4

Unfolding Industry Dynamics in East and South Asia

Since 2001, developments including the ascent of China, the improved long-term potential of the Indian economy, the growth of intraregional trade in Asia, and the declining share of the United States in the exports of East Asian economies induced many to believe that, in spite of ongoing globalization, the Asian countries were decoupling from the United States. This view gained adherents, although the growth of the U.S. economy and the expanding U.S. trade deficit meant that in 2005 the United States absorbed close to 16 percent of total world imports, against 18.4 percent in 2000 and 14.2 percent in 1995. With more than a third of the global growth contributed by China and India between 2005 and 2007, China came to be viewed as an economic force comparable to the United States. Initial worries that Chinese firms would erode the exports of other Asian countries eased somewhat once other East and Southeast Asian countries found that their exports to China were growing. The threat from China's textile exports following China's accession to the World Trade Organization (WTO) also proved to be less acute than other Asian countries—particularly South Asian ones—had anticipated.[1] China's textile exports rose steeply after 2003, but worldwide demand and product diversification by other exporters enabled firms in Pakistan, Bangladesh, and Sri Lanka to cushion the shock. The emergency protections against Chinese imports provided by the United States and European Union also helped to create some breathing room for these countries. Southeast Asian countries found that they were able to achieve mutually acceptable trading relations with China,

[1]Yang (2006) observed that following China's accession to the WTO, China's impact on other Asian countries would be mainly with respect to trade in textiles, garments, and electronics. Writing in 2004, Eichengreen, Rhee, and Tong stated that export competition from China would be strongest in light manufactures and processed commodities. But China's growth would generate strong demand for capital equipment and components from high-income countries, principally Japan, the Republic of Korea, and the United States.

thanks to the intermediation of production networks dominated by multinational corporations (MNCs). While China focused more on final assembly of electronics, electrical engineering, telecommunications, and office equipment,[2] the Southeast Asian countries concentrated on producing and exporting assembled, packaged, and tested electronic components to China. Primary producers such as Malaysia and Indonesia also benefited from the demand for wood products, minerals, and tree crops. Japan, the Republic of Korea, and Taiwan, China, exported capital equipment, high-value components, and transport equipment. All of these countries also gained from the import of low-priced final goods from China, courtesy of China's productivity gains and competitive suppliers.

With the global economy and trade growing by 3.8 and 7.5 percent, respectively, in 2007 (see table 4.1)—rates without precedent—there were few clouds on the horizon, and those few appeared distant. Worries over the subprime mortgage market in the United States, which began surfacing in late 2007 and spread in early 2008, did not dispel the optimism about the basic health of the global economy until almost the middle of 2008. According to a *World Economic Outlook* (WEO) forecast in the summer of 2008, the International Monetary Fund still pegged global growth at 3.7 percent. By the fourth quarter of 2008, when the full magnitude of the global recession became apparent, forecasters quickly realized that their recent projections for 2008 and 2009 were wildly optimistic and based on questionable assumptions.

First and foremost was the convenient assumption that rapid economic growth could be sustained indefinitely by bubbles in key sectors in major economies. Warnings of the threat of asset bubbles had been aired since 2005, but policy makers in Western countries pinned their hopes on the efficiency of markets, capitalized on the benefits, and bravely underplayed the risks—as did financial institutions. Across much of Asia, governments felt confident that they could easily cope with a temporary squall, because in reaction to the crisis of 1997–98, several East Asian countries had accumulated vast reserves of foreign exchange.[3] Most

Table 4.1 Global GDP and Trade Growth
% annual growth

	2004	2005	2006	2007
World GDP	4.1	3.5	4.0	3.8
World trade	10.4	7.8	9.8	7.5
Low- and middle-income countries' GDP	7.5	6.9	7.7	8.1

Source: World Development Indicators Database; World Bank 2009.

[2]Steinfeld (2004) refers to the shallow integration of Chinese firms in production networks.

[3]The accumulation of resources by Asian countries which extend credit to foreign buyers to purchase Asian exports raises tradable output and can have a positive effect on productivity gains from technology absorption and learning by doing. However, it has a cost in terms of deferred consumption (Korinek and Serven 2010).

also were comfortable with their macroeconomic circumstances and growth momentum, and downplayed concerns over the likelihood of a major financial meltdown in the United States.

Second, policy makers had lulled themselves into believing that they could gently deflate bubbles and achieve a soft landing with the help of tested policy instruments. The advanced countries were more confident than the industrializing economies because their markets were supposedly deeper, more resilient, and inherently self-equilibrating. Thus, it was widely believed in 2007–08 that the subprime mortgage problem could be contained. When it began to spread and to take on crisis proportions in the United States, other countries continued to pin their hopes on the decoupling hypothesis, underestimating their dependence on trade with the United States and exposure to its financial markets.[4] These convenient assumptions were dashed when the numerous overlapping strands of globalization conveyed and magnified the shock from the U.S. financial markets to the rest of the world—and from financial markets to the real sector, first in the United States and then in the European Union and other industrializing economies. Virtually no country or major sector was spared.

Third, the prominence of the U.S. economy in an integrated world environment was reaffirmed. Other economies such as the European Union, Japan, and China were revealed as having neither the growth momentum, the share of trade, nor the economic weight to serve as an adequate counterweight to the United States.[5] China, with 8 percent of world trade in 2008, was not a large enough player; the European Union, although large, was too enmeshed with the U.S. economy, its own banks far too exposed to U.S. housing and real estate markets and overall too fiscally conservative to play an autonomous role in a strongly countercyclical manner.[6]

Fourth, the contribution of financial development and innovation to efficient allocation of resources, productivity, and growth that had been gaining prominence was abruptly called into question. Suddenly, doubts arose as to whether it was healthy for the U.S. economy to derive 8 percent of GDP and 40 percent of corporate profits from the financial sector. The crisis raised questions as to the allocative capabilities of financial entities and the consequences for economies, both advanced and industrializing, of the increasing concentration of highly talented

[4]Clearly, trade and financial decoupling lagged far behind the levels assumed in popular belief and casual empiricism. See Dooley and Hutchison (2009); Eichengreen and others (2009); Kose, Otrok, and Prasad (2008); and Levy-Yeyati (2009).

[5]Moreover, East Asia's export dependency on North America and the EU is high—overall 9 percent of East Asian GDP was dependent on exports to the former and 7.4 percent to the latter (Cohen-Setton and Pisani-Ferry 2008).

[6]This fiscal conservatism was reinforced during 2010 by the crisis that engulfed Greece and imperiled the Euro.

people in privately lucrative financial activities with low or negative social returns that could be contributing to widening income disparities. The United Kingdom had 8 percent of GDP originating in finance, Singapore over 11 percent, China 6 percent, and India over 9 percent; all were suddenly alerted to the ambiguous benefits of financialization and the disutility of making financial development a central plank of their growth strategies.[7]

Fifth, Asia's embracing of production networks came under scrutiny as levels of exports began to implode throughout the region. Production networks have been hailed as vehicles that have promoted intra-industry trade in the East Asian region and the participation of firms throughout the region. Production networks have also been associated with the mobilizing of industrial capabilities in East Asia and with buttressing the success of the export-led strategy. The crisis, however, revealed important vulnerabilities and costs. One vulnerability was that intra-industry trade in parts, components, and raw materials had concealed the persistent heavy reliance on the United States and the European Union (EU) for exports of final products that incorporated these intermediates.[8] Hence, when demand in the United States began to crumble in late 2008, this created a ripple effect through the production networks. A related cost was that the pyramidal system of intra-industry trade meant that when demand for final goods went into reverse, networking magnified the effects for suppliers of parts and services and assembly operations, which are sometimes distributed over a number of countries. Just as production networking and associated intra-industry trade was advantageous in generating flows on the upside of the long boom, it increased the severity of the downturn once the bubble-driven growth had abruptly collapsed. This experience has highlighted the costs of production networking straddling regions and countries.

Production networking is an outcome of legacy and choice. Starting in the 1970s, East Asia's efforts to industrialize coincided with the off-shoring of manufacturing from Western countries, with foreign direct investment (FDI) serving as the vehicle. This created a patchwork of production units across the East Asian region.

[7]Economic crises rooted in the financial sector cause such major dislocation for the real sector and for consumers that recovery can be a much slower process (Reinhart and Rogoff 2009). Furthermore, deep crises are associated with a permanent decline in the level of output—including a prolonged slowdown of investment (Blanchard 2009; Cerra and Saxena 2008). The findings of Cerra, Panizza, and Saxena (2009) suggest, though, that targeted countercyclical measures can promote recovery (especially in relatively closed economies)—as is apparent from the rebound of activity in India and China. How durable these are likely to be in the absence of globally coordinated actions will become apparent in due course.

[8]Asian Development Bank (2009). Gaulier, Lemoine, and Unal-Kesenci (2004) observe that $10 of Chinese processed exports incorporated $4 of imports from Japan; Korea; Taiwan, China; and Singapore.

Over time, the picture has changed as evolving comparative advantage, national policies, and shifting objectives of MNCs have weeded out producers in some countries and added them in others. But by and large, first-mover advantages have imparted a certain inertia, reinforced by the efforts of MNCs to maintain a portfolio of production units and exploit localized expertise, cost advantages, and market opportunities, as well as local incentives. This overlapping, multicountry assortment of producers provided MNCs, large retailers in industrial countries, and contractors such as Li and Fung and Wal-Mart with the means to engineer production networks that stoked competition among producers, encouraged innovation and new start-ups, duplicated sources of supply for similar products, and melded production capacity in several countries or regions (Fung, Fung, and Wind 2008).

Sixth and finally, the 2008–09 crisis underscores the autonomous growth potential of late-starting industrializers with very large economies and high rates of saving. The two economies that have demonstrated the greatest resilience (and have partially neutralized the effects of the external shock) are China and India. They grew by 9.1 and 6.8 percent, respectively, in 2009 and are forecast to grow by 8.4 and 8.1 percent during 2010–14 (Kuijs 2010; EIU 2010). Four factors linked to their performance during the past decade or so are enabling them to defy the drag exerted by a slower growing global economy. A large backlog of investment in infrastructure and the prospect of decades of urbanization are two enduring sources of demand. A third is the scope for industrial deepening, technological catch-up, and incorporating green technologies into all relevant activities in China. There is similar scope for building a modern, green industry in India.[9] Raising energy efficiency as infrastructure building and industrial development proceed can only augment the demand for capital. That these investment imperatives can be largely satisfied from domestic resources confers a fourth significant advantage and greatly reduces dependence on foreign providers. China's low public indebtedness also facilitates expansion of public investment. India, which has run large public deficits, is more constrained, but it too benefits from being able to finance those deficits mainly from domestic savings—as Japan has done since the 1990s.

In both countries, the share of household consumption in GDP is still fairly low, 35 percent in China and 54 percent in India.[10] This allows room for demand to grow. Thus, the weakening of international trade that circumscribes the growth impetus from exports can be partially compensated for by domestic investment and consumption demand. It is this demand potential in two of the world's growth poles that will induce flows of FDI, which, as we noted earlier, will supplement productivity growth through capital and technology transfer from external sources.

[9] On the development of renewable energy resources, see Mathews (2006).

[10] See Prasad (2009). In 2008, household savings in India, at over 30 percent, were the highest in the world—higher than China's (29 percent).

The global crisis of 2008–09 is likely to have macroeconomic implications for the industrial geography of Asia. A number of comfortable certitudes will need to be reappraised, and, as we have indicated above, the prevailing symbiosis between China and India—and between China and other Asian countries—might not persist. What replaces it will depend on the future course of economic relations between India and China, and on the industrial capabilities of other Asian countries and their competitiveness relative to the two Asian giants. We examine these considerations next.

Industrial Trends in the Rest of Asia

The Asian economies affected by China's expanding economic footprint and India's emerging economic presence can be divided into three categories: high-income economies, including Japan, Singapore, Korea, and Taiwan, China; middle-income countries, concentrated in Southeast Asia; and low-income countries, principally in South Asia, but including Vietnam, Cambodia, and the Lao People's Democratic Republic. Each set of countries has benefited from trade with China, and some are seeing their exports to India increase. However, industries in these countries must also compete with Chinese exports in a widening range of goods, and India has likewise stepped up the pressure in services and a narrower range of manufactures (see chapter 3). Here we address the following questions. First, how have the manufacturing economies of other Asian countries evolved over the past decade? Second, what are some of the significant trends in major traded items, and how has the composition of trade changed over time? Third, what light do revealed comparative advantage (RCA) indicators shed on the course of industrial development, and is this consistent with other information on manufacturing capabilities? Fourth, are the lower- and middle-income countries moving up the technology ladder to higher-value items? In addition, what is the direction industrial diversification might take? And what are the options for the high-income economies as their labor-intensive and low-technology products face intensifying competition from imports?

High-Income Economies

As incomes rise, the share of manufacturing in GDP tends to decline for a variety of reasons. One is the tendency of the relative prices of manufactured products to fall. This is both because of higher productivity relative to services and because they are traded in more competitive (global) markets. Another reason is that the income elasticity—and also the price elasticity of demand for most manufactures—may be lower, which pulls down their share. A third reason is that manufacturing is more movable than are services. However, the information and communication technology (ICT) revolution is lowering the odds against (impersonal) services relocating. Also, the more labor-intensive activities tend to migrate to countries where the wage costs are lower. Codified technologies for the more mature products facilitate the process and make it easier for late-starting industrializers to speedily attain levels of productivity comparable to those in the more advanced countries. Aside from labor costs, late-starting developers generally offer other attractions; these may include lower costs of land and cheaper utility rates as well as generous fiscal incentives favoring land-, water-, and energy-intensive activities, some with high up-front fixed costs.[11] With barriers to trade declining and transport costs also falling, buyers of a range of manufactured products have found it cost-effective to purchase from foreign suppliers and, in many instances, to locate their own production overseas as well.

Because manufacturing has long been the principal driver of growth, productivity, and technological change in Japan, in Korea, and in Taiwan, China, these economies have resisted the hollowing of their manufacturing sectors. Nevertheless, market forces are proving irresistible, and each is experiencing a steady contraction in the share of manufacturing. The labor-intensive activities are the most susceptible, although they are not the only ones affected. The huge expansion of resource-based industries such as those producing petrochemicals, cement, ferrous and non-ferrous metals, and bulk pharmaceuticals in neighboring Asian countries has triggered a geographical redistribution of such industries as well.

The outcome is most clearly apparent in the case of Japan, where the ratio of manufacturing to GDP has fallen to 18 percent, compared to 28 percent in 1980. A glance at figure 4.1 shows how the composition of the manufacturing sector has also been altered. Producers of electronics, machinery and transport equipment have enlarged their shares at the expense of iron, steel, and petrochemicals. Similar but less marked changes are apparent in Korea (figure 4.2).

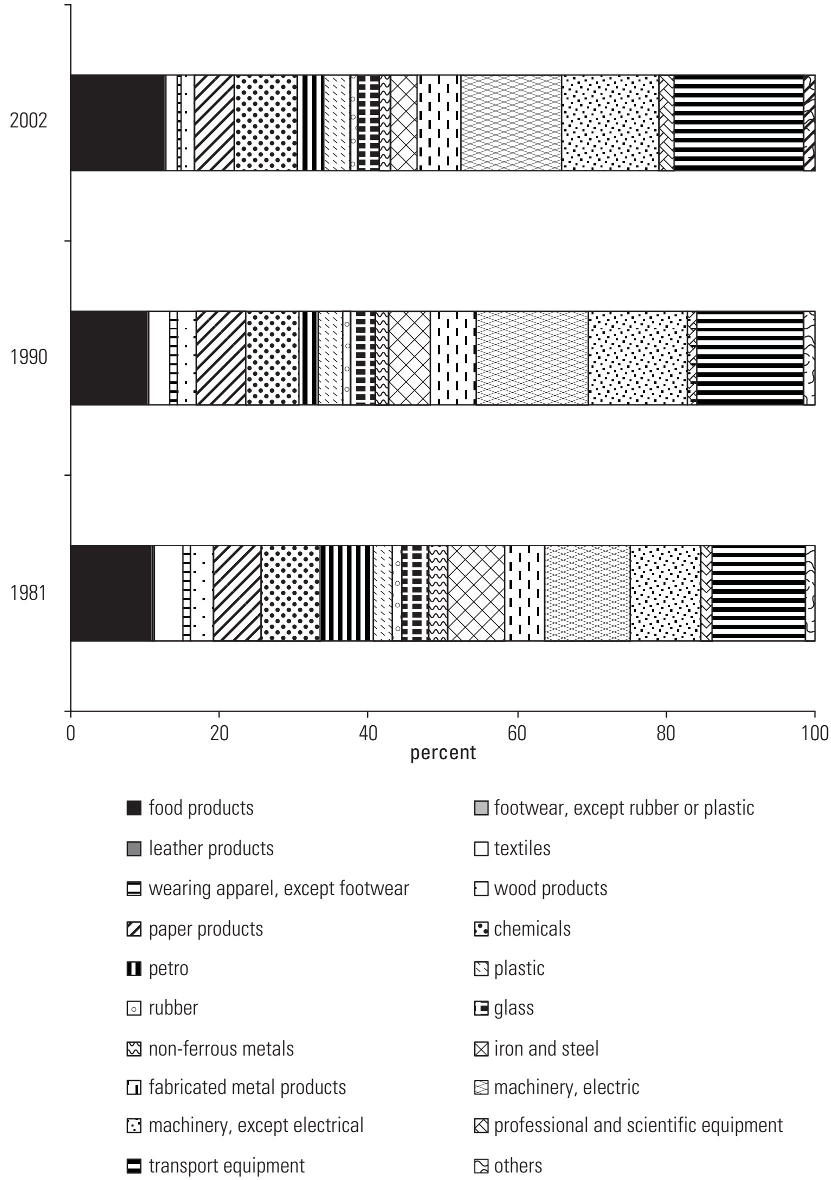
The economy of Taiwan, China, also has undergone a significant sectoral adjustment as large segments of its manufacturing industries have transferred to the mainland to take full advantage of lower costs (see figure 4.3). Most upstream activities in electronics and machinery industries remain in Taiwan, China, but these now constitute 19.5 percent of GDP (National Statistics, Republic of China (Taiwan) 2009).

The pattern of trade for the high-income Asian economies essentially mirrors the change sweeping their industries. All three remain dependent upon the export of manufactures but now face intensifying competition and are struggling to sustain competitiveness by dint of innovation.[12] As can be seen from figures 4.4, 4.5, and 4.6, the weight of medium- and high-tech items has increased. Within these categories, the three economies are specializing in high-value

[11]Although labor costs are generally a small—and shrinking—fraction of total manufacturing costs, when profit margins are narrow, lower wages can exert a strong pull.

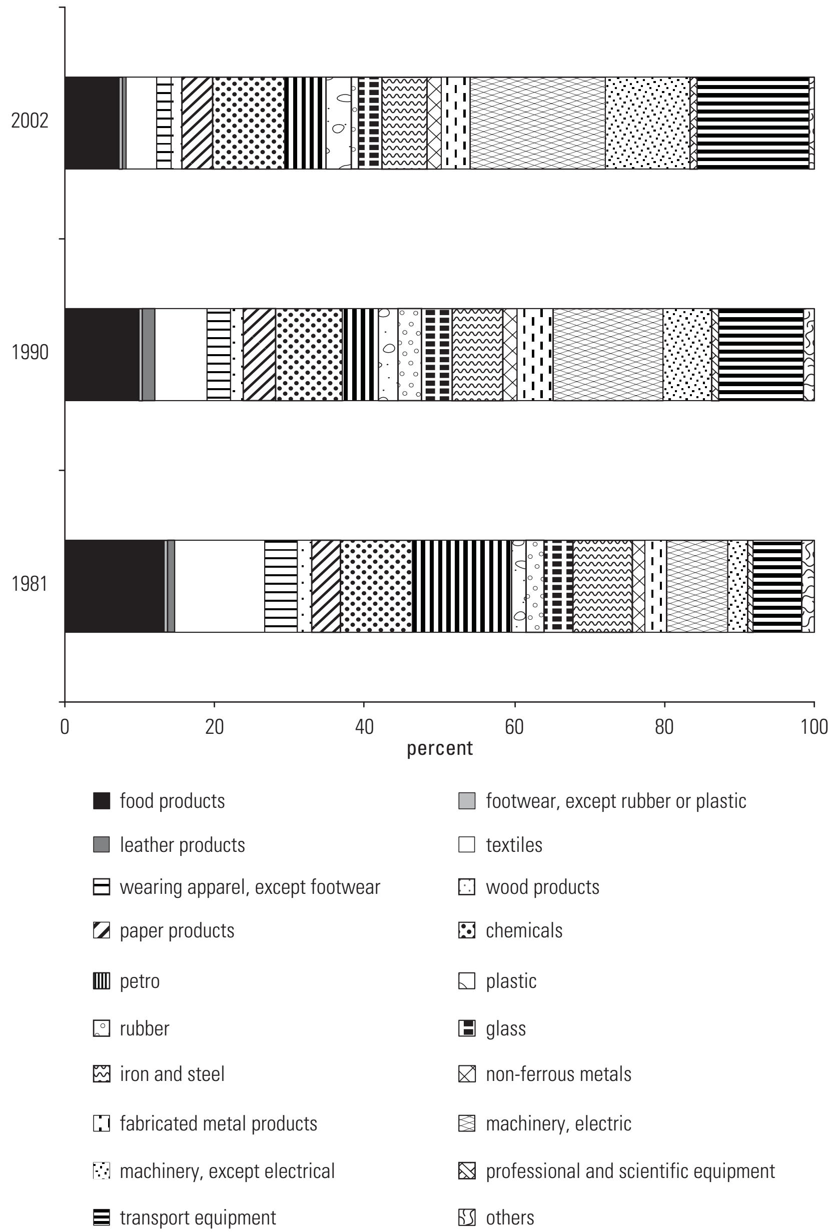
[12]Only Japan's high-end garments industry survives. Its textile industry is also struggling to remain profitable through innovation and diversification into new synthetic meterials, medical supplies, and materials for the construction and auto industries (figure 4.4).

Figure 4.1 Industrial Composition by Type of Manufactures of Japan: 1981, 1990, and 2002



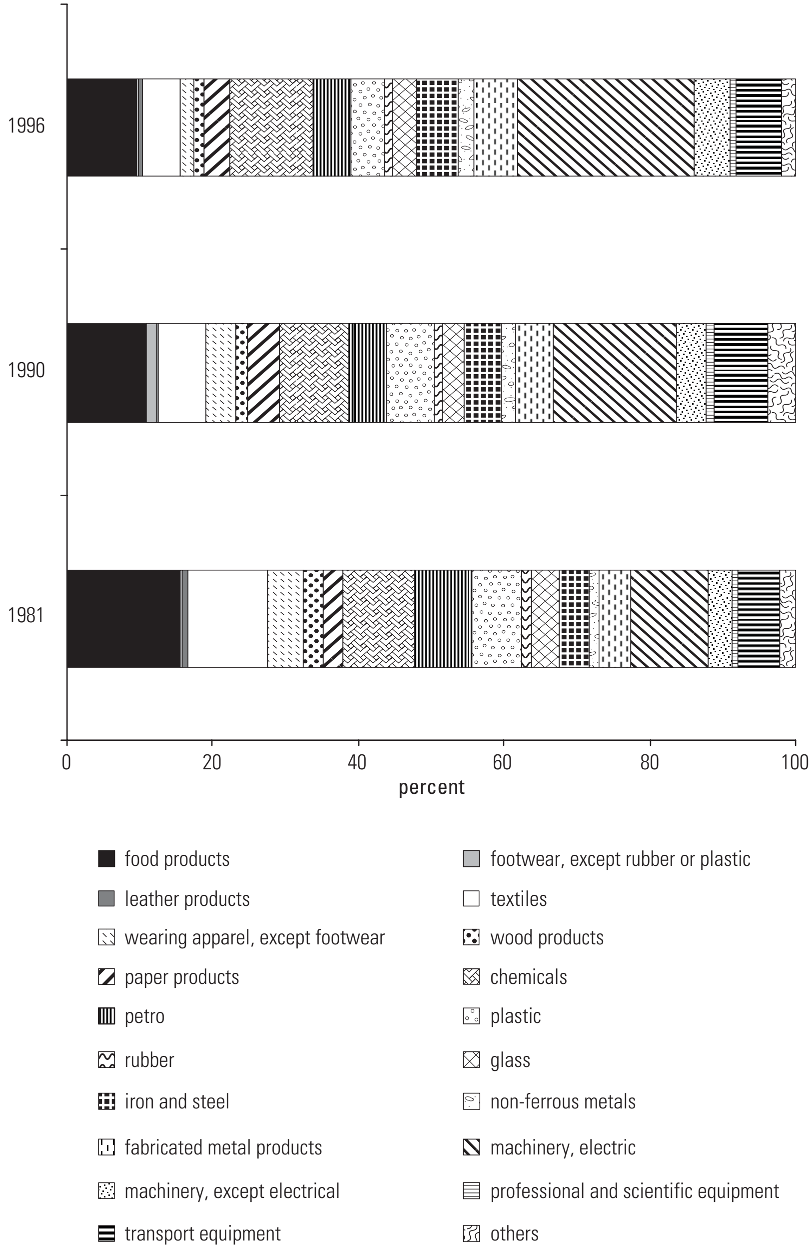
Source: UNIDO INDSTAT3.

Figure 4.2 Industrial Composition by Type of Manufactures of the Republic of Korea: 1981, 1990, and 2002



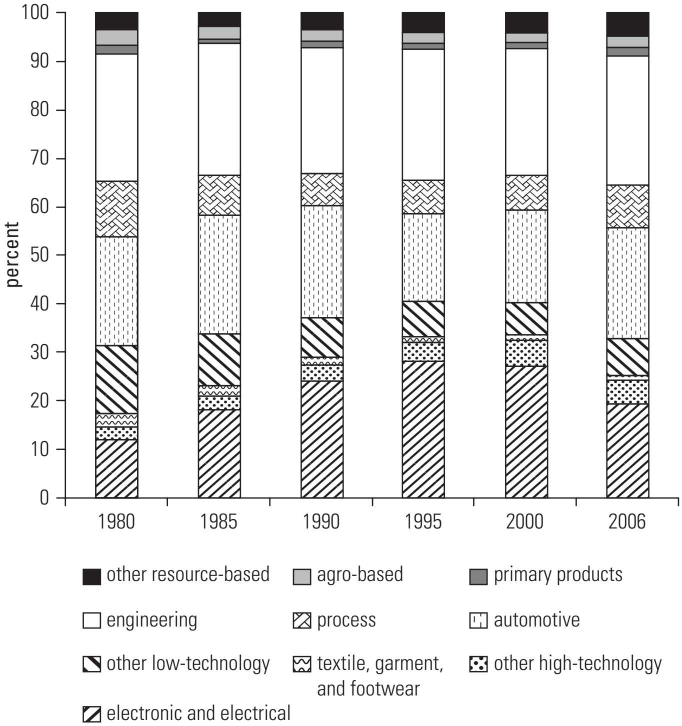
Source: UNIDO INDSTAT3.

Figure 4.3 Industrial Composition by Type of Manufactures of Taiwan, China: 1981, 1990, and 1996



Source: UNIDO INDSTAT3.

Figure 4.4 Export Composition of Japan by Technology Class



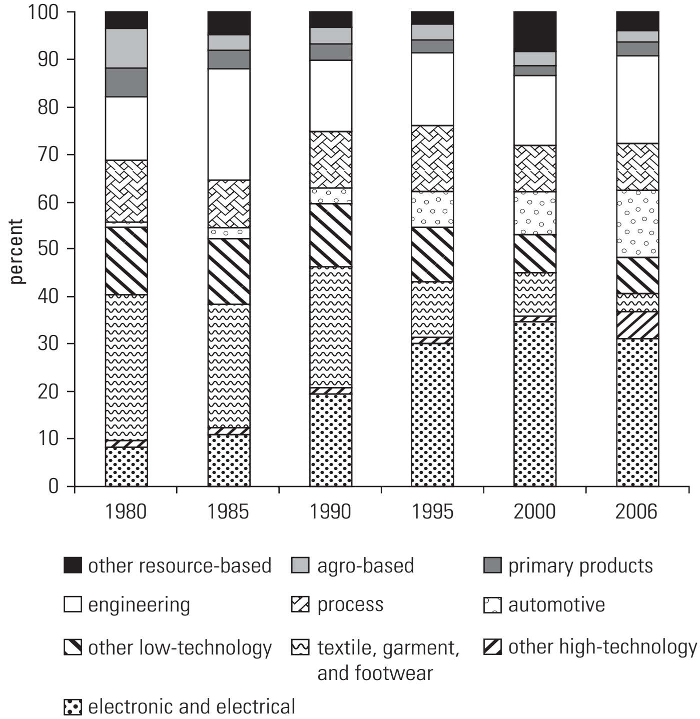
Source: Authors' calculations based on UN Comtrade data.

products—capital and scientific equipment, machinery, and components being the most prominent.

The product space analysis for these three economies also points to the increasing importance of capital goods. For Japan, the scope for diversification and upgrading is fairly narrow, because the average sophistication of its exports is already high (see figure 4.7 and figure 4.8). Among the most promising opportunities for Japan are engineering goods and industrial raw materials. The composition of these areas for diversification has shifted more toward machinery in 2006 compared to 1987 (tables 4.2 and 4.3).

Relative to Japan, Korea's product space in 1987 indicated a broader spectrum of opportunities for upgrading. By 2006 the distribution had tightened (see figures 4.9 and 4.10). The rapid evolution of Korea's export capabilities can be seen from an examination of the commodities listed in tables 4.4 and 4.5. In 1987, opportunities for upgrading and diversification for Korea included a number of low-tech products such as toys, musical instruments, and textiles, in addition to a

Figure 4.5 Export Composition of the Republic of Korea by Technology Class

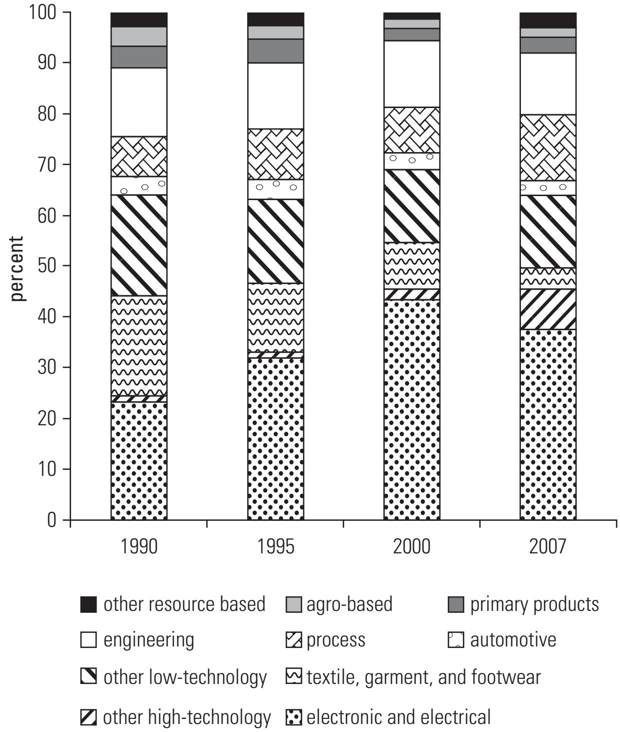


Source: Authors' calculations based on UN Comtrade data.

number of the less complex high-tech items such as picture tubes (used in television screens or monitors). By 2006, the composition had altered radically to include more sophisticated high-tech products such as optical instruments, electronic components, and engineering goods (machinery). This is a reflection of the industrial capabilities acquired by Korea over the course of two decades. Similarly, Taiwan, China's opportunity for upgrading and diversification had narrowed by 2006 compared to the situation in 1995 (see figures 4.11 and 4.12). Like Korea, the composition of Taiwan, China's options for upgrading and diversification are concentrated in medium- and high-tech products (see tables 4.6 and 4.7).

An important development paralleling the evolution of comparative advantage is the rising share of exports from these four high-income economies to China. Since the early 1990s, exports to China from these economies have grown substantially (see figure 4.13). In 2006, more than one-fifth of exports from Korea and Taiwan, China, were shipped to China. The four economies and China are part of a tightly knit production network cemented by FDI, whereby China

Figure 4.6 Export Composition of Taiwan, China, by Technology Class



Source: Authors' calculations based on UN Comtrade data.

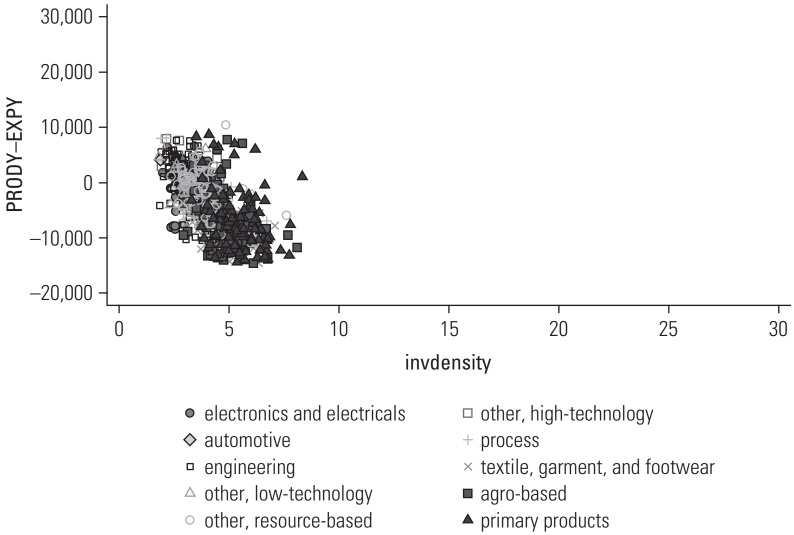
imports the capital equipment and key intermediate inputs from its three high-income neighbors[13] and exports a part of the output to the rest of the world—a networking arrangement that has strongly influenced the composition and value added of Chinese exports (also see Prasad 2009; Asian Development Bank 2009).

The evolution of product space for Singapore has taken the same direction as in Korea and Taiwan, China. With rising wages, the scope for diversifying its manufacturing activities and upgrading products is becoming restricted (see figures 4.14 and 4.15). As in the other high-income Asian economies, the shift is toward more high-tech (electronic) and medium-tech items such as watch components and optical products (see tables 4.8 and 4.9). Each of these economies is being pushed by competitive pressures (mainly from China) into

(*text continues on page 144*)

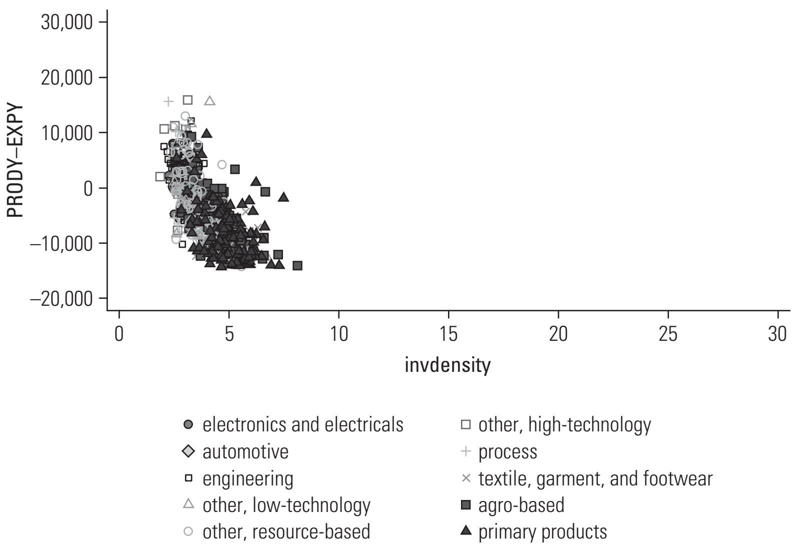
[13]Exports to China largely explain the rebound in manufacturing activity in Japan and Korea during the second half of 2009.

Figure 4.7 Product Space of Japan, 1987



Source: Authors' calculations based on UN Comtrade data.

Figure 4.8 Product Space of Japan, 2006



Source: Authors' calculations based on UN Comtrade data.

Table 4.2 Top 10 "Upscale" Commodities with the Highest Density in Japan, 1987

Short description	Density	Technology class	PRODY–EXPY
Musical instruments, N.E.S.	0.55638	LT2	4,594
Motorcycles, autocycles; sidecars of all kinds, etc	0.532631	MT1	4,129
Rail locomotives, electric	0.525335	MT2	8,060
Photographic cameras, flash apparatus, parts, accessories, N.E.S.	0.523405	HT2	2,957
Printing presses	0.522007	MT3	5,600
Telecommunications equipment, N.E.S.	0.507709	HT1	1,800
Other sound recording and reproducer, N.E.S.; video recorders	0.496983	MT3	1,102
Other rail locomotives; tenders	0.48729	MT2	6,206
Metal-forming machine-tools	0.472177	MT3	5,229
Steam power units (mobile engines but not steam tractors, etc.)	0.46722	HT2	7,972

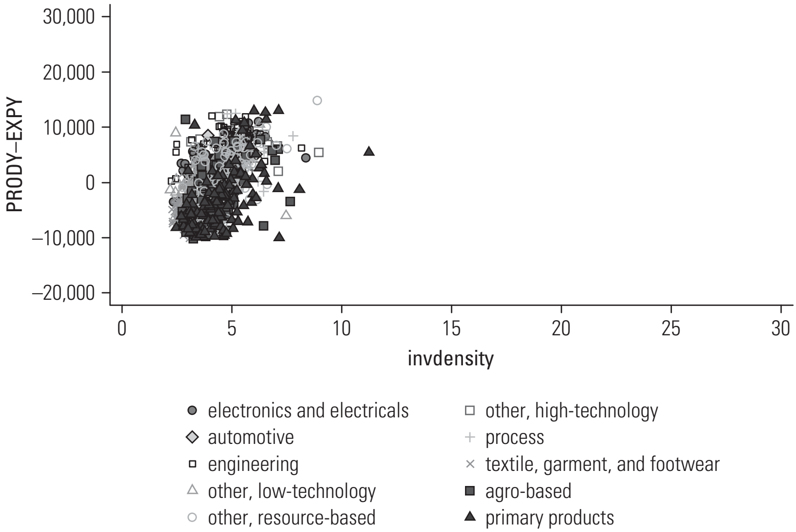
Source: Authors' calculations using UN comtrade data. Technology classification is based on Lall (2000).
Note: HT1 = electronic and electrical products; HT2 = other high-technology products; LT1 = textiles, garments, and footwear; LT2 = other low-technology products; MT1 = automotive products; MT2 = process industry; MT3 = engineering products; PP = primary products; RB1 = agriculture-based products; RB2 = other resource-based products.

Table 4.3 Top 10 "Upscale" Commodities with the Highest Density in Japan, 2006

Short description	Density	Technology class	PRODY–EXPY
Optical instruments and apparatus	0.53694	HT2	2,030
Printing presses	0.490102	MT3	7,501
Photographic and cinematographic apparatus and equipment, N.E.S.	0.489971	HT2	10,654
Other machines and tools for working metal or metal carbides, N.E.S.	0.458992	MT3	6,544
Weaving, knitting, etc., machines, machines for preparing yarns, etc.	0.450559	MT3	5,195
Cellulose acetates	0.449124	MT2	15,671
Crystals and parts, N.E.S., of electronic components of heading 776	0.44501	HT1	2,225
Machines for extruding manmade textile; other textile machinery	0.443969	MT3	1,380
Metal-cutting machine tools	0.431927	MT3	4,373
Halogen and sulfur compounds of nonmetals	0.428799	RB2	6,420

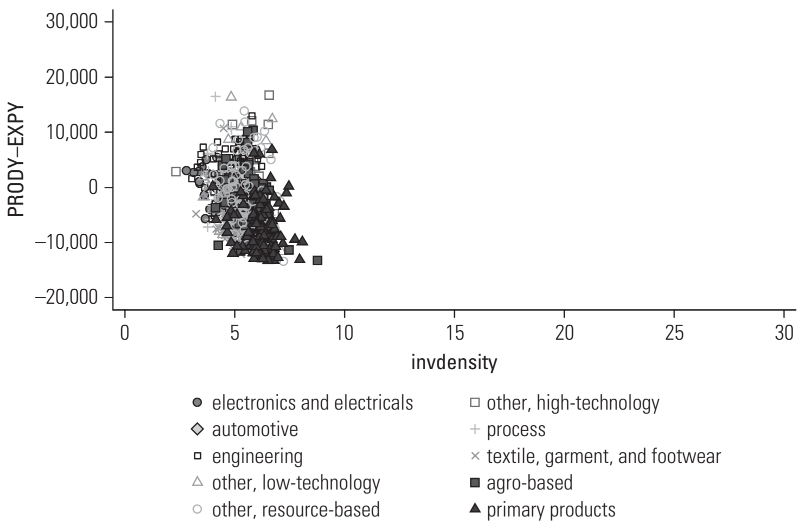
Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

Figure 4.9 Product Space of the Republic of Korea, 1987



Source: Authors' calculations based on UN Comtrade data.

Figure 4.10 Product Space of the Republic of Korea, 2006



Source: Authors' calculations based on UN Comtrade data.

Table 4.4 Top 10 "Upscale" Commodities with the Highest Density in the Republic of Korea, 1987

Short description	Density	Technology class	PRODY–EXPY
Portable radio receivers	0.412405	MT3	680
Musical instruments, N.E.S.	0.410817	LT2	8,967
Other sound recording and reproducer, N.E.S.; video recorders	0.407477	MT3	5,475
Children's toys, indoor games, etc	0.404916	LT2	509
Watches, watch movements, and cases	0.403	MT3	6,928
Microphones; loudspeakers; audio-frequency electric amplifiers	0.37149	HT1	3,451
Tulle, lace, embroidery, ribbons, trimmings, and other small wares	0.361857	LT1	1,643
Television receivers, color	0.361731	HT1	2,160
Television cathode ray tubes	0.349637	HT1	3,348

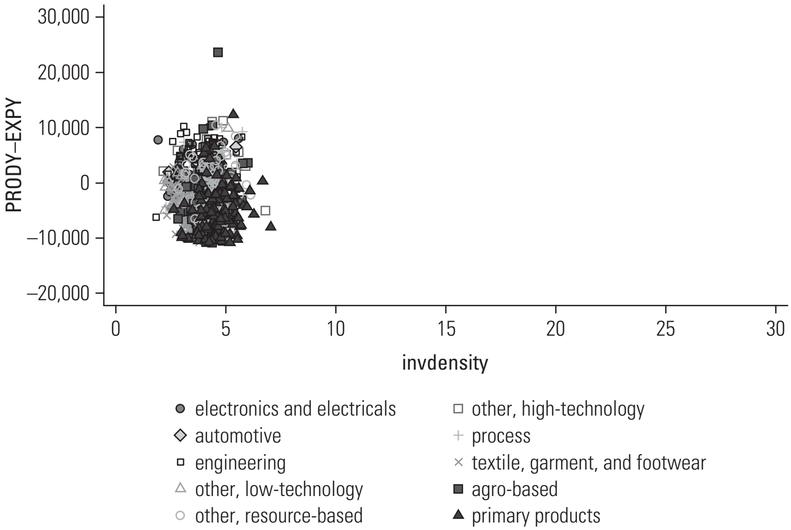
Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

Table 4.5 Top 10 "Upscale" Commodities with the Highest Density in the Republic of Korea, 2006

Short description	Density	Technology class	PRODY–EXPY
Optical instruments and apparatus	0.431612	HT2	2,842
Crystals and parts, N.E.S., of electronic components of heading 776	0.358525	HT1	3,037
Printed circuits and parts thereof, N.E.S.	0.329223	MT3	1,598
Electronic microcircuits	0.318382	HT1	2,745
Portable radio receivers	0.304986	MT3	3,636
Television receivers, monochrome	0.297786	HT1	2,859
Other electrical machinery and equipment, N.E.S.	0.295666	HT1	1,066
Parts, N.E.S., of and accessories for apparatus falling in heading 76	0.294377	HT1	715
Lenses and other optical elements of any material	0.291567	MT3	4,510
Weaving, knitting, etc., machines, machines for preparing yarns, etc.	0.289247	MT3	6,007

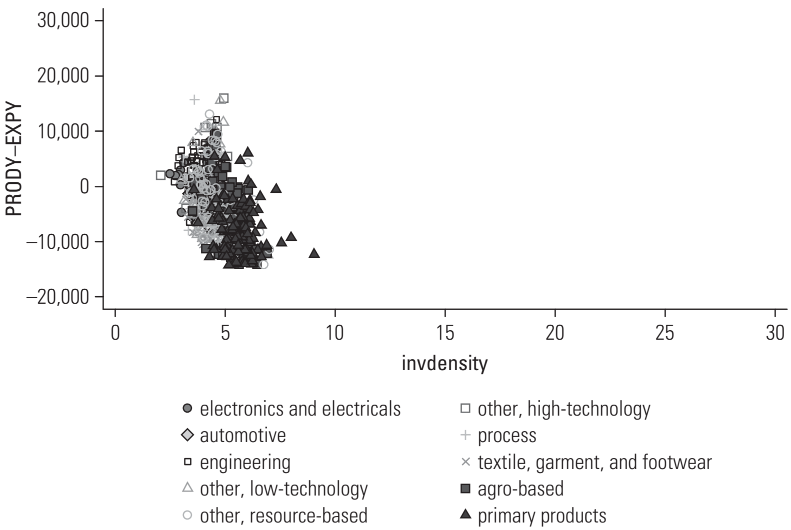
Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

Figure 4.11 Product Space of Taiwan, China, 1995



Source: Authors' calculations based on UN Comtrade data.

Figure 4.12 Product Space of Taiwan, China, 2006



Source: Authors' calculations based on UN Comtrade data.

Table 4.6 Top 10 "Upscale" Commodities with the Highest Density in Taiwan, China, 1995

Short description	Density	Technology class	PRODY–EXPY
Other electronic valves and tubes	0.521362	HT1	7,776
Photographic cameras, flash apparatus, parts, accessories, N.E.S.	0.467948	HT2	2,156
Children's toys, indoor games, etc.	0.45628	LT2	384
Baby carriages and parts thereof, N.E.S.	0.426852	LT2	620
Clocks, clock movements, and parts	0.422245	MT3	1,561
Electronic microcircuits	0.420811	HT1	1,538
Invalid carriages; parts, N.E.S., of articles of heading 785	0.417452	MT1	1,989
Motorcycles, autocycles; sidecars of all kind, etc.	0.414916	MT1	357
Other sound recording and reproducer, N.E.S.; video recorders	0.399394	MT3	161
Calculating, accounting, cash registers, ticketing, et.c, machines	0.396287	HT1	1,222

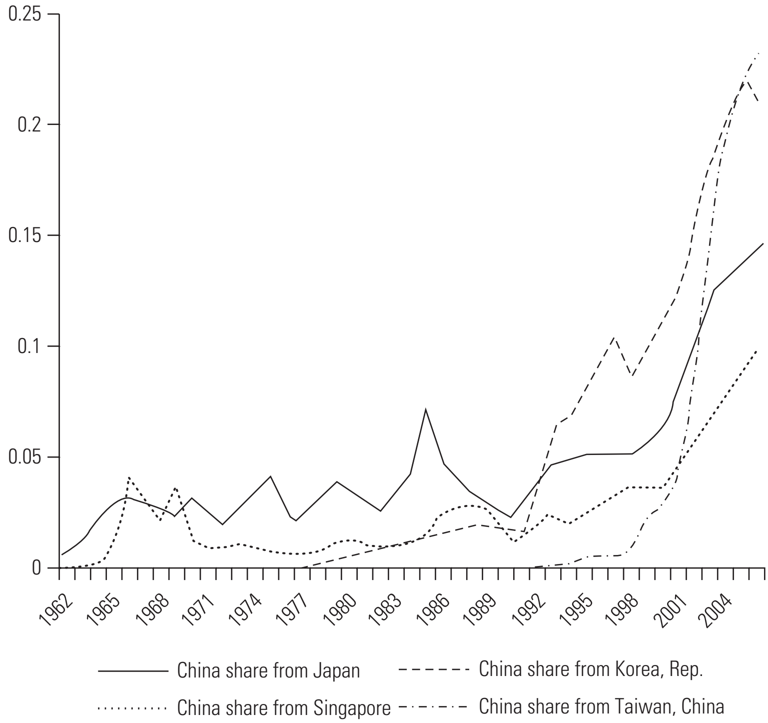
Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

Table 4.7 Top 10 "Upscale" Commodities with the Highest Density in Taiwan, China, 2006

Short Description	Density	Technology Class	PRODY–EXPY
Optical instruments and apparatus	0.484053	HT2	2,081
Crystals and parts, N.E.S., of electronic components of heading 776	0.404476	HT1	2,276
Printed circuits and parts thereof, N.E.S.	0.373448	MT3	836
Electronic microcircuits	0.366439	HT1	1,984
Lenses and other optical elements of any material	0.35053	MT3	3,749
Television receivers, monochrome	0.346917	HT1	2,098
Weaving, knitting, etc., machines, machines for preparing yarns, etc.	0.344998	MT3	5,246
Parts, N.E.S., of and accessories for machines of headings 7512 and 752	0.338037	HT1	2,972
Other electrical machinery and equipment, N.E.S.	0.337847	HT1	305
Other machines or tools for working metal or metal carbides, N.E.S.	0.334271	MT3	6,595

Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

Figure 4.13 Share of Exports Destined for China



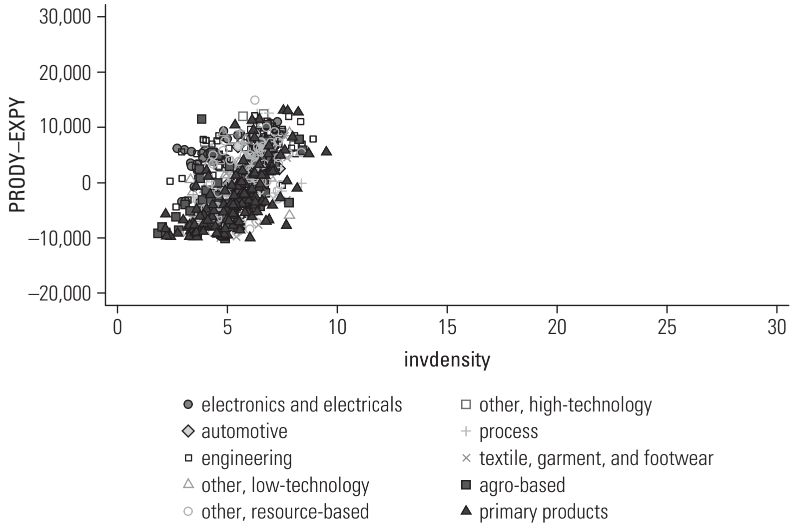
Source: Authors' calculations based on UN Comtrade data.

the upper end of various product categories, including automotive, engineering, other transport, capital equipment, sophisticated components, industrial raw materials, and pharmaceuticals.

Middle-Income Economies

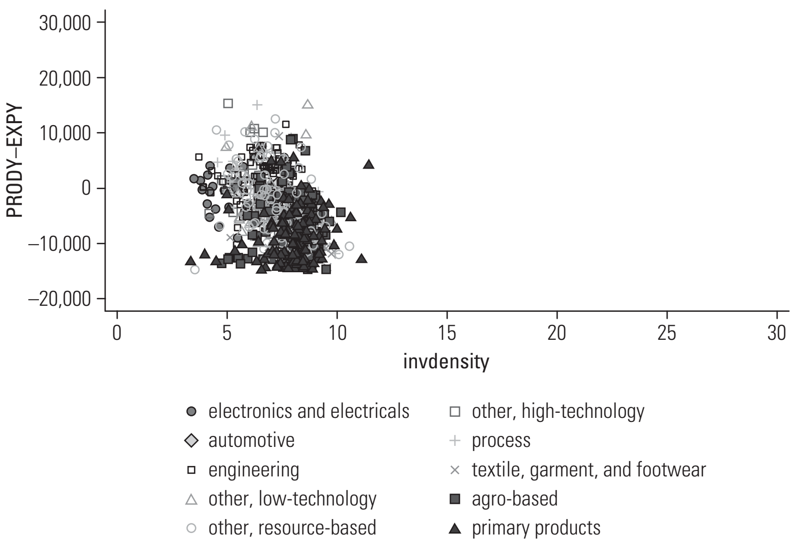
Beginning in the 1970s, the middle-income economies of Southeast Asia transitioned to export-oriented manufacturing—with the help of FDI—in light industries such as textiles, footwear, and consumer electronics. A decade later, they entered into production of electronic components and equipment and automobile manufacturing, also with the help of FDI from the United States and the high-income East Asian economies. Figure 4.16 and table 4.10 present the growing contribution of industry to GDP. It has risen in three countries, with only the Philippines showing a decline. The shift in the composition of manufacturing toward electronics and transport industries in the 1990s is apparent from figures 4.17, 4.18, 4.19, and 4.20. In all four countries, assembly and processing

Figure 4.14 Product Space of Singapore, 1987



Source: Authors' calculations based on UN Comtrade data.

Figure 4.15 Product Space of Singapore, 2006



Source: Authors' calculations based on UN Comtrade data.

Table 4.8 Top 10 "Upscale" Commodities with the Highest Density in Singapore, 1987

Short description	Density	Technology class	PRODY–EXPY
Radio receivers for motor vehicles	0.419293	MT3	291
Telecommunications equipment, N.E.S.	0.367705	HT1	6,231
Other sound recording and reproduction, N.E.S.; video recorders	0.342748	MT3	5,533
Portable radio receivers	0.340884	MT3	737
Calculating, accounting, cash registers, ticketing, etc., machines	0.328277	HT1	5,910
Microphones; loudspeakers; audio-frequency electric amplifiers	0.301605	HT1	3,509
Children's toys, indoor games, etc.	0.301335	LT2	567
Crystals and parts, N.E.S., of electronic components of heading 776	0.297748	HT1	2,949
Parts, N.E.S., of and accessories for apparatus falling in heading 76	0.297151	HT1	5,644
Air-conditioning machines and parts thereof, N.E.S.	0.282536	MT3	2,830

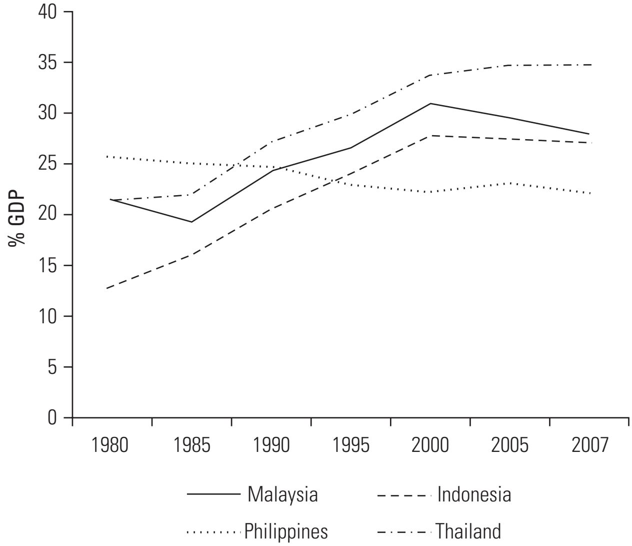
Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

Table 4.9 Top 10 "Upscale" Commodities with the Highest Density in Singapore, 2006

Short description	Density	Technology class	PRODY–EXPY
Crystals and parts, N.E.S., of electronic components of heading 776	0.287318	HT1	1,678
Watches, watch movements, and cases	0.269138	MT3	5,620
Electronic microcircuits	0.264946	HT1	1,386
Printed circuits and parts thereof, N.E.S.	0.256303	MT3	238
Other radio receivers	0.255811	MT3	134
Parts, N.E.S., of and accessories for machines of headings 7512 and 752	0.243415	HT1	2,374
Parts, N.E.S., of and accessories for machines of headings 7511 and 7518	0.236869	HT1	4,075
Lenses and other optical elements of any material	0.233473	MT3	3,150
Offline data processing equipment, N.E.S.	0.23059	HT1	323
Organo-sulfur compounds	0.221744	RB2	10,490

Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

Figure 4.16 Manufacturing, Value Added



Source: World Development Indicators Database.

Table 4.10 Manufacturing, Value Added
% GDP

Country	1980	1985	1990	1995	2000	2005	2007
Indonesia	13.0	16.0	20.7	24.1	27.8	27.4	27.0
Malaysia	21.6	19.3	24.2	26.4	30.9	29.6	28.0
Philippines	25.7	25.2	24.8	23.0	22.2	23.2	22.0
Thailand	21.5	21.9	27.2	29.9	33.6	34.7	34.8

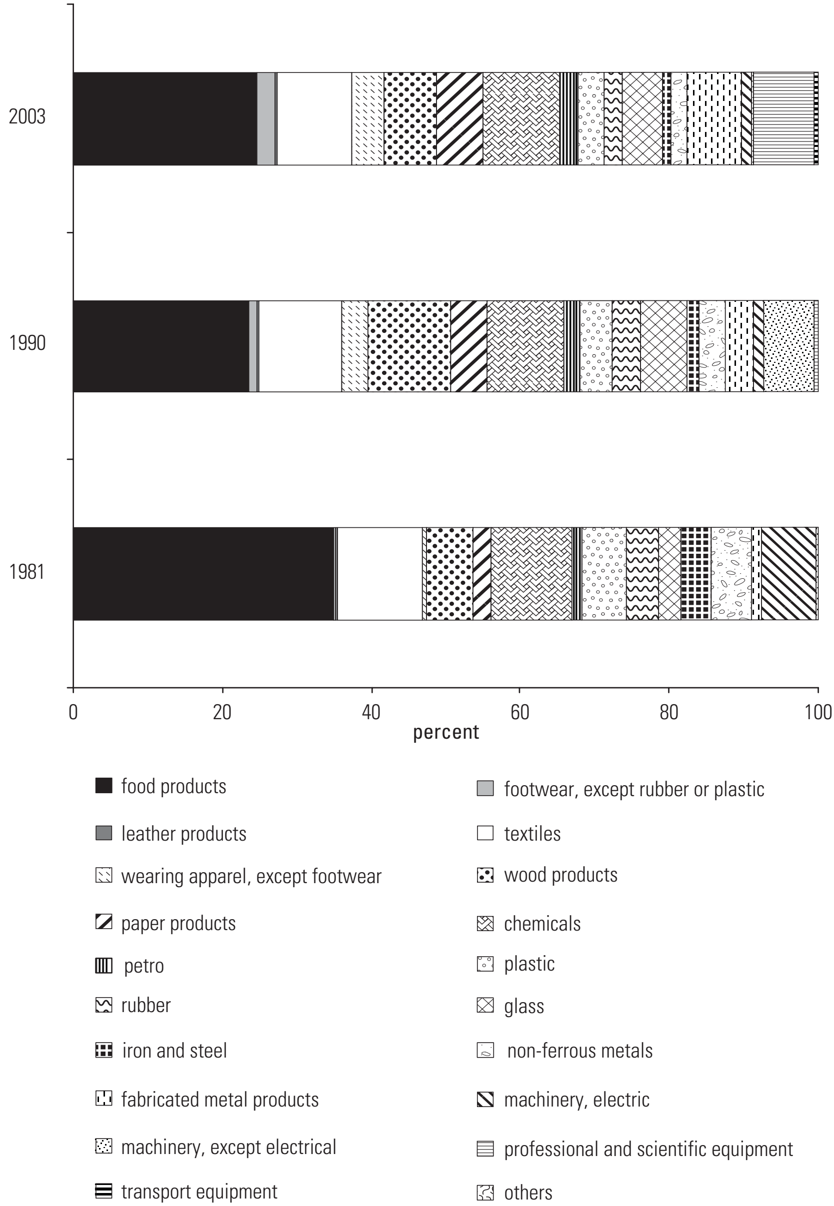
Source: World Development Indicators Database.

activities predominate, and as a consequence, value added has remained low—typically less than 30 percent. This can be seen from table 4.10. Unlike Korea and Taiwan, China, which successfully moved upstream, the Southeast Asian economies have failed to graduate from the processing of high-tech standardized commodities produced mainly by MNCs—or for MNCs by joint ventures or local suppliers.

The growth of manufacturing has been matched by the imports of parts and materials and by the exports of assembled products and components. Among the four countries, Malaysia is the most trade dependent. Malaysia and the Philippines are the two relying most heavily on electronic and electrical engineering exports, followed by Thailand and Indonesia. The importance of high-tech assembled exports notwithstanding, these countries' static RCA continues (with all due

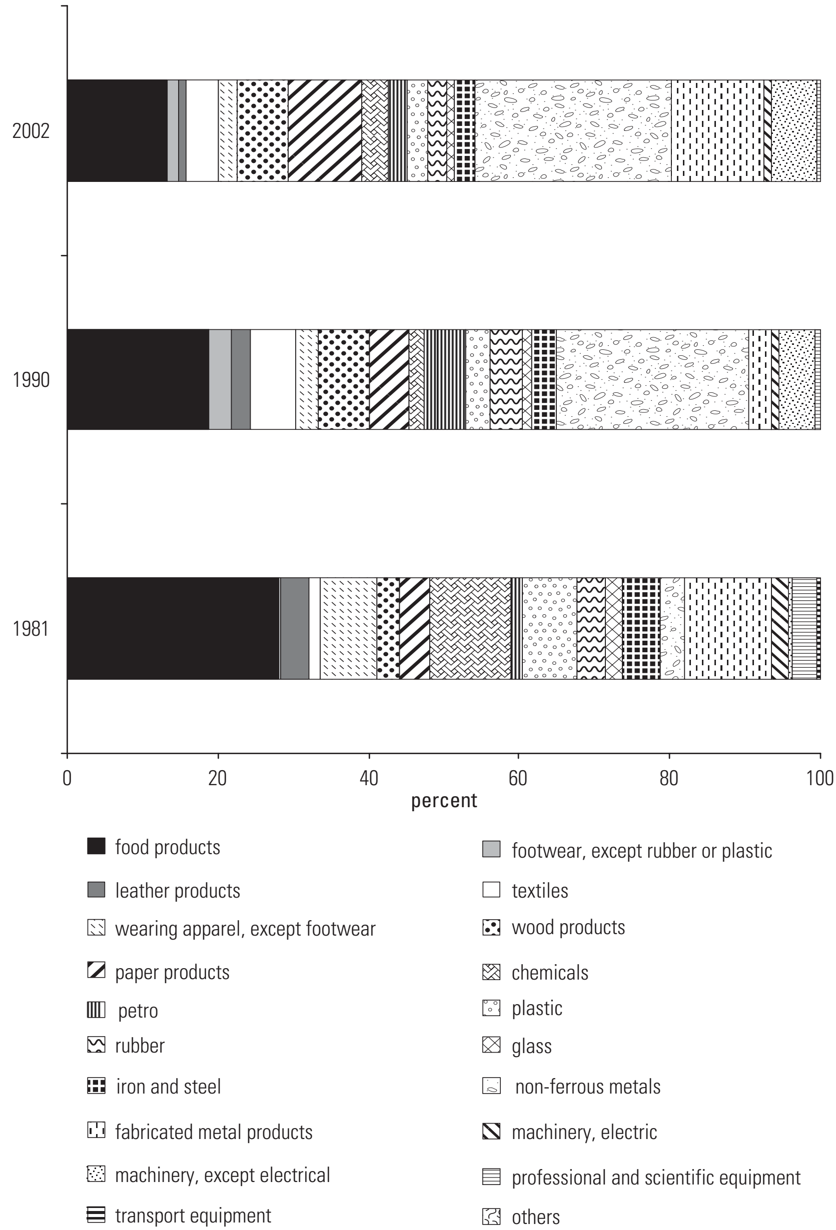
(*text continues on page 152*)

Figure 4.17 Industrial Composition by Type of Manufactures of Indonesia: 1981, 1990, and 2003



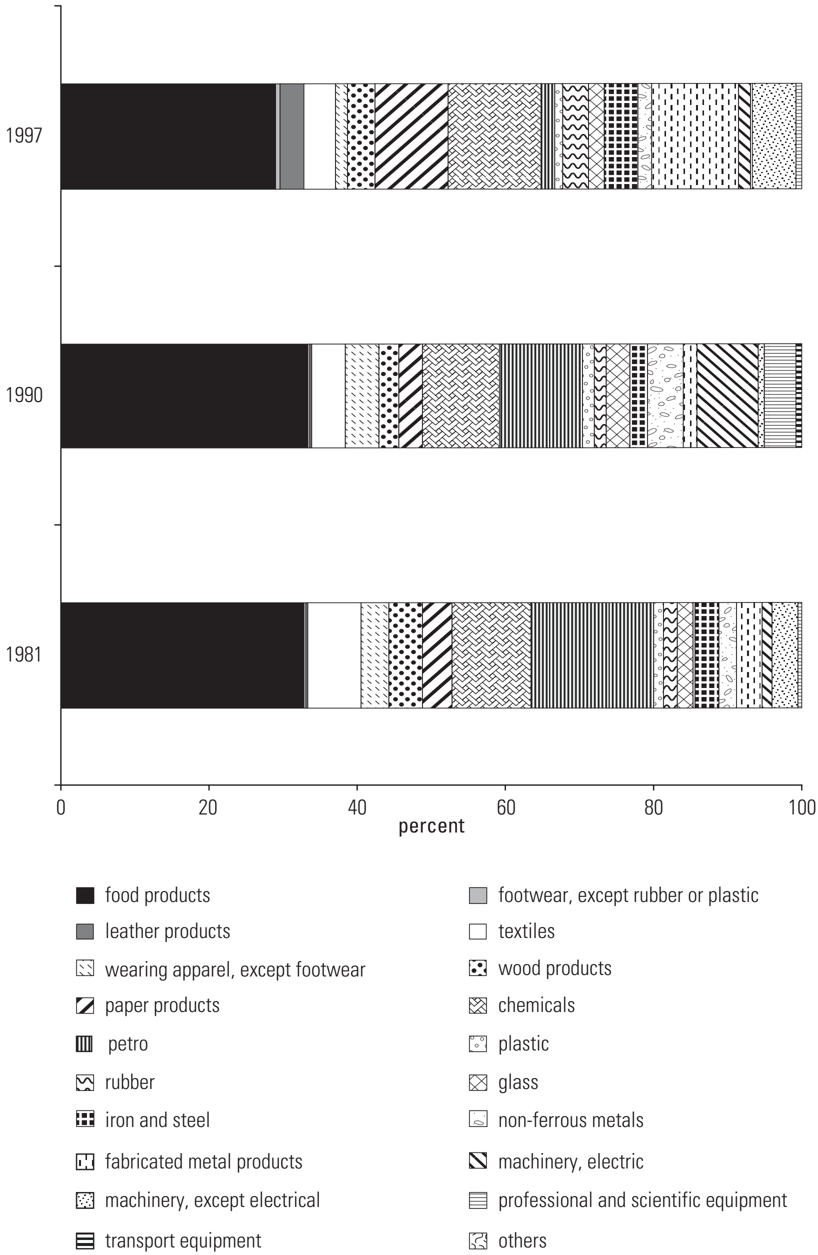
Source: UNIDO INDSTAT3.

Figure 4.18 Industrial Composition by Type of Manufactures of Malaysia: 1981, 1990, and 2002



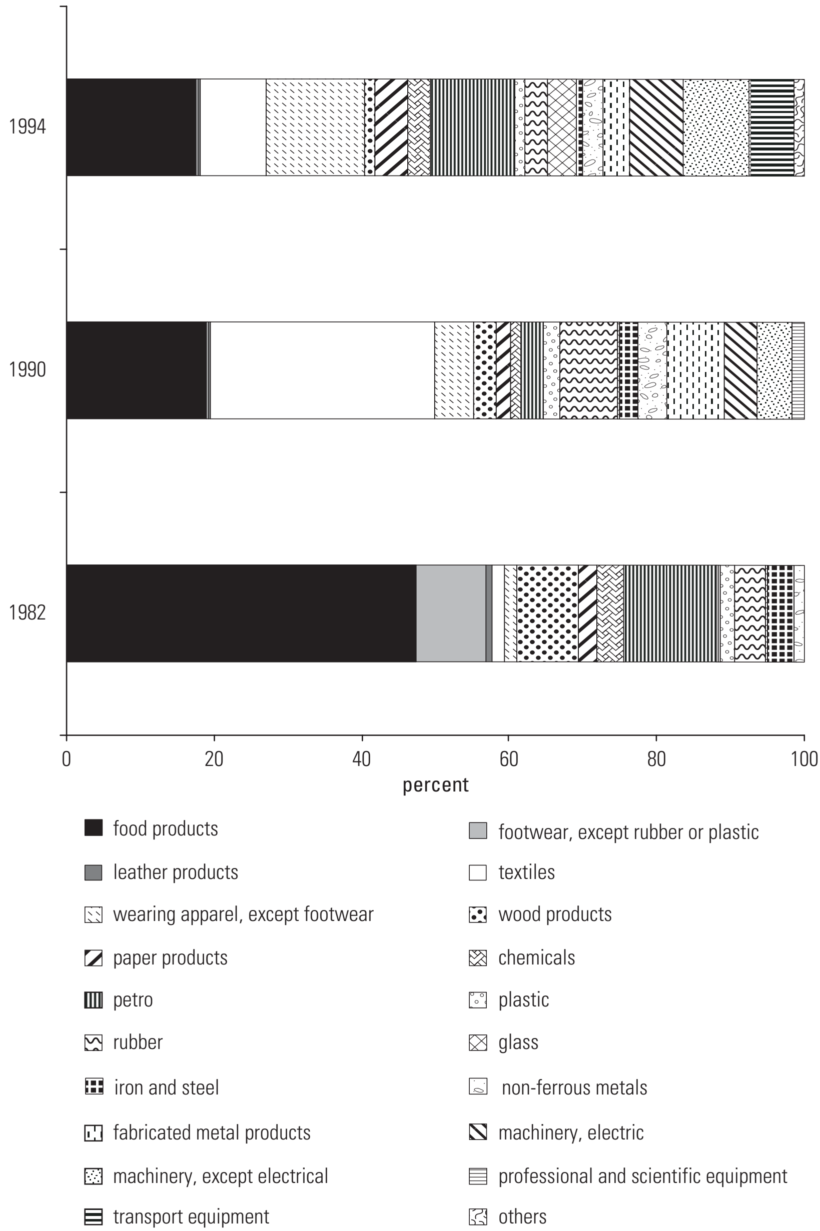
Source: UNIDO INDSTAT3.

Figure 4.19 Industrial Composition by Type of Manufactures of the Philippines: 1981, 1990, and 1997



Source: UNIDO INDSTAT3.

Figure 4.20 Industrial Composition by Type of Manufactures of Thailand: 1981, 1990, and 1994



Source: UNIDO INDSTAT3.

caveats) to reside in a range of primary products, resource-based products, and low- and medium-tech manufactures (see tables 4.11, 4.12, 4.13, and 4.14). The industrial platforms created by FDI have failed to inculcate homegrown technological capability; in spite of numerous incentives, local firms have faced difficulty in carving out a larger industrial role for themselves, establishing a brand name, and becoming innovative (see Yusuf and Nabeshima 2009).

The slow progress in technological upgrading, following decades of industrialization, is constraining the ability of the leading Southeast Asian countries to

Table 4.11 Top 10 Four-Digit-Level Commodities with the Highest RCA in Indonesia: 1980, 2006

Short description	RCA	PRODY	Technology class
1980			
Palm nuts and kernels	44.40	500	PP
Saw logs and veneer logs, of nonconiferous species	29.89	917	RB1
Vegetable plaiting materials	25.82	4,154	PP
Petroleum gases, N.E.S., in gaseous state	15.75	8,367	PP
Natural rubber latex; natural rubber and gums	14.12	1,901	PP
Nickel ores and concentrates; nickel mattes, etc.	12.47	9,200	RB2
Pepper; pimento	12.33	1,779	PP
Goat and kid skins, raw, whether or not split	12.18	1,337	PP
Tin ores and concentrates	11.29	1,722	RB2
Pitprops, poles, piling, post and other wood in the rough, N.E.S.	11.12	10,648	RB1
2006			
Calf leather	70.72	1,181	LT1
Palm kernel oil	67.39	2,258	RB1
Typewriters; check-writing machines	47.76	6,099	HT1
Palm oil	45.85	2,321	RB1
Palm nuts and kernels	36.42	1,807	PP
Tin and tin alloys, unwrought	35.96	3,044	PP
Natural rubber latex; natural rubber and gums	32.91	1,781	PP
Knitted or crocheted fabrics, elastic or rubberized	31.69	9,578	LT1
Coconut (copra) oil	25.95	1,417	RB1
Nickel ores and concentrates; nickel mattes, etc.	24.81	12,050	RB2

Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

Table 4.12 Top 10 Four-Digit-Level Commodities with the Highest RCA in Malaysia: 1980, 2006

Short description	RCA	PRODY	Technology class
1980			
Palm kernel oil	88.55	2,627	RB1
Palm oil	74.36	2,772	RB1
Tin and tin alloys, unwrought	48.62	1,989	PP
Natural rubber latex; natural rubber and gums	43.26	1,901	PP
Saw logs and veneer logs, of nonconiferous species	41.30	917	RB1
Wood, nonconiferous species, sawn, planed, tongued, grooved, etc.	30.23	2,340	RB1
Diodes, transistors, photocells, etc.	22.36	6,938	HT1
Pepper; pimento	21.34	1,779	PP
Railway or tramway sleepers (ties) of wood	18.85	2,417	RB1
Wood, simply shaped, N.E.S.	17.17	7,176	RB1
2006			
Palm oil	31.70	2,321	RB1
Hydrogenated animal or vegetable oils and fats	23.66	3,511	RB1
Fatty acids, acid oils, and residues; degras	23.65	8,885	RB1
Gramophones and record players, electric	23.58	12,741	MT3
Articles of apparel, clothing accessories of plastic or rubber	20.05	6,158	LT1
Palm kernel oil	20.02	2,258	RB1
Other radio receivers	14.36	15,213	MT3
Plywood consisting solely of sheets of wood	13.71	5,650	RB1
Saw logs and veneer logs, of nonconiferous species	11.25	1,415	RB1
Natural rubber latex; natural rubber and gums	10.96	1,781	PP

Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

diversify their product mix. In 1987, the product space for Indonesia showed a wide dispersion. This suggests that underlying industrial capabilities were not conducive to diversification, although there were many upgrading opportunities, because the average sophistication of exports was low at that time (see figure 4.21). By 2006, the distribution had shifted toward the origin, pointing to the scope for diversification of its exports (see figure 4.22). Upgrading opportunities were mainly in low-tech and resource-based products for Indonesia in 1987 (see table 4.15). The opportunity set had not changed much by 2006, except for the addition of

Table 4.13 Top 10 Four-Digit-Level Commodities with the Highest RCA in the Philippines: 1980, 2006

Short description	RCA	PRODY	Technology class
1980			
Castor oil seeds	247.77	730	PP
Coconut (copra) oil	239.39	5,944	RB1
Manila hemp, raw or processed but not spun, its tow and waste	234.90	1,155	RB1
Copra	127.24	2,447	PP
Copper ore and concentrates; copper matte; cement copper	101.73	2,708	RB2
Banana, plantain, fresh or dried	61.37	1,619	PP
Sugars, beet and cane, raw, solid	45.35	2,820	RB1
Fuel wood and wood charcoal	43.45	2,204	PP
Articles and manufacture of carving, molding materials, N.E.S.	37.87	5,476	LT2
Molasses	35.41	2,824	RB1
2006			
Manila hemp, raw or processed but not spun, its tow and waste	143.03	1,527	RB1
Coconut (copra) oil	117.54	1,417	RB1
Diodes, transistors, photocells, etc.	32.42	9,787	HT1
Photographic cameras, flash apparatus, parts, accessories, N.E.S.	23.77	10,515	HT2
Banana, plantain, fresh or dried	15.58	3,535	PP
Glass, N.E.S.	10.48	13,732	RB2
Ceramic plumbing fixtures	9.60	5,013	MT3
Vegetable textile fibers, N.E.S., and waste	8.85	2,518	RB1
Articles and manufacture of carving, molding materials, N.E.S.	8.82	5,133	LT2
Builders' carpentry and joinery (including prefabricated)	7.69	10,113	RB1

Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

one high-tech product (see table 4.16). The options lie mainly in resource-based and low-tech products like textiles and food products, although the actual commodities have changed.

The change in the product space for Malaysia resembles that of Indonesia in some respects. Relative to 1987, the distribution has shifted inward, with more commodities closer to the origin (see figures 4.23 and 4.24). The difference is the

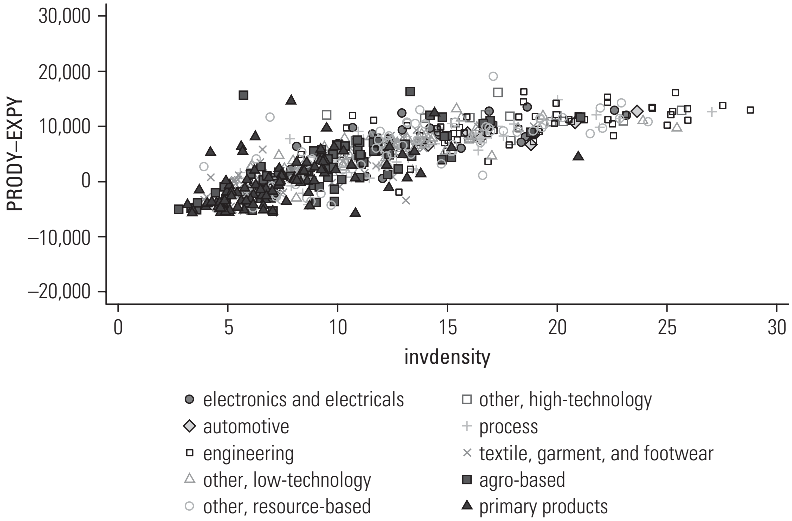
Table 4.14 Top 10 Four-Digit-Level Commodities with the Highest RCA in Thailand: 1980, 2006

Short description	RCA	PRODY	Technology class
1980			
Vegetable products roots and tubers, N.E.S., fresh, dried	135.89	1,695	PP
Flour, meals and flakes of potatoes, fruit and vegetables, N.E.S.	107.28	1,792	RB1
Rice, semimilled or wholly milled	81.32	1,946	PP
Castor oil	69.20	1,544	RB1
Vegetable textile fibers, N.E.S., and waste	68.83	543	RB1
Tin and tin alloys, unwrought	48.38	1,989	PP
Sesame seeds	40.82	468	PP
Fabric, woven, of continuous regenerated textile materials	36.50	3,919	MT2
Precious and semiprecious stones, not mounted, set, or strung	34.92	4,656	RB2
Natural rubber latex; natural rubber and gums	25.41	1,901	PP
2006			
Natural rubber latex; natural rubber and gums	32.45	1,781	PP
Rice, semimilled or wholly milled	23.15	2,678	PP
Vegetable products roots and tubers, N.E.S., fresh, dried	23.01	2,039	PP
Hygienic, pharmaceutical articles of unhardened vulcanized rubber	17.46	10,149	RB1
Starches, insulin and wheat gluten	16.83	6,755	RB2
Crustaceans and mollusks, prepared or prepared, N.E.S.	16.11	17,929	RB1
Fruit, fruit-peel, and parts of plants, preserved by sugar	16.08	3,218	RB1
Fish, prepared or preserved, N.E.S.	14.91	5,528	RB1
Tires, pneumatic, new, for aircraft	10.29	7,177	RB1
Articles of apparel, clothing accessories of plastic or rubber	9.70	6,158	LT1

Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

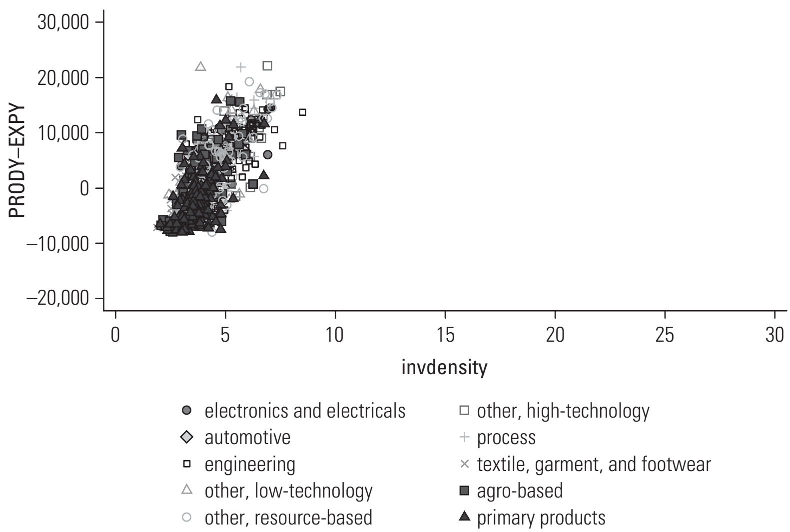
change in the composition of upgrading opportunities for Malaysia. In 1987, half of the items that presented upgrading opportunities were primary products or low-tech products (see table 4.17). By 2006, these had been largely replaced by medium- and high-tech products, mostly electronics, demonstrating Malaysia's export-oriented industrial focus (see table 4.18).

Figure 4.21 Product Space of Indonesia, 1987



Source: Authors' calculations based on UN Comtrade data.

Figure 4.22 Product Space of Indonesia, 2006



Source: Authors' calculations based on UN Comtrade data.

Table 4.15 Top 10 "Upscale" Commodities with the Highest Density in Indonesia, 1987

Short description	Density	Technology class	PRODY–EXPY
Nickel ores and concentrates; nickel mattes, etc.	0.256007	RB2	2,673
Undergarments of textile fabrics, not knitted or crocheted; men's, boys' undergarments, other than shirts	0.23813	LT1	789
Petroleum gases and other gaseous hydrocarbons, N.E.S., liquefied	0.237669	PP	5,299
Crude petroleum and oils obtained from bituminous materials	0.203862	PP	133
Outerwear knitted or crocheted, not elastic nor rubberized; women's, girls', infants' suits, dresses, etc., knitted, crocheted	0.197408	LT1	95
Undergarments, knitted or crocheted; of cotton, not elastic or rubberized	0.190617	LT1	122
Outerwear, knitted or crocheted, not elastic or rubberized; other, clothing accessories, nonelastic, knitted or crocheted	0.188632	LT1	374
Clothing accessories, knitted or crocheted, N.E.S.	0.183501	LT1	328
Outerwear knitted or crocheted, not elastic or rubberized; jerseys, pullovers, slipovers, cardigans, etc.	0.182652	LT1	1,166
Fabrics, woven, less than 85% of discontinuous synthetic fibers	0.181785	MT2	607

Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

Table 4.16 Top 10 "Upscale" Commodities with the Highest Density in Indonesia, 2006

Short description	Density	Technology class	PRODY–EXPY
Outerwear, knitted or crocheted, not elastic or rubberized; jerseys, pullovers, slipovers, cardigans, etc.	0.37064	LT1	1,899
Fish, dried, salted or in brine; smoked fish	0.350937	RB1	5,558
Nickel ores and concentrates; nickel mattes, etc.	0.34071	RB2	3,758
Personal adornments and ornaments articles of plastic	0.338178	LT2	1,057
Peripheral units, including control and adapting units	0.336881	HT1	3,959

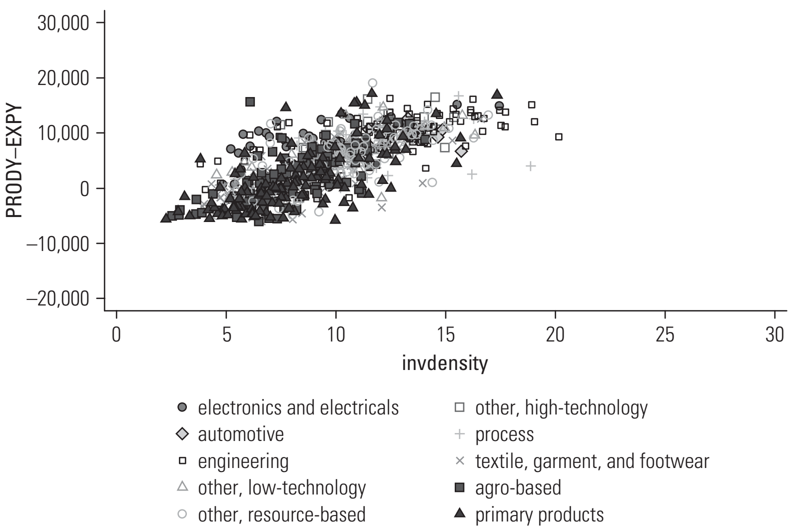
(*continued on next page*)

Table 4.16 *(continued)*

Short description	Density	Technology class	PRODY–EXPY
Crustaceans and mollusks, prepared or prepared, N.E.S.	0.336157	RB1	9,638
Petroleum gases and other gaseous hydrocarbons, N.E.S., liquefied	0.33395	PP	530
Fish fillets, frozen	0.330533	PP	7,188
Yarn, 85% synthetic fibers, not for retail; monofil, strip, etc.	0.330421	LT1	1,873
Pearls, not mounted, set ,or strung	0.328312	RB2	8,849

Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

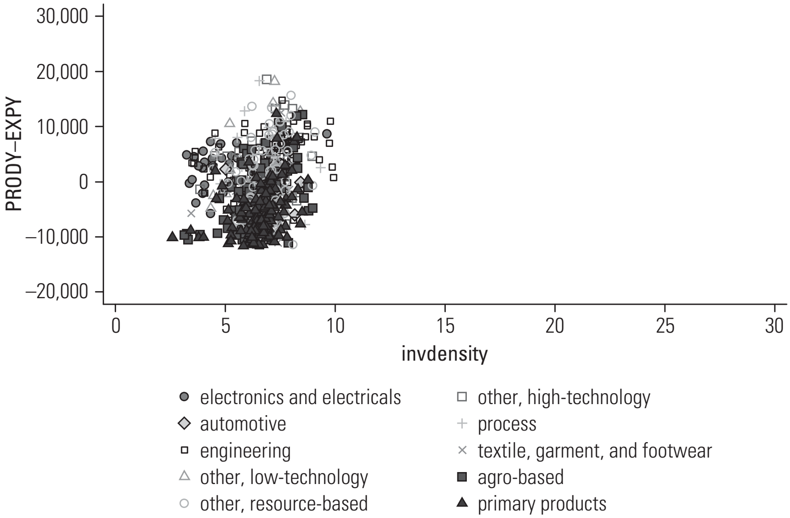
Figure 4.23 Product Space of Malaysia, 1987



Source: Authors' calculations based on UN Comtrade data.

Relative to Indonesia and Malaysia, the Philippines' export performance was stronger in the early stages of industrialization; this is reflected in the tighter distribution of commodities in the product space for 1987 (see figure 4.25). However, compared with Indonesia and Malaysia, the Philippines did not capitalize as much on its initial advantages. Industrialization and export diversification in the Philippines has made headway, and although some medium- and high-tech products surfaced in the product space for 2006, they are fewer than for Malaysia and Indonesia (see figure 4.26 and tables 4.19 and 4.20).

Figure 4.24 Product Space of Malaysia, 2006



Source: Authors' calculations based on UN Comtrade data.

Table 4.17 Top 10 "Upscale" Commodities with the Highest Density in Malaysia, 1987

Short description	Density	Technology class	PRODY–EXPY
Radio receivers for motor vehicles	0.26207	MT3	4,424
Petroleum gases and other gaseous hydrocarbons, N.E.S., liquefied	0.261955	PP	5,272
Undergarments of textile fabrics, not knitted or crocheted; men's, boys' undergarments, other than shirts	0.232194	LT1	762
Umbrellas, canes, and similar articles and parts thereof	0.219664	LT2	2,429
Portable radio receivers	0.217257	MT3	4,871
Fabrics, woven, less than 85% of discontinuous synthetic fibers	0.214142	MT2	580
Undergarments, knitted or crocheted; of cotton, not elastic or rubberized	0.214104	LT1	95
Crude petroleum and oils obtained from bituminous materials	0.212354	PP	107
Other radio receivers	0.211516	MT3	961
Outerwear knitted or crocheted, not elastic or rubberized; women's, girls', infants' suits, dresses, etc., knitted, crocheted	0.209722	LT1	68

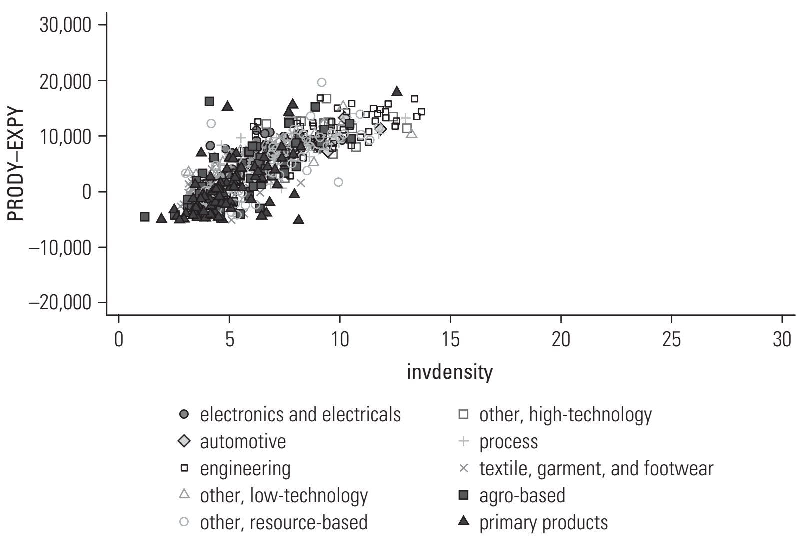
Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

Table 4.18 Top 10 "Upscale" Commodities with the Highest Density in Malaysia, 2006

Short description	Density	Technology class	PRODY–EXPY
Crystals, and parts, N.E.S., of electronic components of heading 776	0.309486	HT1	4,860
Peripheral units, including control and adapting units	0.287641	HT1	353
Printed circuits, and parts thereof, N.E.S.	0.286852	MT3	3,420
Other radio receivers	0.280185	MT3	3,316
Electronic microcircuits	0.279775	HT1	4,568
Portable radio receivers	0.276732	MT3	5,459
Other sound recording and reproduction, N.E.S.; video recorders	0.275605	MT3	4,344
Other electrical machinery and equipment, N.E.S.	0.264674	HT1	2,889
Parts, N.E.S., of and accessories for apparatus falling in heading 76	0.252825	HT1	2,538
Parts, N.E.S., of and accessories for machines of headings 7512 and 752	0.250685	HT1	5,556

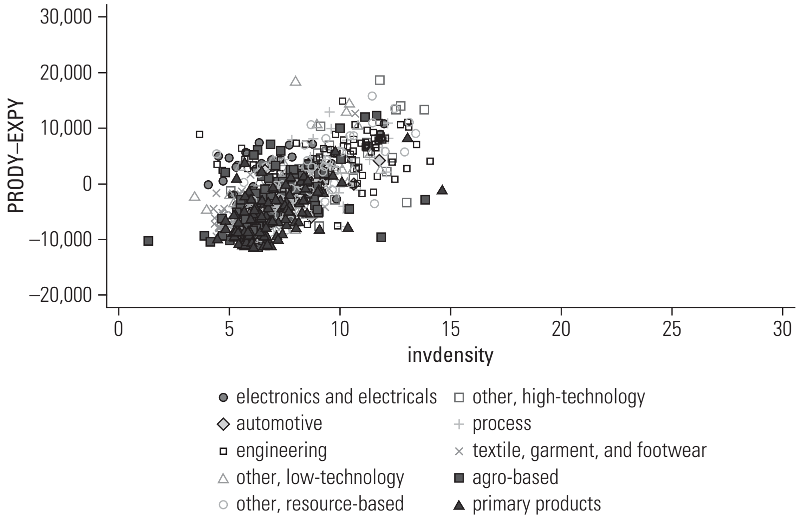
Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

Figure 4.25 Product Space of the Philippines, 1987



Source: Authors' calculations based on UN Comtrade data.

Figure 4.26 Product Space of the Philippines, 2006



Source: Authors' calculations based on UN Comtrade data.

Table 4.19 Top 10 "Upscale" Commodities with the Highest Density in the Philippines, 1987

Short description	Density	Technology class	PRODY–EXPY
Nickel ores and concentrates; nickel mattes, etc.	0.329816	RB2	3,270
Undergarments of textile fabrics, not knitted or crocheted; men's, boys' undergarments, other than shirts	0.319229	LT1	1,385
Manufactured goods, N.E.S.	0.317147	LT2	3,486
Clothing accessories, knitted or crocheted, N.E.S.	0.309774	LT1	924
Outerwear, knitted or crocheted, not elastic or rubberized; jerseys, pullovers, slipovers, cardigans, etc.	0.305111	LT1	1,762
Undergarments, knitted or crocheted; of cotton, not elastic or rubberized	0.298848	LT1	718
Women's, girls', infants' outerwear, textile, not knitted or crocheted; dresses	0.298766	LT1	438

(*continued on next page*)

Table 4.19 *(continued)*

Short description	Density	Technology class	PRODY–EXPY
Outerwear, knitted or crocheted, not elastic or rubberized; other, clothing accessories, nonelastic, knitted or crocheted	0.298534	LT1	971
Outerwear knitted or crocheted, not elastic or rubberized; women's, girls', infants' suits, dresses, etc., knitted, crocheted	0.297937	LT1	691
Tobacco refuse	0.290068	PP	1,310

Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

Table 4.20 Top 10 "Upscale" Commodities with the Highest Density in the Philippines, 2006

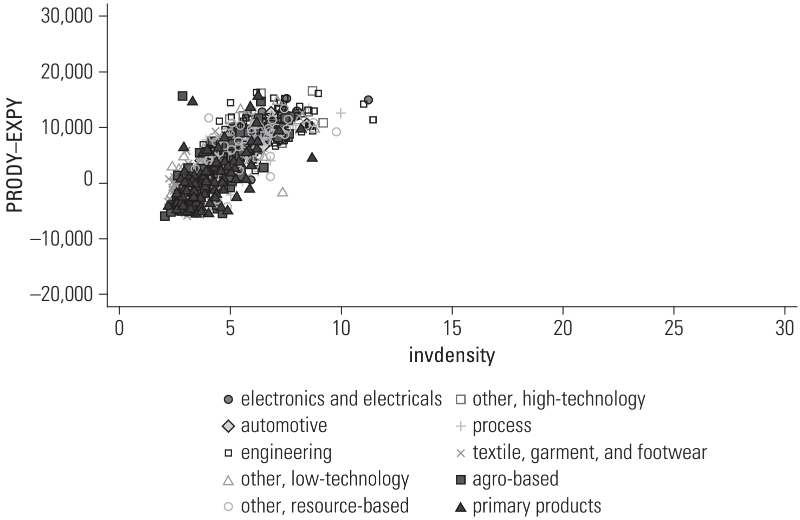
Short description	Density	Technology class	PRODY–EXPY
Watches, watch movements, and cases	0.274277	MT3	8,885
Pearls, not mounted, set, or strung	0.22628	RB2	5,327
Printed circuits, and parts thereof, N.E.S.	0.225104	MT3	3,504
Crystals and parts, N.E.S., of electronic components of heading 776	0.221333	HT1	4,943
Clocks, clock movements, and parts	0.21449	MT3	2,448
Peripheral units, including control and adapting units	0.212142	HT1	437
Fish, dried, salted or in brine; smoked fish	0.20813	RB1	2,036
Electronic microcircuits	0.200308	HT1	4,651
Other electrical machinery and equipment, N.E.S.	0.188276	HT1	2,972
Flours and meals of meat, fish, etc., unfit for humans; greaves	0.187836	PP	846

Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

Thailand's commodity distribution in the product space tightened between 1987 and 2006, and opportunities for diversification have increased (see figures 4.27 and 4.28). These include medium- and high-tech products—again, mostly electronic components displacing low-tech (e.g., garments and personal items) and resource-based commodities (e.g., food products) (see tables 4.21 and 4.22).

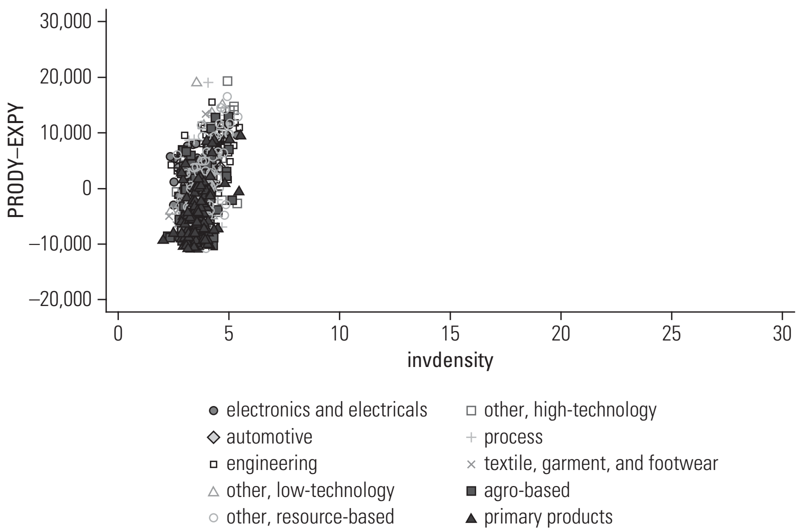
From the product space analysis, it appears that these four economies enhanced their industrial (and export) potential between 1987 and 2006. The promising areas of diversification and upgrading in 1987 were mostly within primary,

Figure 4.27 Product Space of Thailand, 1987



Source: Authors' calculations based on UN Comtrade data.

Figure 4.28 Product Space of Thailand, 2006



Source: Authors' calculations based on UN Comtrade data.

Table 4.21 Top 10 "Upscale" Commodities with the Highest Density in Thailand, 1987

Short description	Density	Technology class	PRODY–EXPY
Undergarments of textile fabrics, not knitted or crocheted; men's, boys' undergarments, other than shirts	0.450218	LT1	778
Manufactured goods, N.E.S.	0.420227	LT2	2,879
Clothing accessories, knitted or crocheted, N.E.S.	0.410723	LT1	317
Outerwear, knitted or crocheted, not elastic or rubberized; jerseys, pullovers, slipovers, cardigans, etc.	0.409869	LT1	1,155
Undergarments, knitted or crocheted; of cotton, not elastic or rubberized	0.39557	LT1	111
Outerwear knitted or crocheted, not elastic or rubberized; other clothing accessories, nonelastic, knitted or crocheted	0.393131	LT1	363
Macaroni, spaghetti, and similar products	0.381835	RB1	1,357
Outerwear, knitted or crocheted, not elastic or rubberized; women's, girls', infants' suits, dresses, etc., knitted, crocheted	0.380661	LT1	84
Umbrellas, canes, and similar articles and parts thereof	0.374083	LT2	2,445
Travel goods, handbags, etc., of leather, plastics, textile, others	0.363848	LT1	365

Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

resource-based, and low-tech products, because the Southeast Asian countries were more resource abundant on balance than the Northeast Asian ones (see table 4.23). By 2006, the steady development of electronic, automotive, and machinery industries via FDI had widened the options, primarily for Malaysia and Thailand. But the industrial deepening and backward linkages foreshadowed by the product space analysis have yet to be realized, and MNCs are not taking the lead in moving industrialization in these countries to the next level. For this to happen, diversification and upgrading[14] must be spearheaded by domestic firms with the requisite strategy and resources.[15] Without such firms, it is questionable whether the industrialization

[14]Upgrading is also dependent on the supply and quality of scientific and technical skills. Quality, in particular, remains poor throughout Southeast Asia, constraining technological capabilities and undermining the efforts to stimulate innovation.

[15]Kim (2007) maintains that the current trading arrangements are inhibiting the accumulation of social experience capital needed to enter more technology-intensive areas.

Table 4.22 Top 10 "Upscale" Commodities with the Highest Density in Thailand, 2006

Short description	Density	Technology class	PRODY–EXPY
Crystals and parts, N.E.S., of electronic components of heading 776	0.423955	HT1	5,657
Printed circuits and parts thereof, N.E.S.	0.417283	MT3	4,218
Peripheral units, including control and adapting units	0.395574	HT1	1,150
Electronic microcircuits	0.393997	HT1	5,365
Other sound recording and reproduction, N.E.S.; video recorders	0.377896	MT3	5,141
Clocks, clock movements, and parts	0.376103	MT3	3,162
Pearls, not mounted, set, or strung	0.373857	RB2	6,041
Other electrical machinery and equipment, N.E.S.	0.369362	HT1	3,686
Fabrics, woven, of continuous synthetic textile materials	0.368156	MT2	3,484
Parts, N.E.S., of and accessories for machines of headings 7512 and 752	0.353374	HT1	6,354

Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

Table 4.23 Subsoil Assets, 2000
US$ per capita

Country	Subsoil assets
Malaysia	6,922
Indonesia	1,549
China	511
Thailand	469
Pakistan	265
India	201
Bangladesh	83
Korea, Rep.	33
Philippines	30
Japan	28
Singapore	0
Sri Lanka	0

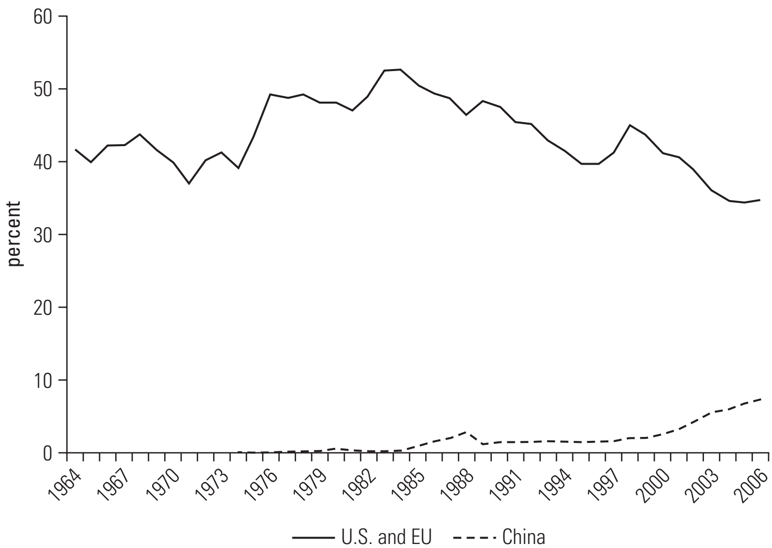
Source: World Development Indicators Database.

of the Southeast Asian countries can proceed in the directions suggested by product space analysis.[16]

Trade Competition: China, India, and the Rest

So much for industrialization—now what of trade? The United States and the European Union absorbed the majority of Southeast Asia's exports through the mid-1980s. In 1983, 53 percent of the manufactured exports from Southeast Asian countries were to the United States and the European Union. The trend for direct exports to these regions has been downward, since more of the exports are being absorbed by final assemblers in China, who sell the bulk of their output in OECD (Organisation for Economic Co-operation and Development) markets (see figure 4.29).

Figure 4.29 Share of Manufactured Exports of Southeast Asian Countries Destined for the United States, EU15, and China



Source: Authors' calculations based on UN Comtrade data.
Note: Southeast Asian countries include Indonesia, Malaysia, the Philippines, and Thailand.

[16]Southeast Asian firms have demonstrated limited initiatives aimed at moving up the manufacturing value chain; in recent years, private investment has flowed more into finance, real estate, and retail services than into manufacturing.

Export Overlap with Southeast Asia

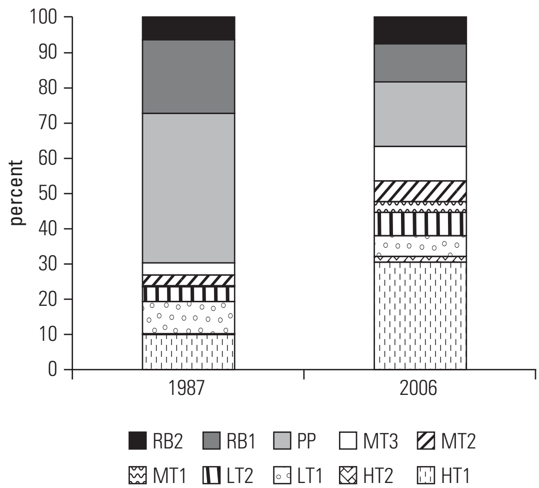
As recently as 1987, 70 percent of Southeast Asia's trade with India was in primary and resource-based products (see figure 4.30). Although these countries still export a significant amount of primary and resource-based products to India (for instance, Malaysia and Indonesia both export palm oil and petroleum, Thailand is an exporter of rice, and Indonesia also exports wood products), in recent years the composition of exports from Southeast Asian countries has altered to feature electronics and electrical components. In fact, the share of primary and resource-based products is now only half of what it was in 1987.

Imports by Southeast Asian countries from India consist of items such as cotton, oil seeds, meat, precious stones, and iron and steel. Although the exports of medium- and high-tech products from India to Southeast Asian countries increased between 1987 and 2006, primary and resource-based products still account for more than 60 percent, only a slight change from 1987 (see figure 4.31).

The overlap in exports between India and Southeast Asian middle-income economies has increased in the past 10 years, especially for the Philippines, although the degree of overlap is low compared to the overlap with China's exports (see figures 4.32 and 4.33).

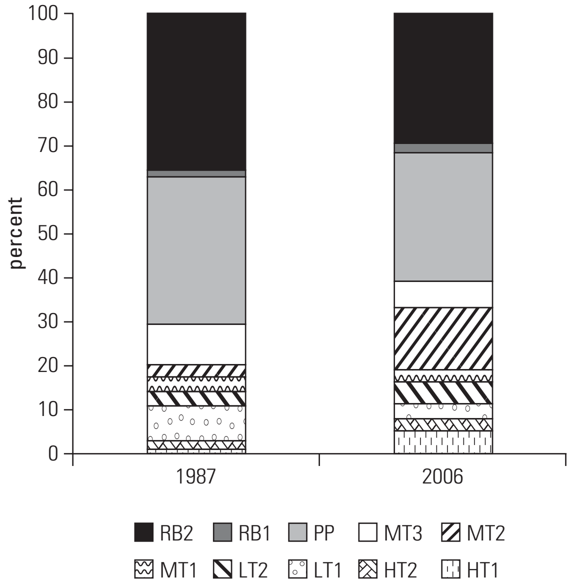
The exports from middle-income Southeast Asian economies currently facing competition from India are low-tech products such as garments, textiles, and footwear, and medium-tech manufactures (see figure 4.34 and table 4.24). Looking

Figure 4.30 Composition of Exports from Southeast Asia to India, 1987 and 2006



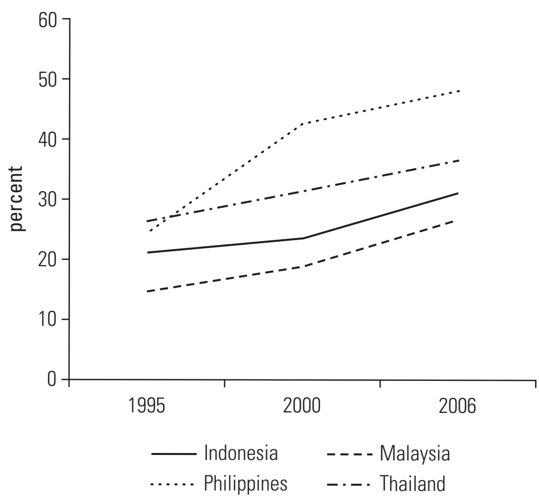
Source: Authors' calculations based on UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

Figure 4.31 Composition of India's Exports to Southeast Asian Countries, 1987 and 2006



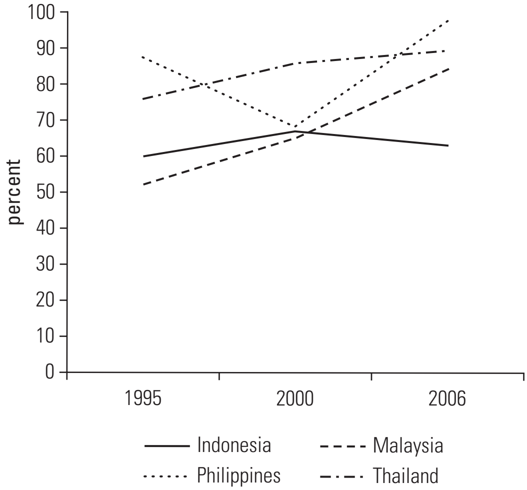
Source: Authors' calculations based on UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

Figure 4.32 Share of Overlapping Trade Values between Southeast Asian Countries and India



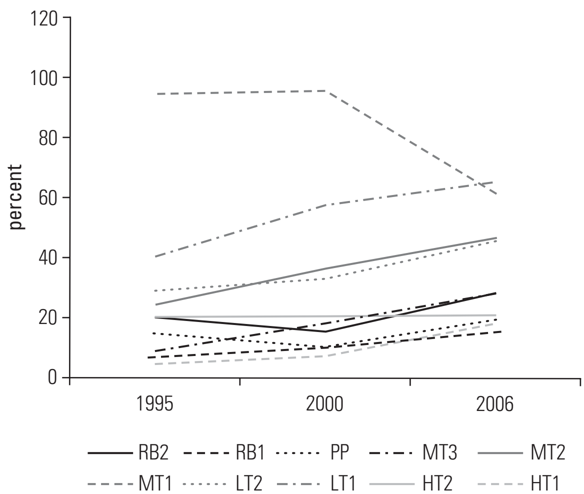
Source: Authors' calculations based on UN Comtrade data.

Figure 4.33 Share of Overlapping Trade Values between Southeast Asian Countries and China



Source: Authors' calculations based on UN Comtrade data.

Figure 4.34 Share of Overlapping Trade Values between Southeast Asian Countries and India by Technology Class



Source: Authors' calculations based on UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

Table 4.24 Share of Overlapping Trade Values between Southeast Asian Countries and India by Technology Class
percent

	1995	2000	2006
HT1	4.6	7.2	18.0
HT2	20.0	20.5	21.0
LT1	40.3	57.4	65.3
LT2	28.8	32.9	45.4
MT1	94.2	95.7	61.2
MT2	24.5	36.0	46.4
MT3	8.9	18.0	28.0
PP	14.7	10.2	19.3
RB1	6.7	10.1	15.1
RB2	19.9	15.3	28.2

Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

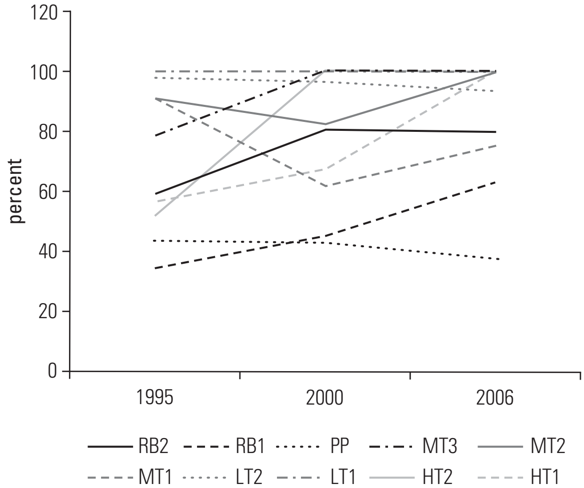
ahead, the data suggest that competition could extend to other products as well; with the exception of automotive products, the overlap between the exports of middle-income Southeast Asian economies and those of India is increasing.

Compared with the case of India, exports from the middle-income countries in East Asia are facing much stiffer competition from China (see figure 4.35 and table 4.25). Exports of Southeast Asian countries are quite similar to those of China, except for primary products, automotive products, and resource-based products. This is partly a reflection of the nature of the production networks and intra-industry trade. However, it would be naïve to assume that such symbiotic arrangements can persist in the future. Given the current crisis and possible changes in external conditions, it is more likely that these countries will be competing head to head with China. We will explore this in more detail in chapter 6.

Industrialization and Trade of the Low-Income Asian Countries

With the exception of Vietnam, the low-income countries of South and Southeast Asia have been unable to progress beyond industrial adolescence. Inward-looking, protectionist policies and bouts of political disorder, arguably exacerbated by neighborhood effects, have hamstrung countries such as Pakistan, Bangladesh, Nepal, Sri Lanka, and Cambodia. The promise of the 1950s and 1960s, when economies such as Pakistan appeared to be on the threshold of rapid industrialization, was never realized. The growth performance of Pakistan, Bangladesh, and

Figure 4.35 Share of Overlapping Trade Values between Southeast Asian Countries and China by Technology Class



Source: Authors' calculations based on UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

Table 4.25 Share of Overlapping Trade Values between Southeast Asian Countries and China by Technology Class
percent

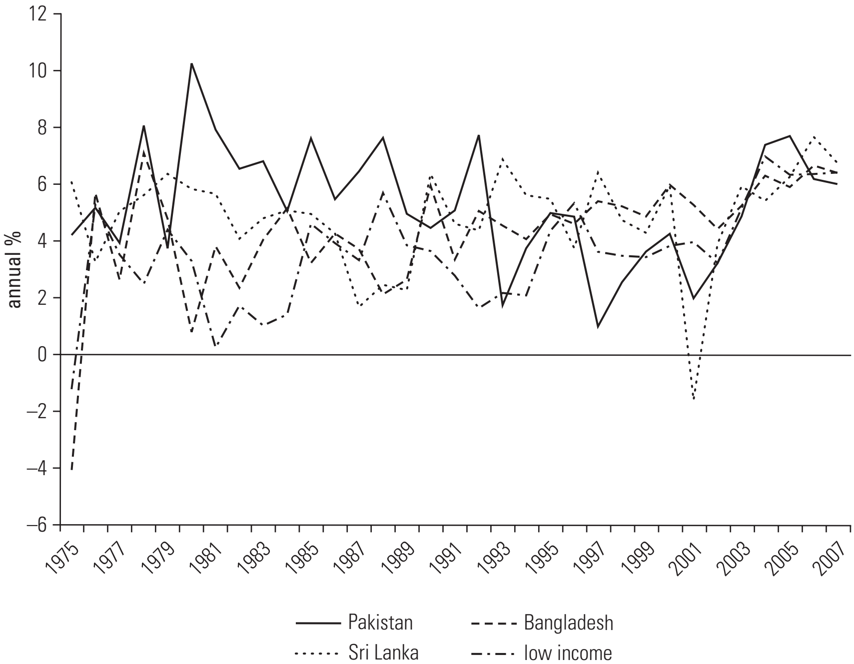
	1995	2000	2006
HT1	56.4	67.5	100.0
HT2	51.8	100.0	99.6
LT1	100.0	100.0	100.0
LT2	97.6	96.2	93.2
MT1	91.4	61.5	74.8
MT2	90.8	82.2	99.8
MT3	78.2	99.9	100.0
PP	43.4	42.8	37.3
RB1	34.6	45.4	63.0
RB2	59.3	80.6	80.0

Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

Sri Lanka between 1975 and 2007 has been above the average for developing countries (see figure 4.36 and table 4.26), but it has not been reinforced as it was in East Asia by a local or FDI-led virtuous spiral of industrialization and exports.

Because the development of manufacturing industries did not extend much beyond textiles, garments, and other low-tech activities, the share of manufacturing (and industry) in GDP remains relatively low. An arrested industrial transition has impeded the transfer of workers from agriculture to industry, and the

Figure 4.36 GDP Growth



Source: World Development Indicators Database.

Table 4.26 Average Annual GDP Growth, 1975–2007

Country	Average annual GDP growth (%)
Bangladesh	4.32
Pakistan	5.31
Sri Lanka	4.88
Low-income countries	3.59

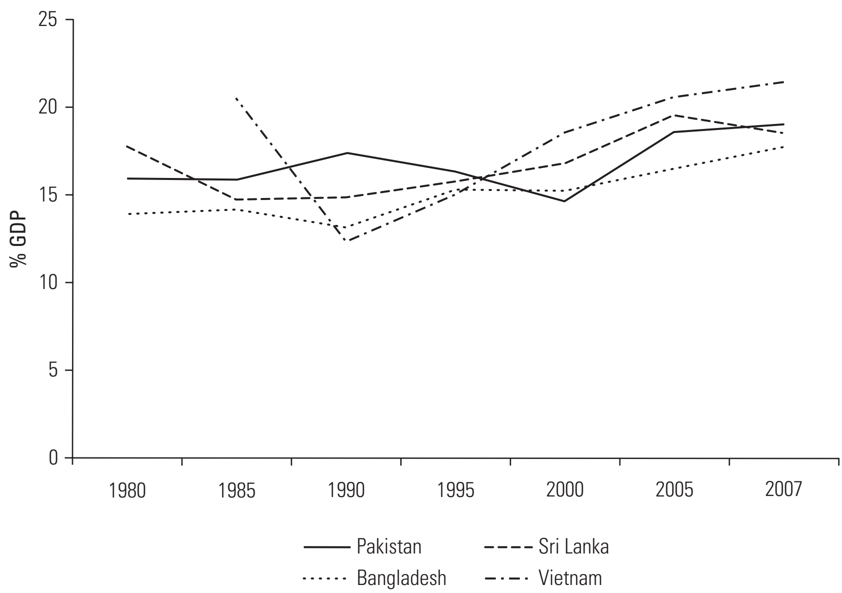
Source: World Development Indicators Database.

share of the primary sector remains close to 20 percent of GDP. Moreover, growth in these countries continues to fluctuate with reference to the fickle, weather-related fortunes of agriculture.

Partial industrialization is closely associated with two other characteristics of these economies. On average, they are less open and trade dependent than East Asian countries, and manufactures constitute a lesser share of exports. The stock of human capital is smaller and poorer in quality,[17] and percentagewise, the annual additions also tend to be modest. Furthermore, because industrialization has been marking time, the potential for growth- and productivity-enhancing technological change is also circumscribed.

Figures 4.37, 4.38, 4.39, 4.40, and 4.41 expose the factors underlying the performance of the low-income countries. Industry does not command a large enough share (Vietnam is a possible exception). The composition of manufactured exports leans toward textiles and light consumer items, and the fastest-growing exports are mainly low-tech, labor-intensive products with limited growth prospects.

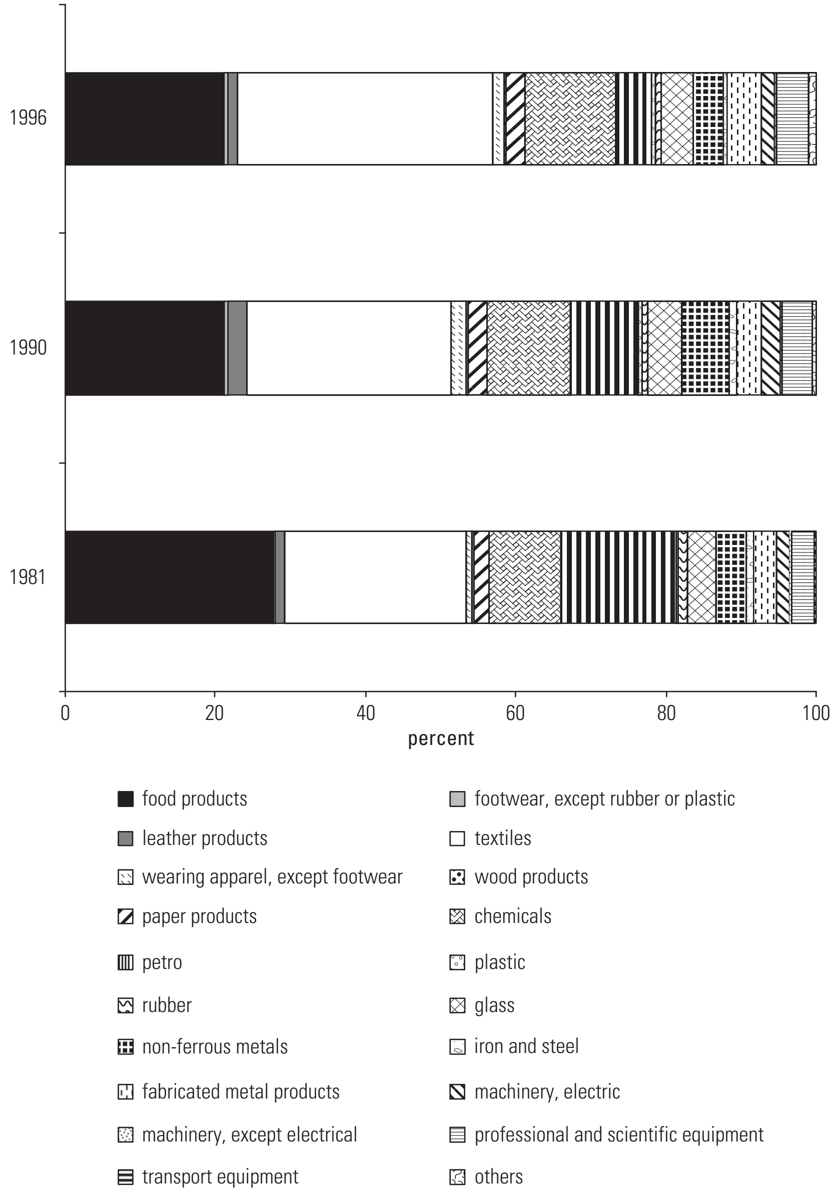
Figure 4.37 Manufacturing, Value Added



Source: World Development Indicators Database.

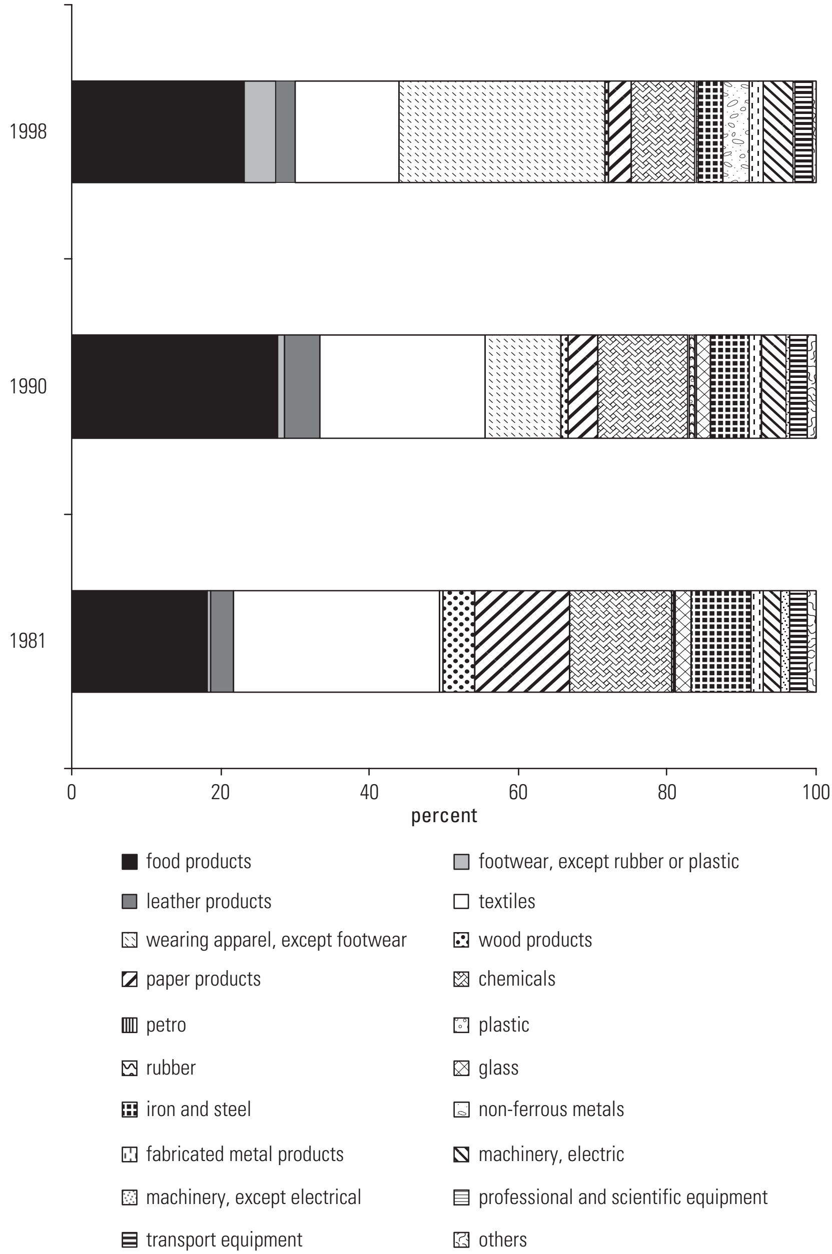
[17]Schooling quality and English language skills have stagnated or declined in each of these countries.

Figure 4.38 Industrial Composition by Type of Manufactures of Pakistan: 1981, 1990, and 1996



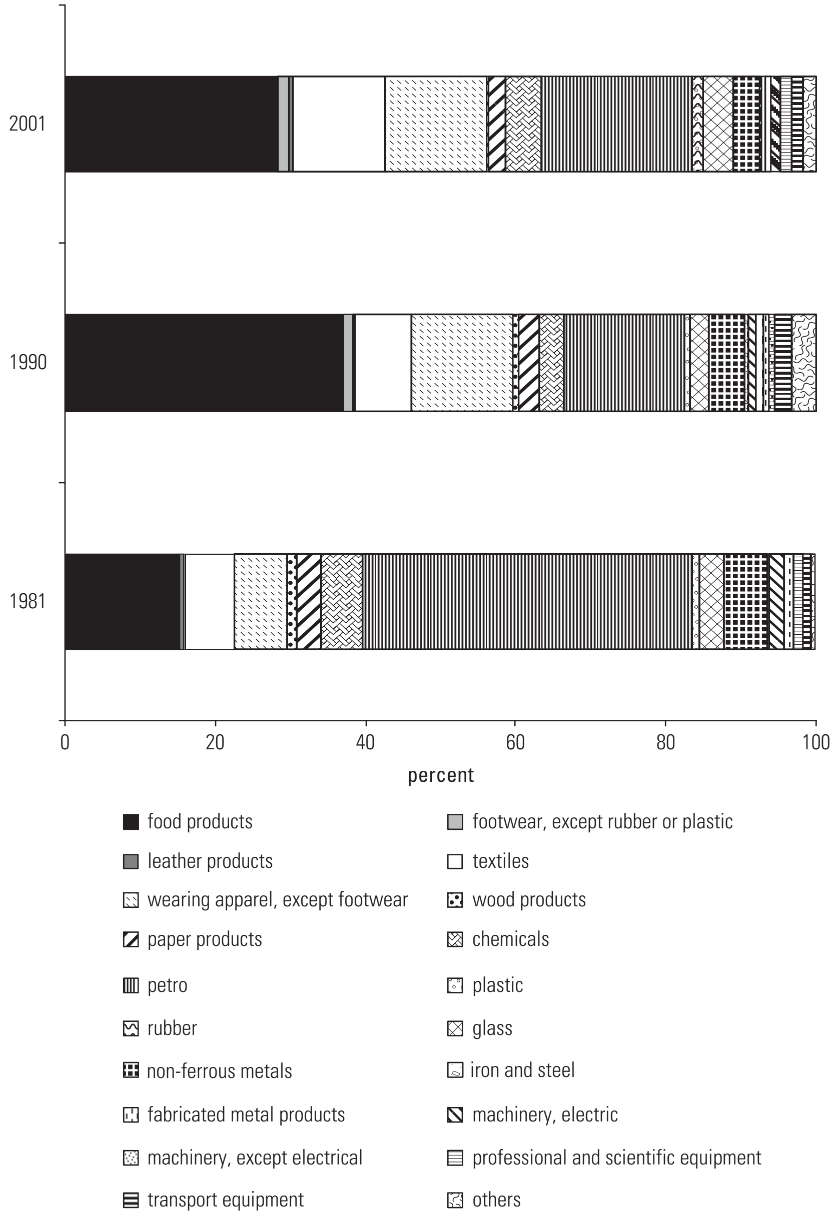
Source: UNIDO INDSTAT3.

Figure 4.39 Industrial Composition by Type of Manufactures of Bangladesh: 1981, 1990, and 1998



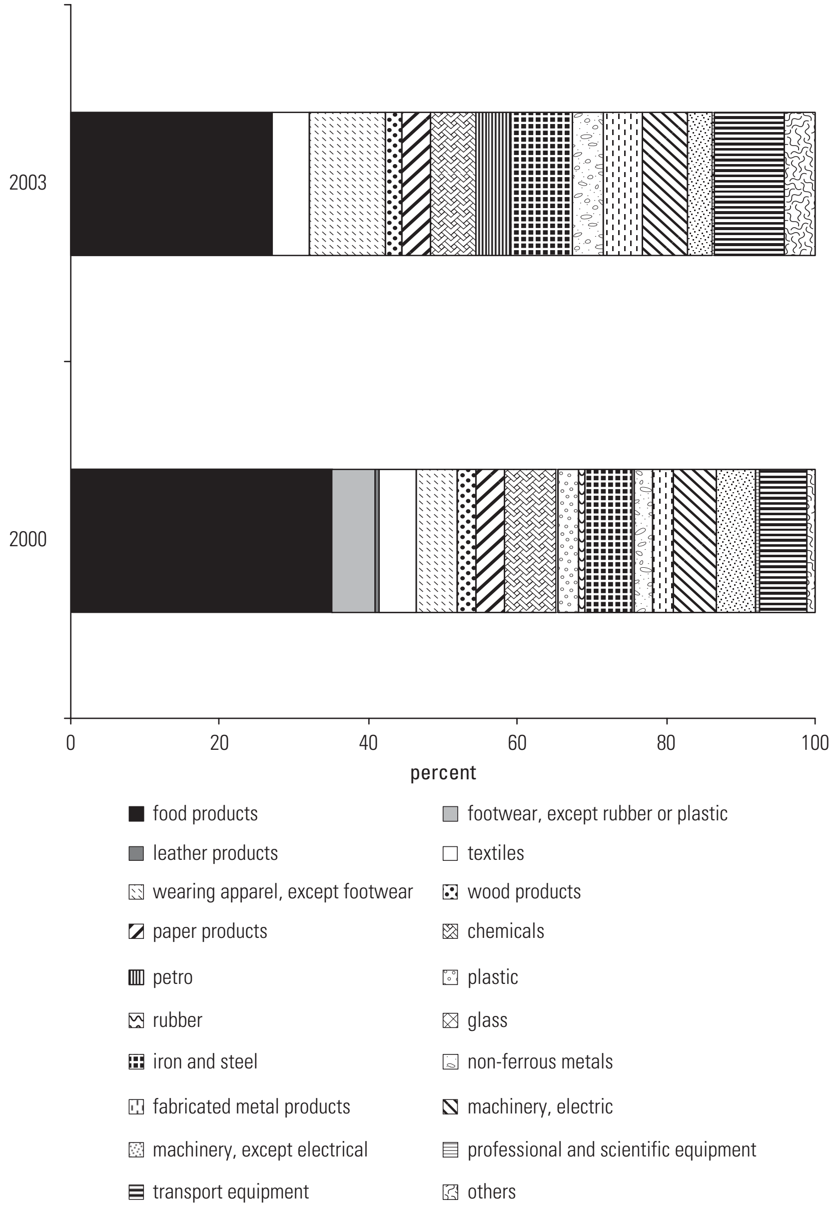
Source: UNIDO INDSTAT3.

Figure 4.40 Industrial Composition by Type of Manufactures of Sri Lanka: 1981, 1990, and 2001



Source: UNIDO INDSTAT3.

Figure 4.41 Industrial Composition by Type of Manufactures of Vietnam: 2000, 2003



Source: UNIDO INDSTAT3.

The RCA calculations underscore the limited manufacturing capabilities of South Asian economies. More important, they point to the slow rate of change between 1985 and 2006. In Bangladesh, for example, jute products, garments, and textiles were among the products with the highest RCA in 1985. Twenty years later, jute products and garments retained the top spots, the difference being that garments had increased their dominance and had edged out primary commodities such as leather, tea, and shellfish (see table 4.27).

The evolution of Pakistan's comparative advantage is similar. In 1985, primary products such as rice, molasses, oil seeds, and raw cotton and simple manufactures such as carpets, cotton yarn, and fabric were among the most competitive products. By 2006, much like that of Bangladesh, Pakistan's comparative advantage had climbed a few notches to encompass a broader range of fabrics, garments, and other textile articles, all representative of an industrial beginner and not what one might expect of a country that had entered the race to industrialize at the same time as Korea and Taiwan, China (see table 4.28). In the 1960s, Pakistan looked like a winner; but its economic stride faltered in the following decades because of unfocused policies and protectionism.

Sri Lanka and Vietnam have much in common. Production and export of primary products such as fibers, oil seeds, tea, and rubber were Sri Lanka's strengths in 1985. By 2005, these exports were supplemented by garments (see table 4.29). Much the same description fits Vietnam (see table 4.30). The products differ, but the RCA story is the same—although by all accounts, Vietnam is industrializing faster through FDI, including investment by Chinese producers of light manufactures seeking lower-wage production platforms.

The United States and the European Union are the principal trading partners of Asia's low-income countries (see figure 4.42). Nearly 80 percent of exports from Bangladesh and Sri Lanka are absorbed by these two markets (and more than half of the exports of Pakistan and Vietnam). Exports to China and India are growing but are still fairly small, although China is becoming an important export destination for Vietnam, Bangladesh, and Pakistan (see figure 4.43). India has remained an insignificant market for these countries, except for Sri Lanka (see figure 4.44).

Imports are a different story, because China, in particular, is a highly competitive producer of the low- and medium-tech manufactures that these countries require. In fact, one-quarter of Bangladesh's imports now come from China, whose market share is expanding throughout South Asia (see figure 4.45). India is also enlarging its market share, but its penetration is most visible in Bangladesh and Sri Lanka (see figure 4.46). From tables 4.31 and 4.32 we can see the composition of the largest and fastest-rising imports into the low-income South Asian countries, as well as the origins of these imports. For the leading imports in terms of value, China is the major supplier of textiles and (with India) of lower-quality iron and steel products. India is a significant source of chemical products.

Product space analysis offers some clues as to the prospects for industrial diversification in South Asia and Vietnam. Compared with Southeast Asian economies,

Table 4.27 Top 10 Four-Digit-Level Commodities with the Highest RCA in Bangladesh: 1985, 2006

Short Description	RCA	PRODY	Technology class
1985			
Jute, other textile bast fibers, N.E.S., raw, processed but not spun	1392.27	255	RB1
Fabrics, woven, of jute or other textile bast fibers of heading 2640	817.86	278	LT1
Bags, sacks of textile materials, for the packing of goods	409.76	603	LT1
Live animals of a kind mainly used for human food, N.E.S.	98.07	6,188	PP
Under garments of textile fabrics, not knitted or crocheted; men's and boys' shirts	71.79	3,160	LT1
Leather of other hides or skins	68.47	852	LT1
Other fresh, chilled, or frozen meat or edible meat offal	52.92	8,045	PP
Yarn of textile fibers, N.E.S.	47.53	4,887	LT1
Crustaceans and mollusks, fresh, chilled, frozen, salted, etc.	36.86	5,548	PP
Tea	31.15	536	PP
2006			
Jute, other textile bast fibers, N.E.S., raw, processed but not spun	872.05	448	RB1
Fabrics, woven of jute or other textile bast fibers of heading 2640	370.46	842	LT1
Undergarments, knitted or crocheted; of other fibers, not elastic or rubberized	118.94	2,404	LT1
Undergarments of textile fabrics, not knitted or crocheted; men's and boys' shirts	72.04	3,979	LT1
Men's and boys' outerwear, textile fabrics not knitted or crocheted; trousers, breeches, and the like	64.01	4,528	LT1
Undergarments, knitted or crocheted; of cotton, not elastic or rubberized	61.63	5,645	LT1
Men's and boys' outerwear, textile fabrics not knitted or crocheted; jackets, blazers, and the like	51.06	4,466	LT1
Yarn of textile fibers, N.E.S.	46.36	6,319	LT1
Bags, sacks of textile materials, for the packing of goods	31.83	2,620	LT1
Outerwear, knitted or crocheted, not elastic or rubberized; jerseys, pullovers, slipovers, cardigans, etc.	30.96	10,190	LT1

Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

Table 4.28 Top 10 Four-Digit-Level Commodities with the Highest RCA in Pakistan: 1985, 2006

Short description	RCA	PRODY	Technology class
1985			
Animal or vegetable fertilizer, crude	129.29	2,304	PP
Carpets, carpeting, and rugs, knotted	103.92	1,256	LT1
Castor oil seeds	96.86	1,134	PP
Tarpaulins, sails, tents, camping goods, etc., of textile fabrics	82.04	3,457	LT1
Molasses	74.45	2,490	RB1
Rice, semimilled or wholly milled	61.64	1,693	PP
Raw cotton, excluding linters, not carded or combed	57.63	1,690	PP
Cotton yarn	55.39	3,087	LT1
Cotton fabrics, woven, unbleached, not mercerized	52.70	2,484	LT1
Leather or other hides or skins	52.58	852	LT1
2006			
Articles of leather used in machinery or mechanical appliances, etc.	281.61	2,134	LT1
Cotton fabrics, woven, unbleached, not mercerized	120.97	2,527	LT1
Carpets, carpeting, and rugs, knotted	105.93	2,088	LT1
Linens and furnishing articles of textile, not knitted or crocheted	95.00	3,203	LT1
Undergarments, knitted or crocheted; of other fibers, not elastic or rubberized	92.18	2,404	LT1
Cotton yarn	90.10	3,830	LT1
Cotton waste, not carded or combed	89.76	2,954	PP
Rice, semimilled or wholly milled	82.28	2,678	PP
Molasses	52.38	1,680	RB1
Articles of apparel, clothing accessories of leather	49.40	5,318	LT1

Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

the product space of Bangladesh hardly changed between 1987 and 2006 (figures 4.47 and 4.48). The densities of upgrading and diversification opportunities barely increased between 1987 and 2006, suggesting that the potential for diversifying did not improve after 1987, nor did the composition of the industrial opportunities (see tables 4.33 and 4.34). In both years, apparel is the favored product group, and few other manufactures enter the picture.

Pakistan's situation is a little brighter. The distribution of the product space moved closer to the origin and became tighter, suggesting a modest gain in industrial capabilities between 1987 and 2006 (see figures 4.49 and 4.50). However, closer inspection of the most promising products reveals that the majority are

Table 4.29 Top 10 Four-Digit-Level Commodities with the Highest RCA in Sri Lanka: 1985, 2005

Short description	RCA	PRODY	Technology class
1985			
Vegetable textile fibers, N.E.S., and waste	542.99	813	RB1
Tea	239.94	536	PP
Sesame seeds	115.90	1,662	PP
Fuel wood and wood charcoal	95.43	2,288	PP
Coconut (copra) oil	60.22	1,312	RB1
Castor oil seeds	53.63	1,134	PP
Spices, except pepper and pimento	38.35	1,272	PP
Natural rubber latex; natural rubber and gums	34.59	2,114	PP
Nuts edible, fresh or dried	34.02	2,294	PP
Men's and boys' outerwear, textile fabrics not knitted or crocheted; other outer garments	32.11	5,714	LT1
2005			
Vegetable textile fibers, N.E.S., and waste	809.67	1,186	RB1
Tea	350.52	604	PP
Copra	326.45	552	PP
Undergarments, knitted or crocheted; of other fibers, not elastic or rubberized	204.04	1,988	LT1
Spices, except pepper and pimento	74.72	1,387	PP
Precious and semiprecious stones, not mounted, set, or strung	70.31	3,167	RB2
Hydrogenated animal or vegetable oils and fats	68.80	2,966	RB1
Other tires, tire cases, tire flaps and inner tubes, etc.	60.96	7,593	RB1
Undergarments of textile fabrics, not knitted or crocheted; women's, girls', infants' undergarments, textile, not knitted, etc.	54.74	2,889	LT1
Undergarments, knitted or crocheted; of wool or fine animal hair, not elastic or rubberized	44.11	4,836	LT1

Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

unchanged (see table 4.35 and 4.36). As in Bangladesh, the path to upgrading and diversification for Pakistan has not extended beyond apparel and some resource-based products.

Although a lack of data for Vietnam precludes us from commenting on its future industrialization, episodic information suggests that Vietnam is in a better position to diversify and upgrade its export basket relative to Bangladesh and Pakistan. In 2006, at least, the distribution of product space resembles that of the Southeast Asian rather than the South Asian economies, and the distribution

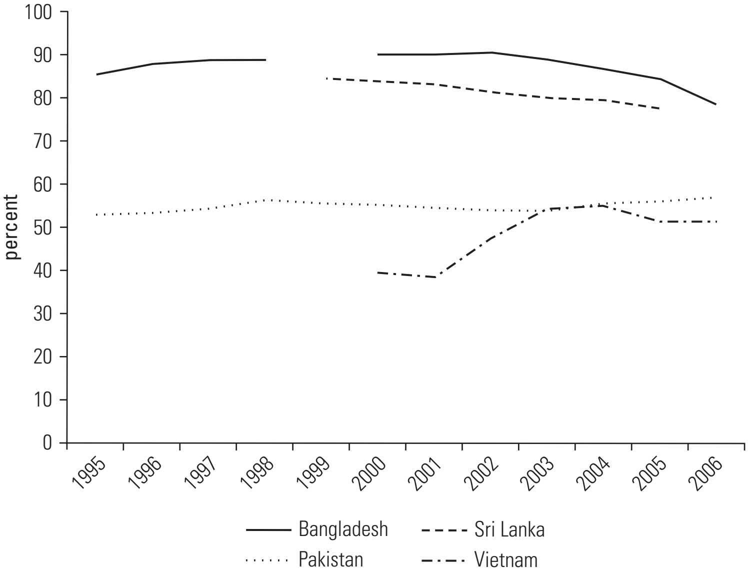
Table 4.30 Top 10 Four-Digit-Level Commodities with the Highest RCA in Vietnam: 2000, 2006

Short description	RCA	PRODY	Technology class
2000			
Roasted iron pyrites	273.64	7,484	RB2
Vegetable textile fibers, N.E.S., and waste	119.17	3,317	RB1
Rice, semimilled or wholly milled	50.90	2,459	PP
Pepper; pimento	48.90	2,739	PP
Men's and boys' outerwear, textile fabrics not knitted or crocheted; overcoats and other coats	42.84	2,745	LT1
Crustaceans and mollusks, fresh, chilled, frozen, salted, etc.	31.55	3,339	PP
Fuel wood and wood charcoal	26.24	2,363	PP
Tin and tin alloys, worked	24.23	6,731	PP
Coffee, green, roasted; coffee substitutes containing coffee	22.82	858	PP
Silk yarn and spun from noil or waste; silkworm gut	21.85	4,060	LT1
2006			
Anthracite, not agglomerated	113.24	1,809	PP
Copra	109.45	1,151	PP
Vegetable textile fibers, N.E.S., and waste	100.48	2,518	RB1
Pepper; pimento	38.27	2,205	PP
Rice, semimilled or wholly milled	37.42	2,678	PP
Men's and boys' outerwear, textile fabrics not knitted or crocheted; overcoats and other coats	28.87	4,230	LT1
Fish fillets, frozen	25.89	15,479	PP
Crustaceans and mollusks, fresh, chilled, frozen, salted, etc.	24.49	5,097	PP
Vegetable products, roots and tubers, N.E.S., fresh, dried	23.87	2,039	PP
Coffee, green, roasted; coffee substitutes containing coffee	23.42	1,120	PP

Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

relative to South Asian economies is closer to the origin (see figure 4.51). However, Vietnam's short-term opportunities for diversification and upgrading also lie in primary, resource-based, and low-tech products, similar to the situation for the Southeast Asian countries in 1987 (table 4.37). Whether or not Vietnam can follow the Southeast Asian path to industrial development remains to be seen. As in Southeast Asia and China, the speed of transformation is likely to depend on Vietnam's ability to attract FDI in medium- and high-tech products, the level of domestic investment, and the emergence of domestic industrial and technological capabilities.

Figure 4.42 Dependence on U.S. and EU Markets

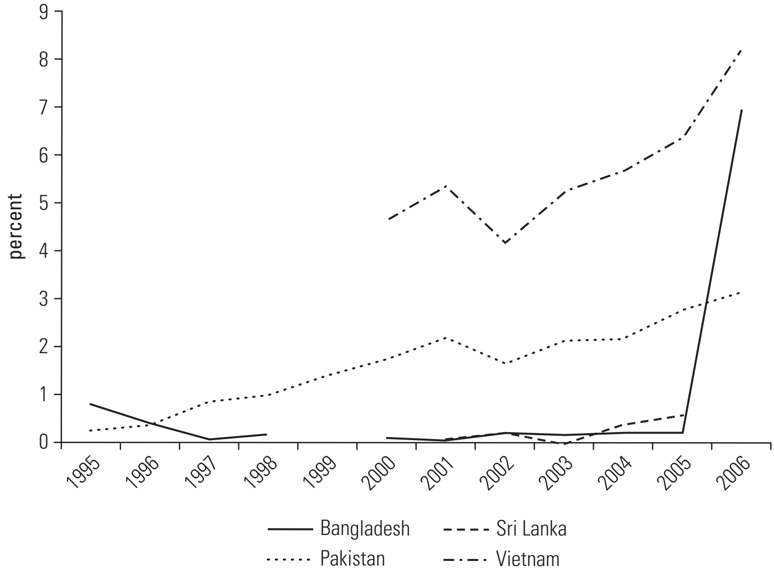


Source: Authors' calculations based on UN Comtrade data.

Given the slow pace of industrial progress in South Asian countries (excluding India), the prospect of catching up with the industrializing frontrunners is not improving. The production of textiles, food products, and processed commodities is the low and circuitous (and perhaps never-ending) path to industrial deepening. Pakistan, Bangladesh, Nepal, and Sri Lanka are specializing in low-value commodities, which occupy parts of the product space with fewer links to other commodity groups. Vietnam is a little different, but its industrial potential remains to be fully exploited.

The challenge facing South Asian countries is how to accelerate industrial change after decades of stagnation (although Pakistan, Sri Lanka and Bangladesh have all sustained GDP growth rates that are above the average for developing countries), and how to supplement consumption-driven growth with net exports by diversifying the export mix into medium-tech commodities promising better returns. There are some signs that such shifts may be implemented with the help of domestic entrepreneurship backed by domestic capital mobilized through the financial system. Foreign investment in manufacturing seems unlikely to mushroom in the near future; in fact, foreign investors have largely avoided industrial ventures in the low-income South Asian countries (except for India), because the business climate has been distinctly unfavorable there. Efforts at industrial and

Figure 4.43 Exports to China from Bangladesh, Sri Lanka, Pakistan, and Vietnam



Source: Authors' calculations based on UN Comtrade data.

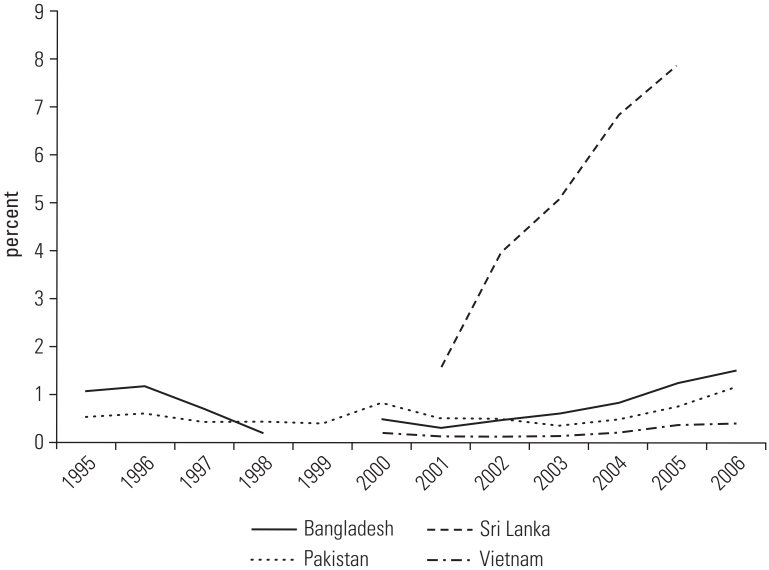
export diversification, should they intensify, would also confront intense competition from established producers in East Asia and the excess capacity in many industries. These problems will be compounded by less robust growth in import demand from some Western markets, most notably the United States. Marking time in industrial terms is economically and politically unpalatable for low-income countries, with growing and youthful populations, and facing mounting problems associated with unemployment, poverty, the looming challenge from climate change, and, in some cases, smoldering social unrest.

Chances are that the global economy will not regain the tempo it briefly achieved during 2005–07. With GDP growth and trade expanding more slowly, the countries of East and South Asia will need to strike a new equilibrium among themselves and with other countries. The most significant challenge will be the growing, reorienting, or downsizing of their industries in response to development strategies pursued by India and China and adjustment in the United States.

Technological Capabilities and Competitiveness

The external conditions may be not as favorable as in the past for the developing countries to diversify and deepen their industries by exploiting export opportunities.

Figure 4.44 Exports to India from Bangladesh, Sri Lanka, Pakistan, and Vietnam



Source: Authors' calculations based on UN Comtrade data.

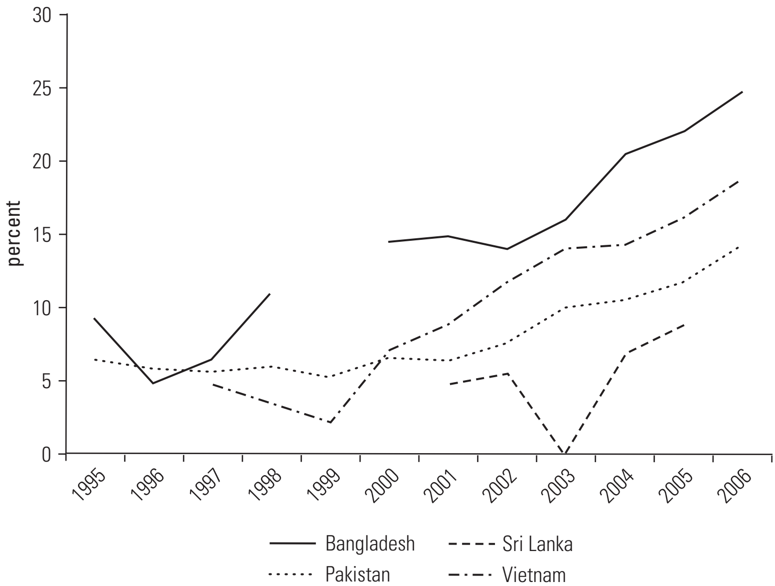
Consequently, Asian—mainly East Asian—countries are attempting to develop indigenous technological capabilities to cater to the wants of lower- and middle-income consumers in Asia, as well as buyers in industrialized countries.[18] In the face of stiffening competition within Asia, technology is coming to be viewed as a more important driver of growth than capital (Prahalad and Krishnan 2008). Following the example of Japan and Korea, countries are intensifying technology efforts and recognizing that FDI is only a partial answer, although such flow can facilitate technology transfer. There are several metrics that are used to assess the technological capabilities of a country. Some are input based, such as tertiary education enrollment and spending on R&D, and some are based on outputs, such as patents and published papers.

Tertiary Education

Except for Korea, Japan, and Thailand, Asian countries are lagging behind in terms of tertiary education enrollment (see table 4.38). While the gross enrollment rate in

[18]Some of this is through cost innovation that helps reduce the prices of manufactures and expands their markets.

Figure 4.45 China's Share of Imports in Bangladesh, Sri Lanka, Pakistan, and Vietnam



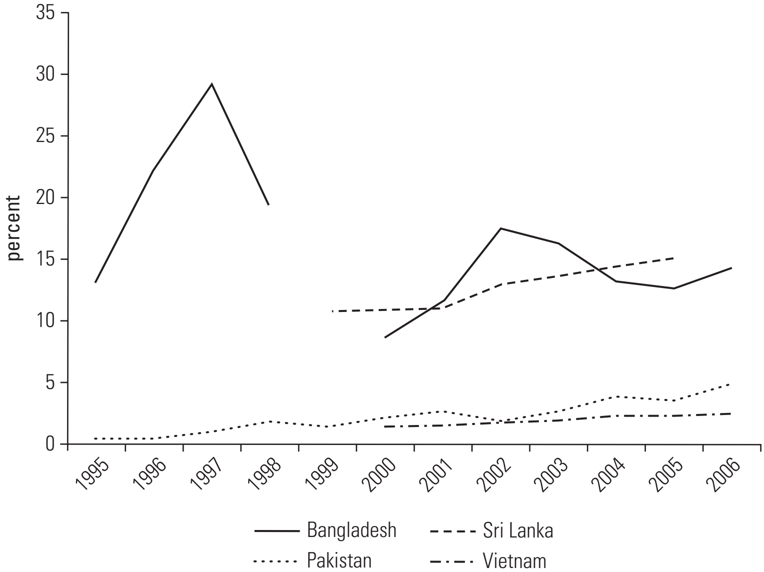
Source: Authors' calculations based on UN Comtrade data.

Korea is 93 percent (much higher than that of the United States), the enrollment rates in Japan and Thailand are 57 percent and 46 percent, respectively. Gross enrollment rates in other East Asian economies range from 17 percent in Indonesia to 29 percent in the Philippines. The gross enrollment rate in South Asia is low. India leads the pack with 12 percent, followed by Bangladesh (7 percent) and Pakistan (5 percent).

Enrollment in science and engineering fields is another indicator of the capacity to absorb and develop technology. More than half of all students in China, Japan, Singapore, and Thailand earn science and engineering degrees (see table 4.39). A significant percentage of students in Bangladesh; Hong Kong, China; Korea; and Taiwan, China; also earn their degrees in science and engineering fields, while relatively few students are graduating with science and engineering degrees in India, Pakistan, and the Philippines. The experience of East Asia suggests that to build indigenous technological capabilities, countries need to produce a sufficient supply of scientists and engineers, with these fields accounting for more than half of the total enrollment or graduation at the current stage of development. Quality of education must buttress quantity, and by all indications, the quality of education is wanting in Southeast and South Asian countries.[19] South and Southeast Asian

[19]On the quality of tertiary education in Southeast Asia, see Yusuf and Nabeshima (2010).

Figure 4.46 India's Share of Imports in Bangladesh, Sri Lanka, Pakistan, and Vietnam



Source: Authors' calculations based on UN Comtrade data.

Table 4.31 Largest Imports of South Asian Countries
percent

Product	Product share	Share of U.S.	Share of EU15	Share of Japan	Share of China	Share of India
Gold, nonmonetary unwrought, semimanufactured	5.3	0.2	0.8	0.4	0.0	0.0
Polyethylene in primary forms	2.1	3.0	2.7	2.6	0.7	3.5
Polypropylene in primary forms	1.9	7.3	1.3	2.9	0.3	17.6
Iron/steel coils of other than high carbon steel	1.6	0.5	2.8	27.9	16.6	1.4
Fabrics mixed with fibers other than cotton, wool, etc.	1.6	0.8	4.7	9.6	31.8	0.8
Fabrics mixed mainly or solely with cotton	1.6	0.1	1.0	1.4	84.5	0.3
Blooms, etc., of other than high carbon steel	1.5	0.3	0.8	2.8	68.1	6.4
Refined copper, unwrought	1.4	0.0	0.5	2.9	0.1	5.6
Waste of other iron or steel	1.4	10.3	16.2	6.9	0.1	0.1
Sheets and plates of other than high carbon steel	1.4	0.6	5.1	19.2	31.1	3.2

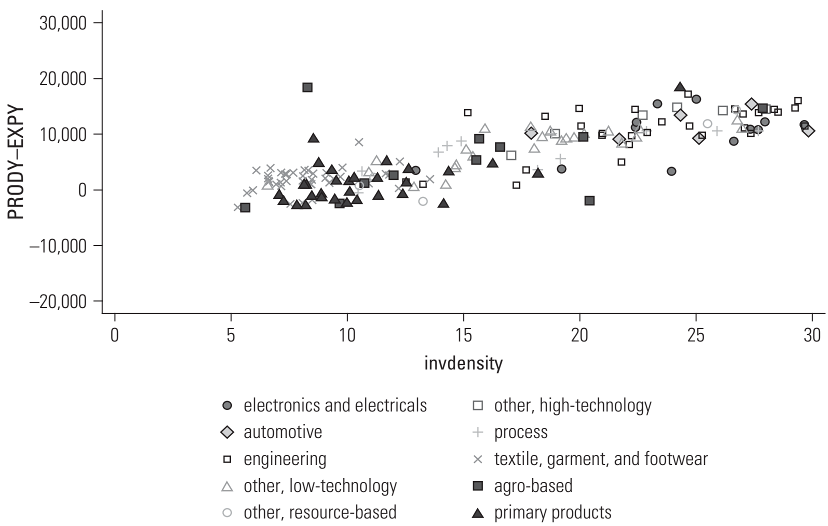
Source: Authors' calculations based on UN Comtrade data.

Table 4.32 Fastest-growing Imports of South Asian Countries
percent

Product	Annual growth rate	Share of U.S.	Share of EU15	Share of Japan	Share of China	Share of India
Blooms, etc., of high-carbon steel	488.0	0.1	1.2	5.3	54.0	1.2
Vinyl chloride (chloroethylene)	463.3	0.0	0.0	32.7	0.1	1.1
Liquefied propane and butane	397.6	0.1	0.0	0.1	0.0	0.0
Diamonds, cut, otherwise worked, not mounted or set	390.1	0.7	5.5	5.5	0.1	0.5
Diamonds, sorted, rough, simply sawn	382.1	0.0	91.5	0.0	0.0	0.0
Unrefined copper	371.6	0.0	0.1	2.1	0.4	0.1
Skins and other parts of birds with feather	365.0	15.2	10.3	0.2	2.9	0.0
Slag, dross, etc., and waste from manufacture	357.3	0.0	0.0	35.3	0.0	63.9
Skins and other parts of birds	350.3	3.5	1.1	1.3	0.6	0.0
Ingots of iron or steel	334.4	0.0	0.1	0.0	36.3	51.0

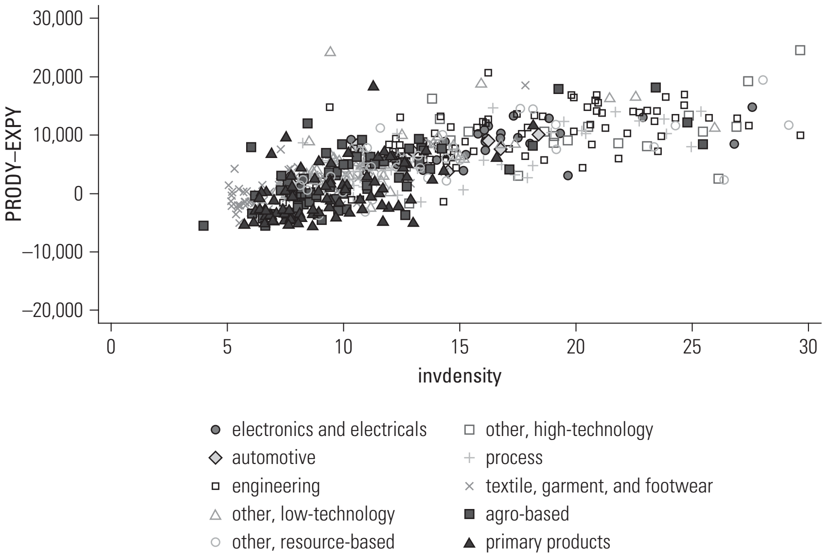
Source: Authors' calculations based on UN Comtrade data.

Figure 4.47 Product Space of Bangladesh, 1987



Source: Authors' calculations based on UN Comtrade data.

Figure 4.48 Product Space of Bangladesh, 2006



Source: Authors' calculations based on UN Comtrade data.

Table 4.33 Top 10 "Upscale" Commodities with the Highest Density in Bangladesh, 1987

Short description	Density	Technology class	PRODY–EXPY
Undergarments of textile fabrics, not knitted or crocheted; men's, boys' undergarments, other than shirts	0.164584	LT1	3,512
Basketwork, wickerwork; brooms, paint rollers, etc.	0.15237	LT2	656
Women's, girls', infants' outerwear, textile, not knitted or crocheted; dresses	0.152142	LT1	2,564
Men's and boys' outerwear, textile fabrics not knitted or crocheted; jackets, blazers, and the like	0.152046	LT1	2,011
Men's and boys' outerwear, textile fabrics not knitted or crocheted; other outerwear	0.151764	LT1	1,615
Women's, girls', infants' outerwear, textile, not knitted or crocheted; other outer garments of textile fabrics, not knitted or crocheted	0.150978	LT1	1,437
Outerwear, knitted or crocheted, not elastic or rubberized; jerseys, pullovers, slipovers, cardigans, etc.	0.149653	LT1	3,888

(*continued on next page*)

Table 4.33 *(continued)*

Short description	Density	Technology class	PRODY–EXPY
Men's and boys' outerwear, textile fabrics not knitted or crocheted; trousers, breeches, and the like	0.144188	LT1	977
Undergarments of textile fabrics, not knitted or crocheted; women's, girls', infants' under garments, textile, not knitted, etc.	0.140466	LT1	1,357
Clothing accessories, of textile fabrics, not knitted or crocheted	0.14026	LT1	707

Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

Table 4.34 Top 10 "Upscale" Commodities with the Highest Density in Bangladesh, 2006

Short description	Density	Technology class	PRODY–EXPY
Outerwear knitted or crocheted, not elastic or rubberized; other clothing accessories, nonelastic, knitted or crocheted	0.198168	LT1	1,397
Outerwear, knitted or crocheted, not elastic or rubberized; women's, girls', infants' suits, dresses, etc., knitted, crocheted	0.192436	LT1	293
Outerwear, knitted or crocheted, not elastic or rubberized; jerseys, pullovers, slipovers, cardigans, etc.	0.188801	LT1	4,263
Women's, girls', infants outerwear, textile, not knitted or crocheted; other outer garments of textile fabrics, not knitted or crocheted	0.182024	LT1	785
Undergarments, knitted or crocheted; of synthetic fibers, not elastic or rubberized	0.175899	LT1	230
Men's and boys' outerwear, textile fabrics not knitted or crocheted; other outer garments	0.171985	LT1	363
Fish, dried, salted or in brine; smoked fish	0.165889	RB1	7,922
Footwear	0.158627	LT1	12
Fish, frozen, excluding fillets	0.154622	PP	135
Corsets, garters, etc., not knitted or crocheted, elastic and nonelastic	0.153908	LT1	1,419

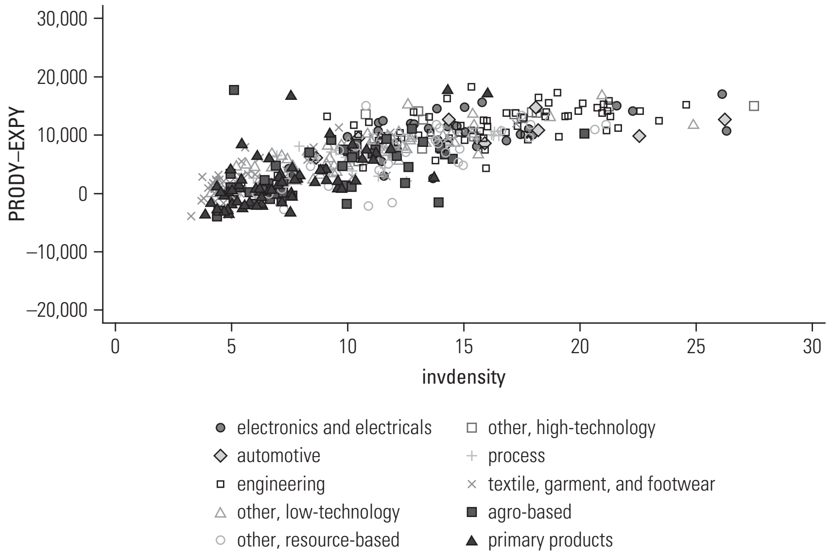
Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

countries have a lot of catching up to do before they can expect to derive significant productivity gains from the technology push.

R&D Spending

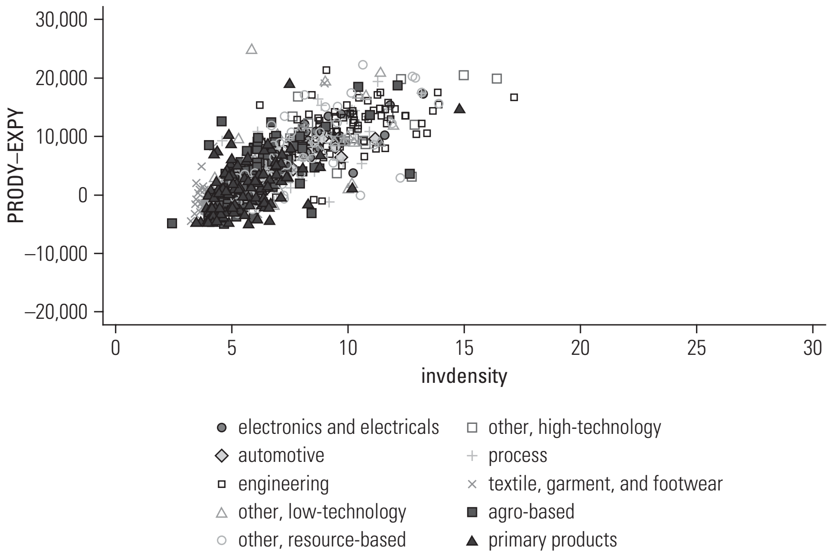
Expenditure on R&D is another metric often used to judge the technological capabilities of a country. Japan is by far the largest spender on R&D as a share of

Figure 4.49 Product Space of Pakistan, 1987



Source: Authors' calculations based on UN Comtrade data.

Figure 4.50 Product Space of Pakistan, 2006



Source: Authors' calculations based on UN Comtrade data.

Table 4.35 Top 10 "Upscale" Commodities with the Highest Density in Pakistan, 1987

Short description	Density	Technology class	PRODY–EXPY
Undergarments of textile fabrics, not knitted or crocheted; men's, boys' undergarments, other than shirts	0.268009	LT1	2,820
Men's and boys' outerwear, textile fabrics not knitted or crocheted; other outer garments	0.251025	LT1	923
Men's and boys' outerwear, textile fabrics not knitted or crocheted; jackets, blazers, and the like	0.241909	LT1	1,319
Women's, girls', infants' outerwear, textile, not knitted or crocheted; dresses	0.239259	LT1	1,872
Clothing accessories, of textile fabrics, not knitted or crocheted	0.23549	LT1	15
Women's, girls', infants' outerwear, textile, not knitted or crocheted; other outer garments of textile fabrics, not knitted or crocheted	0.234831	LT1	745
Outerwear, knitted or crocheted, not elastic or rubberized; other clothing accessories, nonelastic, knitted or crocheted	0.231841	LT1	2,405
Undergarments, knitted or crocheted; of cotton, not elastic or rubberized	0.230236	LT1	2,152
Silkworm cocoons and silk waste	0.228981	PP	1,116
Outerwear, knitted or crocheted, not elastic or rubberized; jerseys, pullovers, slipovers, cardigans, etc.	0.226621	LT1	3,196

Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

Table 4.36 Top 10 "Upscale" Commodities with the Highest Density in Pakistan, 2006

Short description	Density	Technology class	PRODY–EXPY
Outerwear, knitted or crocheted, not elastic or rubberized; other clothing accessories, nonelastic, knitted or crocheted	0.289847	LT1	2,002
Undergarments, knitted or crocheted; of cotton, not elastic or rubberized	0.283071	LT1	322
Outerwear, knitted or crocheted, not elastic or rubberized; women's, girls', infants' suits, dresses, etc., knitted, crocheted	0.277122	LT1	897
Outerwear, knitted or crocheted, not elastic or rubberized; jerseys, pullovers, slipovers, cardigans, etc.	0.271571	LT1	4,867
Women's, girls', infants' outerwear, textile, not knitted or crocheted; other outer garments of textile fabrics, not knitted or crocheted	0.266353	LT1	1,389

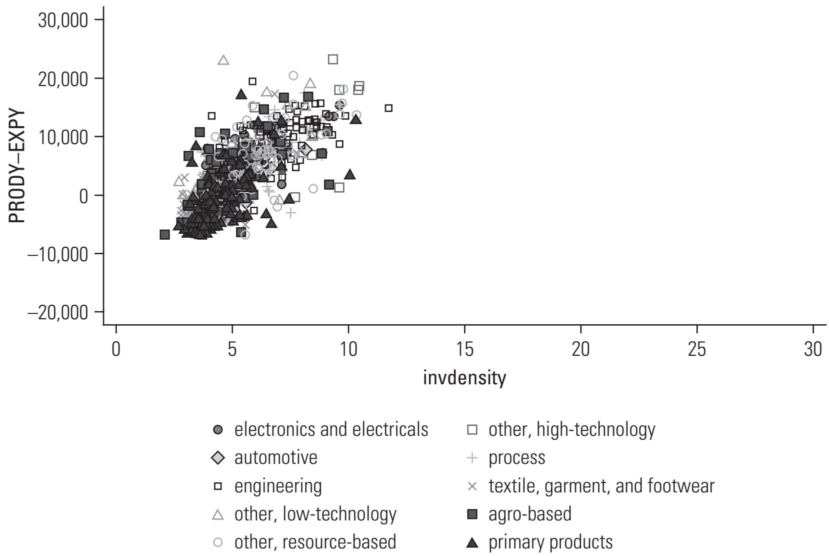
(*continued on next page*)

Table 4.36 (continued)

Short description	Density	Technology class	PRODY–EXPY
Undergarments, knitted or crocheted; of synthetic fibers, not elastic or rubberized	0.262442	LT1	835
Men's and boys' outerwear, textile fabrics not knitted or crocheted; other outer garments	0.251116	LT1	968
Fish, dried, salted or in brine; smoked fish	0.249676	RB1	8,526
Fish, frozen, excluding fillets	0.244581	PP	740
Fabrics, woven, less than 85% of discontinuous synthetic fibers	0.240432	MT2	393

Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

Figure 4.51 Product Space of Vietnam, 2006



Source: Authors' calculations based on UN Comtrade data.

GDP, with 3.4 percent of GDP so devoted in 2006 (see table 4.40). Korea has quickly ramped up its spending on R&D since 2000, and now it rivals Japan, with 3.2 percent of GDP channeled into R&D. Singapore also has been increasing its spending on R&D, which in 2006 accounted for 2.4 percent of GDP. The most impressive increase is in China, with the R&D outlay rising from 0.6 percent of GDP in 1999 to 1.4 percent in 2008. Given the rapid economic growth during this

Table 4.37 Top 10 "Upscale" Commodities with the Highest Density in Vietnam, 2006

Short description	Density	Technology class	PRODY–EXPY
Personal adornments and ornament articles of plastic	0.370375	LT2	2,158
Outerwear, knitted or crocheted, not elastic or rubberized; other clothing accessories, nonelastic, knitted or crocheted	0.351969	LT1	134
Outerwear, knitted or crocheted, not elastic or rubberized; jerseys, pullovers, slipovers, cardigans, etc.	0.341022	LT1	3,000
Fish, dried, salted or in brine; smoked fish	0.32256	RB1	6,659
Corsets, garters, etc., not knitted or crocheted, elastic or nonelastic	0.310899	LT1	156
Flours and meals of meat, fish, etc., unfit for human; greaves	0.306868	PP	5,469
Fish fillets, frozen	0.291687	PP	8,289
Base metal domestic articles, N.E.S., and parts thereof, N.E.S.	0.291541	LT2	960
Candles, matches, combustible products, etc.	0.289748	LT2	811
Crustaceans and mollusks, prepared or unprepared, N.E.S.	0.279235	RB1	10,739

Source: Authors' calculations using UN Comtrade data. Technology classification is based on Lall (2000).
Note: See the note to table 4.2.

Table 4.38 Gross Enrollment in Tertiary Education

Country/economy	1998	2000	2002	2006
Korea, Rep.	66.0	78.4	86.8	92.6
Japan	43.7	47.4	50.5	57.3
Thailand	—	35.2	41.0	45.9
Malaysia	22.1	25.9	28.0	30.2
Philippines	27.3	—	30.4	28.5
China	—	7.7	12.7	21.6
Indonesia	—	—	15.0	17.0
India	—	9.6	10.4	11.9
Vietnam	—	9.5	—	—
Bangladesh	—	5.4	6.0	6.8
Pakistan	—	—	2.5	4.5
Sri Lanka	—	—	—	—
Singapore	—	—	—	—
Taiwan, China	—	—	—	—

Source: World Development Indicators Database.
Note: — = not available.

Table 4.39 Percentage of First University Degrees in Science and Engineering

Country/economy	Year	Percentage
Bangladesh	2003	41.5
China	2004	56.2
Hong Kong, China	2004	37.7
India	2006	20.3
Japan	2005	63.3
Korea, Rep.	2004	45.6
Pakistan	2006	24.0
Philippines	2004	25.5
Philippines	2006	27.4
Singapore	2004	58.5
Taiwan, China	2005	40.8
Thailand	2001	68.9

Source: National Science Board (2008). Data for India, Pakistan, and the Philippines are from the World Bank Knowledge Assessment Methodology data set (http://www.worldbank.org/kam).

Table 4.40 R&D Spending by Country

Country	1996	2000	2002	2004	2005	2006
China	0.6	0.9	1.1	1.2	1.3	1.4
India	0.7	0.8	0.7	0.7	—	—
Indonesia	—	0.1	—	—	—	—
Japan	2.8	3.0	3.2	3.2	3.3	3.4
Korea, Rep.	2.4	2.4	2.5	2.9	3.0	3.2
Malaysia	0.2	0.5	0.7	0.6	—	—
Pakistan	—	0.1	0.2	—	0.4	—
Philippines	—	—	0.2	—	—	—
Singapore	1.4	1.9	2.2	2.2	2.4	2.4
Sri Lanka	0.2	0.1	—	0.2	—	—
Thailand	0.1	0.3	0.2	0.3	—	—
Vietnam	—	—	0.2	—	—	—

Source: World Development Indicators Database.
Note: — = not available.

period, the increase in the volume of resources committed to R&D is phenomenal. The literature on R&D spending suggests that doubling such spending over a decade (along with a buildup of human capital and institutions supportive of innovation) can help lead to a technological takeoff for a country (Hu and Jefferson 2008). If China can sustain its research, it may emerge as a technology powerhouse in East Asia alongside Japan and Korea. But there is plenty of evidence to suggest that the efficient utilization of funds is probably the key to superior growth outcomes, and such efficiency is predicated on the accumulation of experience (managerial, research related, and marketing) in firms and research entities, which is a slow process.

Another indicator of technology potential is how R&D spending is distributed among the principal actors: private businesses, government, and higher education. In general, private firms are responsible for around two-thirds of R&D spending in OECD countries. In East Asia, firms account for a significant portion of R&D spending except in Indonesia and Vietnam (see table 4.41). In both Indonesia and Vietnam, government is the major source of R&D spending. This is also the case in South Asia. The share of government in R&D spending is more than 60 percent in India, Pakistan, and Sri Lanka. While the public sector is usually responsible for the bulk of basic and early-stage applied research, the task of technology development and the commercializing of innovation falls on firms. R&D spending during the development process can be viewed as a part of the effort to assimilate and internalize foreign technology while building the foundations of a national innovation system. During the rapid-growth phase of Japan, more than 30 percent of R&D was devoted to learning. Firms are in a much better position to identify the technologies that have the greatest commercial payoff, and they need to expend some effort in understanding these technologies. They must

Table 4.41 Composition of R&D Spending
percent

Country/economy	Business enterprise	Government	Higher education	Private nonprofit
China	71.1	19.7	9.2	—
Hong Kong, China	48.3	2.2	49.5	—
India	19.8	75.3	4.9	—
Indonesia	14.3	81.1	4.6	—
Japan	77.2	8.3	12.7	1.9
Korea, Rep.	77.3	11.6	10.0	1.2
Malaysia	71.5	10.4	18.1	—
Pakistan	—	67.6	32.4	—
Philippines	68.0	19.1	11.1	1.8
Singapore	65.7	10.4	23.9	—
Sri Lanka	5.5	61.0	33.6	—
Thailand	43.9	22.5	31.0	2.6
Vietnam	14.5	66.4	17.9	1.1

Source: UNESCO Institute for Statistics Data Centre.
Note: Hong Kong, China; India; Malaysia; Sri Lanka (2004). Philippines. Thailand (2003). Vietnam (2002). Indonesia (2001). — = not available.

also acquire the absorptive capacity through tailored organizational mechanisms and in-house research (Cohen and Levinthal 1990). Knowledge does not flow freely; it must be acquired.[20] The striking characteristic of research in the low-income economies of South Asia is the small share of the business sector, which explains, in part, the limited progress toward diversification in the past and threatens to hobble future efforts in this direction.

Patents

Tertiary education and R&D feed knowledge-generating activities, but they must be complemented by measures of output. A more sensitive—though far from adequate—measure of budding technological capabilities is the number of patents applied for and registered by the residents of a country (see Scotchmer 2004). This has tended to be based on the patents granted by the U.S. Patent and Trademark Office (USPTO) for several reasons. First, because the criteria for submission, the examination of patents, and the decision to award patents differ across countries, the number of patents granted by any one country is not directly comparable with that of another; in addition, the quality of patents differs. Using data from a specific patent office eliminates this incompatibility. Because the United States has been the major market for Asian economies, using data from the USPTO is appropriate. Second, applying to a foreign patenting office is more expensive. Therefore, only high-quality patents are submitted for approval, which serves to filter the data.

Table 4.42 lists the number of patents granted to Asian economies in 1992, 2000, and 2008. Japan is the leader by a wide margin, with more than 36,000 patents awarded in 2008.[21] Korea is a distant second, followed by Taiwan, China. The number of patents granted to these economies grew quite rapidly between 1992 and 2008. China now ranks fourth among Asian economies. In 2000, China received 163 patents—fewer than Singapore, with 242 patents, and comparable to India, with 131 patents. However, by 2008 Chinese residents were receiving triple the number of patents granted to Indian residents, and four times the number granted to residents of Singapore. Malaysia also saw the number of patents granted to its residents increase dramatically during this period, albeit from a base of just 11.

Patent grants are a good measure of technological capability, but they lag actual development by two to three years because of the time it takes to evaluate patent applications. Patent applications are a good indicator of how seriously countries are

[20]See, for instance, Kodama and Suzuki (2007) on the importance of proactive learning by firms.

[21]In fact, among the foreign countries, Japan receives the greatest proportion of awarded patents (60 percent), followed by Germany. In any given year, about half of all patents granted by the USPTO are to foreign residents.

Table 4.42 Number of Patents Granted by the USPTO

Country/economy	1992	2000	2008
Japan	23,151	32,922	36,679
Korea, Rep.	586	3,472	8,731
Taiwan, China	1,252	5,806	7,779
China	41	163	1,874
India	24	131	672
Singapore	35	242	450
Malaysia	11	47	168
Thailand	2	30	40
Philippines	7	12	22
Indonesia	9	14	19
Pakistan	1	5	7
Sri Lanka	2	5	2
Bangladesh	0	0	0
Vietnam	0	0	0

Source: U.S. Patent and Trademark Office (USPTO).

engaging in innovation activities, although the true informational content of this indicator can be overstated. Table 4.43 lists the number of patent applications by residents of different Asian economies. The relative rankings do not differ from those in table 4.42. What is notable is that lower-income countries such as Pakistan, Sri Lanka, Vietnam, and Bangladesh are now starting to apply for more patents.

Overall, Japan, Korea, and Taiwan, China, are currently the technological leaders in Asia, with the greatest capacity to exploit the opportunities for upgrading and diversifying manufacturing activities. They are in the best position to groom new industries as existing ones become unprofitable and begin to migrate. These economies may not avoid a further hollowing of their manufacturing sectors, but any such shrinkage will not be the result of inadequate attention to research. The true test will be the way this shift translates into innovations that are commercially profitable and that enable these economies to maintain their lead over competitors from China and India. China is rapidly building up its technological capacity, as is apparent from the growth in R&D spending and the increase in patents granted. India and Singapore, to a lesser extent, are also adding to this capacity. This is demonstrated in the speed with which they are catching up, but the innovation capabilities of these countries have yet to mature (see, for example, Dahlman 2007; Sigurdson and others 2006; Simon and Cao 2009; Thomson and Sigurdson 2008). Among Southeast Asian countries, Malaysia and Thailand are starting to give more attention to technological development in order to

Table 4.43 Number of Patent Applications Submitted to the USPTO

Country/economy	1992	2000	2008
Japan	38,633	52,891	82,396
Korea, Rep.	1,471	5,705	23,584
Taiwan, China	2,667	9,046	18,001
China	129	469	4,455
India	64	438	2,879
Singapore	89	632	1,226
Malaysia	16	104	297
Thailand	11	92	96
Philippines	10	32	69
Indonesia	11	9	13
Pakistan	2	7	13
Sri Lanka	0	6	12
Vietnam	0	0	10
Bangladesh	0	1	0

Source: U.S. Patent and Trademark Office (USPTO).

improve their indigenous technological capacity. Other economies in Asia are lagging far behind. They have yet to assign sufficient priority to urgently needed technology development, which will be a key determinant of how their manufacturing sectors evolve. Given the lead time in building R&D infrastructure and skills, their priority should be technology absorption. Once they accomplish that, they can move on to more ambitious goals.

Future Prospects

The external conditions that will face Asian countries in the years ahead are uncertain. A United States that is forced to rebalance its economy and a European Union that must accommodate similar rebalancing by several members, removes a vast amount of demand and injects a high degree of uncertainty for Asian exporters, because no one country or group of countries can substitute for U.S. and EU import demand. Asian exporters from the smaller economies must also contend with the likely partial dismantling of production networks. The emergence of production networking was the result of a decrease in transportation and communication costs, along with the willingness of firms in advanced countries to relocate and disperse their production around the globe. East Asian countries were able to catch the wave at the right moment, while others, including those in South Asia, allowed the opportunity to pass. Many hope that there will be another wave to catch; however, it is not clear that there will be any successors to the exports of garments and electronics, which facilitated the explosive growth of production networks. The rising energy costs, stemming from lower availability of fossil fuels and from environmental concerns, will temper the growth of trade in general and favor production in large markets (such as China and India). Given these likely external conditions, countries in Asia need to critically examine where their comparative advantage lies, whether they can sustain desired growth rates with the current suite of activities and if not, in which directions they can profitably diversify. For several East Asian economies, their comparative advantage and diversification opportunities may continue to reside in electronics. There is no new industry on the horizon that is likely to dislodge electronics. In addition to electronics, Southeast Asian countries have comparative advantage in resource-based products, reflecting their endowments. For South Asian countries, diversification opportunities are meager and are concentrated in labor-intensive, low-tech products, although the lack of significant change in their export composition and comparative advantage suggest that even such minimal diversification may be difficult to achieve. Without a significant strengthening of technological capacity, South Asian manufacturers other than India face a crisis.

Leading economies in Asia such as Japan, Korea, and Taiwan, China, are emphasizing domestic technological capabilities to stave off deindustrialization. Other Southeast Asian countries are just now realizing the importance of developing such capabilities. Their domestic technological capabilities are still low, although they are investing more in R&D and there are some (albeit few) signs of technological deepening. The problem countries are all in South Asia. They are poor in resources and human capital, and they lag the rest of industrial Asia by as much as three decades. Whether these countries can develop or attract firms that can compete with those in China and India will determine their industrial futures.

References

ADB (Asian Development Bank). 2009. *Asian Development Outlook 2009: Rebalancing Asia's Growth.* Mandaluyong City, Philippines: ADB.

Blanchard, Olivier J. 2009. "Sustaining a Global Recovery." *Finance and Development* 46(3): 8–12.

Cerra, Valerie, Ugo Panizza, and Sweta Chaman Saxena. 2009. "International Evidence on Recovery from Recessions." Working Paper WP/09/183, International Monetary Fund, Washington, DC.

Cerra, Valerie, and Sweta Chaman Saxena. 2008. "Growth Dynamics: The Myth of Economic Recovery." *American Economic Review* 98(1): 439–57.

Cohen, Wesley M., and Daniel A. Levinthal. 1990. "Absorptive Capacity: A New Perspective on Learning and Innovation." *Administrative Science Quarterly* 35(March): 128–52.

Cohen-Setton, Jeremie and Jean Pisani-Ferry. 2008. "Asia-Europe: The Third Link." Bruegel Working Paper 2008/04, Bruegel, Brussels.

Dahlman, Carl J. 2007. “China and India: Emerging Technological Powers.” *Issues in Science and Technology* (Spring). http://www.issues.org/23.3/dahlman.html

Dooley, Michael P., and Michael M. Hutchison. 2009. “Transmission of the U.S. Subprime Crisis to Emerging Markets: Evidence on the Decoupling-Recoupling Hypothesis.” Working Paper 15120, National Bureau of Economic Research, Cambridge, MA.

Economist Intelligence Unit (EIU). 2010. *India Country Forecast July 2010.* London: EIU.

Eichengreen, Barry, Ashoka Mody, Milan Nedeljkovic, and Lucio Sarno. 2009. “How the Subprime Crisis Went Global: Evidence from Bank Credit Default Swap Spreads.” Working Paper 14904, National Bureau of Economic Research, Cambridge, MA.

Eichengreen, Barry, Yeongseop Rhee, and Hui Tong. 2004. “The Impact of China on the Exports of Other Asian Countries.” NBER Working Paper Series 10768, National Bureau of Economic Research, Cambirdge, MA.

Fung, Victor K., William K. Fung, and Yoram Wind. 2008. *Competing in a Flat World: Building Enterprises for a Borderless World.* Upper Saddle River, NJ: Pearson Education Inc.

Gaulier, Guillaume, Francoise Lemoine, and Deniz Unal-Kesenci. 2004. “China’s Integration in Asian Production Networks and Its Implications.” Discussion Paper 04033, Research Institute of Economy, Trade and Industry, Tokyo.

Hu, Albert Guangzhou, and Gary H. Jefferson. 2008. “Science and Technology in China.” In *China’s Great Economic Transformation,* ed. Loren Brandt and Thomas G. Rawski. New York: Cambridge University Press.

Kim, Yong Jin. 2007. “A Model of Industrial Hollowing-out of Neighboring Countries by the Economic Growth in China.” *China Economic Review* 18(2): 122–38.

Kodama, Fumio, and Jun Suzuki. 2007. “How Japanese Companies Have Used Scientific Advances to Restructure Their Business: The Receiver-Active National System of Innovation.” *World Development* 35(6): 976–90.

Korinek, Anton and Luis Serven. 2010. “Real Exchange Rate Undervaluation: Static Losses, Dynamic Gains.” World Bank Policy Research Working Paper 5250, World Bank, Washington, D.C.

Kose, Ayhan M., Christopher Otrok, and Eswar S. Prasad. 2008. “Global Business Cycles: Convergence or Decoupling?” Working Paper 14292, National Bureau of Economic Research, Cambridge, MA.

Kuijs, Louis. 2010. “China Through 2020: A Macroeconomic Scenario.” World Bank China Research Working Paper 9, World Bank, Beijing.

Lall, Sanjaya. 2000. “The Technological Structure and Performance of Developing Country Manufactured Exports, 1985–98.” *Oxford Development Studies* 28(3): 337–69.

Levy-Yeyati, Eduardo. 2009. “On Emerging Markets Decoupling and Growth Convergence.” VoxEU.org.

Mathews, John. 2006. “China and the Developing World. Harnessing the Latecomer Effect for Industrial Catch-up—and the Case of Renewable Energy Sources in the 21st Century.” Beijing Forum, Beijing.

National Science Board. 2008. “Science and Engineering Indicators.” Arlington, VA: National Science Foundation. http://www.nsf.gov/statistics/seind08/.

Prahalad, C. K., and M. S. Krishnan. 2008. *The New Age of Innovation: Driving Cocreated Value through Global Networks.* New York; McGraw-Hill.

Prasad, Eswar. 2009. "Rebalancing Growth in Asia." Working Paper 15169, National Bureau of Economic Research, Cambridge, MA.

Reinhart, Carmen M., and Kenneth Rogoff. 2009. "The Aftermath of Financial Crises." *American Economic Review* 99(2): 466–72.

Republic of China (Taiwan). 2009. *National Statistics.* http://eng.stat.gov.tw/ct.asp?xItem=25763&CtNode=5347&mp=5.

Scotchmer, Suzanne. 2004. *Innovation and Incentives.* Cambridge, MA: MIT Press.

Sigurdson, Jon, Jiang Jiang, Xinxin Kong, Wang Yongzhong, and Tang Yuli. 2006. *Technological Superpower China.* Northampton, MA: Edward Elgar Publishing.

Simon, Denis Fred, and Cong Cao. 2009. "China's Future: Have Talent, Will Thrive." *Issues in Science and Technology* (Fall). http://www.issues.org/26.1/simon.html

Steinfeld, Edward S. 2004. "China's Shallow Integration: Networked Production and the New Challenges for Late Industrialization." *World Development* 32(11): 1971–87.

Thomson, Elspeth, and Jon Sigurdson. 2008. *China's Science and Technology Sector and the Forces of Globalization.* Singapore: World Scientific Publishing.

World Bank. 2009. *Global Economic Prospects 2009.* Washington, DC: World Bank.

Yang, Yongzheng. 2006. "China's Integration into the World Economy: Implications for Developing Countries." *Asia-Pacific Economic Literature* 20(1): 40–56.

Yusuf, Shahid, and Kaoru Nabeshima. 2009. *Tiger Economies under Threat: Comparative Analysis of Malaysia's Industrial Prospects and Policy Options.* Washington, DC: World Bank.

———. 2010. "From Technological Mastery to Innovation." Washington, DC: World Bank.

5

The Drivers of Asia's Industrial Geography

The preceding chapters examined the evolving composition of industry in Asia and how countries are competing with China and India in global markets. In this chapter, we look at some of the factors that will affect industrial change and trade flows over the medium term. We highlight the following five factors:

- The adjustment and growth of the U.S. economy
- Savings and investment in China, India, and other major Asian economies
- Technological shifts
- Industrial networking, clustering, corporate competitiveness, and the pattern of trade
- The evolution of industrial capabilities in other Asian countries

These are by no means the only relevant ones—there are other economic and geopolitical factors that will play a mediating role; however, the above five deserve primacy for reasons we will explain.

Rebalancing the United States

For close to a quarter-century, the U.S. economy has served as the principal global locomotive—and a main contributor to the success of export-led growth in Asia. The willingness of the United States to open its market to exports from East Asia and Western Europe,[1]—as well as the strength of U.S. consumer demand for

[1]To build the economies of its Cold War allies, the U.S. pursued trade and exchange-rate policies that, over time, downsized a number of major domestic industries such as steel and autos.

imports—stimulated industrial development[2] in the exporting countries, while U.S. foreign direct investment (FDI) helped finance export-oriented industrialization and cemented trading relationships. A U.S. trade deficit of approximately 1.5 percent of GDP in the 1990s, which widened to a high point of 6 percent of GDP in 2006–07, enlarged the role of the U.S. market in the global trading system. This seemingly insatiable demand for imported manufactures, along with the associated hollowing of U.S. industry,[3] strongly bolstered manufacturing activities in China, India, and other Asian countries. Undoubtedly, the formation of the European Union and intraregional trade in Asia also fueled demand, but the United States was the most important mover and importer. A narrowing and gradual elimination of the U.S. current account deficit has massive implications for Asian countries that have depended upon exports to fuel their industrialization. The need to lower external debt and mobilize domestic resources to meet domestic priorities means that household savings (as a percentage of disposable income) must return to earlier U.S. trend rates of 8–10 percent, from the level under 5 percent witnessed in 2009, and government overspending must be curtailed.[4] Foreign borrowing to maintain current expenditure for the indefinite future is not a viable option for any country, not even one whose currency is an international unit of account and a store of value.[5]

Thus, the medium- and longer-term prognosis calls for higher U.S. domestic savings to finance investment priorities, to close domestic and external financing gaps, and to diminish the indebtedness of households—and of the government. This could mean lower potential growth as more of it derives from activities that produce smaller gains in productivity and are, on balance, less innovative. The potential growth rate of the U.S. economy over the long term is expected to fall by almost 1 percent per year—from about 3 percent to close to 2 percent. There are several reasons for this. First, household deleveraging and rebuilding of assets will most probably result in weaker demand from consumers. This is unlikely to be offset by increased investment, because spending on real estate may not climb

---

[2]Technology transfer from the United States through a number of channels also facilitated industrial development.

[3]Some of it happened through the transfer overseas of production facilities by U.S. multinational corporations (MNCs).

[4]The revival of consumption demand in the first quarter of 2010 pushed down household savings and foreshadows at least a temporary widening of the current account deficit.

[5]The “exorbitant privilege” enjoyed by the United States because of the dollar being the premier reserve currency is discussed by Reinhart and Reinhart (2010). This has been reinforced by the flight to safety precipitated by the financial crisis, causing the dollar to strengthen against the Euro. The degree to which this privilege is retained will depend upon regulatory measures to safeguard the attractiveness of U.S. financial markets and policy actions to rebalance the U.S. economy in the medium term (see Blanchard and Cottarelli 2010 on the 10 fiscal commandments for the Organisation for Economic Co-operation and Development (OECD) countries).

back to precrisis levels (Blanchard 2009). Both could adversely affect the change in total factor productivity. This rose by 0.9 percent annually between 1995 and 2000, but by 1.4 percent annually from 2001 through 2008. Unless export-led investment in manufacturing significantly contributes to productivity, a lower rate is in the cards. Compounding these is the anticipated decline in the growth of the labor force from 12.1 percent during 1998–2008 to 8.2 percent between 2008 and 2018 (Feldstein 2010; Lee, Rabanal, and Sandri 2010). Measures to limit global warming, if they are actively pursued, are also likely to raise the capital coefficient of development. With the U.S. economy generating less demand for Asian manufactures and U.S. firms competing more aggressively in foreign markets, industrialization and growth could be slowed in the smaller countries dependent on exports, as well as in countries at an early stage of industrial development with a narrow range of low-tech, raw material–based, and processed exports—countries such as Pakistan, Bangladesh, Cambodia, and Vietnam. The larger countries, such as China and India, have the resources, domestic markets, and growth momentum, while advanced economies such as Japan and the Republic of Korea have the technological capabilities and the corporate strength to compete in export markets, realize some of the opportunities associated with global warming, and take steps that will partially neutralize the long-run costs.

Savings and Investment

In the months immediately following the financial crisis of 2008–09 and its aftermath,[6] some believed that a savings glut[7] was resulting in underconsumption and trade surpluses in some Asian countries. Proponents of this view have argued that East Asian countries reacted to the pain inflicted by the crisis of 1997–98 by adopting domestic expenditure reduction and export-promoting exchange-rate and financial policies in order to accumulate foreign exchange reserves. This was in order to reduce their vulnerability to speculative attacks, sudden stops of capital, and capital flight.[8] The success of this effort at insuring against shocks is reflected in the vast foreign reserves held mainly by East Asian countries. In conjunction with the expansionary monetary and weak regulatory policies of some Western countries, along with their high public-sector indebtedness, the global

[6]For a succinct account of the causes of the financial crisis in the United States see Levine (2010). On factors contributing to increased subprime lending, see Mian, Sufi, and Trebbi (2010).

[7]Globally, the savings rate as a percentage of GDP has remained more or less static since 1995. It was 22.3 percent in the mid-1990s, declined to 20.6 percent in 2002, and rose to 22.8 percent in 2005. Mollerstrom (2010) maintains that for the U.S. current account deficits to be caused by capital inflows triggered by rising savings, U.S. investment—not just consumption—ought also to have risen by up to 4 percent.

[8]The crisis of 1997–98 also induced Asian borrowers to cut down short-term debts and to avoid mismatches in the maturity of their debt obligations.

economy is facing severe imbalances. One group of countries is consuming too much and borrowing to finance this spending, and another group may not be consuming enough. A solution advocated to promote the adjustment of Asian countries with current account surpluses—and to reduce the deficits of the United States, the United Kingdom, and some of the EU economies—is for East Asian households to increase their consumption so that domestic demand, rather than exports, becomes the engine of growth and raises the international demand for the exports of countries running deficits. A reduction in the so-called savings glut, it is argued, could (relatively) painlessly solve the adjustment issues for a handful of the most seriously affected countries and could restore growth.

A closer examination of savings in the Asian region indicates that they rose in only China, India, and Vietnam. This was mainly because of rapid growth and, in China's case, also because greater productivity and profitability of Chinese corporations[9] significantly increased corporate savings. The high savings of Chinese households and the rising savings of Indian households are also ascribed to precautionary motives: both countries lack adequate pension and health safety nets. In both countries, the limited access to finance compels families to save for children's education, down payments for the purchase of homes, the acquisition of major durables (cars particularly), and the accumulation of dowries for daughters—or the equivalent of bride prices for young women rendered scarce by sex imbalances (Chamon and Prasad 2007; Wei and Zhang 2009). Habit persistence and inertia in the face of rising incomes might be another factor explaining the rise in savings (Horioka and Wan 2006).[10] In the other Asian countries, savings remained constant or even declined, but in some cases, investment declined even more. This slowdown in investment is not entirely explicable, but it is linked to excessive, often speculative investment in the 1990s, prior to the crisis of 1997–98; to the overhang of capacity it created in the real estate sector and in manufacturing; and to the uncertain investment climate in some Southeast Asian countries. A number of industrializing East and Southeast Asian countries, which tended to run current account deficits prior to 1997–98—countries such as Thailand and Malaysia—welcomed trade surpluses and enlarged their foreign exchange holdings. Viewed as excessive by some, these reserves have nonetheless underwritten fiscal

[9]The bulk of the increased profits have accrued to only a subset of the state-owned enterprises, the largest beneficiaries being the producers of resource-based commodities, tobacco products, and suppliers of information technology (IT) services. Low dividend payout rates have contributed to the high levels of corporate saving and investment. Profitability has also been buttressed by low borrowing costs and other fiscal incentives provided to the corporate sector.

[10]Neither Prasad (2009) nor Horioka and Wan (2006) find that the age structure of the population explains Chinese savings. Household savings tend to follow a U-shaped rather than an inverted-U-shaped pattern, with young households and older households being the higher savers.

stimulus packages and assisted these countries in coping with the global economic contraction during 2009.

Are higher consumption propensities the recipe for faster growth in Asia and the world and the way to repair global resource imbalances? Although popular, this view needs to be treated with caution for two reasons. First, because the world could be heading toward a shortage of savings: savings in the advanced countries, in some instances already low, are projected to fall as the rising number of aging households begin to eat into their assets. This tendency will be exacerbated by higher dependency ratios (as the elderly population increases in number) and slowing growth of incomes. In several countries, expansionary fiscal policies have led to public dissaving and have generated large public-sector deficits that are likely to persist far into the future. These deficits and their servicing also need to be factored in as the adequacy of global savings is assessed.

Take, for example, the Indian case. India's national accounts for 2008 indicate that consumption as a percentage of GDP was 65 percent, while household savings were 24 percent. Meanwhile, investment was close to 39 percent of GDP, and the current account deficit was 1.4 percent of GDP. The large public sector deficits argue against increased public consumption. In theory, household consumption could grow faster—reversing recent trend rates—and this could offset a further deterioration of net exports or weakening of investment growth. In purely arithmetic terms, such rebalancing could sustain GDP growth rates of 7–8 percent per year for a few years, if foreign financing at affordable terms is available to accommodate continuing external deficits. However, given the likely shortage of savings globally, such affordability will be in question, and such widening of the current account deficit would raise the probability of foreign exchange becoming a constraint on growth.

Second, a premature focus on domestic consumption as a driver of growth in developing countries has future ramifications for industrial development. Demand from households, the majority of which are lower-middle- and middle-income households, will be weighted toward food, housing, transportation, light consumer goods, household goods, and services, whereas the faster-growing exports comprise higher-value manufactures and processed commodities. Quite likely, such a shift would significantly dampen investment in manufacturing activities that are more sophisticated, capital intensive, scale sensitive, and value adding. A reorientation of manufacturing and services to serve domestic consumers would also affect the investment in human capital: Tertiary-level professional and technical skills needed for an expanding higher-income overseas market would be less in demand, leading to slower increase in the stock of tertiary level science and technology (S&T) skills; there could possibly be more brain drain, especially of the most talented. The faster-growing segments of manufactured exports are also the ones that are more sophisticated, of higher quality, and with greater value added. By focusing on the domestic market, these countries may well forego exports that are more profitable and technology intensive; that can deepen domestic manufacturing capabilities; that can stimulate process and product innovation; and that can be the springboard for the emergence of corporate champions, the ones spearheading technology acquisition and investment in research and development (R&D). In addition, the imports of advanced machinery and components underpinning many of the exports serve as a vital conduit for R&D and technology transfer from more advanced trading partners. If they decline, most likely there would be a parallel decline in FDI in the more high-tech manufacturing and services activities in these countries.

Among the middle-income East and Southeast Asian economies, savings have very likely peaked in China and could decline as financial deepening and reforms of the health and social security systems lessen the need for precautionary savings and as the middle class's increasing wants for positional goods raises consumption. Barring an acceleration of growth in Southeast Asia, it is uncertain as to whether a dip in dependency ratios could push savings above existing levels. Indian savings could rise further if the economy expands at Chinese rates, or they could flatten out. In the rest of South Asia, savings will go higher if incomes begin rising more steeply, which is not likely. On balance, the outlook calls for a declining ratio of savings even if governments do not aggressively push consumption propensities.

Will there be a demand for these savings, or will a sizable fraction end up financing consumption and investment in the deficit-ridden postindustrial societies? There are four reasons for maintaining that the demand for investment will be greater in the future and that Asia may need to save more and not less.

First, most of Asia is still developing. Even in countries such as China and Malaysia, which have acquired significant industrial capabilities, the industrial base is not deep. For incomes to continue rising at a rapid (single-digit) pace, these countries must engage in further rounds of industrialization. More capital-, technology-, and skill-intensive activities—industry and services—need to be introduced, which will require costly investment. Healthcare and multimedia services are as capital intensive as, if not more than, manufacturing. South Asia—including India—lags far behind, and here much of the needed industrial base and infrastructure have yet to be built. In all, these countries' capital-to-labor ratios are a fraction of those in the United States.

Second, Asia's population is still mostly rural. Half of China's population, more than two-thirds of India's, and half of Indonesia's still are classified as non-urban. This has profound implications for the development of adequate urban housing and infrastructure to accommodate the almost inevitable transfer of the majority of these people to the cities. Affordable housing of decent quality, transport, communications, water, energy, sanitation, and sanitary waste disposal, to name the most essential, will consume immense amounts of capital. Aside from new investment to accommodate the urban population of the future, there is the vast backlog of investment to raise the living standards of existing urban inhabitants, many of whom live in slums[11] with the bare minimum of services—and often not even that. Asia’s capital requirements for urban and infrastructure development have been frequently computed—and they are enormous—and as we indicate below, these projections might gravely understate the actual needs (see Asian Development Bank 2009).

Third, global warming will greatly increase the outlay on infrastructure of all kinds and, over time, require a replacement of production equipment, industrial boilers, coal-based power plants, and transport equipment. It will complicate the development process and enlarge investment needs. Inevitably, countries will be slow to face the new imperatives and delay will add to the costs, but eventually the bill will come due. For all Asian countries, global warming requires investments to conserve energy and water; to protect coastal and deltaic areas from rising sea levels; and to safeguard cities, in particular, from extreme weather events, be they heat waves or hurricanes. Cities and transport systems in Asia have evolved with the barest nod to design features that would mitigate carbon emissions and enhance livability. For too long, most municipalities in even the arid regions have avoided planning for the long haul and have preferred to assume that somehow the needed energy and water supplies will be forthcoming. Motorized vehicles are the preferred means of transport in even the poorest countries; it is this preference, reinforced by auto producers and affiliated industries and abetted by governments desperately seeking growth engines, that is determining the layout of cities. An extraordinarily small number of Asian cities are systematically developing comprehensive public transport systems and evincing a serious commitment to reducing greenhouse gas (GHG) emissions. It is unclear when a real change in thinking and lifestyles will occur. What is increasingly obvious is that with every passing day, decisions are being taken and investments being made that will be costly to reverse or modify in the future, when reversing mistakes may become unavoidable—barring, of course, the miraculous discovery of one or more technological fixes. Poorly designed and insulated buildings; energy inefficient appliances, equipment, and processes; urban spatial designs that further embed automobility into living and travel arrangements; and water extraction, sanitation, delivery, and industrial use practices that reduce the availability of clean water—together these are hastening the onset of warming and leading to water scarcity and storing problems for the future. The day will come when cities will need to be incrementally or hastily deconstructed and rebuilt to conform with lifestyles that consume much less fossil fuel–based energy. The longer the delay in making the switch to such a lifestyle, the greater will be the eventual burden of adjustment.

Fourth, social expenditures will add to the claims on investible resources. One is the needed investment in skills to narrow the technological gap between

[11]About 1.2 billion urban dwellers worldwide live under slum conditions.

developing Asia and the advanced countries, as well as to build the knowledge capital that will stimulate innovation. More education, training, and research will absorb higher-level skills; in addition, upgrading education will call for large expenditures on capital-intensive facilities—not just classrooms, but also laboratories, computers, and state-of-the-art communications technology. Raising both the level and quality of education in much of Asia and bringing technological capabilities of all countries up to the level that Korea is at today will be a huge and costly undertaking.

For several of the Asian societies that can anticipate a sharp increase in the proportion of the elderly in the next two decades, facilities must be created and resources put aside to accommodate the medical and other expenses of the non-working old—making cities elder friendly, for example. If the thinking and research on elder care in Japan is an indication of what is to come, a variety of medical, robotic, and information and communication technology (ICT)–based devices could contribute to the quality of life of the elderly through heightened mobility, monitoring and care, entertainment, access to services, and routine medical assistance. A substitution of relatively scarce labor by capital is in the cards.[12] Societies where a fifth or more of the population is over 65 years of age will require a different mix of urban furniture, services, equipment, and life support systems. In a word, the elderly will enjoy decent living standards only if societies are willing to make the investments in the R&D, capital assets, and facilities necessary to cope with steeply rising dependency ratios.

The potential demand for investment is there, enough to absorb the current level of savings and more. That this demand is not manifesting itself has to do with the divide between private and social returns, distorted tax and other incentives, and risk perceptions that are diverting resources into the financial sector[13] and real estate—distortions that are accentuated by increasing income disparities and greater imbalances in power relationships. The transport, energy, and financial industries, for example, strongly and effectively oppose measures that would constrain their prospects. Both public and private entities are reluctant to boldly plan for the future and embark on risky schemes—some inciting strong political opposition from industries and vested interests. In several cases, governments lack the foresight, planning skills, and resources to engage in investment or underwrite the risks of the private sector.

---

[12]An increasing number of these will be single children who would need to take care of two sets of parents. Even if these children decide to rely on external services for the care, the number of available caregivers is insufficient.

[13]More than 25 years ago James Tobin (1987) expressed skepticism as to the real economy outcomes of financial activity (and the mushrooming of transactions resulting in paper gains and losses) although he staunchly believed in the advantages of financial market efficiency.

Although higher consumption spending in East Asia would provide a welcome boost to demand in the medium term and may help deficit countries to adjust,[14] those Asian households that are accumulating precautionary savings as incomes rise are doing the right thing from a purely private perspective, and they might also be contributing to the larger social good over the long term. It is now up to governments to compensate for the market's myopia and ensure, with the help of the price mechanism and other incentives and signals, that the resources are efficiently invested in the interests of long-term sustainability. It is increasingly apparent that unaided market forces subject to myriad distortions and manipulation will certainly lead to suboptimal outcomes.

Major Technological Shifts

We noted earlier that a succession of general-purpose technologies have been associated with periods of rapid growth. Most recently and spectacularly, semiconductors and other advances in the realm of electronics, computers, the Internet, and mobile telecommunications are jointly responsible for bringing an enormous spate of innovations across diverse segments of the economy, for inducing investment, and for nudging the global growth to unprecedented heights. There is plenty of impetus left in the electronics and IC technologies, and this could be used most fruitfully in conjunction with technological innovation in low-carbon energy generation, new materials, urban transport systems, robotics, and bioinformatics. Significant advances in these areas through basic and applied research could help to sustain rapid development in Asia. The importance of these technologies is widely recognized, and five Asian economies are committing large sums to research that could have a bright commercial future. Of the five—Japan; Korea; China; Taiwan, China; and India—Asia's two most populous economies have arguably the most at stake and the most to gain for several reasons.

First, by participating in technological breakthroughs, they could reap early-mover advantages and corner a sizable share of the global market, instead of having to acquire and assimilate the technology from abroad and then compete with other countries to secure a piece of the global export trade. Second, successful innovations would be a boost to industry, with many spillovers, and the basis for productivity growth. They would launch a flotilla of firms, both small and large, among which could emerge a few world-class suppliers able to establish global brands and provide the two Asian countries with much-needed corporate heft. For China to nurture an innovative firm such as Samsung or Canon in an expanding field would represent tangible progress.

---

[14]This, of course, assumes that these deficit countries can expand their exports substantially when much of their manufacturing capacity has already relocated outside of the country.

Third, both China and India are urbanizing and industrializing economies with much ground still to cover. These countries are currently building their research infrastructure, training large numbers of researchers, and attempting to define their areas of comparative advantage in R&D. By entering relatively new fields with many scientific and technological secrets yet to be unlocked, China and India can enhance the productivity of their spending on research. The fact that they are at an earlier stage of development means that there is more scope for incorporating new technologies into manufacturing equipment and urban infrastructure. This process is also incentivized and expedited by the ongoing, large-scale investment in fixed assets in both countries. Thus, by achieving a pole position in leading-edge technologies that are still relatively immature, China and India can gain an edge on industrialized—and especially postindustrial—economies where the share of manufacturing is shrinking.

In this race to take the lead in the signature technologies of a "green economy," China has a considerable advantage over India. The scale of its R&D effort is far greater—it is producing many more researchers every year—and Chinese companies are near the forefront in the production of photovoltaic cells (PVCs), wind turbines, and high density batteries.[15] Moreover, Chinese research in nanotechnology, which is likely to affect the development of advanced materials, is yielding promising results.

R&D in green technologies represents an important facet of a broader strategy to deepen industrial capabilities and competitiveness using technology as the lever. All of the industrialized and industrializing countries are engaged in this technological arms race, and the stakes are high, because competitiveness and return on capital are increasingly a function of quality, design, and innovation. For standardized and labor-intensive products, costs of labor certainly matter a good deal; however, even in these product categories, process innovation that reduces costs and product innovation that differentiates a product and enhances its value contribute to profitability. In more valuable products, sophisticated technologies can confer a decisive advantage. As noted above, the frontrunners are Japan and Korea, if the metric used is R&D expenditure relative to GDP. They also lead others in Asia in the number of patents registered with the U.S. Patent and Trademark Office (USPTO). Taiwan, China; Singapore; and China are in third, fourth, and fifth places, respectively. The larger Southeast Asian economies and India follow, with the other South Asian countries trailing far behind. The latter have not entered the technological race thus far, which

[15]China invested heavily in nonfossil sources of energy during the 11th Plan and intends to redouble its efforts in this regard during the 12th Plan. Solar power for instance, is being heavily subsidized, especially for projects in remote regions ("Hedging all bets" 2010). See Adams, King, and Ma (2009) on China's R&D effort. The Indian firm Suzlon is also one of the foremost manufacturers of wind turbines, while China's BYD is a leader in high-density batteries.

partly explains their industrial composition and export competitiveness, and the characteristics of their narrowly circumscribed product space.

Among the industrializing countries, China is clearly setting the pace. The most striking aspect of its performance are the rates of change of key indicators. These are quite startling and overshadow those of India. In purchasing power parity (PPP)–adjusted terms, China is now the second-largest spender on R&D and has the second-largest contingent of researchers in the world after the United States. On its current trajectory, China should pull ahead of Korea and Taiwan, China, with respect to patents and papers in the near future. Moreover, because China's research spans many more subsectors, it is also likely to prove more fruitful overall than that of these two economies. Japan currently enjoys a huge lead over all other Asian economies but is having difficulty translating this into manufacturing success across a broad front and into GDP growth. Japan is likely to retain innovation-based competitiveness in autos, consumer electronics, and manufacturing equipment, and Korea has a well-honed and seemingly durable advantage in electronics, mobile telecommunications, white goods, and transport equipment. However, firms in both countries face intensifying competition from up-and-coming rivals in China—and within a decade, most likely from India as well.

As the research on innovation has convincingly established, the bulk of the downstream applied R&D, the kind that leads to commercial outcomes, is conducted by firms. A number of larger firms, especially, collaborate with scientists in universities and research institutes and monitor the research published by the scientific press. They are ready to acquire intellectual property (IP) with commercial promise from such institutions, but the innovativeness of the manufacturing industry and how it fares in the hard school of international competition depends upon how effectively firms deploy their own generated and acquired technologies. The Japanese, Korean, and Taiwanese miracles may have been sparked and sustained by the guiding hand of the state, state-directed financial bodies, and specialized research institutes established by the state, but large Japanese firms and trading houses, large Korean conglomerates, and small- and medium-sized Taiwanese firms—networked with MNCs—built the manufacturing engines of these three economies and actually delivered the miracles. Starting with modest production facilities, low-tech products, and no research or international marketing expertise (and no brand names), firms in the "miracle economies" acquired the manufacturing, research, and marketing capabilities and the much-coveted brand recognition. Whether the three countries remain competitive in the areas they now dominate or enter and colonize new industries will be decided by the competencies and the inventiveness of manufacturing firms.

So it will be in the rest of Asia. Recognizing this, the Chinese government and Chinese firms are trying hard to become global players and to establish a secure foothold in major product categories through their price competitiveness, technological upgrading, homegrown innovation, acquisition of IP from other sources, takeover of foreign firms and their brands, and determined efforts to build their own brands.[16] Indian firms are beginning to engage in a similar effort. But throughout the rest of Asia, almost four decades of industrialization, while it has led to the birth of a number of industrial conglomerates and major firms (frequently through the midwifery of governments), have not given rise to manufacturing powerhouses with global ambitions that have contributed to the industrial achievements of the leading economies.

Clustering of Industrial Activities

Manufacturing activity is primarily an urban phenomenon. In East Asia, the most dynamic and fastest-growing manufacturing industries emerged in a relatively small number of cities. In key instances, groups of firms in an industrial subsector formed integrated clusters through the use of a common labor pool, buyer-supplier relationships, collaboration to refine and develop technologies, joint marketing efforts, information gathering and training systems, and, in order to present a united front when lobbying for government support. Where cluster networking took root, it helped internalize technological spillovers and, in the most successful cases, achieve the balance between competition and cooperation that can be the basis for a virtuous growth spiral. Realizing the benefits of industrial clustering, governments (national as well as subnational) throughout East Asia have sought to grow clusters—in particular, clusters of high-tech firms. They have pursued clustering by seeding selected urban locations with science parks, incubators, and extension services; by encouraging local universities to engage in research and establish industrial linkages; by inducing venture capitalists to invest in small and medium enterprises (SMEs) in the area; and by attracting a major anchor firm, local or foreign, that could trigger the in-migration of suppliers and imitators. Governments have supported these initiatives with investment in infrastructure and urban services and through a variety of tax and financial incentives (see Yusuf, Nabeshima, and Yamashita 2008).

Some clusters materialized autonomously; others congealed as a result of initiatives by national and local governments, frequently in close coordination with industrial associations. In many instances, attempts to create the cluster effect led

[16]The Chinese firms making headway in this regard are Haier, Lenovo, Huawei, and ZTE. Lenovo's experience with the acquisition of IBM's PC business and that of TCL with the takeover of Thomson's TV arm suggests that the acquisition of large foreign firms with brand names can bolster the fortunes of ambitious Chinese companies—if they can muster the managerial expertise to harness and grow the reputational capital of the acquired foreign assets and to cope with the challenges posed by transnational operations. (On Lenovo's circumstances, see "Short of Soft Skills" 2009.) The acquisition of Volvo, the Swedish carmaker, by Geely, the privately owned Hangzhou-based Chinese manufacturer, will be another important test case of whether Chinese firms can turn around an ailing foreign company and effectively sustain and capitalize on its reputation.

nowhere, even when a number of firms established production facilities at an urban location. Over the span of nearly four decades, East Asia notched up enough successes to become the global hub of manufacturing, from the beginnings in Japan followed by the growth of industrial clusters in Korea; Taiwan, China; Southeast Asia; and then China. Dense urban-industrial agglomerations, some with networked clusters of firms, have been vital to the growth of productivity, for technological change, and for promoting further industrialization by opening opportunities and stimulating supplies of capital and skills.

This is the past; what of the future? One striking aspect of recent industrialization and clustering in Asia is its slowing in many countries. In Japan, industrialization has been in retreat for two decades, with many lower-tech clusters withering and a hollowing even of higher-tech clusters. There are no new industrial hotspots in Japan, although manufacturing clusters flourish in cities like Nagoya and Kyoto. New clusters of "green manufacturing" could arise in Kyushu, for example, but they are more likely to displace existing activities than to expand the industrial base. Deindustrialization in Korea is at an earlier stage; here, as in Japan, it is possible that the investment in "green" technologies, in the life sciences, and ICT could trigger an upsurge of manufacturing activities in existing locations, with emergent clusters displacing or complementing the old. However, Korea, much like Japan, is a maturing industrial country increasingly unlikely to foster new industrial clusters or reclaim the industrial ground it has lost mainly to China and Southeast Asia.

The high-tech electronics, IT, and biotech industries of Taiwan, China, are in a healthy steady state, but most of the low- and even medium-tech industries, which are sensitive to labor costs, have migrated to the mainland. The principal manufacturing clusters in Taiwan, China, remain robust; however, the odds are against new clusters springing up on the island with the cost structure, market access, and supply of skills favoring the mainland.

That future industrialization is more likely in developing Asia is no surprise. What is surprising is the virtual absence of budding industrial agglomerations in Southeast Asia, with the exception of Vietnam. Industrial growth continues in all the leading Southeast Asian economies; however, it is largely through densification in existing industrial agglomerations and in already established industrial subsectors. From the perspective of industrial clustering in these countries, what is remarkable from the earlier assessment of production patterns, exports, and value added is the limited evidence of industrial deepening through backward linkages to the manufacturing of components, intermediates, and production equipment.

In Thailand, clusters of firms producing auto parts, electronics, foodstuffs, textiles, and engineering products are mainly in the Bangkok metro area and its vicinity. In spite of the government's efforts at dispersing industry, industrial agglomerations have not begun to coalesce elsewhere in the country. The existing Malaysian centers of manufacturing in KL/Klang Valley, Penang, Malacca, and

Johor Bahru are holding onto their electrical and engineering industries, but rising costs are eating into the competitiveness of labor-intensive assembly operations. Textiles and footwear are declining. Again, new urban agglomerations of manufacturing are not springing up in other parts of the country.

Widening of activity in established industrial centers and existing lines of production is also apparent in Indonesia and the Philippines, but there is scant evidence of diversification or of deepening, or signs of nascent industrial agglomerations that could breed tomorrow's manufacturing clusters.

During the past decade, new centers of manufacturing have blossomed, and a clustering of textiles and light consumer electronics manufacturing may be ongoing in a few Vietnamese cities—principally Haiphong, Hanoi, Ho Chi Minh City, and Da Nang.[17] Further west in South Asia, industrialization in Pakistan, Bangladesh, and Sri Lanka remains concentrated in a few of the main urban areas. The clusters that exist are mainly focused on textiles and garments. In Pakistan there is a well-known cluster producing surgical instruments and sports equipment, mainly soccer balls. According to trade and production statistics, production has risen in all three countries, but the mix is static and potential backward and forward linkages are not thickening the domestic value chain. The surgical instruments cluster in the Pakistani city of Sialkot, for instance, has not diversified into more sophisticated, derivative products. Nor, for that matter, have textile producers in Dhaka used R&D in new synthetic materials to serve other industries, using their expertise as a point of departure. Garment manufacturers in Sri Lanka, many in the vicinity of Colombo, have increased domestic value added through the domestic production of lace, ribbons, zippers, and buttons but have not diversified into other industries. A combination of factors, including adequate profits from existing production lines, risk aversion, the scarcity of skills, research bottlenecks, entrepreneurial shortsightedness, financing constraints, and market uncertainties, might explain why old clusters have not evolved and few new ones have emerged. But the fact remains that the manufacturing sector is stagnating in the three countries.

India is a different story, with more evidence of industrial acceleration and diversification, but by no means on the scale of China's from the 1980s through 2008. India's industrial capacity is deepening and diversifying in the Mumbai, Nasik, Pune urban region, and around Delhi and Agra, Chennai, and Kolkata. Textile clusters continue to flourish in Tirupur, as do farm machinery clusters in Punjab and Haryana. It is too early to know if the investment in the auto, petrochemicals, iron and steel, and engineering industries will create new clusters, increase domestic value added, spur innovation (in metallurgical and chemical fields, for example), and put India firmly on the path to higher-tech industrialization.

[17]Kuchiki (2007) notes the formation of an electronics cluster anchored by Canon in Hanoi and of a garments cluster in Haiphong.

That some Indian firms are scrambling to enlarge their global presence suggests that change is afoot. How dramatically this will affect India's industrial composition and geography will depend upon the country's supply of skills and market opportunities (domestic as well as foreign), entrepreneurial energies, and elasticity of financing.

This leaves China, where three major urban industrial agglomerations—the Pearl River Delta (PRD), Changjiang, and Bohai regions—have given rise to multiple clusters producing everything from toys, footwear, and garments to computers and autos. Industrial deepening in these three regions is continuing; in addition, industrial agglomerations are expanding in Chengdu, Chongqing, Xian, Wuhan, and Dalian, and in Henan, Jiangxi, Guangxi, and Guizhou provinces, as some industries are moving out of the crowded PRD in search of space, labor, and lower costs. Industry is also booming in Anhui, along the coast in Fujian, and is reviving in the northeastern provinces such as Liaoning and Jilin.

As a full-spectrum industrializer, with a commitment to deepening and upgrading of manufacturing capabilities and pursuit of high-tech opportunities, China is likely to enhance its capacity and competitiveness in virtually every manufacturing subsector. Given the strong gains in labor productivity throughout the manufacturing sector, there is little reason to anticipate a decline in China's competitiveness in light manufacturing. Ceglowski and Golub's (2007) computing of China's unit labor costs in manufacturing underscores its advantage over its competitors. It is an advantage deriving from productivity gains that have outpaced the increase in wages and, thus far, the appreciation of the exchange rate. A weakening of East Asian currencies and the Euro relative to the dollar in 2009–10 led to an appreciation of China's trade-weighted real effective exchange rate. China's decision to end the implicit pegging of the renminbi to the dollar and intensifying wage pressures are likely to result in further appreciation of the real effective exchange rate. This will be offset by the migration of labor and land intensive activities to lower cost inland cities and by falling transport costs. How this plays out is difficult to gauge, but it would be unwise to assume that China is ready to forsake labor intensive manufacturing with several hundred million underemployed workers in agriculture and significant productivity gains to be realized. Hence, other early-stage industrializing Asian countries will have to battle Chinese producers if they want to expand their global market share or export to China. For the South Asian economies, it is not enough to maintain a competitive advantage in garments, textiles, and light manufactures; they need to break out of these old industrial strongholds and compete in other areas with better growth prospects, which India is doing. At the other end of the spectrum, Chinese firms—some allied with MNCs—are already emerging as formidable competitors in electronics, pharmaceuticals, metallurgical products, transport equipment, and engineering equipment. Thus, they will be competing with manufacturers in Japan and Korea, many of which have set up production facilities in China.

The map of Asian manufacturing viewed from this angle shows a gradual withdrawal of manufacturing activities from the Eastern rim economies—Japan, Korea, and Taiwan, China—and a transfer of labor-intensive production to China and Southeast Asian countries, among others. Manufacturing is positioned to grow in China, with new centers joining the old, as infrastructure development and rising costs in coastal areas push some of the more footloose industries into the interior. Manufacturing capabilities will also deepen, and more Chinese firms will be operating near the technological frontiers in key industries.

The industrial prospects of Southeast Asia are uncertain. A country such as Vietnam has a future in light manufacturing and processing, because MNCs will want to maintain multiple sources of supply, and Chinese FDI is transferring some labor-intensive activities to Vietnam. Singapore will need to specialize in high-tech niche areas and depend on the competitiveness of services. For reasons we will elaborate later, Malaysia, the Philippines, Thailand, and Indonesia risk a manufacturing stasis or even a partial rollback unless they can make the leap in technological and manufacturing capabilities to compete with China, India, and the Northeast Asian countries at the higher end of the technological spectrum. Likewise, South Asian countries other than India could remain in a low-level manufacturing equilibrium barring political and policy breakthroughs—national and international—that focus the leadership on more ambitious development objectives, radically change the opportunity set, and begin to significantly ease the shortages of skills, infrastructure, and capital.

Shift in Global Production Networks

The manufacturing industry in East Asia is notable for its export orientation and the degree to which production of tradables throughout the region is integrated into international production networks. These buyer- and supplier-driven value chains have arisen out of investment and sourcing decisions of MNCs and buyers in the industrialized countries. They are the legacies of strategies, of incentives of technologies facilitating dispersed production, and of an era when energy was cheap and the United States displayed a seemingly limitless appetite for the manufactures of East Asia.

Production networks have supported and motivated a sprawling industrial archipelago extending from Singapore to Korea. In South Asia, India, Bangladesh, and Sri Lanka have a role in the manufacturing of garments, but it is a relatively minor role that has developed in the past decade. The core of the system lies in East Asia, China, and Southeast Asia. Dispersed manufacturing permits efficient specialization, redundancy in sources of supply, and great supply elasticity. Most of the risk resides with the myriad suppliers scattered over a half-dozen economies competing in a cutthroat market managed by buyers and integrators who serve as intermediaries for final buyers.

The heyday of production networking might be passing for several reasons, and its slow atrophy will affect the spatial distribution of manufacturing in Asia.

First, networking has resulted in hypercompetitive markets for standardized, modular products with codified technologies. This may have done wonders for intra-industry trade and greatly benefited consumers in the high-income importers of finished products, but with quasi-rents sharply reduced, producers of items feeding international value chains have difficulty accumulating the resources to grow out of low-end unskilled labor-intensive processing activities.[18] They stay relatively low-tech; they have difficulty, given the nature of products and the chains, to diversify or upgrade skills and products. This partly explains why Malaysia has been unable to climb out of assembly and processing of electronics into other products. This is not the only reason, but it is one of them. Networks have a locking-in effect for the many production cogs that feed the ocean-spanning value chains. Networking, apparently, is not a ladder out of low- or midlevel manufacturing activities.

Second, networking, for all its virtues and presumed efficiency, is a complex, energy-intensive activity entailing significant transaction costs for all the players. These add to the cost of products and will rise with energy prices.[19]

Third, dispersed production makes it harder for assemblers to plan and develop products, and the risks involved have implications for inventory holding and for the flexibility of production. In most instances, a clustering of assemblers and suppliers is the most cost-effective approach. It facilitates coordination, makes possible just-in-time delivery, and reduces insurance and warehousing costs. It also simplifies design and development of products—even in the Internet era (Moody 2001; Eberhardt and others 2004).[20] In fact, most final producers are consolidating their production chain and prefer to deal with as few suppliers as possible, and co-location is an advantage. Moreover, buyers are also finding that purchasing from fewer reputable producers is more efficient than buying from many suppliers scattered over several countries.[21] By focusing purchases, a number of costs are minimized, including the costs of monitoring compliance with labor,

[18] This may account for the continued specialization of countries such as Bangladesh, Sri Lanka, and Pakistan in garments and textiles (Almeida 2010).

[19] The likelihood of oil prices rising can be envisioned from some simple statistics. The per capita daily consumption of oil is 2.5 gallons in the United States. It is 1.9 gallons in Korea and 1.4 gallons in Japan. Were China to approach Korea's level by 2020, its consumption would reach 40 million barrels per day (bpd) as against approximately 8 million bpd in 2009. This would imply, for instance, a rising stock of light vehicles reaching 225 million from approximately 60 million in 2010, based on annual domestic production of 15 million cars as against 13 million in 2009 (Kopits 2010). On the rising cost of seaborne trade, see Rubin (2009).

[20] These matter less for standardized commodities produced using mature technologies.

[21] On such trends in the apparel industry, see Gereffi and Frederick (2010).

environmental, and phytosanitary rules, along with rules having to do with security regulations in importing countries. If this practice spreads, networks will be severely pruned.

Fourth, the sunk capital in MNC production facilities in a number of Asian countries and the long-standing relationships with local suppliers and governments have provided a certain inertial stability to networks. Furthermore, many MNCs, while recognizing the advantages of concentrating production in China, have been loath to put all their eggs in one basket. To a certain extent, the purpose of diffusion of production sites was to exploit trade agreements, to circumvent trade restrictions (such as highly restrictive garment trades), and to avoid trade disputes, especially between United States and other East Asian economies. If such restrictions and concerns over trade frictions remain, there will still be some dispersion of production activities. However, the crisis of 2008–09, a slowing of U.S. demand for imports, and the increasing relative prominence of the Chinese market over the medium and longer term could reinforce other tendencies, leading to a shakeout and concentration of industrial production in Asia, as well as a greater readiness to locate facilities in China and to buy from producers in China.[22] If this happens, more of the production currently scattered over East and South Asia will gravitate toward clusters in China's industrial cities, and intra-industry trade could decline. This will reduce costs all around; in addition, a concentration of suppliers and sources of supply will increase the bargaining power of suppliers and help widen profit margins.[23]

This signifies a substantial reduction of standardized commodity production in the middle- and lower-middle-income Asian countries and its relocation in China and possibly India. Low-income Southeast Asian and South Asian countries might continue to hold on to their markets for garments and textiles,[24] but the transition to other standardized commodities (e.g., electronics) traded via global networks could be far more difficult than it would have been 20 years ago, when Southeast Asian countries were entering the markets for manufactured commodities. In fact, the prospects for these countries to further their industrialization using the leverage provided by trade have dimmed. Unless regional trading opportunities can impart the needed stimulus, it is unlikely that the domestic markets in the smaller South Asian countries will boost industrialization—something they have failed to do thus far.

---

[22]Between the fourth quarter of 2008 and the third quarter of 2009, industrial production fell in all but these six countries: China, India, Kazakhstan, Norway, Singapore, Korea, and Vietnam (Bloomberg 2010).

[23]Sturgeon and Van Biesebroeck (2010) examine the concentration of auto manufacturing in large middle-income countries such as China.

[24]For example, there is scope for trade in textiles between India and China because of differences in areas of specialization. China's exports of finished textiles could lead to imports of intermediate yarn and cloth from India (Cerra, Rivera, and Saxena 2005).

Indian producers are, to a degree, integrated into the production network for textiles but not for other products; hence, a shrinking of these vehicles for trade would affect growth. It will also affect the scale of diversification into products imported by advanced countries via networks. Were India to become an alternative hub to China for a wide range of standardized products, then it is possible to foresee industrialization along traditional lines. Barring that, and assuming slow or moderate growth of world trade over the medium run, industrialization in India will be paced and directed more by domestic demand. India might yet surprise the world by matching China's past performance using services (not just IT services) as the principal driver of growth and exports, by relying less on FDI, and by deriving more of the industrializing impetus from domestic demand and not from network-mediated exports to the United States and the European Union. This would be a significant achievement. From the perspective of Asian industrial geography, it would lead to an even greater relative concentration of manufacturing activity in China and parts of Southeast Asia. The outcome would be an unusual state of affairs. China would become the undisputed leader in many subsectors of manufacturing, and other Asian countries would be more dependent on services for growth and the balancing of their trade. Instead of using a broad manufacturing base as the ladder to higher incomes, the rest of Asia would have to place their bets on a number of high-tech and capital-intensive manufacturing industries, on innovation, on productivity growth from services, and from intensively trading services. Although services is the dominant sector in most Asian countries, we know little about the potential of a services-led model to deliver high and sustainable growth rates for low- and middle-income countries.[25] Indian experience with the off-shoring of impersonal services holds out some hope, but the contribution of the sector to employment and the GDP is small and empirical evidence underlying its long-term potential as a driver of growth is slender indeed.

References

Adams, Jonathan, Christopher King, and Nan Ma. 2009. *China: Research and Collaboration in the New Geography of Science.* Philadelphia: Thomson Reuters.

ADB (Asian Development Bank). 2009. *Asian Development Outlook 2009: Rebalancing Asia's Growth.* Mandaluyong City, Philippines: ADB.

Almeida, Rita K. 2010. "Openness and Technological Innovation in East Asia: Have They Increased the Demand for Skills?" World Bank Policy Research Working Paper 5272, World Bank, Washington, DC.

[25]See Grabowski (2009), which sketches an Indian model of growth that partially skips a stage of manufacturing development and moves to higher tech industry and to tradable services.

Blanchard, Olivier. 2009. "Sustaining a Global Recovery." *Finance and Development* 46(3): 8–120.

Blanchard, Olivier and Carlo Cottarelli. 2010. "Ten Commandments for Fiscal Adjustment in Advanced Economies." VoxEU.org.

Bloomberg. 2010. http://www.bloomberg.com.

Ceglowski, Janet, and Stephen Golub. 2007. "Just How Low Are China's Labour Costs?" *World Economy* 30(4): 597–617.

Cerra, Valerie, Sandra A. Rivera, and Sweta Chaman Saxena. 2005. "Crouching Tiger, Hidden Dragon: What Are the Consequences of China's WTO Entry for India's Trade?" Working Paper WP/05/101. International Monetary Fund, Washington, DC.

Chamon, Marcos, and Eswar Prasad. 2007. "Why Are Savings Rates of Urban Households in China Rising?" IZA Discussion Paper 3191. Institute for the Study of Labor.

Eberhardt, Markus, Julie McLaren, Andrew Millington, and Barry Wilkinson. 2004. "Multiple Forces in Component Localisation in China." *European Management Journal* 22(3): 290–303.

Feldstein, Martin. 2010. "U.S. Growth in the Decade Ahead." Working Paper 15685. National Bureau of Economic Research, Cambridge, MA.

Gereffi, Gary, and Stacey Frederick. 2010. "The Global Apparel Value Chain, Trade and the Crisis: Challenges and Opportunities for Developing Countries." World Bank Policy Research Working Paper 5281, World Bank, Washington, DC.

Grabowski, Richard. 2009. "An Alternative Indian Model?" *Journal of Asian Economies* 20: 50–61.

"Hedging All Bets". 2010. The Economist Intelligence Unit, April 12.

Horioka, Charles, and Junmin Wan. 2006. "The Determinants of Household Saving in China: A Dynamic Panel Analysis of Provincial Data." Working Paper 12723. National Bureau of Economic Research, Cambridge, MA.

Kopits, Steven R. 2010. "EIA: The China Syndrome." Econbroswer.com.

Kuchiki, Akifumi. 2007. "Agglomeration of Exporting Firms in Industrial Zones in Northern Vietnam: Players and Institutions." In *Industrial Agglomeration and New Technologies,* ed. Matsatsugu Tsuji, Emanuele Giovannetti, and Mitsuhiro Kagami. Cheltenham, UK: Edward Elgar Publishing.

Lee, Jaewoo, Paul Rabanal, and Damiano Sandri. 2010. "U.S. Consumption after the 2008 Crisis." IMF Staff Position Note. International Monetary Fund, Washington, DC.

Levine, Ross. 2010. "An Autopsy of the U.S. Financial System." NBER Working Paper 15956. National Bureau of Economic Research, Cambridge, MA.

Mian, Atif, Amir Sufi, and Francesco Trebbi. "The Political Economy of the Subprime Mortgage Credit Expansion." NBER Working Paper 16107. National Bureau of Economic Research, Cambridge, MA.

Mollerstrom, Johanna. 2010. "The Source of the Global Trade Imbalances: Saving Glut or Asset Price Bubbles?" VoxEU.org.

Moody, Patricia E. 2001. "What's Next after Lean Manufacturing?" *MIT Sloan Management Review* 42(2): 12–13.

Prasad, Eswar. 2009. "Rebalancing Growth in Asia." Working Paper 15169. National Bureau of Economic Research, Cambridge, MA.

Reinhart, Carmen M., and Vincent Reinhart. 2010. "Is the US Too Big to Fail?" VoxEU.org.

Rubin, Jeff. 2009. *Why Your World Is about to Get a Lot Smaller.* New York: Random House.

"Short of Soft Skills: Lenovo's Bid to Become a Global Brand Is Coming Unstuck." 2009. *Business China,* June 8.

Sturgeon, Timothy J., and Johannes Van Biesebroeck. 2010. "Effects of the Crisis on the Automotive Industry in Developing Countries: A Global Value Chain Perspective." World Bank Policy Research Working Paper 5330, World Bank, Washington, DC.

Tobin, James. 1987. *Policies for Prosperity: Essays in a Keynesian Mode.* Cambridge, MA: The MIT Press.

Wei, Shang Jin, and Xiaobo Zhang. 2009. "The Competitive Saving Motive: Evidence from Rising Sex Ratios and Savings Rates in China." Working Paper 15093. National Bureau of Economics, Cambridge, MA.

Yusuf, Shahid, Kaoru Nabeshima, and Shoichi Yamashita, eds. 2008. *Growing Industrial Clusters in Asia: Serendipity and Science.* Washington, DC: World Bank.

6

Industrial Strategy at a Crossroads

For at least three decades most of the industrializing economies of East and South Asia have delivered rates of growth that are above average for developing economies. With a few exceptions, such as the Philippines, East (including Southeast) Asian economies grew much faster than the norm, and with the exception of Nepal, the South Asian economies stayed above the rates for the rest of the developing world. The outstanding performers among these economies all hewed to a model of growth whose drivers were investment—domestic and foreign—and exports. Other factors such as political stability, fundamentally sound macropolicies, trade liberalization, and human capital no doubt contributed, but these would have been insufficient in the absence of the virtuous spiral generated by the dynamic intertwining of exports and domestic investment in technology and productive assets. Export-led growth was the rallying cry throughout East Asia; it was what kept “animal spirits” high through good times and buoyed or revived economies when the economic climate soured because of a domestic shock or an international downturn. After the East Asian crisis of 1997–98, many commentators were quick to announce the demise of the East Asian model; however, the economies of the region defied the odds and recovered—although, because of weakening investment and a slowing of export growth, only China regained the precrisis momentum.

Rapidly increasing exports complemented by high rates of investment eluded most of the South Asian economies, with only India able to crank up domestic investment to over 30 percent of GDP—and that only after 2003; hence, growth in South Asia was slower, because countries in the region relied mainly on the export of garments, textiles, and resource-based products. When India’s growth reached levels comparable to those of East Asia, it was a boom in the exports of services that served as the catalyst. This aroused entrepreneurial activity in India, stimulated domestic capital spending, and began attracting investment from abroad.

No such catalytic development occurred in the other South Asian countries; instead, several have had to cope with domestic sociopolitical issues that have darkened the investment climate.

The great global recession of 2008–09 is forcing a reappraisal of development strategies in Asia and in other regions as well. At the heart of this reappraisal are conjectures regarding the future sources of growth, the course of globalization, and the roles of the United States, the European Union (EU), China, and, in the distance, India, Brazil, and the Russian Federation. For the purposes of decision making, policy makers and business managers cannot avoid making such conjectures and must develop a coherent view to inform plans and guide investments. In the remainder of this chapter, we will sketch three different scenarios and, on the basis of certain assumptions, identify the one we believe is most likely to prevail, as well as the consequences for the industrial geography of the Asian region.

Scenario 1: Business as Usual

The most analytically convenient scenario is inevitably one with minimal changes. With minor modifications, perceived trends are extrapolated into the future.[1] This has its advantages, because extrapolation with only a small amount of tweaking is safer than the alternatives, as it involves the least amount of judgment. Under this scenario, the world economy gradually recovers during 2010–11 and resumes full-bore growth equivalent to the average for the period 2004–07, with trade growing in due course by 6–7 percent.[2] Growth of East Asian economies rebounds to 6 percent or more, with the Japanese economy expanding at close to 2 percent and China achieving high single-digit rates of GDP growth. South Asia, with India at the forefront, also begins to accelerate, with the performance of individual countries in the region influenced by political factors and the weather. As in the past, growth would be pulled by investment and trade, with domestic consumption playing a greater or lesser part depending on the stage of development, the maturity of the financial sector, the adequacy of social safety nets, and the openness of individual countries.[3] Manufacturing industry and exports of manufactures would again serve as the principal motors of the economies, complemented in China and India by infrastructure development and a deepening of business

[1]Serven and Nguyen (2010) maintain that the post 2008–09 crisis "configuration of current account deficits might not differ from the pre-crisis situation" (p. 14) because many of the determinants are unchanged.

[2]The World Trade Organization forecasts that global trade will grow by 9.5 percent in 2010.

[3]According to computable general equilibrium (CGE) model simulations, further trade liberalization would deliver gains amounting to not much more than 0.2 percent of global GDP by 2015, and these would favor the developed countries and industrializing countries such as China and Brazil, not the poorer countries (Anderson and Martin 2005; Polaski 2006; Ackerman 2006).

services.[4] Southeast Asian middle-income countries would continue to benefit from rising intra-industry trade in intermediate products, with China and Japan providing the twin axes of production networks, mainly serving retail markets in the United States and the EU. For the lagging South Asian economies to improve their game, capital spending on infrastructure and manufacturing would need to rise sharply, with more of the increased and diversifying production of industrial items being exported. In every case, the recipe for industrial development is virtually the same. Each country attempts to enlarge its shares of existing product markets, to upgrade existing product groups, and to diversify into products that leverage acquired comparative advantage. For the foreseeable future, assembled and processed commodities, which have served as the vanguard of export-led growth, would dominate manufactured exports. There is change, but it is of the incremental kind. There are no projections of disruptive technologies or new technological epochs, or of a radical reorientation of trade flows from the United States and the EU to China; there is only more of the same, perhaps with some of the low-income countries and India aggressively pushing industrialization.

This scenario—while it is surely plausible for the near term, in view of the recovery of most Asian economies—rests on the critical assumption that the demand for Asia's exports will return to the levels reached during 2001–07, with only moderate changes in the mix of products exported. The recovery of East Asia's trade that started in the second half of 2009 is a positive sign, but the buoyancy of trade in the medium run is likely to be tempered by four factors. First is the high likelihood that demand from the United States will remain low for years. Consumers in the United States sustained the East Asian export machine from the 1970s until at least 2007. Import demand from other nations certainly reinforced U.S. demand, but the centrality of the U.S. market for Asian suppliers went largely unchanged and was underscored by the speed at which trade flows began drying up after U.S. import demand plunged in 2008. With U.S. consumers eventually having to raise their savings (above 4–5 percent rates) and deleverage, and with the United States forced to narrow its current account deficit through a combination of slower growth, a depreciation of the dollar, and a variety of measures to enhance the competitiveness of its tradables (whether goods or services), its trading partners can expect weaker demand for imports and greater competition from U.S. exports. Some of the EU countries will also need to curb their demand for imports in order to erase their twin deficits. The expanding public sector debts and contingent liabilities of several Organisation for Economic Co-operation

[4]China's investment rate rose to 46 percent in 2009 as a result of increased spending on infrastructure, housing, and manufacturing capacity. This will have steepened the decline in the marginal product of capital that was already apparent (Brooks and Barnett 2006). Under the circumstances, further increasing investment to sustain growth would be counterproductive.

and Development (OECD) countries narrow the scope for reflationary policies.[5] So also does the level of external indebtedness, particularly of the United States. That the East Asian countries will continue to bankroll the United States' large current account deficits through the purchase of U.S. Treasuries is likely in the medium term[6] but questionable in the long run.

A second factor, related to the first, is the potential for growing the international trade of light consumer goods, electronics and electrical products, auto parts, and other manufactured commodities. These are standardized goods trading in relatively saturated markets. In several industries there is global excess capacity, fierce price competition, and narrow profit margins. China is now the ranking producer of steel, cement, aluminum, and glass. It is pulling ahead of the Republic of Korea in shipbuilding, and it produced more cars than the United States in 2009. As a result of continuing investment in capacity in these industries and others in the absence of an exit of smaller inefficient producers (of cement and steel, for example), capacity utilization rates in 2008 had fallen into the 75 percent range for steel, cement, and aluminum, and even lower for methanol, polycrystalline silicon, and wind power equipment. This partly explains the declining investment in manufacturing capacity in a number of Southeast Asian countries in recent years and the shift toward real estate and business services. If future growth is likely to be slower, a rebound in private investment in East Asia may not materialize and, under these conditions, it is not clear that India could enter the market for electronics and auto parts without increasing the pressure on all participants to levels that could force a major shakeout of industry across Asia, triggering a bout of protectionism. Investors are being cautious elsewhere as well. American companies are husbanding large cash assets, which they are unwilling to plough into productive assets because the outlook for manufacturing is uncertain with stock market movements providing little guidance as they are influenced much more by the ample supply of liquidity and low interest rates than by the prospects of the real sector.

A third factor, linked to the first two, is the maturing of the electronics and information and communication technologies, which underpinned the latest stage of industrialization in East Asia. Although bio- and nanotechnology and renewable energy–related technologies all have promise, none has developed in a manner conducive to a new wave of industrialization with significant consequences for GDP growth and employment. Biotech has been viewed as a promising industrial force for almost two decades; it has led to important advances in medicine and the agricultural sciences, for example. But the multiple subfields nourished by biotechnology have

[5]Concerns that monetary easing and fiscal stimuli administered during 2009–10 could lead to higher rates of inflation are adding to the worries of policy makers in some countries.

[6]Caballero, Farhi and Gourinchas (2008) and Caballero (2010) argue that the world is short of safe AAA-rated assets and that emerging economies have made little progress in generating these. Hence, countries will continue to accumulate U.S. Treasuries and finance U.S. external account imbalances.

neither individually nor collectively provided the foundations for a new base of industry with significant growth, employment, and export prospects. Nanotech, advanced materials, and energy technologies may begin to show traction, but it might be a decade or more before they become more than niche industries.[7] It is difficult to identify an industrial technology that could promise a sustained acceleration of growth rates.

The fourth factor is the cost of energy and raw materials. So long as they were low (stable or falling), they could be conveniently ignored and used to generate globe-spanning, energy-intensive production networks. In 2007–08, the increase in the prices of fossil fuels and critical metals served as a forewarning of pressure on suppliers (see figure 6.1). Prices eased when the global economy went into a tailspin, but if growth rates were to approach the levels attained in 2006–07, the supply elasticities for energy and raw materials are such that inflationary tendencies would very quickly resurface. Evidence of this possibility became apparent in 2010. Rising prices would curb demand[8] and begin undermining the viability of industries and trading systems built on cheap energy and mineral supplies. Growth would be caught between the pincers of rising costs and weakening demand.[9]

Asian economies were sustained during 2006–07 by asset bubbles generated by expansionary monetary policies and financial innovations in advanced economies that encouraged leveraging and consumption, side by side with high savings in the Middle East and East Asia that facilitated borrowing. A return to the state of affairs that precipitated the great recession of 2008–09 is scarcely desirable. Were it to happen, the global economy would experience, at the very best, another year or two of uneasy expansion that could not last.

Scenario 2: Concentration of Economic Activities in China and India

Business as usual will be difficult to restore for more than a handful of years. A possible scenario for the Asian economies starts with a return to near normalcy in 2010–11 but then veers in a different direction.

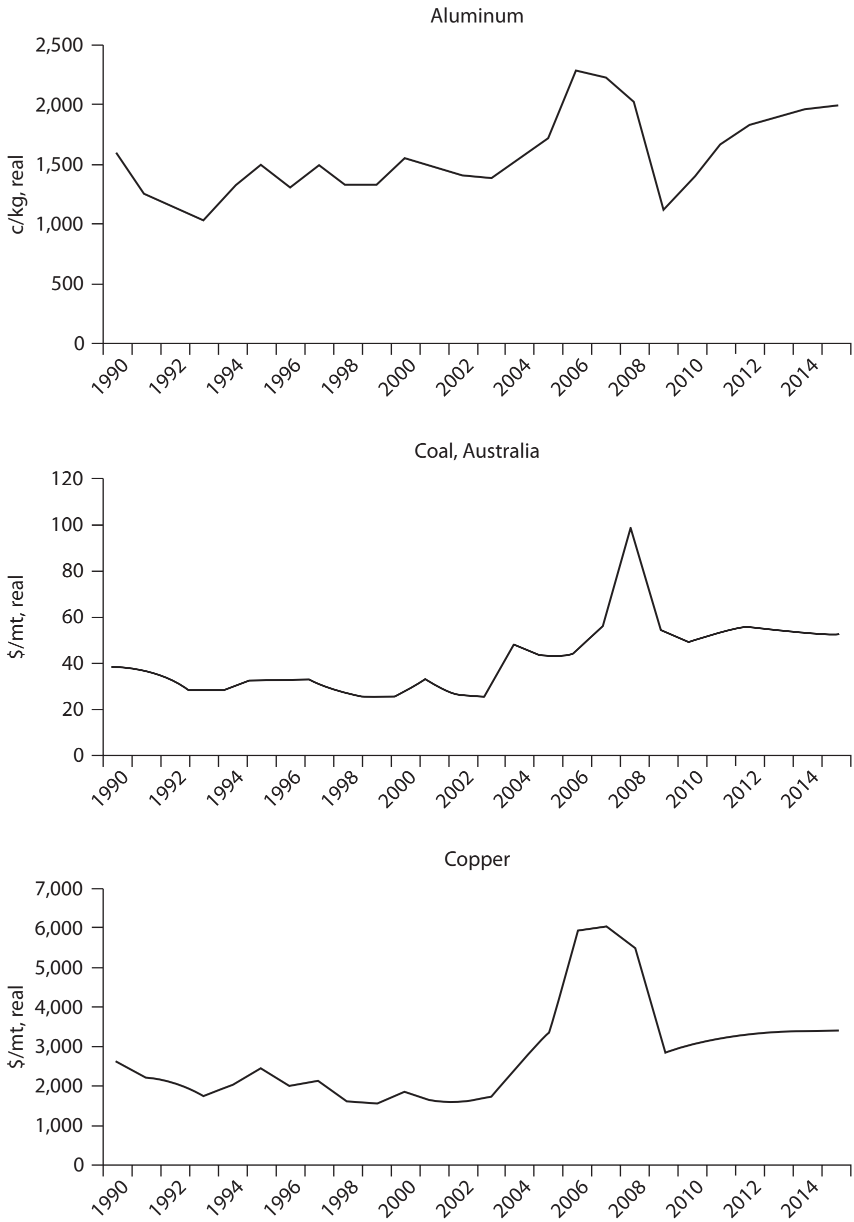
Consider the implications of prolonged sluggish growth in the United States and the continuation of its struggle to adjust the current account deficit to accommodate

[7]It is notable that the venture capital industry in the United States, which is flush with funds, has few outstanding successes to report since the end of the dot-com boom. Over the past five years, only Facebook and Twitter have yielded the high returns that venture capitalists seek.

[8]Oil priced at over $85 per barrel could depress economic activity in the United States.

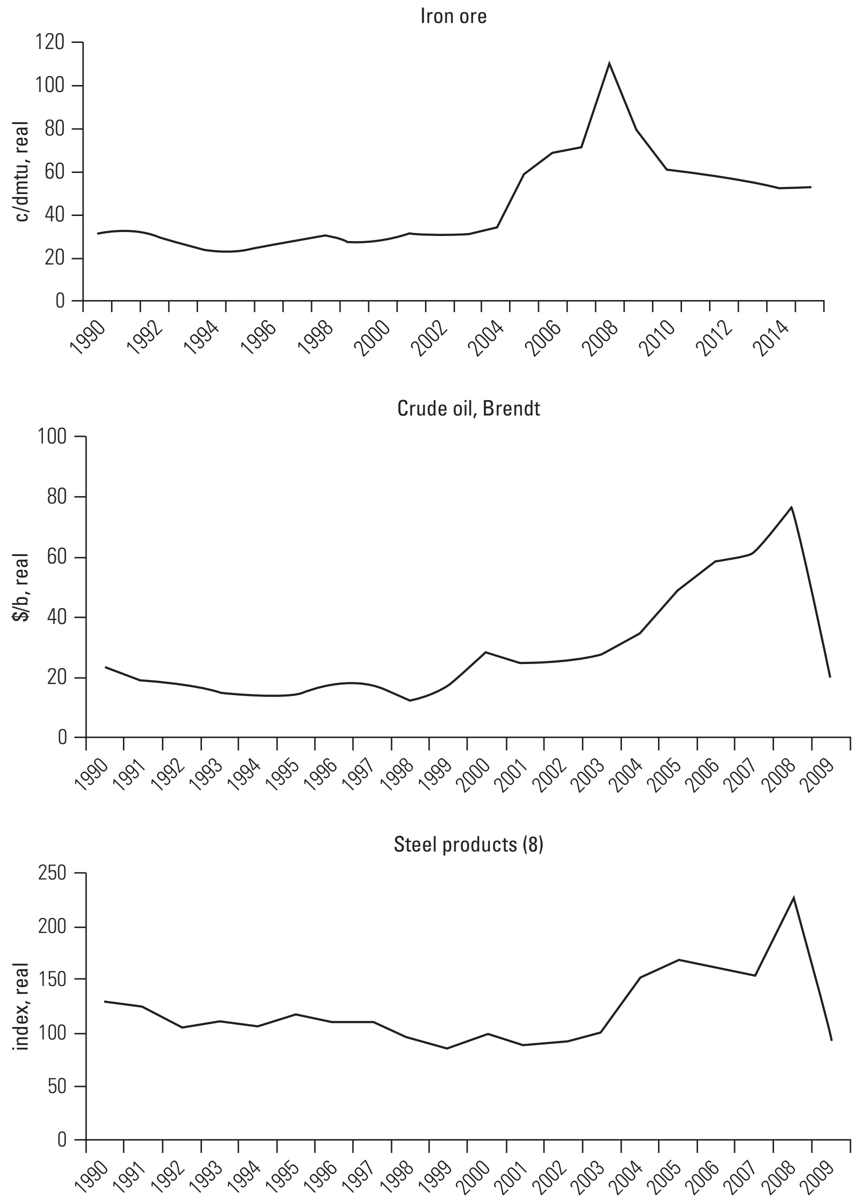
[9]In the 1980s and the 1990s, global economic expansion was buoyed by low energy prices. With extraction costs rising and "peak oil" approaching, another energy dividend is not in the offing, and greenhouse gas (GHG) concerns argue for a tax on carbon.

Figure 6.1 Global Commodity Prices



(*continued on next page*)

Figure 6.1 ***(continued)***



Source: Global Economic Monitor Database, World Bank.
Note: $ = U.S. dollar: c = U.S. cent; mt = metric ton; dmtu = dry metric ton unit; b = barrel. “Steel products (8)” includes rebar (concrete reinforcing bars), merch bar (merchant bars), wire rod, section (H-shape), plate (medium), hot rolled coil/sheet, cold rolled coil/sheet, and galvanized iron sheet.

a waning foreign appetite for U.S. Treasuries. This situation could be paralleled by a depreciation of the dollar relative to other major trading currencies (the dollar has depreciated significantly against the yen but strengthened vis-à-vis the euro),[10] which would further quench the U.S. appetite for imports from Asia while, arguably, diverting resources into tradables and discouraging the overseas transfer of production, including the outsourcing of services.[11] If the United States exports more and imports less, either other countries take up the slack by growing faster and importing more—in which case world trade expands—or past U.S. deficits, which contributed so lavishly to global demand, are transferred to other countries, which then run smaller surpluses or incur larger deficits. Either way, there is likely to be some decline in export growth from Asia to the United States, particularly of manufactures. Until a realignment of trade flow occurs, the growth impulse from trade surpluses enjoyed by several Asian countries will diminish.

Alternatively, the United States could face bigger deficits as the European countries forced to eliminate large current accounts that cannot be financed by capital inflows push adjustment onto other countries. Accommodating the adjustment of Spain, Italy, Greece, and other European countries running deficits would require a reduction in the surpluses of other members of the EU, in particular Germany, and of East Asian trading partners, especially China. A fiscally conservative stance by Germany, and other European countries with surpluses would redirect most of the pressure onto China and the United States, i.e., China would export less to the EU countries and derive less growth from trade and/or the United States would experience a widening of its deficit absent significant fiscal tightening. In any event, rebalancing would be painful and could affect the direction of globalization.

A narrowing of the U.S. external deficit by moderating demand for the imports of manufactures could accelerate a number of developments signaled by recent trends in trade and industrialization across Asia. As noted above, East Asian trade has flourished in part because of manufacturing activities that, as a result of national incentive regimes, foreign direct investment (FDI), and opportunities for trade, were integrated into international production networks. These delivered final goods to U.S., EU, and Japanese markets by mobilizing the region's production capabilities in a cost-effective way. An electronic gadget might be assembled in one country, but its parts might come from three others. These might take a circuitous route through yet another country, where some of the parts are assembled into a module and additional work is done on the module itself to prepare it for the recipient assembler. By distributing demand among a host of suppliers, the vertical disintegration of the production process led to much greater intra-industry

[10]Feldstein (2010) maintains that the dollar must also depreciate against the euro and that the euro area may need to run an overall current account deficit to balance surpluses elsewhere.

[11]Liu and Trefler (2008) estimate that the insourcing of services to the United States is outweighing outsourcing.

trade, which we documented in chapter 2. By combining productive assets and specialized skills from several countries, networking allowed sharing of the benefits from trade. To the degree that the network consolidated dispersed East Asian manufacturing activities into one reasonably well-articulated system, it facilitated a mutually advantageous coexistence. This is why several empirical studies do not find much evidence of China (or India, for that matter) intensifying pressures on neighboring countries. On the contrary, countries worried about competition from firms in China (and later in India) but welcomed the upsurge of demand from China, somewhat mediated by production networks. In spite of inevitable tensions, the Asian symbiosis sustained the export-led model, although barely.

Production networking as practiced in East Asia has its costs. Vertical specialization of production among firms in different countries gives rise to numerous problems noted earlier—communication, defining specifications and designs, monitoring work practices, and meeting delivery schedules. There are problems also of customs, insurance, shipping, invoicing, and fulfillment. These transaction costs are nontrivial and can add 10 percent or more to the cost of the product (Sirkin, Hemerling, and Bhattacharya 2008). There is also the cost of shipping intermediate products back and forth. The time factor for goods that have to be shipped from distant places means that users need to hold precautionary inventories and tie up working capital. Although networks have knit suppliers together, assemblers and parts producers can have difficulty working closely on design and jointly coordinating refinements in technologically fast-moving industries. As with just-in-time production and delivery, there is no substitute for proximity in contributing to the efficient conception, design, development, and manufacture of a product. The more sophisticated the product, the more customized the individual components; and the more complex the task of integration, the greater the efficiency gains and (vertical) technological spillovers[12] from a clustering of firms jointly engaged in the product's manufacture.

This leads to efforts among East Asian economies to increase domestic value added by localizing more segments of the value chain. In countries where a focus on assembly and processing activities means that domestic value added in most export-oriented manufacturing rarely exceeds 30 percent, raising GDP growth by increasing value added is the constant focus of policy makers. The creation of local manufacturing clusters that internalize multiple production activities is one of the uppermost objectives of governments in Asia. The agglomeration of suppliers and assemblers in clusters is more likely to occur where the potential local markets are largest, because this facilitates design and testing and lessens risk. The presence of large markets confers other benefits such as access to credit and to skilled workers, and the presence of many buyers makes it easier to realize economies of scale and of scope. Clustering is also more likely in economies hosting

[12]These are more common than horizontal spillovers and strengthen the case for clustering.

major firms with expertise in integration and a focus on research and development (R&D) to bolster international competitiveness (see Yusuf 2008).

In East and South Asia today, China and India are the two major economies with good growth prospects and emerging homegrown multinational corporations (MNCs) with the ambition to innovate. Japan's economy is as large as China's, but it is unlikely to expand by more than 1–2 percent per year. Although Indonesia is a populous country, it is at an earlier stage of industrialization. Hence, if production networks are to coalesce in the urban-industrial regions of individual countries, China and India are the most likely sites.

If trade grows more slowly, energy costs remain high or even climb higher, competition in product markets intensifies, and MNCs move to rationalize their production in the Asia region—all eminently plausible outcomes that could occur together—then a decline in vertical specialization and a transfer of intermediate and component production to China and (eventually) India is definitely possible. It will be a gradual process, and the rest of Asia would certainly not be denuded of manufacturing, but value chains could become concentrated in clusters, and more of these clusters could be located in Asia's giant economies. Furthermore, a larger share of their production would be aimed at the domestic market under the assumption that trade would not provide the opportunities it once did. The evidence presented on intra-industry trade in chapter 2 points to this trend, as does increasing competition between Chinese producers and others in East Asia and OECD markets.

The losers would be the smaller economies of Asia and those with unattractive business climates. Relative to East Asian economies, especially those in the northeast, business climates in Pakistan, Bangladesh, Nepal, and Sri Lanka are far more challenging, and these countries are ranked low according to various measures of competitiveness (see tables 6.1, 6.2, and 6.3). Some are also prominent in the failed state index (table 6.4). Because of the unfavorable business climate and high risks, South Asian countries (with the exception of India) also do not receive much FDI (see figures 6.2 and 6.3). With slower-growing trade and little FDI inflow, these countries are likely to be characterized by low growth.

Middle-income countries in East Asia also face difficult challenges. Countries such as Malaysia could lose most of their component manufacturing to China and India as MNCs restructure their operations, cut excess capacity, and prune the extra costs of shipping parts from one place to another. With both China and India having integrated into the global economy, maintaining several production units for insurance purposes will be less important. Lean operations that benefit from cluster-induced spillovers could dominate decision making in a world where more of the growth comes from two major Asian economies.[13] Hence, for the

[13]The lean approach to manufacturing and retailing has been reinforced by years of intensifying competition and, most recently, by the global recession. Companies have mobilized

(*continued on next page*)

Table 6.1 Doing Business Indicators (Rank)

Country/economy	2006	2007	2008	2009
Singapore	2	1	1	1
Japan	10	11	12	12
Thailand	20	18	15	13
Malaysia	21	25	24	20
Korea, Rep.	27	23	30	23
Taiwan, China	35	47	50	61
Pakistan	60	74	76	77
China	91	93	83	83
Vietnam	99	104	91	92
Sri Lanka	75	89	101	102
Bangladesh	65	88	107	110
India	116	134	120	122
Indonesia	115	135	123	129
Philippines	113	126	133	140

Source: World Bank 2005, 2006, 2007, 2008.

leading Southeast Asian industrializing countries to sustain their competitiveness, it is vital to secure medium-term performance in electronic and automotive products, and it is only through a rapid accumulation of domestic technological capacity that they can grasp fresh industrial and trade opportunities. Fortunately (or unfortunately), they have rich natural resources to lean on while they build up indigenous capabilities. The risk is that countries are distracted by other social and political issues and are unable to muster the consensus needed to press ahead with industrialization in difficult times with no obvious models to guide them. A loss of momentum could lead to a slow retreat of manufacturing in Southeast Asia, with countries becoming mainly resource-based commodity exporters with low and volatile growth rates.

Japan, Korea, and Taiwan, China, have developed their technological capabilities sufficiently to accommodate and benefit from this kind of scenario. Even so, Chinese

(*continued from previous page*)
a variety of techniques and software to reduce cycle times, warehousing, equipment downtime, energy costs, and material wastage. Producers, moreover, have redoubled their efforts to customize products for individual markets and to use the wealth of data now at their disposal to identify the preferences of customers and use marketing tools to target them more effectively (Womack and Jones 1994; Moody 2001).

Table 6.2 Global Competitiveness Index

Country/economy	1997	2003	2009–10
Singapore	1	8	3
Japan	14	13	8
Taiwan, China	8	16	12
Korea, Rep.	21	23	19
Malaysia	9	26	24
China	29	46	29
Thailand	18	31	36
India	45	37	49
Indonesia	15	60	54
Vietnam	49	50	75
Sri Lanka	—	57	79
Philippines	34	65	87
Pakistan	—	75	101
Bangladesh	—	91	106

Source: Lopez-Claros and others 2006; Porter, Schwab, and Sala-i-Martin 2007; World Economic Forum 2010.
Note: — = not available.

Table 6.3 Global Competitiveness Ranking

Country/economy	2004	2006	2008	2009
Singapore	2	3	2	3
Japan	21	16	22	17
Malaysia	16	22	19	18
China	22	18	17	20
Taiwan, China	12	17	13	23
Thailand	26	29	27	26
Korea, Rep.	31	32	31	27
India	—	27	29	30
Indonesia	49	52	51	42
Philippines	43	42	40	43

Source: IMD World Competitiveness Yearbook 2009.

Note: Ordered by rank in 2009. — = not available.

and Indian firms will begin exerting great pressure on the established firms from Japan, Korea, and Taiwan, China. Their ability to sustain their lead over competitors from China and India will depend upon the productivity of innovation systems and the agility of firms in developing and marketing new ideas.

Table 6.4 Failed-States Index (Rank)

Country	2006	2009
Pakistan	9	10
Bangladesh	19	19
Sri Lanka	25	22
Philippines	68	53
China	57	57
Indonesia	32	62
Thailand	79	79
India	93	87
Vietnam	70	94
Malaysia	98	115
Korea, Rep.	123	153
Singapore	133	160
Japan	135	164

Source: Failed States Index 2009.

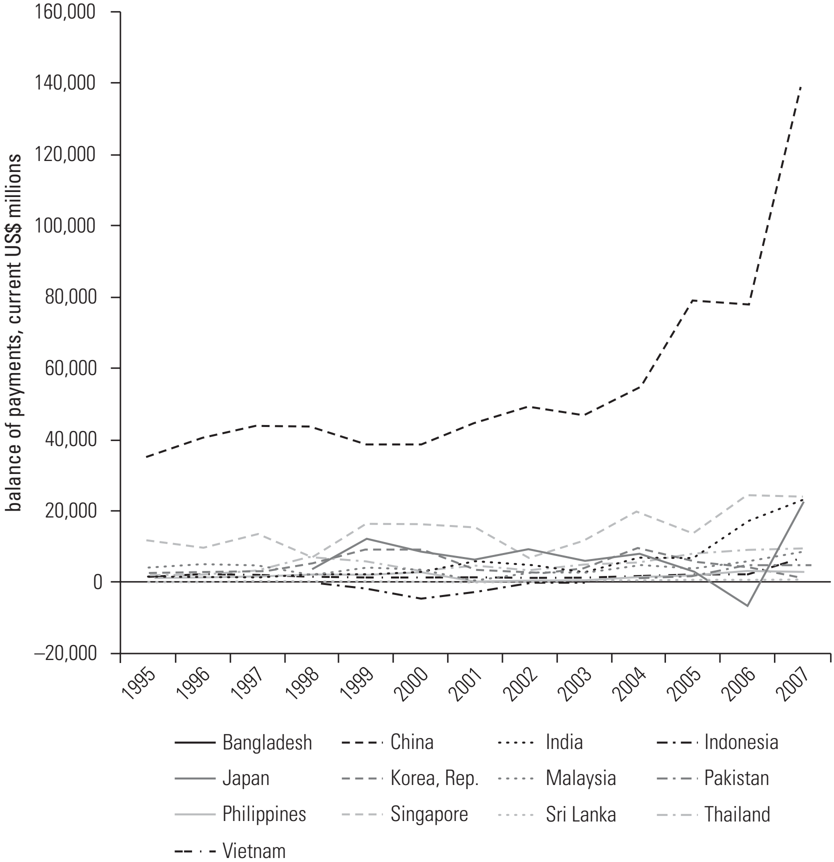
Scenario 3: New Industrial Epoch, New Opportunities

A third scenario (and the one least likely to materialize in the near term, but whose likelihood will increase with time) revolves around the dawning of a new technological epoch that gives industrialization a major jolt, triggering another virtuous spiral. The technological epoch could arise, for example, from a global consensus that highly damaging climate change is a near certainty unless radical measures are taken to arrest GHG emissions, and, moreover, that shared rising prosperity will demand innovations to significantly conserve energy and other exhaustible materials.

This is a fairly utopian scenario.

East Asian industrialization was the outcome of a serendipitous coming together of a number of factors. One deserving primacy is the revolution in electronics and communication technologies, which opened up a broad avenue for industrial development. Key decisions leading to the modularization of the technology and to standardization facilitated a dispersal of production and of innovation, both product- and process-related. Spearheaded by FDI, the off-shoring of electronics assembly inducted several East Asian economies into MNC production networks and launched the most important phase of export-led industrialization in East Asia. Its significance can be gauged from the gulf that separates industry in South Asia from that of East Asia. South Asia—India excepted, which never managed to attract FDI in electronics—remains wedded to the manufacturing of textiles and garments, whereas most East Asian economies transitioned rapidly from textiles and resource-based goods to the processing of electronics—moving as a result into the middle-income category.

Figure 6.2 Foreign Direct Investment, Net Inflows

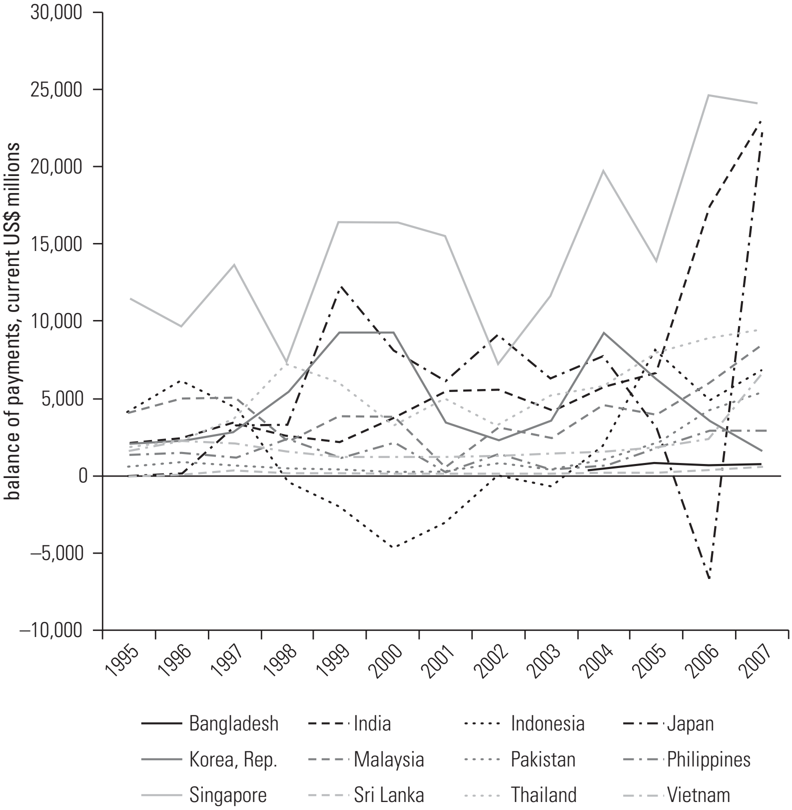


Source: World Development Indicators Database.

The electronics/ICT revolution is by no means a spent force.[14] However, unless innovation and demand continues spiraling (and not just from the United States), the East Asian countries graduate into the design and manufacturing of complex components and production equipment for the electronics industry, and the South Asian economies move into significant niches they vacate, electronics alone will not be the pathway to successively higher stages of industrialization. What, then, are the options on the horizon? The most likely is a cluster of activities under

[14]There is more innovation apparent in software than in hardware.

Figure 6.3 Foreign Direct Investment, Net Inflows, Excluding China



Source: World Development Indicators Database.

the rubric of "green technologies." This is still an ill-defined set of possibilities, but the avenues for technological advances and new manufacturing are becoming clearer.[15] What is not clear yet is how a focus on green technologies will affect total output, investment, production methods, employment, and industrial geography.[16]

[15] In the future, the emphasis of sustainability in the various dimensions of development will multiply the opportunities for innovation. Countries pursuing sustainability through policy, regulation, standard-setting, investment, and incentives will stimulate companies to innovate in particular ways (Prahalad and Krishnan 2008).

[16] A note of caution is warranted. High-tech sectors, in spite of being the focus of innovation and leading the field with respect to gains in productivity, often are too small to drive

(*continued on next page*)

Green technologies range from energy and water conservation to nanotechnology, advanced materials, and waste disposal. The core manufacturing activities that will translate green technologies into industrial change are likely to be those producing material and equipment for generating renewable energy and transmitting it over smart grids; new materials that are lightweight, biodegradable, or recyclable and can be manufactured with the smallest release of carbon; transport equipment and power supplies that meet green criteria; building materials; and household and industrial equipment that will promote conservation and the inputs for a low-carbon urban infrastructure. As currently perceived, most of these products are research-, skill-, and capital-intensive. Few are likely to employ armies of production line workers, although value added per worker would surely rise. Perhaps the industries that best fit the profile of a breakthrough technology with dense manufacturing linkage are new automotive and transport technologies. Assuming that the global stock of automobiles—more broadly, internal combustion engines—will need to be replaced by propulsion devices with a negligible direct carbon signature, and that future additions will be mainly green technology–based vehicles, we stand on the threshold of a new industrial revolution. The three biggest sources of GHGs (if we exclude humans, rice cultivation, deforestation, and cattle) are power plants, transport equipment, and buildings. Should the vast majority of these sources need to be replaced to minimize climate change, and should "green" become the order of the day, manufacturing industry will have to take on a challenge. And once green is "it," every other activity will be affected, requiring redesign, retooling, and change in the structure of industry.

Is Asia positioned to compete for this type of manufacturing activity with all that it entails in terms of technology and human capital? Some countries are, and those that can develop research capabilities and absorb the new production technologies will be the big winners and will participate in what could turn out to be a new industrial epoch (see Felipe, Kumar, and Abdon (2010) for a ranking of countries).

Concluding Observations

Economists and other social scientists are discovering that forecasts based on the models and empirical techniques we currently employ are subject to large margins

(*continued from previous page*)
GDP growth directly. The U.S. semiconductor industry at its peak in 2000 contributed just 0.6 percent of GDP. The information technology (IT) industry in India accounts for 0.7 percent of GDP. Technological spillovers raise the contribution of these sectors, but the fact remains that the bulk of GDP growth from manufacturing or services derives from traditional industries such as food processing and construction materials and mid-tech transport and engineering industries (McKinsey Global Institute 2010).

of error.[17] But there is no escape from forecasting—from making educated guesses as to what the future holds. Explaining the past can be satisfying, but if economics becomes an extension of history, its utility as a guide to decision making could be greatly reduced. The decision-making process would be substantially impoverished.

In this book we have looked back in time using data series and the literature on development to size up a process, to understand the unfolding pattern of changes in Asia affecting trade and industry, and to hypothesize about the future dimensions of one critical part of national economies: the manufacturing sector. Our understanding of the development process leads to the proposition that growth in Asian economies has thus far been inseparable from industrialization and from the expanding trade in manufactures. Furthermore, the economies that have successfully graduated into high-tech manufacturing activities have all first acquired a solid base of manufacturing capabilities in electronics and electrical engineering industries. Hence, when we look ahead, our working hypothesis is that the development and growth of low- and middle-income economies—and even high-income economies—will be a function both of industrialization and of the form it takes. A corollary of this proposition is that trade will strongly influence the pace and characteristics of industrialization. This is more applicable to the smaller economies, but even the larger ones are unlikely to thrive if the growth of trade slows—or worse, grinds to a halt.

Through a review of recent trends, we have tried to determine how manufacturing activities are evolving in Asia and to highlight the role of China and India, which are the fastest growing among the industrializing Asian economies and which have major roles in the world trading system.

Out of this analysis, reading the trends and reviewing the information on some of the significant corporate players brings us to a prognosis of a slowing of growth and trade in Asia, a greater concentration of manufacturing and associated research capabilities in China, a more gradual increase of such capabilities in India, and stagnation or decline in manufacturing in other Asian countries (Vietnam being a possible exception, because it is somewhat coextensive with the economy of Southern China). Services may partially compensate for the arrested development of manufacturing in some countries, but past experience suggests that they may prove to be less dependable vehicles for rapid and sustainable growth rooted in innovation and improving productivity. Nor do we see a continuing acceleration in the trade in services fueled (as was the case with manufacturing) by demand from the United States and, to a lesser degree, from other OECD countries. On the contrary, this demand will be

[17] Taleb (2007) has drawn attention to the now infamous and unpredictable "black swans." Others have pointed to the unexpected threats and opportunities that are hidden in "fat tails" of event distributions.

slower to materialize from the United States and some countries in the EU, which also will need to compete far harder to balance their books with the rest of the world.

If industrialization and growth languishes in the rest of Asia, China's gains—and India's—will be partially negated by weaker external demand, by the threat of trade frictions, and by an unwinding of globalization.

We think that this outcome is avoidable, although just barely. As the Doha Round of talks has shown, hammering out compromises that partially and fairly address the competing interests of nations is a difficult business.[18] Making and implementing long-term development policies in the current political circumstances of most Asian countries is also a formidable undertaking. Doctrinal differences in approaches to development, as well as varied readings of the evidence on the sources of growth, the gains from freer multilateral trade, factor flows, the contribution of urbanization, and how global warming can be arrested, make it hard to define clear objectives and to chart a course for a diverse assortment of countries.

Rather than attempt the impossible, which is to set forth a detailed roadmap for all of Asia, we offer a parsimonious set of proposals that could enable Asian countries—and others—to achieve higher rates of sustainable growth.

It appears that the world needs to enter a new technology-induced spiral that entails a large amount of spending on fixed assets, generating massive employment and the promise of substantial returns over the longer term. Neither biotechnology, advanced materials, nor nanotechnology—all of which hold promise—have yielded these. However, the new industrial green revolution could conceivably deliver the goods. With the threat of global warming providing irresistible motivation, a rapid and systematic development of technologies in the following five areas can stimulate the development of new industries:

- Low-carbon urban infrastructure and services delivery
- Low-carbon transport solutions and energy-delivery infrastructure
- Low-carbon energy infrastructure
- Water delivery, purification, management, and conservation technologies for urban and rural uses
- Lean natural resource use technologies for industry

Exploiting currently available technologies in each of these areas and exploring fresh possibilities, if aggressively pursued, would generate the growth and the

[18]A multifaceted dissection of the global trading environment following the collapse of trade in 2008 and with reference to the issues arising from the Doha Round can be found in Baldwin (2009). See also Hufbauer and Stephenson (2009).

employment that Asian countries are seeking. It would harness electronics technologies and give a focus to research on new materials and nanotechnologies.[19] Moreover, it would yield the much-needed bonus of cutting GHG emissions, containing water use, and lessening the depletion of nonrenewable resources and environmental damage. Another benefit of more compact cities designed for walking would be the improvement in public health.

A new technological epoch will require a strong push and incentives from government—both negative and positive. Public spending on infrastructure, support for research, and underwriting of some risk capital would need to be combined with a multitude of other reinforcements and sanctions, including standards for equipment and infrastructure, pricing regimes, and regulatory arrangements. A neoliberal state that trusts in the market and adopts a fundamentalist low profile is less likely to achieve results.

The successful launch of a new technological epoch would give rise to a round of cross-sectoral investment incentives that would fuel growth directly and from gains in productivity arising from innovation and improved efficiency. Middle- and high-income countries would have new industries to expand into, and technological change would rejuvenate existing industries. Ideally, this would lead to a regionwide reshuffling of industrial shares, with the technologically more advanced countries going down new industrial pathways, and the low-income countries moving up the industrial ladder and occupying the spaces vacated by middle-income countries, as well as finding new niches of their own creation.

A new technological epoch that makes possible sustainable growth and curbs global warming will absorb an enormous volume of resources. The winners will be countries that can mobilize resources and maintain high levels of investment.

References

Ackerman, Frank. 2006. "Assessing the Effects of Trade Liberalisation: A Critical Examination." *QA—Rivista dell' Associazione Rossi-Doria* no. 3.

Anderson, Kym, and Will Martin. 2005. "Agricultural Trade Reform and the Doha Development Agenda." Policy Research Working Paper 3607. World Bank, Washington, DC.

Bai, Chunli. 2005. "Ascent of Nanoscience in China." *Science* (309): 61–63.

Baldwin, Richard. 2009. *The Great Trade Collapse: Causes, Consequences and Prospects.* London: Centre for Economic Policy Research.

Brooks, Ray, and Steven A. Barnett. 2006. "What's Driving Investment in China?" IMF Working Paper 06/265. International Monetary Fund, Washington, D.C.

Caballero, Richard. 2010. "Understanding the Global Turmoil: It's the General Equilibrium, Stupid." VoxEU.org.

[19] China's efforts to become a leader in nanotechnologies are described by Bai (2005), and the opportunities for middle income countries are discussed by Niosi and Reid (2007).

Caballero, R., E. Farhi and P. Gourinchas. 2008. "Financial Crash, Commodity Prices, and Global Imbalances." NBER Working Paper 14521. National Bureau of Economic Research, Cambridge, MA.

"Failed States Index 2009." *Foreign Policy*.

Feldstein, Martin. 2010. "Is the Euro Overvalued?" http://www.project-syndicate.org.

Felipe, Jesus, Utsav Kumar, and Arnelyn Abdon. 2010. "As You Sow So Shall You Reap." Asian Development Bank, Manila.

Hufbauer, Gary, and Sherry Stephenson. 2009. "Trade Policy in a Time of Crisis: Suggestions for Developing Countries." Policy Insight 33. Centre for Economic Policy Research, London.

IMD (International Institute for Management Development). 2009. *World Competitiveness Yearbook.* Laussane, Switzerland: IMD.

Liu, Runjuan, and Daniel Trefler. 2008. "Much Ado About Nothing: American Jobs and the Rise of Service Outsourcing to China and India." Working Paper 14061. National Bureau of Economic Research, Cambridge, MA.

Lopez-Claros, Augusto, Michael E. Porter, Klaus Shwab, and Xavier Sala-i-Martin. 2006. *The Global Competitiveness Report 2006–2007.* New York: Palgrave Macmillan.

McKinsey Global Institute. 2010. *How to Compete and Grow: A Sector Guide to Policy.* Washington, DC: McKinsey & Company.

Moody, Patricia E. 2001. "What's Next after Lean Manufacturing?" *MIT Sloan Management Review* (Winter): 12–13.

Niosi, Jorge, and Susan E. Reid. 2007. "Biotechnology and Nanotechnology: Science-based Enabling Technologies as Windows of Opportunity for LDCs?" *World Development* 35(3): 426–38.

Polaski, Sandra. 2006. *Winners and Losers: Impact of the Doha Round on Developing Countries.* Washington, DC: Carnegie Endowment for International Peace.

Porter, Michael, Klaus Schwab, and Xavier Sala-i-Martin. 2007. *The Global Competitiveness Report 2007–2008.* New York: Palgrave Macmillan.

Prahalad, C. K., and M. S. Krishnan. 2008. *The New Age of Innovation: Driving Cocreated Value through Global Networks.* New York: McGraw-Hill.

Serven, Luis, and Ha Nguyen. 2010. "Global Imbalances Before and After the Global Crisis." World Bank Policy Research Working Paper 5354. World Bank, Washington, DC.

Sirkin, Harold L., James W. Hemerling, and Arindam K. Bhattacharya. 2008. *Globality: Competing with Everyone from Everywhere for Everything.* New York: Business Plus.

Taleb, Nassim Nicholas. 2007. *The Black Swan: The Impact of the Highly Improbable.* New York: Random House.

Womack, James P., and D. T. Jones. 1994. "From Lean Production to Lean Enterprise." *Harvard Business Review* (March–April): 93–103.

World Bank. 2005. *Doing Business in 2006.* Washington, DC: World Bank.

———. 2006. *Doing Business in 2007.* Washington, DC: World Bank.

———. 2007. *Doing Business in 2008.* Washington, DC: World Bank.

———. 2008. *Doing Business in 2009.* Washington, DC: World Bank.

World Economic Forum. 2010. *The Global Competitiveness Report 2009–2010.* New York: World Economic Forum.

Yusuf, Shahid. 2008. "Can Clusters Be Made to Order?" In *Growing Industrial Clusters in Asia: Serendipity and Science,* ed. Shahid Yusuf, Kaoru Nabeshima, and Shoichi Yamashita. Washington, DC: World Bank.

Index

Figures, notes, and tables are indicated by *f*, *n*, and *t*, respectively.

ECO-AUDIT

Environmental Benefits Statement

The World Bank is committed to preserving endangered forests and natural resources. The Office of the Publisher has chosen to print ***Changing the Industrial Geography in Asia*** on recycled paper with 50 percent post-consumer waste, in accordance with the recommended standards for paper usage set by the Green Press Initiative, a nonprofit program supporting publishers in using fiber that is not sourced from endangered forests. For more information, visit www.greenpressinitiative.org.

Saved:

- 17 trees
- 5 million Btu of total energy
- 1,599 lb. of net greenhouse gases
- 7,701 gal. of waste water
- 468 lb. of solid waste

green press INITIATIVE

A GREAT BURST OF GLOBALIZATION brought the 20th century to a close, creating upheaval in the world economy from roughly 1995 to 2008. And now, with the new century barely commenced, a second upheaval is in the offing following the severe financial crisis that plunged the global economy into recession in 2008–09. The first upheaval witnessed a massive migration of manufacturing and certain business services that transformed Asia into the industrial heartland of the world. The second upheaval will likely consolidate Asia's industrial preeminence and could result in a concentration of industrial activities in the two most populous and fastest-growing Asian economies—China and India.

As the two Asian giants become the industrial equals of the United States, Germany, and Japan, the ramifications will affect trade and growth worldwide, the future of development in China and India, and industrialization throughout Asia. *Changing the Industrial Geography in Asia: The Impact of China and India* examines these developments, focusing specifically on China and India. Its analysis and conclusions will be of particular interest to policy makers and academics, as well as anyone with an interest in how China and India are likely to reshape industry throughout Asia.

"*Changing the Industrial Geography in Asia* is rich in detailed analysis of the continuing transformation of the manufacturing sector in Asia, both in terms of its moving geography and its composition. For those interested in understanding the prospects of post–financial crisis Asia, this book is a must read. It is a refreshing return to economic fundamentals, including the new problems of climate change and dwindling energy resources, and will remain the leading reference on Asian transformation for a long time to come."

RAKESH MOHAN, Professor in the Practice of International Economics and Finance, Yale School of Management; Senior Fellow, Jackson Institute of Global Affairs, Yale University; former Deputy Governor, Reserve Bank of India

"The authors consolidate a remarkable amount of data and analysis on the industrial structure of Asia and its emergence as the industrial center of the global economy."

BARRY BOSWORTH, Senior Fellow, The Brookings Institution

THE WORLD BANK

ISBN 978-0-8213-8240-0

SKU 18240