deficit vis-à-vis China. The deficit, as currently measured between the two countries, is clearly overstated, as it does not originate only in China, but also in economic partners belonging to the same production chains. By subtracting the estimated import content from conventional trade values, the value added approach enables bilateral transactions to be adjusted in line with the actual values created in the two countries.

The 2005 US-China trade shortfall would have even been cut by more than half, from US$ 218 to US$ 101 billion, if it had been estimated in value added and adjusted for processing trade (see Figure 9). Similarly, in 2008, the US$ 285 billion bilateral deficit would have been reduced by more than 40 per cent. The difference must be attributed to the value added from other economies, such as Japan, the Republic of Korea, Malaysia, etc., embedded in Chinese exports to the United States, as illustrated with the iPhone example below.

Figure 9

United States-China trade balance: Traditional statistics versus value added (VA) terms (in billions of US$)

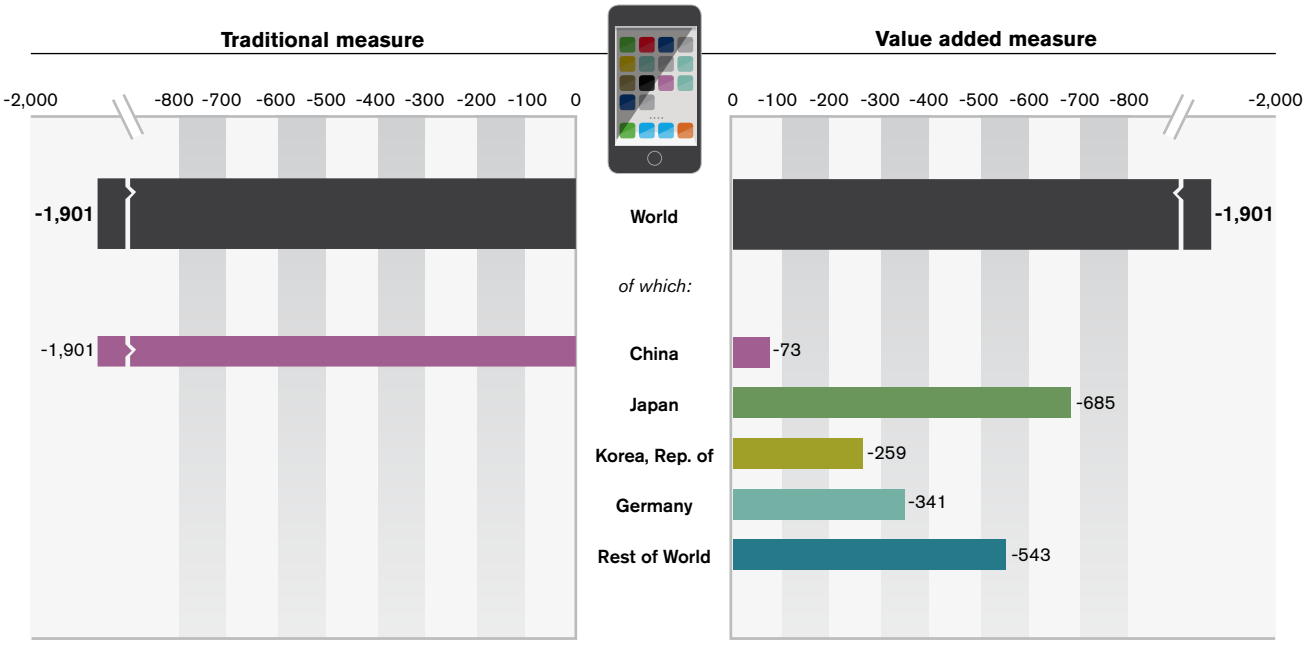
Note: China's processing trade data not available for 2000.

Sources: UN Comtrade Database and WTO estimates.

Figure 10 presents a decomposition of the US trade deficit in iPhones with China by the different countries that contributed to its production.[9] The derived share of China to the US deficit reflects its role as the final assembler in the iPhone production chain and varies tremendously according to the statistical measure retained. Based on the value added estimation, China accounts for less than 4 per cent of the US deficit in iPhones, while Japan, which is not included in the traditional evaluation, accounts for more than 35 per cent of the same deficit. This example also demonstrates that, whatever the statistical method applied, the global trade balance of an economy remains unchanged.

Figure 10

2009 US trade balance in iPhones (in millions of US$)



Source: Meng and Miroudot (2011).

Endnotes

[1] See United Nations (2010).

[2] See Isakson (2007).

[3] See Leontief (1951).

[4] For example, the World Input-Output Database (WIOD) project: see http://www.wiod.org/.

[5] See Maurer and Degain (2010).

[6] The "trade and transport" sector in the AIO table comprises: wholesale and retail trade and transportation. The "other services" sector comprises: telecommunications, finance, insurance, real estate, education and research, medical and health service, restaurants, hotel and other services.

[7] The "computers and electronic equipment" sector in the AIO table comprises: electronic computing equipment, semiconductors and integrated circuits, and other electronics and electronic products.

[8] The "Industrial Machinery" sector in the AIO table comprises: boilers, engines and turbines, general machinery, metal working machinery, specialized machinery.

[9] See Xing and Detert (2010).

X. Cross-regional spillover of economic growth: The territorial impact of global manufacturing in China

- The coastal regions of China, in particular the East Coast and the South Coast, have demonstrated outstanding growth as a result of preferential development policies strongly orientated towards exports.

- These two coastal regions have made a significant contribution to regional development elsewhere, although other regions also played different and specific parts in transferring growth momentum from one to the other.

- The “unbalanced growth” strategy has fostered regional disparities, which have gradually pushed the government to look for more stable and sustainable development models.

Contents

A. Unbalanced economic growth: 1978-1998[1]

In 2010, China became the second-largest economy in the world, surpassing Japan in terms of nominal gross domestic product (GDP). Despite occasional slowdowns, the country has registered a high level of economic growth in the last 30 years or so, since the launch of the Reform and Open-Door Policy in 1978. Its development strategy is based on the "unbalanced" growth model of economist Albert Hirschman, which asserts that "an economy, to lift itself to higher income levels, must and will first develop within itself one or several regional centres of economic strength" (Hirschman, 1958).

Table 1 and Figure 1 present output growth rates in real terms, by region and by industry, over the final 10 years of the "unbalanced growth" period.[2] The output of the whole country rose by 203 per cent during that period, but the speed of growth was quite uneven at the regional level. Two coastal regions, the East Coast and the South Coast, recorded higher average growth (242 per cent and 368 per cent) than other regions, the contrast being especially sharp with regional neighbours, such as the North East (119 per cent) and Central (142 per cent). Comparing by industry, heavy industry and other services registered relatively high average growth (258 per cent and 351 per cent), whereas mining experienced the lowest average growth (58 per cent).

In order to elucidate the "unbalanced" structure of development during the period, Tables 2 and 3 extract from Table 1 the cells with figures exceeding referential rates of growth, which are the "whole country" rates for regional estimates and "all industries" rates for sectoral estimates. Looking at Table 2, two coastal regions, the East Coast and the South Coast, play the leading roles in the growth of almost all industries. The North West also shows strong growth, but this growth largely depends on industries tied to primary products. Table 3 shows that growth in every region is overwhelmingly influenced by heavy industry and other services. Light industry is also important in most regions, although its performance appears to be poor in the North East and North West.

As shown below, the "unbalanced" development strategy was implemented in a way that gave highly preferential treatment to the coastal regions of China. In 1980, the government established special economic zones at Shenzhen, Zhuhai, Shantou and Xiamen, on the South Coast, with investment incentives for foreign-affiliated firms to set up factories there. In 1984, 14 other cities in coastal districts were opened to foreign companies. Hainan, on the South Coast, also became a special economic zone in 1988.

Table 1

Output growth rates by region and by industry, 1987-1997 (percentage)

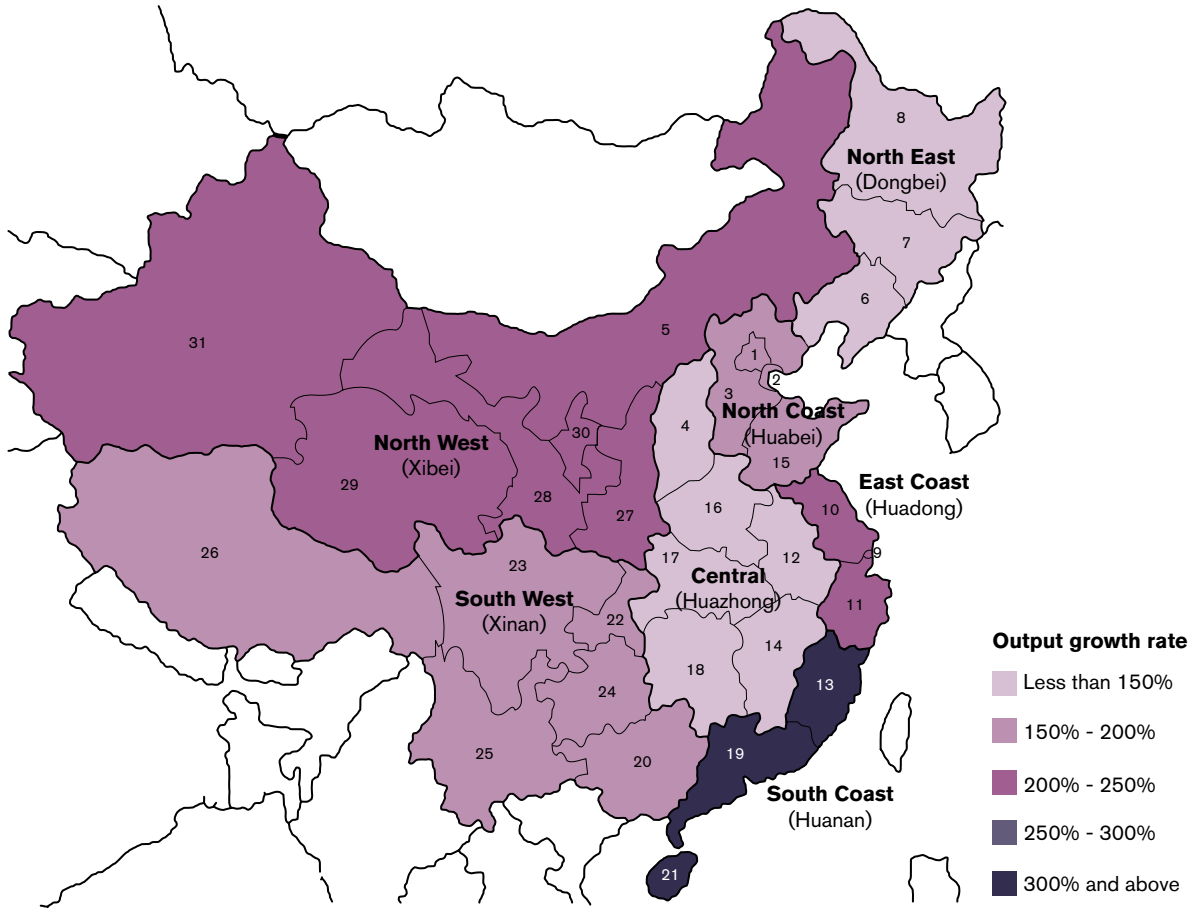
	Agriculture	Mining	Light industry	Energy	Heavy industry	Construction	Transport	Trade	Other services	All industries
North East	131.1	11.3	114.2	53.2	151.5	106.6	79.1	168.8	230.6	**119.3**
North Coast	107.2	56.3	202.0	62.2	261.8	192.8	136.8	136.3	398.0	**193.0**
East Coast	96.3	82.2	259.4	122.9	266.8	258.3	119.4	186.5	525.7	**242.0**
South Coast	126.2	112.8	477.8	287.0	569.3	323.8	368.6	165.9	603.1	**368.1**
Central	79.1	73.3	209.2	82.8	200.4	120.5	121.1	82.5	199.9	**141.7**
North West	181.5	141.9	184.8	144.9	228.2	252.6	251.6	178.2	298.9	**208.7**
South West	118.2	49.5	194.9	81.0	246.4	212.6	129.9	113.7	279.9	**175.9**
Whole country	**108.4**	**58.2**	**234.2**	**100.4**	**258.1**	**197.0**	**152.5**	**141.4**	**351.3**	**203.2**

Note: See Annex 2 for the geographical coverage of each region.

Sources: The Interregional Input-Output Tables of China, IRIO87 (Ichimura and Wang, 2003) and MRIO97 (IDE-JETRO 2003).

Figure 1

Output growth rates, 1987-1997 (percentage)



Note: See Annex 2 for the geographical coverage of each region.

Sources: The Interregional Input-Output Tables of China, IRIO87 (Ichimura and Wang, 2003) and MRIO97 (IDE-JETRO, 2003).[3]

Table 2

Regions with growth higher than "whole country" growth rates, by industry, 1987-1997

	Agriculture	Mining	Light industry	Energy	Heavy industry	Construction	Transport	Trade	Other services	All industries
North East	+							+		
North Coast					+				+	
East Coast		+	+	+	+	+		+	+	+
South Coast	+	+	+	+	+	+	+	+	+	+
Central		+								
North West	+	+		+		+	+	+		+
South West	+					+				
Whole country	///	///	///	///	///	///	///	///	///	///

Note: The "whole country" growth rates and "all industries" growth rates are calculated from official Chinese statistics, from which each of the regional/sectoral breakdowns has been estimated.

Sources: The Interregional Input-Output Tables of China, IRIO87 (Ichimura and Wang, 2003) and MRIO97 (IDE-JETRO 2003) (based on Table 1).

Table 3

Industries with growth higher than "all industries" growth rates, by region, 1987-1997

	Agriculture	Mining	Light industry	Energy	Heavy industry	Construction	Transport	Trade	Other services	All industries
North East	+				+			+	+	///
North Coast			+		+				+	///
East Coast			+		+	+			+	///
South Coast			+		+		+		+	///
Central			+		+				+	///
North West					+	+	+		+	///
South West			+		+	+			+	///
Whole country			+		+				+	///

Note: The "whole country" growth rates and "all industries" growth rates are calculated from official Chinese statistics, from which each of the regional/sectoral breakdowns has been estimated.

Sources: The Interregional Input-Output Tables of China, IRIO87 (Ichimura and Wang, 2003) and MRIO97 (IDE-JETRO 2003) (based on Table 1).

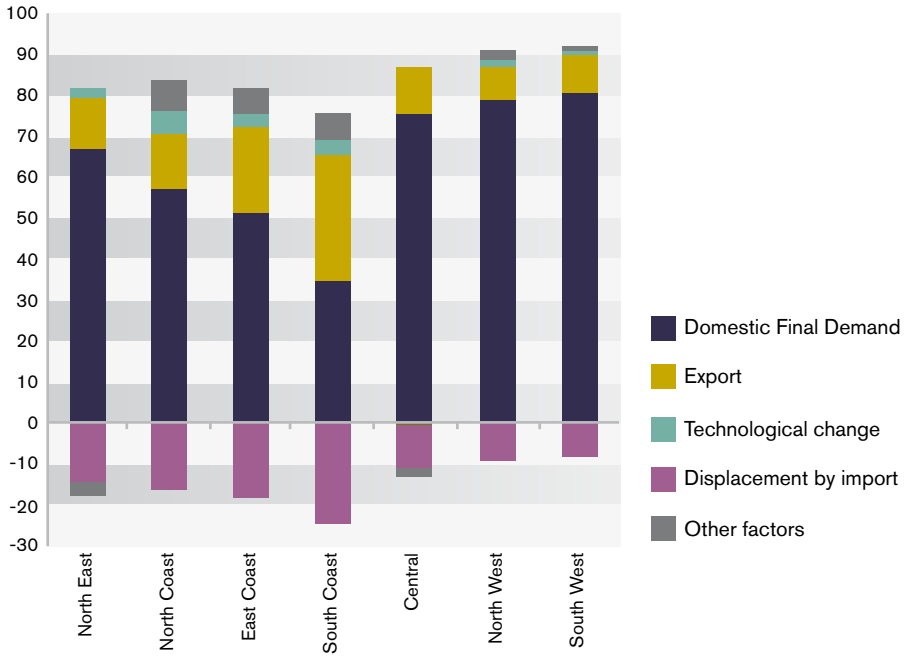
In order to analyse the impact of this preferential development strategy, each of the growth rates in Table 2 is decomposed in terms of the following factors:[4]

1. contribution of domestic final demand, i.e. consumption and investment,
2. contribution of foreign demand, i.e. exports,
3. contribution of changes in production techniques,
4. (negative) contribution of imports through displacement of domestic production, and
5. other unidentified factors.

Figure 2 shows the results of decomposition by region (averaged over industries). In general, domestic final demand is the most dominant factor, though the variation for other factors across the regions warrants close attention. The contribution of foreign demand is significantly higher for coastal regions, particularly for the East Coast and the South Coast, whereas the inland regions, Central, the North West and the South West, are heavily domestic-oriented. Also, the (negative) contribution of imports through the displacement of domestic production presents a clear correlation with the degree of export contribution, meaning that the growth factors for coastal regions are highly foreign-dependent both on the input side (=import) and the output side (=export).

Figure 2

Decomposition of growth factors (percentage)



Sources: The Interregional Input-Output Tables of China, IRIO87 (Ichimura and Wang, 2003) and MRIO97 (IDE-JETRO 2003).

Particularly interesting is the contribution made by changes in production techniques. Again, significantly higher contribution rates are observed among the coastal regions. This indicates that the production techniques of industries in coastal regions have changed more rapidly than in inland regions, helping to accelerate output growth there. This is related to the massive inflow of foreign capital into the special economic zones. As a result of the "Coastal Area Development Strategy" implemented in 1987, more than 90 per cent of foreign firms are concentrated along the coast, and this is considered to have significantly affected industrial production systems there.

The question, however, is to what extent benefits of the outstanding growth of coastal regions have been transferred to, and shared by, other regions, especially the lagging inland regions, as postulated by Hirschman's "unbalanced" development strategy. Table 4 and Figure 3 illustrate the selected channels of cross-regional spillover of regional output growth, with the above-average contribution rates from other regions being highlighted in red numbers (see the technical notes for the calculation method). The main features of the table can be summarized as follows:

1. Two coastal regions, the East Coast and the South Coast, make the largest growth contributions to almost all regions. Also, their mutual influence is quite significant (EC→SC: 6.60 per cent, SC→EC: 6.01 per cent), showing strong economic linkages between them.
2. The East Coast is less affected by the performance of other regions. It is a contributor, rather than a beneficiary, of cross-regional growth spillover. The North Coast is the reverse; it benefits substantially from others yet contributes very little in return, except to the North West (NC→NW: 4.84 per cent).
3. The North West receives its largest contribution from Central (C→NW: 5.47 per cent), as well as feeling a substantial impact from many other regions. This is attributed to the fact that the region is the biggest energy supplier to industries all over the country. In contrast, Central serves as an important transit point for transferring the growth spillover from coastal regions to the remote inner China.
4. As one of the remotest regions, the North East receives the smallest benefits from others. Endowed with rich natural resources of land, energy and forests, the region was called the "industrial cradle of China" in the 1950s and played an important role in the early stages of the country's economic development. It has fostered a well-developed, yet relatively independent, industrial base with a high degree of self-sufficiency. The South West, another remote region, also displays a high degree of independence. Yet this is mainly due to its unfavourable geography and poor transport and communication networks with the rest of the country. The region, however, gains some direct contribution from the East Coast and the South Coast. (EC→SW: 2.79 per cent, SC→SW: 4.78 per cent).

Table 4

Shares of growth contribution from each region, 1987-1997 (percentage)

	North East	North Coast	East Coast	South Coast	Central	North West	South West	Total
North East	95.8	-1.1	2.0	1.1	0.0	1.6	0.8	**100.0**
North Coast	1.6	77.0	**7.9**	**4.5**	**4.1**	**2.7**	2.3	**100.0**
East Coast	1.8	2.0	86.3	**6.0**	1.2	1.3	1.4	**100.0**
South Coast	1.7	1.8	**6.6**	82.4	**3.0**	1.5	**3.1**	**100.0**
Central	1.3	0.8	**8.5**	**6.7**	77.2	2.5	**3.0**	**100.0**
North West	2.2	**4.8**	**4.8**	**3.0**	**5.5**	78.0	1.7	**100.0**
South West	0.7	0.6	**2.8**	**4.8**	1.3	0.6	89.3	**100.0**

Note: The average rate of cross-regional contribution is 2.72, and the number in a cell is highlighted if it exceeds this average, showing important channels of cross-regional growth contribution.

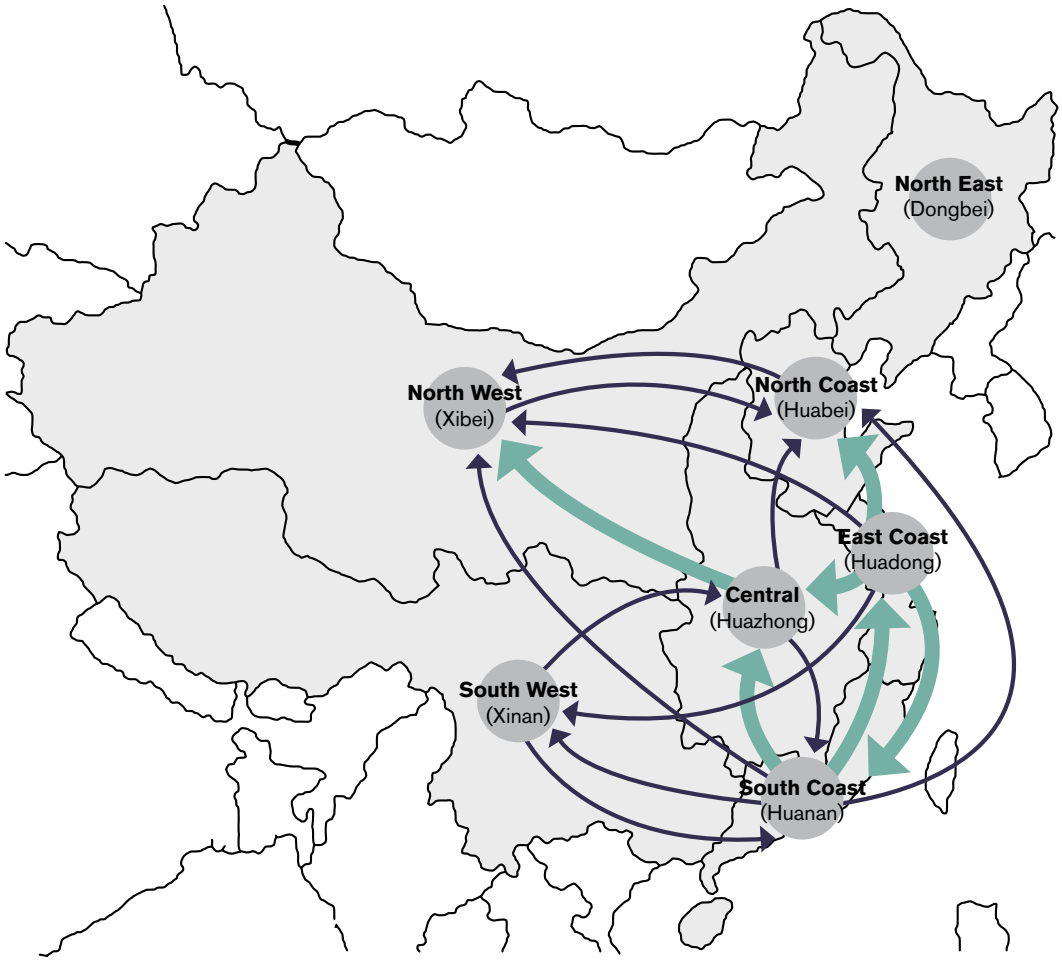
Sources: The Interregional Input-Output Tables of China, IRIO87 (Ichimura and Wang, 2003) and MRIO97 (IDE-JETRO 2003).

B. Rebalancing the regional disparities: 1999 to the present

The rapid development of the coastal regions led to growing regional disparities, especially towards the end of the 1990s. To alleviate the problem, the "Western Regions Development" strategy was launched in 1999, followed by the "Promotion of North-East Region" in 2003. Since then, the development perspective of China has gradually shifted towards one of balanced and sustainable growth.

Figure 3

Selected channels of cross-regional growth spillover (based on Table 4)



Note: Arrows indicate the selected channels with above-average contribution rates of growth spillover. Thicker arrows are assigned to the channels with more than 5% contribution rates.

The global financial crisis provided a further spur to change. In November 2008, the government announced a counter-crisis fiscal package of four trillion yuan (about US$ 520 billion). It was a fiscal commitment on an unprecedented scale, far surpassing the one in 1998 to meet the Asian currency crisis. It was strongly orientated towards promoting the development of inland regions (see Table 5) through rural infrastructure projects, such as the construction of roads, railroads and airports, as well as the supply of cheap houses. Also, substantial amounts (approximately 25 per cent of the total) were allocated for reconstruction in the Sichuan province after the devastating earthquake of 2008.

Figure 4 compares the output loss caused by the crisis with the gain brought by the counter-crisis measures.[5] As for the magnitude of output loss (crisis impact), coastal regions, such as the East Coast and the South Coast, suffered most due to their structural dependence on exports. As for the output gain (policy impact), the impact was felt most in the South-West region, which is unsurprising given the Sichuan reconstruction programme. It is followed by Central, which may have benefited from the South West's expansion thanks to its geographical proximity.

It is disturbing that the net effect on South Coast is negative. This simulation outcome is partly attributed to the magnitude of the impact of the crisis on the coastal regions. But the weakness of the impact of the counter-crisis measures on the South Coast is equally surprising. The export-oriented policies of the "unbalanced growth" strategy, with their aim of promoting the coastal regions, may have created serious structural problems for the South Coast. The region was strategically shaped to be highly foreign-dependent, with poor economic linkages to domestic markets (see Figure 2). As a result, while it has suffered considerably from the world recession, the South Coast may not have been able to benefit sufficiently from the government's massive financial commitment to developing inland regions.[6]

From 2011, the 12th Five-year Plan will be implemented. It emphasizes the importance of structural transformation from an export-dependent architecture to a more harmonious, sustainable economic system geared to domestic consumer demand. The speech of Premier Wen Jiabao on the opening day of the 2011 National People's Congress contained a strong message to reduce income inequality and improve the quality of life. After 30 years of ceaseless growth and expansion, the Chinese economy is at a crossroads.

Table 5

Allocation of four trillion yuan (RMB) fiscal expenditure

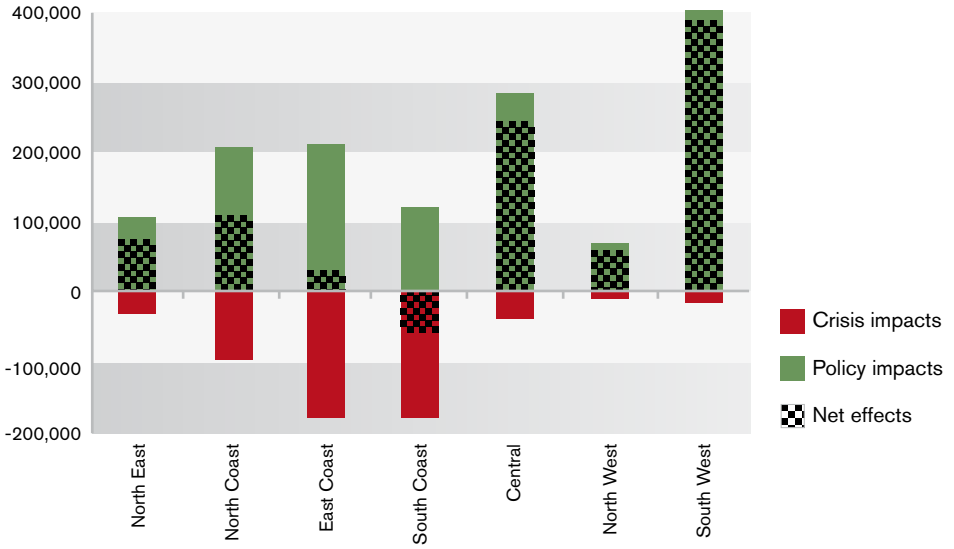
Allocation to:	%
Priority projects on roads, railways, airways, water supply and improvement of city electric networks	**37.5**
Reconstruction of the Sichuan region	**25.0**
Construction of low rent/low-priced housing	**10.0**
Construction of rural infrastructure	**9.3**
Investment in R&D to adjust the industrial structure	**9.3**
Investment in energy-saving, environmental protection and restoring the ecosystem	**5.3**
Investment in health, education, culture and social work	**3.8**

Note: Investment is to be carried out in both 2009 and 2010.

Source: 21st Century Business Herald (in Japanese, 21 Shiji Jingji Baodao), 22 May 2009.

Figure 4

Comparison of crisis and policy impacts (in millions of US$)



Note: Crisis impact is the total value of the simulated amount of output declines from the third quarter of 2008. Policy impact is the additional output resulting from two years' expenditure.

Source: The Transnational Interregional Input-Output Table between China and Japan, 2000, IDE-JETRO.

Endnotes

[1] Much of the analysis in this chapter is based on two previously-written papers: Meng and Qu (2008), and Okamoto and Inomata (2011). The authors are most obliged to Mr. Chao Qu and Mr. Nobuhiro Okamoto for their kind consent to use these works in this study.

[2] The analytical data were converted into real terms using the Grid-Search Method, which was developed by Bo Meng and introduced in Meng and Qu (2008).

[3] The basic layout of the Interregional Input-Output Tables of China is very similar to the Asian International Input-Output Tables constructed by IDE-JETRO (see Annex 3 for a brief description).

[4] See Round (1985), Dietzenbacher and Los (1998), and de Boer (2006) for the technical details of decomposition method.

[5] In order to calculate the effect of China's counter-crisis measure, some assumptions were made in the simulation exercise. The composition of fiscal injection is indicated in Table 5. In particular, 25 per cent of the expenditure is considered to go to the South-West region for the reconstruction of Sichuan province. It is assumed that 40 per cent of the expenditure is to be carried out in 2009 and 60 per cent in 2010.

[6] This outcome is theoretical and limited to the hypothesis stated for the simulation. In particular it does not factor in the rapid recovery of world trade in 2010.

XI. Glossary

Antidumping duty: Duties imposed on goods deemed to be dumped and causing injury to competitors in the importing country. Dumping is any good sold on an export market at below its home cost of production.

Applied duty/Applied tariff: Duty that is actually charged on imports. This can be below the bound duty.

Bilateral trade balance: The difference between an economy's exports and its imports with another economy.

Binding coverage: The percentage of products (or "tariff lines") in a member's list of commitments that are legally committed (or "bound") in the WTO.

Bound duty/Bound tariff: The tariff a WTO member undertakes not to exceed. Once a rate of duty is bound, it may not be raised without compensating the affected parties.

Capital goods: Tangible items used in the production of other goods. Examples include factories, machinery equipment (e.g. computers) and tools.

Commercial services: All services except those provided by a government (i.e. services supplied neither on a commercial basis, nor in competition with one or more service suppliers).

Consumer goods: Goods destined for final consumption by individual households or communities (e.g. food and beverages, video games, recorded CDs and DVDs, sports goods, etc.).

Country of origin: According to the Kyoto Convention in international merchandise trade statistics, the country of origin of a good (for imports) is determined by rules of origin established by each country. Individual countries are free to define origin, but within boundaries set by WTO rules.

Demand chain: The demand chain is seen as the counterpart to the supply chain in the total value chain. It usually comprises the main activities in the context of marketing, sales and customer service. In demand-driven supply chains, research and development are closely linked to marketing.

Domestic content of exports (or domestic value added content of exports): The domestic content of exports measures exports net of imported inputs. It corresponds to the accumulation of the value added created by each of the various domestic sectors that contributed directly or indirectly to the supply chain.

Entrepôt: A port or zone where goods can be imported and exported free of duties, without any additional processing.

Export processing zone: Industrial zone with special incentives to encourage both domestic and foreign firms invest in export-oriented activities.

Final consumption: Final consumption consists of goods and services used up by individual households or the community.

Final demand: Personal expenditures, capital expenditures and public sector expenditures for consumption and investment by resident and non-resident agents.

Fixed assets: Tangible or intangible assets that are produced and then themselves used repeatedly to produce other goods.

Foreign Direct Investment: Investment in foreign assets through joint venture, merger and acquisition, with a long-term perspective. It usually involves an active participation in management from the foreign investor.

Global manufacturing: Production activities in which different steps of the manufacturing process take place in different countries.

Goods for processing: Materials or semi-processed goods belonging to country A which are shipped to country B for transformation and then returned to country A.

Information Technology Agreement: Concluded in 1996, the ITA provides for participants to completely eliminate duties on IT products covered by the accord, including computers and semiconductors.

Input coefficient matrix: The amount of goods and services directly required to produce one unit of output. It is derived from the intermediate transaction matrix of the input-output table by dividing each of the transaction values by the total output of the respective industry.

Input-Output table: Presents all inputs and outputs of an economy's industries, including intermediate transactions, primary inputs, and sales to final users. If the external sector is also described, it is called International Input-Output (II-O) table.

Intermediate goods and services: Tangible and intangible products utilized as inputs in production, excluding fixed assets.

Intermediate transaction matrix: The segment of the Input-Output table that captures the progressive commitment of various industries in which the output of an industry is used as an intermediate input of others. It presents the entire nexus of supply-use relations between producers.

Intra-industry trade: Trade within the same industry.

Most-Favoured Nation (MFN): Key WTO principle that bars signatories from any discrimination in treatment of other members.

Non-tariff measures: Measures, other than ordinary tariffs, that can limit imports. Examples include health regulations or phytosanitary rules. Used interchangeably with the term "non-tariff barrier".

Offshoring: Describes an enterprise's decision to contract the supply of specific goods and services to foreign suppliers. These suppliers can be independent or affiliated firms. Offshore-outsourcing is a special case of outsourcing, when the contractual parties are not resident of the same economy.

Outsourcing: An enterprise's decision to acquire specific inputs and services from an outside (unaffiliated) company, instead of producing them internally.

Production network: A group of interconnected companies involved in the production of goods and/or services.

Re-exports: Exports of foreign goods, in the same state as previously imported.

Re-imports: Imports of domestic goods in the same state as previously exported.

Sanitary and phytosanitary measures: Measures to ensure food safety and animal and plant health.

Self-sufficiency ratio: Expresses the size of production in relation to domestic utilization.

Supply chain: The sequence of steps, often completed in different firms and/or locations, needed to produce a final good.

Tariff Escalation: Raising tariff barriers in line with the degree of processing in any imported good.

Tariff line: A product as defined in lists of tariff rates, based on the most detailed level of disaggregation.

Total input / Total output: The column end of Input-Output tables shows the value of total input, which amounts to the sum of the value of Intermediate input and value added of each industry, and at the row end lies the value of total output, which amounts to the sum of the value of intermediate demand and the value of final demand for each product. In a static framework, it is assumed that total input equals total output, so that the column and row ends for a given industry should match exactly.

Trade in value added: An alternative to the traditional measure of international exchanges in goods and services, adapted to the evolution of global supply chains. Enables the domestic content included in gross export flows to be estimated.

Twenty-foot equivalent unit (TEU): A unit of measurement equal to the volume occupied by a standard 20-foot container.

Value added: The value of output minus the value of all intermediate inputs. It represents the contribution of, and payments to, primary factors of production (wages, profit and taxes).

Value chain (global): The sequence of activities that firms undertake to create value, including the various production steps (supply chain), but also all activities belonging to the demand chain, such as marketing, sales and customer service.

Vertical integration: Completing the different process stages of a product within the same firm, or through establishments related to the same firm.

Vertical specialization: Estimated as the proportion of imported inputs or intermediate goods and services embedded in a country's exports.

Vertical trade: International exchanges of goods and services associated with the sequential operations of global supply chains.

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XIII. Abbreviations and symbols

AIO	Asian input-output
APEC	Asia Pacific Economic Cooperation
ASEAN	Association of Southeast Asian Nations
AFTA	ASEAN Free Trade Area
BEC	broad economic categories
BOP	balance of payments
c.i.f.	cost, insurance and freight
CIS	Community of Independent States
dwt	deadweight tonne
EPR	effective protection rate
EPZ	export processing zone
EU	European Union
EUROSTAT	Statistical Office of the European Communities
FDI	foreign direct investment
f.o.b.	free on board
GDP	gross domestic product
ICT	information and communication technology
IDB	Integrated Database (WTO)
IDE-JETRO	Institute of Developing Economies - Japan External Trade Organization
I-O	input-output
II-O	international input-output
ILO	International Labour Organization
IMF	International Monetary Fund
IMTS	International Merchandise Trade Statistics
ITA	Information Technology Agreement
LDCs	least-developed countries
Marisec	Maritime International Secretariat Services
MFN	most favoured nation
MNE	multinational enterprise
NAFTA	North American Free Trade Agreement
NIE	newly industrialized economies
NTM	non-tariff measure
OECD	Organisation for Economic Co-operation and Development
R&D	research and development
SAARC	South Asian Association for Regional Cooperation
SEZ	special economic zone
TEU	twenty-foot equivalent unit
UNCTAD	United Nations Conference on Trade and Development
UNSD	United Nations Statistics Division
VA	value added
VS	vertical specialization
WIOD	World Input-Output Database
WTO	World Trade Organization

The following symbols are used in this publication:

...	Not available
0	Figure is zero or became zero due to rounding
US$	United States dollars

Billion means one thousand million.

Annex 1
Composition of regions and other economic groupings

North America

Bermuda	Canada	Mexico	United States of America	
Other territories in the region not elsewhere specified				

South and Central America and the Caribbean

Antigua and Barbuda	Brazil	Ecuador	Jamaica	Saint Lucia
Argentina	Chile	El Salvador	Netherlands Antilles	Saint Vincent and the Grenadines
Bahamas	Colombia	Grenada	Nicaragua	Suriname
Barbados	Costa Rica	Guatemala	Panama	Trinidad and Tobago
Belize	Cuba	Guyana	Paraguay	Uruguay
Bolivarian Rep. of Venezuela	Dominica	Haiti	Peru	
Plurinational State of Bolivia	Dominican Republic	Honduras	Saint Kitts and Nevis	
Other territories in the region not elsewhere specified				

Europe

Andorra	Denmark	Iceland	Montenegro	Slovak Republic
Austria	Estonia	Ireland	Netherlands	Spain
Belgium	Finland	Italy	Norway	Sweden
Bosnia and Herzegovina	France	Latvia	Poland	Switzerland
Bulgaria	FYR Macedonia	Liechtenstein	Portugal	Turkey
Croatia	Germany	Lithuania	Romania	United Kingdom
Cyprus	Greece	Luxembourg	Serbia	
Czech Republic	Hungary	Malta	Slovenia	
Other territories in the region not elsewhere specified				

Commonwealth of Independent States (CIS)

Armenia	Georgia	Moldova	Turkmenistan	
Azerbaijan	Kazakhstan	Russian Federation	Ukraine	
Belarus	Kyrgyz Republic	Tajikistan	Uzbekistan	
Other territories in the region not elsewhere specified				

Africa

Algeria	Congo	Guinea	Morocco	South Africa
Angola	Congo, Dem. Rep. of	Guinea-Bissau	Mozambique	Sudan
Benin	Côte d'Ivoire	Kenya	Namibia	Swaziland
Botswana	Djibouti	Lesotho	Niger	Tanzania
Burkina Faso	Egypt	Liberia, Rep. of	Nigeria	Togo
Burundi	Equatorial Guinea	Libya	Rwanda	Tunisia
Cameroon	Eritrea	Madagascar	São Tomé and Principe	Uganda
Cape Verde	Ethiopia	Malawi	Senegal	Zambia
Central African Republic	Gabon	Mali	Seychelles	Zimbabwe
Chad	Gambia	Mauritania	Sierra Leone	
Comoros	Ghana	Mauritius	Somalia	
Other territories in the region not elsewhere specified				

Middle East

Bahrain, Kingdom of	Israel	Lebanese Republic	Saudi Arabia, Kingdom of	Yemen
Iran, Islamic Rep. of	Jordan	Oman	Syrian Arab Republic	
Iraq	Kuwait	Qatar	United Arab Emirates	
Other territories in the region not elsewhere specified				

Asia

Afghanistan	Hong Kong (China)	Malaysia	Papua New Guinea	Tonga
Australia	India	Maldives	The Philippines	Tuvalu
Bangladesh	Indonesia	Mongolia	Samoa	Vanuatu
Bhutan	Japan	Myanmar	Singapore	Viet Nam
Brunei Darussalam	Kiribati	Nepal	Solomon Islands	
Cambodia	Korea, Rep. of	New Zealand	Sri Lanka	
China	Lao People's Dem. Rep.	Pakistan	Chinese Taipei	
Fiji	Macao (China)	Palau	Thailand	
Other territories in the region not elsewhere specified				

ASEAN (Association of Southeast Asian Nations) / AFTA (ASEAN Free Trade Area)

Brunei Darussalam	Lao People's Dem. Rep.	The Philippines	Viet Nam
Cambodia	Malaysia	Singapore	
Indonesia	Myanmar	Thailand	

Developed economies

Andorra	Finland	Lithuania	Spain
Australia	France	Luxembourg	Sweden
Austria	Germany	Malta	Switzerland
Belgium	Greece	Netherlands	United Kingdom
Bermuda	Hungary	New Zealand	United States of America
Bulgaria	Iceland	Norway	
Canada	Ireland	Poland	
Cyprus	Italy	Portugal	
Czech Republic	Japan	Romania	
Denmark	Latvia	Slovak Republic	
Estonia	Liechtenstein	Slovenia	

Developing Asia

Afghanistan	India	Mongolia	Solomon Islands
Bangladesh	Indonesia	Myanmar	Sri Lanka
Bhutan	Kiribati	Nepal	Chinese Taipei
Brunei Darussalam	Korea, Rep. of	Pakistan	Thailand
Cambodia	Lao People's Dem. Rep.	Papua New Guinea	Tonga
China	Maldives	The Philippines	Tuvalu
Fiji	Macao (China)	Samoa	Vanuatu
Hong Kong (China)	Malaysia	Singapore	Viet Nam

Newly Industrialized Economies (NIEs)

Hong Kong (China)	Singapore		
Korea, Rep. of	Chinese Taipei		

APEC Members

Australia	Indonesia	Papua New Guinea	Thailand
Brunei Darussalam	Japan	Peru	United States of America
Canada	Korea, Rep. of	The Philippines	Viet Nam
Chile	Malaysia	Russian Federation	
China	Mexico	Singapore	
Hong Kong (China)	New Zealand	Chinese Taipei	

Developing economies

Afghanistan	Cuba	Lebanon	Rwanda
Albania	Djibouti	Lesotho	Saint Kitts and Nevis
Algeria	Dominica	Liberia, Rep. of	Saint Lucia
American Samoa	Dominican Republic	Libya	Saint Vincent and the Grenadines
Angola	Ecuador	Macao, China	Samoa
Antigua and Barbuda	Egypt	Madagascar	São Tomé and Principe
Argentina	El Salvador	Malawi	Senegal
Aruba	Equatorial Guinea	Malaysia	Serbia
Bahamas	Eritrea	Maldives	Serbia and Montenegro
Bahrain, Kingdom of	Ethiopia	Mali	Seychelles
Bangladesh	Falkland Islands	Marshall Islands	Sierra Leone
Barbados	Fiji	Mauritania	Singapore
Belize	French Polynesia	Mauritius	Solomon Islands
Benin	FYR Macedonia	Mexico	Somalia
Bhutan	Gabon	Micronesia	South Africa
Bolivarian Rep. of Venezuela	Gambia	Mongolia	Sri Lanka
Bolivia, Plurinational State of	Ghana	Montenegro	Sudan
Bosnia and Herzegovina	Grenada	Montserrat	Suriname
Botswana	Guam	Morocco	Swaziland
Brazil	Guatemala	Mozambique	Syrian Arab Republic
British Virgin Islands	Guinea	Myanmar	Chinese Taipei
Brunei Darussalam	Guinea-Bissau	Namibia	Tanzania
Burkina Faso	Guyana	Nauru	Thailand
Burundi	Haiti	Nepal	Timor-Leste, Dem. Rep. of
Cambodia	Honduras	Netherlands Antilles	Togo
Cameroon	Hong Kong (China)	New Caledonia	Tonga
Cape Verde	India	Nicaragua	Trinidad and Tobago
Cayman Islands	Indonesia	Niger	Tunisia
Central African Republic	Iran, Islamic Rep. of	Nigeria	Turkey
Chad	Iraq	Niue	Tuvalu
Chile	Israel	Northern Mariana Islands	Uganda
China	Jamaica	Oman	United Arab Emirates
Colombia	Jordan	Pakistan	Uruguay
Comoros	Kenya	Palau	Vanuatu
Congo	Saudi Arabia, Kingdom of	Panama	Viet Nam
Congo, Dem. Rep. of	Kiribati	Papua New Guinea	Yemen
Cook Islands	Korea, Dem. People's Rep. of	Paraguay	Zambia
Costa Rica	Korea, Rep. of	Peru	Zimbabwe
Côte d'Ivoire	Kuwait	The Philippines	
Croatia	Lao People's Dem. Rep.	Qatar	

Annex 2
Geographical coverage of Chinese regions

Region	Geographical coverage
North East	Liaoning **(6)**, Jilin **(7)**, Heilongjiang **(8)**
North Coast	Beijing **(1)**, Tianjin **(2)**, Hebei **(3)**, Shandong **(15)**
East Coast	Shanghai **(9)**, Jiangsu **(10)**, Zhejiang **(11)**
South Coast	Fujian **(13)**, Guangdong **(19)**, Hainan **(21)**
Central	Shanxi **(4)**, Anhui **(12)**, Jiangxi **(14)**, Henan **(16)**, Hubei **(17)**, Hunan **(18)**
North West	Inner Mongolia **(5)**, Shaanxi **(27)**, Gansu **(28)**, Qinghai **(29)**, Ningxia **(30)**, Xinjiang **(31)**
South West	Guangxi **(20)**, Chongqing **(22)**, Sichuan **(23)**, Guizhou **(24)**, Yunnan **(25)**, Tibet **(26)**

Annex 3

The schematic presentation of the IDE-JETRO Asian International Input-Output (AIO) Table

		Intermediate Demand (A)										Final Demand (F)										Export (L)					
		Indonesia	Malaysia	Philippines	Singapore	Thailand	China	Chinese Taipei	Korea, Rep. of	Japan	United States	Indonesia	Malaysia	Philippines	Singapore	Thailand	China	Chinese Taipei	Korea, Rep. of	Japan	United States	Export to India	Export to Hong Kong (China)	Export to EU	Export to R.O.W.	Statistical Discrepancy	Total Outputs
	code	(AI)	(AM)	(AP)	(AS)	(AT)	(AC)	(AN)	(AK)	(AJ)	(AU)	(FI)	(FM)	(FP)	(FS)	(FT)	(FC)	(FN)	(FK)	(FJ)	(FU)	(LG)	(LH)	(LO)	(LW)	(QX)	(XX)
Indonesia	(AI)	A^{II}	A^{IM}	A^{IP}	A^{IS}	A^{IT}	A^{IC}	A^{IN}	A^{IK}	A^{IJ}	A^{IU}	F^{II}	F^{IM}	F^{IP}	F^{IS}	F^{IT}	F^{IC}	F^{IN}	F^{IK}	F^{IJ}	F^{IU}	L^{IG}	L^{IH}	L^{IO}	L^{IW}	Q^{I}	X^{I}
Malaysia	(AM)	A^{MI}	A^{MM}	A^{MP}	A^{MS}	A^{MT}	A^{MC}	A^{MN}	A^{MK}	A^{MJ}	A^{MU}	F^{MI}	F^{MM}	F^{MP}	F^{MS}	F^{MT}	F^{MC}	F^{MN}	F^{MK}	F^{MJ}	F^{MU}	L^{MG}	L^{MH}	L^{MO}	L^{MW}	Q^{M}	X^{M}
Philippines	(AP)	A^{PI}	A^{PM}	A^{PP}	A^{PS}	A^{PT}	A^{PC}	A^{PN}	A^{PK}	A^{PJ}	A^{PU}	F^{PI}	F^{PM}	F^{PP}	F^{PS}	F^{PT}	F^{PC}	F^{PN}	F^{PK}	F^{PJ}	F^{PU}	L^{PG}	L^{PH}	L^{PO}	L^{PW}	Q^{P}	X^{P}
Singapore	(AS)	A^{SI}	A^{SM}	A^{SP}	A^{SS}	A^{ST}	A^{SC}	A^{SN}	A^{SK}	A^{SJ}	A^{SU}	F^{SI}	F^{SM}	F^{SP}	F^{SS}	F^{ST}	F^{SC}	F^{SN}	F^{SK}	F^{SJ}	F^{SU}	L^{SG}	L^{SH}	L^{SO}	L^{SW}	Q^{S}	X^{S}
Thailand	(AT)	A^{TI}	A^{TM}	A^{TP}	A^{TS}	A^{TT}	A^{TC}	A^{TN}	A^{TK}	A^{TJ}	A^{TU}	F^{TI}	F^{TM}	F^{TP}	F^{TS}	F^{TT}	F^{TC}	F^{TN}	F^{TK}	F^{TJ}	F^{TU}	L^{TG}	L^{TH}	L^{TO}	L^{TW}	Q^{T}	X^{T}
China	(AC)	A^{CI}	A^{CM}	A^{CP}	A^{CS}	A^{CT}	A^{CC}	A^{CN}	A^{CK}	A^{CJ}	A^{CU}	F^{CI}	F^{CM}	F^{CP}	F^{CS}	F^{CT}	F^{CC}	F^{CN}	F^{CK}	F^{CJ}	F^{CU}	L^{CG}	L^{CH}	L^{CO}	L^{CW}	Q^{C}	X^{C}
Chinese Taipei	(AN)	A^{NI}	A^{NM}	A^{NP}	A^{NS}	A^{NT}	A^{NC}	A^{NN}	A^{NK}	A^{NJ}	A^{NU}	F^{NI}	F^{NM}	F^{NP}	F^{NS}	F^{NT}	F^{NC}	F^{NN}	F^{NK}	F^{NJ}	F^{NU}	L^{NG}	L^{NH}	L^{NO}	L^{NW}	Q^{N}	X^{N}
Korea, Rep. of	(AK)	A^{KI}	A^{KM}	A^{KP}	A^{KS}	A^{KT}	A^{KC}	A^{KN}	A^{KK}	A^{KJ}	A^{KU}	F^{KI}	F^{KM}	F^{KP}	F^{KS}	F^{KT}	F^{KC}	F^{KN}	F^{KK}	F^{KJ}	F^{KU}	L^{KG}	L^{KH}	L^{KO}	L^{KW}	Q^{K}	X^{K}
Japan	(AJ)	A^{JI}	A^{JM}	A^{JP}	A^{JS}	A^{JT}	A^{JC}	A^{JN}	A^{JK}	A^{JJ}	A^{JU}	F^{JI}	F^{JM}	F^{JP}	F^{JS}	F^{JT}	F^{JC}	F^{JN}	F^{JK}	F^{JJ}	F^{JU}	L^{JG}	L^{JH}	L^{JO}	L^{JW}	Q^{J}	X^{J}
United States	(AU)	A^{UI}	A^{UM}	A^{UP}	A^{US}	A^{UT}	A^{UC}	A^{UN}	A^{UK}	A^{UJ}	A^{UU}	F^{UI}	F^{UM}	F^{UP}	F^{US}	F^{UT}	F^{UC}	F^{UN}	F^{UK}	F^{UJ}	F^{UU}	L^{UG}	L^{UH}	L^{UO}	L^{UW}	Q^{U}	X^{U}
Freight and Insurance	(BF)	BA^{I}	BA^{M}	BA^{P}	BA^{S}	BA^{T}	BA^{C}	BA^{N}	BA^{K}	BA^{J}	BA^{U}	BF^{I}	BF^{M}	BF^{P}	BF^{S}	BF^{T}	BF^{C}	BF^{N}	BF^{K}	BF^{J}	BF^{U}						
Import from India	(CG)	A^{GI}	A^{GM}	A^{GP}	A^{GS}	A^{GT}	A^{GC}	A^{GN}	A^{GK}	A^{GJ}	A^{GU}	F^{GI}	F^{GM}	F^{GP}	F^{GS}	F^{GT}	F^{GC}	F^{GN}	F^{GK}	F^{GJ}	F^{GU}						
Import from Hong Kong (China)	(CH)	A^{HI}	A^{HM}	A^{HP}	A^{HS}	A^{HT}	A^{HC}	A^{HN}	A^{HK}	A^{HJ}	A^{HU}	F^{HI}	F^{HM}	F^{HP}	F^{HS}	F^{HT}	F^{HC}	F^{HN}	F^{HK}	F^{HJ}	F^{HU}						
Import from EU	(CO)	A^{OI}	A^{OM}	A^{OP}	A^{OS}	A^{OT}	A^{OC}	A^{ON}	A^{OK}	A^{OJ}	A^{OU}	F^{OI}	F^{OM}	F^{OP}	F^{OS}	F^{OT}	F^{OC}	F^{ON}	F^{OK}	F^{OJ}	F^{OU}						
Import from the R.O.W.	(CW)	A^{WI}	A^{WM}	A^{WP}	A^{WS}	A^{WT}	A^{WC}	A^{WN}	A^{WK}	A^{WJ}	A^{WU}	F^{WI}	F^{WM}	F^{WP}	F^{WS}	F^{WT}	F^{WC}	F^{WN}	F^{WK}	F^{WJ}	F^{WU}						
Duties and Import Commodity Taxes	(DT)	DA^{I}	DA^{M}	DA^{P}	DA^{S}	DA^{T}	DA^{C}	DA^{N}	DA^{K}	DA^{J}	DA^{U}	DF^{I}	DF^{M}	DF^{P}	DF^{S}	DF^{T}	DF^{C}	DF^{N}	DF^{K}	DF^{J}	DF^{U}						
Value Added	(VV)	V^{I}	V^{M}	V^{P}	V^{S}	V^{T}	V^{C}	V^{N}	V^{K}	V^{J}	V^{U}																
Total Inputs	(XX)	X^{I}	X^{M}	X^{P}	X^{S}	X^{T}	X^{C}	X^{N}	X^{K}	X^{J}	X^{U}																

Valued at producer's price (rows Indonesia to United States)

International freight and insurance on the trade between member countries (A**, F**) (row BF)

Valued at C.I.F (rows CG to CW)

Import duties and import commodity taxes levied on all trade (row DT)

* Each cell of A** and F** represents a matrix of 76 x 76 and 76 x 4 dimension, respectively.

In a column-wise direction, each cell in the table shows the input compositions of industries of a respective country. $\mathbf{A}^{II}$ for example shows the input compositions of Indonesian industries vis-à-vis domestically produced goods and services, i.e. domestic transactions of Indonesia. A^{MI} in contrast shows the input composition of Indonesian industries for imported goods and services from Malaysia. The cells $\mathbf{A}^{PI}$, $\mathbf{A}^{SI}$, $\mathbf{A}^{TI}$, $\mathbf{A}^{CI}$, $\mathbf{A}^{NI}$, $\mathbf{A}^{KI}$, $\mathbf{A}^{JI}$, $\mathbf{A}^{UI}$, $\mathbf{A}^{GI}$, $\mathbf{A}^{HI}$, $\mathbf{A}^{OI}$, $\mathbf{A}^{WI}$ allow the same interpretation for the imports from other countries.

BA and **DA** give international freight and insurance and taxes on these import transactions.

Turning to the 11[th] column from the left side of the table, it shows the compositions of goods and services that have gone to final demand sectors of Indonesia. $\mathbf{F}^{II}$ and $\mathbf{F}^{MI}$, for example, maps the inflow into Indonesian final demand sectors, of goods and services domestically produced and of those imported from Malaysia, respectively. The rest of the column is read in the same manner as the 1[st] column of the table.

$\mathbf{L}^{*G}$, $\mathbf{L}^{*H}$, $\mathbf{L}^{*O}$, $\mathbf{L}^{*W}$ are exports (vectors) to India, Hong Kong (China), EU and the rest of the world.

Vs and **X**s are value added and total input/output, as seen in the conventional national I-O table.

Annex 4
Visualization of supply chains

The conventional approach to this type of study is the linkage analysis, which generally seeks to measure the "strength" of interconnectedness among industries, as discussed in Chapter VI. The magnitude of backward and/or forward linkages is calculated between countries, using the Leontief/Ghosh inverse matrix of an international input-output table. In Chapter VII, however, a new perspective for the evaluation of cross-border production networks was introduced employing the input-output model of Average Propagation Lengths (Dietzenbacher et al. 2005).

Average Propagation Lengths (APL) is defined as:

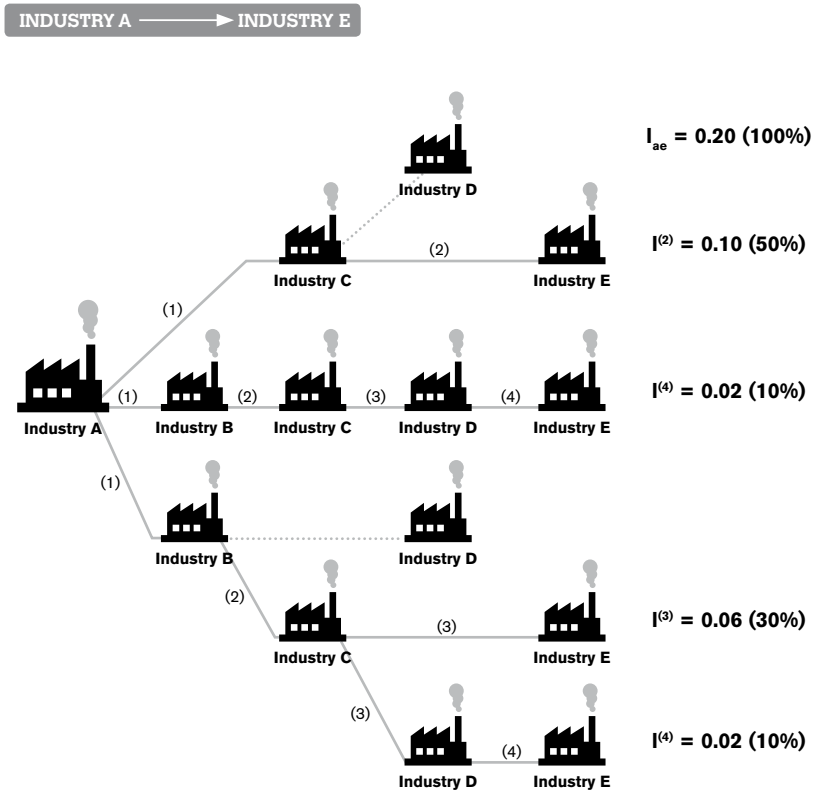
$$v_{ij} = 1*a_{ij} / (I_{ij} - \delta_{ij}) + 2*[A^2]_{ij} / (I_{ij} - \delta_{ij}) + 3*[A^3]_{ij} / (I_{ij} - \delta_{ij}) + \ldots$$
$$= \sum_{k=1}^{\infty} k \left([A^k]_{ij} / \sum_{k=1}^{\infty} [A^k]_{ij} \right)$$

where A is an input coefficient matrix, a_{ij} is its element, I_{ij} is a Leontief inverse coefficient, δ_{ij} is a Kronecker delta which is $\delta_{ij} = 1$ if i = j and $\delta_{ij} = 0$ otherwise, and k is a number of production stages along the path. We also define $v_{ij} = 0$ when $(I_{ij} - \delta_{ij}) = 0$.

The first term in the right-hand side of the upper equation shows that the impact delivered through one-step paths (k=1), i.e. direct impact, amounts to an $a_{ij} / (I_{ij} - \delta_{ij})$ share of the total impact given by the Leontief inverse coefficient (less unity for diagonal elements). Similarly, two-step paths (k=2) contribute an $[A^2]_{ij} / (I_{ij} - \delta_{ij})$ share, and three-step paths (k=3) an $[A^3]_{ij} / (I_{ij} - \delta_{ij})$ share of the total impact. This is evident from $L = I + A + A^2 + A^3 + \ldots$ (L: the Leontief inverse matrix) which is rearranged as $L - I = A + A^2 + A^3 + \ldots$, and hence $(L - I)_{ij} = A_{ij} + [A^2]_{ij} + [A^3]_{ij} + \ldots$

As an illustrative example, consider the following hypothetical supply chain:

Calculation of APL



Source: IDE-JETRO.

When the share of an impact for each path is calculated as given at the ends of the branches, the APL between Industry A and Industry E is derived as:

$$v_{ea} = 1 \times 0\% + 2 \times 50\% + 3 \times 30\% + 4 \times (10+10)\% + 5 \times 0\% + \ldots = 2.7.$$

That is, APL is formulated as a weighted average of the number of production stages in which an impact from industry j goes through until it ultimately reaches industry i, using the share of an impact at each stage as a weight. It represents the average number of production blocks lining up in every branch of all the supply chains, or, in short, an industry's level of fragmentation.

Using these two types of information, namely, the "length" and "strength" of linkages, the supply chains can be visualized as per the following example. Table 1 shows the cross-national APL of Asia-US region in 1985, by country of origin (the left column) and country of destination (the top row). The values of APL were first calculated at the level of seven industrial sectors, and then aggregated into one sector per country by taking weighted averages with output shares as weights.

Table 1

APL in the Asia-US region, 1985

	China	Indonesia	Japan	Korea, Rep. of	Malaysia	Chinese Taipei	Philippines	Singapore	Thailand	United States
China		3.45	3.21	4.55	3.09	4.59	2.80	2.72	2.97	3.27
Indonesia	3.33		3.27	3.23	3.05	3.35	2.67	2.67	3.19	3.26
Japan	3.84	3.48		3.74	3.35	3.90	3.57	3.39	3.52	3.76
Korea, Rep. of	5.24	3.18	3.35		3.09	3.63	3.09	3.01	3.35	3.45
Malaysia	3.41	3.19	3.30	3.27		3.30	2.59	2.48	2.85	3.20
Chinese Taipei	3.70	3.16	3.32	3.63	3.14		3.27	3.00	3.29	3.37
Philippines	3.39	3.05	3.41	3.33	2.83	3.45		2.87	3.02	3.22
Singapore	3.33	2.44	3.10	3.15	2.60	3.28	2.97		2.80	3.09
Thailand	3.43	2.91	3.46	3.48	2.74	3.45	3.04	2.74		3.18
United States	3.82	3.26	3.74	3.62	3.44	3.68	3.40	3.34	3.30	

Source: The Asian International Input-Output Table, 1985, IDE-JETRO.

The "strength" of linkages, as defined in a technical note in Annex 5, is then referred to. If the strength of linkage is less than 0.018, this particular supply chain is omitted from the picture, resulting in a blank cell in the APL table. If, on the other hand, the strength registers as being more than 0.025, this supply chain is considered as a cardinal path, which is translated as a bold number in a highlighted cell. The result of the operation gives the following new APL table. Note that we only consider cross-border linkages, or off-diagonals, and that the values have been rounded up into integers.

Table 2

Screened-out Average Propagation Lengths in the Asia-US region, 1985

	China	Indonesia	Japan	Korea, Rep. of	Malaysia	Chinese Taipei	Philippines	Singapore	Thailand	United States
China								3		
Indonesia			3							
Japan										
Korea, Rep. of										
Malaysia			3					**2**		
Chinese Taipei										
Philippines										
Singapore					3					
Thailand										
United States										

Source: The Asian International Input-Output Table, 1985, IDE-JETRO.

The information given in Table 2 is mapped into the diagram in Figure 1 of Chapter VII as the supply chains among Indonesia, Japan, Malaysia and Singapore in the case of the year 1985.

Annex 5
Other technical notes

Industrial specialization of countries

Industrial specialization is measured by a deviation of output share of an industry from the average of output share of that industry across the countries, or more specifically:

$$IS_i^r = \frac{x_i^r / \sum_i x_i^r}{\sum_r (x_i^r / \sum_i x_i^r) / n}$$

where x_i^r is the output of industry i in country r, and n is the number of countries in the region. This measurement is advantageous over the conventional Location Quotient (LQ) since it avoids the overwhelming size effect of large economies (like the United States) on the industrial structure of the region.

Strength of linkages

The "strength" of linkages is formulated as a simple element-to-element average of Leontief inverse coefficients (less unity for diagonals) and Ghosh inverse coefficients (less unity for diagonals), or $\{(l_{ij} - \delta_{ij}) + (g_{ij} - \delta_{ij})\}/2$, where l_{ij} is a Leontief inverse coefficient, g_{ij} is a Ghosh inverse coefficient, and δ_{ij} is a Kronecker delta which is $\delta_{ij}=1$ if $i=j$ and $\delta_{ij}=0$ otherwise.

The values were first calculated at the level of seven industrial sectors, and then aggregated into one sector per country by taking weighted averages with output shares as weights.

Cross-border transfer of employment opportunities

The sectoral employment of each country generated by the final demands of its trade partners can be calculated in the following form:

$$Emp^{rs} = \hat{E}^r \; L^{rs} \; y^s$$

where $\hat{E}^r$ is a diagonal matrix with employment coefficients (the number of workers required in order to produce one unit of output) of country r in its corresponding diagonal elements and zeros elsewhere, L^{rs} is the international Leontief inverse matrix, and y^s is a final demand vector of country s (= a trade partner).

Cross-border transfer of value added

Transfer of value added from country s to country r can be defined as follows:

$$TVA^{rs} = u' \hat{V}^r \; L^{rs} \; y^s$$

where $\hat{V}^r$ is a diagonal matrix with value-added coefficients of country r in its corresponding diagonal elements and zeros elsewhere, L^{rs} is the international Leontief inverse matrix, y^s is a final demand vector of country s, and u is a summation vector. The calculated results are then standardized by taking a deviation of each country's total figure from the regional grand average, to give indices of value-added gain and give-out potentials.

Decomposition of growth contribution by origins

Consider a three-region I-O model as given as follows:

$x = (I - A)^{-1}\ y = L\ y$

where x, A, y and L are, respectively, a vector of output, a matrix of interregional input coefficients, a vector of final demand, and a matrix of the interregional Leontief inverse. They are defined in the following forms:

$$x = \begin{pmatrix} x^1 \\ x^2 \\ x^3 \end{pmatrix},\ A = \begin{pmatrix} A^{11} & A^{12} & A^{13} \\ A^{21} & A^{22} & A^{23} \\ A^{31} & A^{32} & A^{33} \end{pmatrix},\ y = \begin{pmatrix} y^1 \\ y^2 \\ y^3 \end{pmatrix},\ L = \begin{pmatrix} L^{11} & L^{12} & L^{13} \\ L^{21} & L^{22} & L^{23} \\ L^{31} & L^{32} & L^{33} \end{pmatrix} = (I - A)^{-1}$$

where $x^1 = (x_1^1, x_2^1, \ldots, x_n^1)'$ represents the output vector of region 1 with n sectors, and **I** is an identity matrix with a dimension of 3n x 3n.

Then the outputs of region 1 in the base year (0) and target year (t) can be given as follows.

$$x^1(0) = L^{11}(0)\ y^1(0) + L^{12}(0)\ y^2(0) + L^{13}(0)\ y^3(0)$$

$$x^1(t) = (L^{11}(0) + \Delta L^{11})(y^1(0) + \Delta y^1) + (L^{12}(0) + \Delta L^{12})(y^2(0) + \Delta y^2) + (L^{13}(0) + \Delta L^{13})(y^3(0) + \Delta y^3)$$

Using the two equations above, the output growth rate of region 1 can be written as:

$$\begin{aligned} [\Delta x^1]_i / [x^1(0)]_i &= \left[\left(x^1(t) - x^1(0)\right)\right]_i / [x^1(0)]_i \quad (i = 1, 2, 3, \ldots, n) \\ &= [(L^{11}(0)\ \Delta y^1 + L^{12}(0)\ \Delta y^2 + L^{13}(0)\ \Delta y^3)]_i / [x^1(0)]_i \\ &\quad + \left[\left(\Delta L^{11}\ y^1(0) + \Delta L^{12}\ y^2(0) + \Delta L^{13}\ y^3(0)\right)\right]_i / [x^1(0)]_i \\ &\quad + [(\Delta L^{11}\ \Delta y^1 + \Delta L^{12}\ \Delta y^2 + \Delta L^{13}\ \Delta y^3)]_i / [x^1(0)]_i \end{aligned}$$

in which the output growth of region 1 is decomposed into the contribution of its own domestic demand (Δy^1), of the demand from region 2 (Δy^2), and of the demand from region 3 (Δy^3), and corresponding technical changes (ΔL^{11}, ΔL^{12}, ΔL^{13}).

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The increasing internationalization of supply chains is challenging our interpretation of conventional trade statistics, as traditional concepts like country of origin, or the distinction between goods and services, become blurred.

This publication, jointly produced by the WTO and IDE-JETRO, focuses on the factors that have helped to shape global production. Starting with demand, it describes how a changing economic environment has contributed to the phenomenon of global production. Infrastructure services, tariffs, foreign direct investment, cheaper technology and lower transportation costs have all affected the trading environment and the international exchange of goods, fostering increased market access, amplifying cross-border links between companies and causing trade in intermediate goods to increase. This publication considers the effect of these factors on international production networks, with a particular focus on "Factory Asia". It also shows how the development and evolution of these production networks has promoted economic growth and employment in Asia.

A new statistical measurement – trade in value added – is proposed to complement conventional trade statistics for a deeper and more comprehensive analysis of trade patterns. This methodology offers a new perspective for trade analysts, as it dramatically re-evaluates the importance of some economies as "countries of origin".

The "Made in the World" initiative has been launched by the WTO to support the exchange of projects, experiences and practical approaches in measuring and analysing trade in value added.
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