Chapter 8

Malaysia—Attracting superstar firms in the electrical and electronics industry through investment promotion

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Summary

This case study shows how attracting foreign direct investment (FDI) through active investment promotion jump-started the development of Malaysia's electrical and electronics (E&E) industry, which, facilitated by workforce development and linking programs, significantly upgraded over time. In the early 1970s, proactive investment promotion with high-level political support, along with a competitive investment climate, led a few of the industry's "superstar" firms to locate in Malaysia. This move launched an incipient industry focused on labor-intensive, low-skilled production and assembly. Over the years, the multinational corporations (MNCs) operating in Malaysia gradually shifted into higher-value-added activities and developed local suppliers, and domestic companies emerged onto the scene. This process was supported by a number of government programs, including the provision of incentives, supplier development efforts, and workforce development initiatives. The creation of the Penang Skills Development Centre in 1989 stands out as an internationally recognized example of a tripartite, industry-led workforce development initiative involving the private sector, government, and academia. By looking at a 50-year process, this case study also provides insights into the effectiveness of distinct strategic approaches and policy tools for leveraging FDI at different phases of a country's development.

Malaysia's role in the electrical and electronics global value chain

The electrical and electronics global value chain

The E&E global value chain (GVC) comprises a number of electrical and electronic components, assembly processes, and distribution channels that serve a variety of end markets (see figure 8.1).[1,2] Broadly speaking, the GVC can be divided into five separate production stages:

1. *Inputs stage.* Depending on the component, different raw materials are used in production, such as silicon, plastic, or various metals or chemicals.

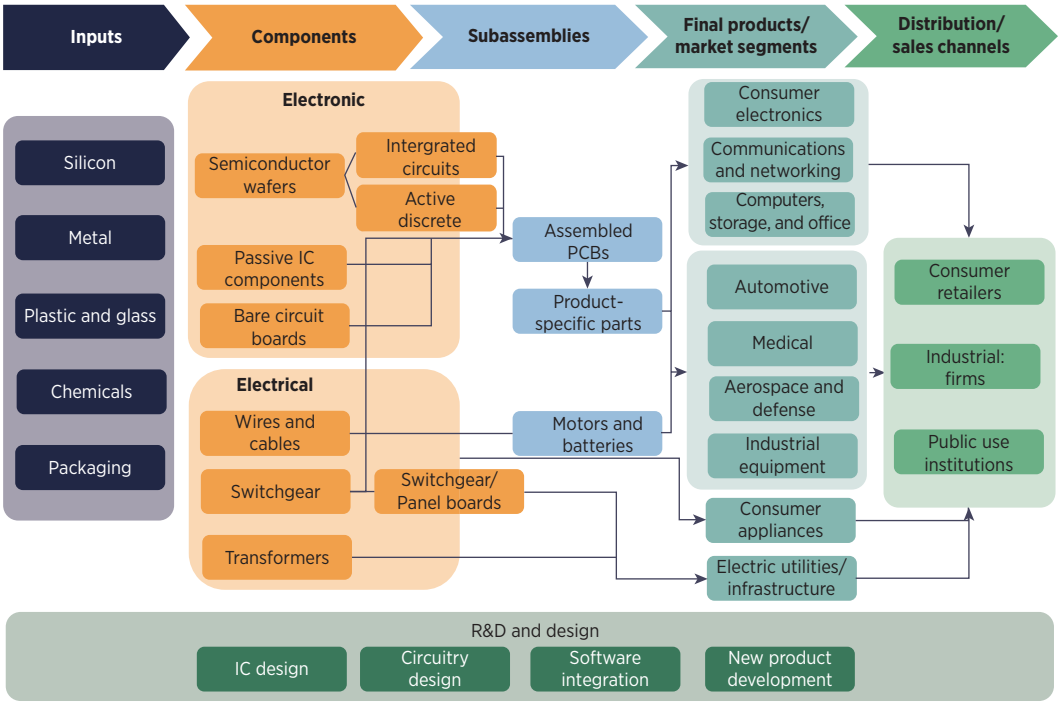
2. *Components stage*. This stage involves the production of (a) electronic components, which are elements with two or more leads or metallic pads intended to create an electronic circuit (such as semiconductors, active and passive integrated circuit [IC] components, and printed circuit boards), and (b) electrical components that transmit and distribute electric power (such as switchgear, transformers, and wires and cables).

3. *Subassemblies stage*. Depending on the final product, its components may go through several assembly stages. For example, electronic components such as circuit boards are often put into plastic or metal enclosures to form electronic subassemblies. Electrical subassemblies generate or store electric power.

4. *Final products and market segments*. The three principal end-market segments (also known as the three C's) are computers, consumer electronics, and communications and networking equipment. Other end markets include automobiles, medical equipment, aerospace and defense, and industrial equipment.

5. *Distribution and sales channels*. The final distribution and sales channels of E&E products depend on the stage of the value chain from which the products are sold, but

FIGURE 8.1 Electrical and electronics global value chain



Source: Frederick and Gereffi 2016, 11. Reproduced with permission.
Note: IC = integrated circuit; PCBs = printed circuit boards; R&D = research and development.

in general the main distribution channel for consumer products is retailers, the main channel for industrial products is direct sales to firms, and the main channel for products with public use is sales to institutions.

There are also research and development (R&D) and design activities that add value outside of the manufacturing process, including IC design, circuitry design, software integration, and new product development.

The E&E GVC is characterized by rapid technological change, large investments in R&D, stringent quality standards, and value chain modularity. The emergence of information technology standards and related standards that spread across the world has allowed specifications for E&E products to be codified and transmitted across distances. Consequently, different stages in the GVC can easily be separated and performed by a variety of geographically dispersed actors, which has led to a high degree of offshoring (Frederick and Gereffi 2013).

The key actors in the E&E GVC are lead firms, contract manufacturers and tier 1 suppliers, and component semiconductor suppliers (Frederick and Gereffi 2016). The GVC's lead firms are engaged in the highest-value-added activities, such as R&D, marketing, branding, design, and new product development. Although some lead firms are still involved in production, many of their functions related to production and logistics have in recent years been outsourced to contract manufacturers (Sturgeon and Kawakami 2011). This change has led to the emergence of large supplier firms that are mainly engaged in production services (electronics manufacturing services) such as component purchasing, circuit board assembly, final product assembly, and testing. If they also engage in some design services, such firms are called original design manufacturers. These contract manufacturers often have their own global production networks; for example, many original design manufacturers are based in Taiwan, China, but perform manufacturing operations in mainland China (Frederick and Gereffi 2016).

The greatest share of value in this GVC is captured by lead firms and component suppliers with strong platform leadership (Sturgeon and Kawakami 2010). Lead firms have buying power through the orders they place with suppliers; this power is earned by technological leadership, large investments in brand development, and the financial risk these firms take on. Contract manufacturers, in contrast, generally capture a smaller share of value because their services are highly substitutable. Although they purchase many components, their buying power is weaker given that their purchases are made on behalf of their customers. In some industries, platform leaders (that is, companies that implant their technology in the products of other companies) play an important role, because they define the system architecture upon which other companies build (Frederick and Gereffi 2016).

The geographic distribution of the E&E GVC has, in recent years, shifted strongly toward Asia for both supply and demand. Although many lead firms in the GVC are still based in the European Union, Japan, or the United States, lead firms have also emerged in newly industrialized countries, such as in China (Huawei and Lenovo); the Republic of Korea (Samsung and LG); and Taiwan, China (Acer). China in particular has increasingly gained importance; in addition to those lead firms, it also hosts a large share of contract manufacturers and component suppliers. Other countries involved in these activities include Indonesia, Malaysia, the Philippines, Singapore, and most recently Thailand and Vietnam (Frederick and Gereffi 2016).

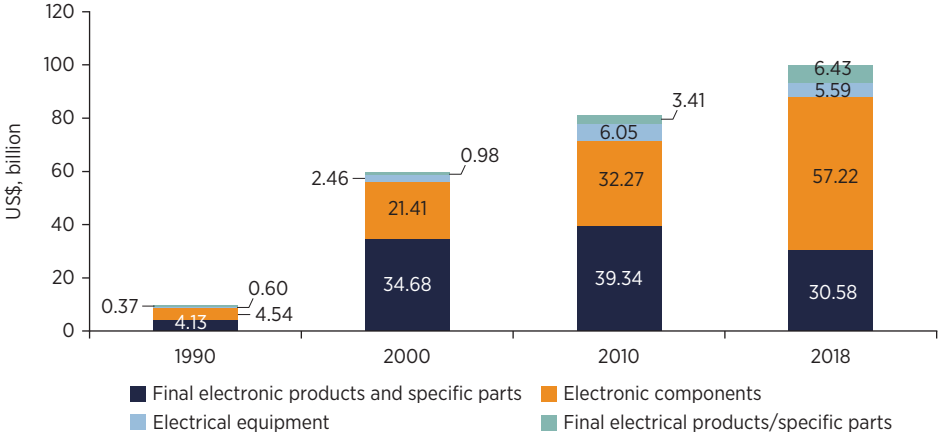
Malaysia's participation in the electrical and electronics global value chain

The E&E industry has played an important role in Malaysia's economy since the 1970s, and it continues to account for a large part of the country's exports. In 2019, Malaysia exported 372.67 billion Malaysian ringgit (RM) (about US$87 billion) in E&E products, which constituted 37.8 percent of its total exports and 44.7 percent of manufacturing exports (MIDA 2020). The country's major export destinations include China; the United States; Singapore; Hong Kong SAR, China; and Japan.

Components, in particular, electronic components, make up a large part of Malaysia's exports. In 2018, the country's E&E export composition was as follows: electronic components (57.2 percent), final electronic products (30.6 percent), final electrical products (6.4 percent), and electrical equipment (5.6 percent) (see figure 8.2). More than 80 percent of the electronic components exported were electronic ICs and micro assemblies. The final electronic products exported were in the following market categories: 42.8 percent computers, storage, and office equipment; 31.3 percent consumer electronics; 17.6 percent industrial equipment; and 8.2 percent medical devices. Although most of Malaysia's exports have grown steadily over the past 30 years, exports in some end markets (such as computers and consumer electronics) have been declining since 1999.

Globally, Malaysia is a significant player in E&E products, accounting for 2.8 percent of world E&E exports in 2018 (4.0 percent of world exports in E&E components and 2.0 percent of world exports in E&E final products and subassemblies) (see table 8.1). However, although Malaysia's exports have increased steeply overall, the country's shares in E&E exports for the East Asia and Pacific region and

FIGURE 8.2 Structure of Malaysia's electrical and electronics exports, 1990–2018



Source: United Nations Comtrade 2020.
Note: Electrical and electronics exports include the following Harmonized System codes: final electronic products or specific parts: 8469, 8470, 8471, 8472, 8473, 8517, 8518, 8519, 8520, 8521, 8522, 8525, 8526, 8527, 8528, 8529, 9006, 9009, 9012, 9014, 9016, 9018, 9019, 9021, 9022, 9024, 9027, 9028, 9029, 9030, 9032, and 950410; electronic components: 8524, 8532, 8533, 8540, 8541, and 8542; electrical equipment: 8501, 8502, 8503, 8504, 8505, 8506, 8535, 8536, 8537, 8538, 8544, 8545, 8546, 8547, and 8548; and final electrical products or specific parts: 732111, 732112, 732113, 841430, 841451, 8415, 8418, 842112, 842191, 842211, 8450, 8509, 8510, 8513, 8514, 8515, 8516, 8530, 8531, 8543, and 9405.

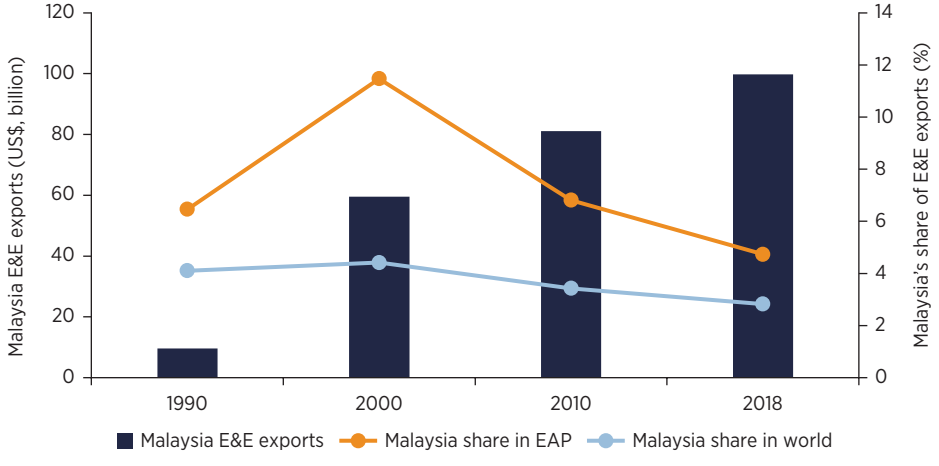
the world have declined over the past two decades (figure 8.3). The main reason for this decline has been a strong shift in both global and regional market share to China over the same period. Whereas in 2000 China's market share of E&E components was only 4 percent globally and 8 percent in the East Asia and Pacific region,

TABLE 8.1 Electrical and electronics exports and market share of select East Asian and Pacific countries, by value chain stage, 1990–2018

	Value (US$, billion)				CAGR (%)	World (EAP) market share (%)			
	1990	2000	2010	2018		1990	2000	2010	2018
E&E components									
Malaysia	5.14	23.87	38.33	62.80	9	7 (11)	5 (11)	4 (8)	4 (7)
China	—	18.18	144.98	249.51	22	0 (0)	4 (8)	16 (31)	17 (28)
Japan	26.27	72.94	88.06	77.35	4	35 (58)	14 (33)	10 (19)	5 (9)
Korea, Rep.	6.54	29.06	58.88	144.26	12	9 (14)	6 (13)	6 (13)	10 (16)
E&E final products and subassemblies									
Malaysia	4.50	35.67	42.75	37.00	8	3 (4)	4 (12)	3 (6)	2 (3)
China	—	50.64	446.97	694.88	26	0 (0)	6 (17)	31 (62)	34 (58)
Japan	67.72	39.16	60.55	50.31	–1	42 (65)	5 (13)	4 (8)	2 (4)
Korea, Rep.	10.54	89.39	66.01	59.55	6	7 (10)	11 (30)	5 (9)	3 (5)

Source: World Bank calculations based on United Nations Comtrade data, 2020.
Note: — = not available; CAGR = compound annual growth rate; E&E = electrical and electronics; EAP = East Asia and Pacific.

FIGURE 8.3 Malaysia's total electrical and electronics exports and its share in East Asia and Pacific and world exports, 1990–2018



Source: United Nations Comtrade data, 2020.
Note: E&E = electrical and electronics; EAP = East Asia and Pacific.

its market share in the segment in 2018 was 17 percent globally and 28 percent in the region (table 8.1). For E&E final products and subassemblies, China's share of exports has grown even more.

Malaysian firms, both foreign and domestic, operate in different segments of the E&E GVC. Several companies are engaged in component manufacturing, especially wafer fabrication,[2] Others are more focused on assembly, packaging, and testing.[3] Some companies have also engaged in IC design and R&D.[4]

The development of Malaysia's electrical and electronics industry: The role of foreign direct investment

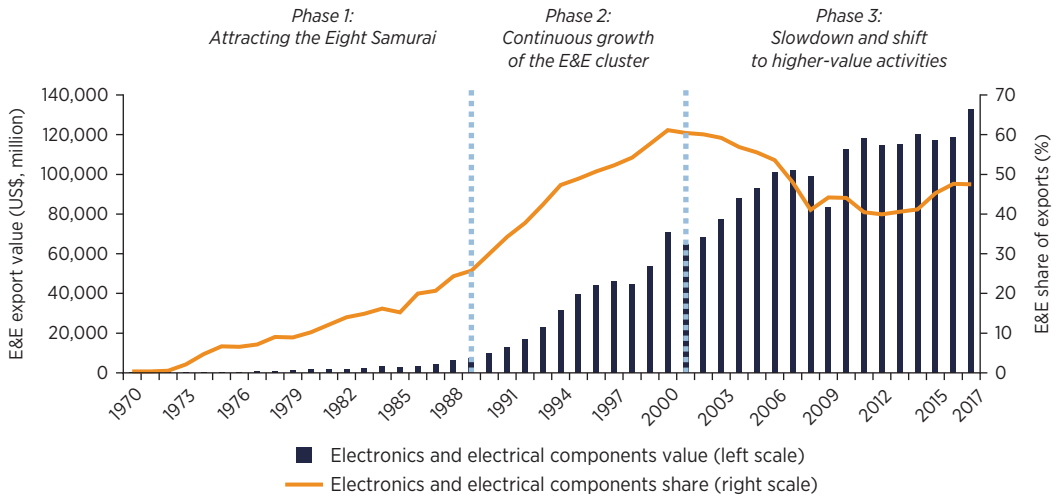
FDI has played a crucial role in the development of Malaysia's E&E industry. According to Malaysian Investment Development Authority (MIDA) estimates, by 2013, close to 85 percent of investments in Malaysia's E&E industry had been FDI (Frederick and Gereffi 2016). More recent data confirm this trend. Out of the RM 81.6 billion invested in Malaysia's E&E industry from 2013 to 2019, RM 74.1 billion (more than 90 percent) were FDI (MIDA 2020).

Malaysia's experience at leveraging FDI to enter into and upgrade within the E&E GVC can be divided into three phases (figure 8.4). From 1970 to the late 1980s (phase 1), Malaysia successfully attracted export-oriented FDI from superstar firms, developing an incipient industry focused on low-skilled components and parts assembly. From the late 1980s to the early 2000s (phase 2), Malaysia's E&E industry became the country's largest generator of manufacturing employment, value-added activities, and exports. Large new FDI inflows were drawn from East Asia, E&E clusters were developed, the first movers upgraded their production capacities, local supplier linkages were created, and domestic firms began to emerge. In the early 2000s, however, growth in exports and employment slowed down, marking the beginning of phase 3. During that phase, the size of Malaysian manufacturing activities decreased as competitors emerged (such as China and Vietnam), but engineering and design activities expanded as existing firms moved new activities into Malaysia. Some domestic firms began to internationalize, and pockets of the industry moved into higher-value-added segments of the GVC.

Phase 1: Early 1970s to late 1980s

The E&E industry in Malaysia had its beginnings in 1972, when the state government of Penang, by actively promoting and creating a favorable climate for investment, managed to attract the first group of foreign investors to the industry. Against a background of 15 percent unemployment in Penang in 1969, then–Chief Minister Dr. Lim Chong Eu created the Penang Development Corporation as the state's investment promotion agency. Subsequently, corporation officials, with high-level political support from Dr. Lim, proactively visited flagship firms abroad to persuade them to locate facilities in Malaysia. They found success: in 1972, eight foreign firms—called the "Eight Samurai"—decided to invest in Malaysia (Hai 2013).[5]

FIGURE 8.4 Malaysia electrical and electronics exports, 1970–2017



Source: World Bank calculations using Atlas of Economic Complexity Data.
Note: The Eight Samurai were Advanced Micro Devices (AMD), Clarion, Hewlett Packard (now Agilent Technologies), Hitachi Semiconductor (now Renesas), Intel, Litronix (now Osram Opto Semiconductors), National Semiconductor (now Fairchild Semiconductor), and Robert Bosch. E&E = electrical and electronics.

To attract foreign investors, Malaysia needed to create a competitive investment climate. Under the umbrella of the Second Malaysia Plan of 1971–75, Malaysia began to shift its economic strategy from promoting import substitution to encouraging export-oriented manufacturing. To attract FDI, the country established free trade zones, most notably the Penang Bayan Lepas industrial parks, and licensed manufacturing warehouses[6] to provide foreign investors with the infrastructure they needed as well as incentives to invest. Such incentives included income tax holidays for up to eight years under "pioneer" status, investment tax credits of up to 40 percent, and export incentives (Rasiah 2015). In addition, under the Second Malaysia Plan, tariff-free operations were offered (Malaysia, Office of the Prime Minister 1971). The E&E industry was also explicitly excluded from requirements to employ *bumiputera* (the indigenous people of Malaysia).

Malaysia was attractive to MNCs in the first phase of development both for structural reasons and because of government policies. Foreign investors found the main reasons to invest to be the availability of low-cost labor with basic technical and English language capabilities, ease of doing business, political stability, tax incentives, active investment promotion, and—especially for reinvestments—strong government support. According to a former executive of one of the Eight Samurai interviewed for this report, "the Government had been doing a remarkable job in supporting foreign investors—every little problem was sought to be immediately resolved, and the Government did not only have an open ear, but actively visited foreign investors to hear about their problems. Every Thursday at 7pm, Chief Minister Lim met with MNC CEOs to discuss and solve the most recent issues." Many of these actions were tailored to individual companies and focused on limiting any disruptions to their GVCs (Freund and Moran 2017). Although Malaysian workers' English language

capabilities were not seen as essential, technical capabilities played an important role. According to an industry veteran interviewed for this report, "then Intel CEO Andy Grove made the decision to invest in Malaysia when having a meal in a Chinese restaurant. Mr. Grove saw a 5 percent service charge, and was very impressed when the waiter could calculate that charge in a matter of seconds." With regard to investment promotion, a clear value proposition, persistence (in the form of multiple visits to certain investors), and high-level government support (from Dr. Lim) were seen as particularly convincing.

In the initial years, GVC upgrading and the creation of local supplier linkages were limited. The first round of investment was in low-value-added parts of the GVC, such as low-skilled component manufacturing or parts assembly (for products such as printed circuit boards), basic consumer product manufacturing and assembly, and simple product testing. In the 1970s and 1980s, forward linkages were basically nonexistent; all output of the semiconductor corporations was exported (Rasiah 1988). Indeed, firms investing in free trade zones or licensed manufacturing warehouses were required to export 100 percent of their production. Backward linkages were also scarce—according to a MIDA survey, in 1981 only 1 percent of inputs to semiconductor firms were supplied by local supporting firms, although by 1986 several firms in Penang reported using more than 6 percent local inputs. The materials supplied locally were mainly unrelated to production, such as papers, boxes, and office furniture (Rasiah 1988). However, these initial FDI inflows helped Malaysia integrate into the E&E GVC, brought Malaysia to the attention of other investors, and set the foundation for further development. By attracting FDI, the Malaysian government achieved its main goal of generating employment—the unemployment rate in Penang fell from 15 percent in the late 1960s to 4 percent in 1980 (Rasiah 2015). Remarkably, 80 percent of employees in the semiconductor industry were female (Rasiah 1988). Additionally, attracting that first set of foreign investors encouraged other investors to follow and proved to be the starting point for development of an E&E cluster. According to a former MNC executive interviewed for this report, "the Eight Samurai coming to Malaysia proved to be the 'tipping point' for more investors to follow in due course." In 1981, 80 percent of companies in the E&E industry were owned by foreign investors (Rasiah 1988).

Phase 2: Late 1980s to early 2000s

The second phase in the development of Malaysia's E&E industry was marked by continuous growth in E&E exports, employment, and FDI inflows as well as the development of supplier linkages. On the back of a commodities crisis in the mid-1980s that led to the consolidation of the industry, the late 1980s saw a new wave of FDI entering Malaysia, which prompted recovery. By then, the E&E industry had become the country's largest generator of manufacturing employment, value-added activities, and exports, and an E&E cluster had formed in Penang. In the 1990s, supplier linkages were developed, although functional upgrading was limited. In about 2000, the E&E industry peaked in export and employment growth—after that, the emergence of competitors such as China, the Philippines, and Vietnam began to take its toll, and several firms relocated out of Malaysia (Kharas, Zeufack, and Majeed 2010).

The second large wave of FDI into Malaysia's E&E industry, in the late 1980s, came mainly from East Asian MNCs (from Hong Kong SAR, China; Japan; Korea; Singapore; and Taiwan, China). The main reasons these firms relocated from their home countries or economies were a strong appreciation of the yen, won, new Taiwan dollar, and Singapore dollar and the loss of Generalized System of Preferences beneficiary status for Hong Kong SAR, China; Korea; Singapore; and Taiwan, China (Rasiah 2015). FDI flows into Malaysia continued in the 1990s—the industry attracted an average of RM 3.31 billion per year between 1991 and 1999. In six of those nine years, according to MIDA, this FDI made up more than 80 percent of total capital investment in Malaysia (Ismail 2001). During this phase, investors chose Malaysia as an FDI destination primarily because of the country's existing ecosystem of firms, adaptable workforce, and investment incentives. For example, when an IC-manufacturing MNC interviewed for this case study considered moving to Malaysia in the early 1990s, "the choice had been between Suzhou (China), Singapore, Bada Valley (Indonesia), and Penang. Ultimately, we chose Penang because it had an entire ecosystem in place, and we had strong confidence in the people on the ground, a decision we haven't regretted for a single day." In 1986, the Malaysian government introduced new incentives to invest, most notably an investment tax allowance of up to 100 percent for qualifying capital expenditures incurred within five years of the project's date of approval (MIDA 2010). However, in the early 1990s both the pioneer companies' tax holidays and this investment tax allowance were made less generous (except for high-technology companies). After 1995, labor-intensive projects were no longer eligible for promotion incentives unless they were located in certain areas or satisfied other narrow conditions (OECD 2013). Malaysian policy makers thus increasingly began to focus their investment promotion efforts on high-value-added activities in the E&E GVC.

Through this influx of new FDI and the development of existing FDI, Malaysia's E&E industry began to mature: new processes and functions were introduced, and its exporters entered new markets. Following the crisis in the mid-1980s, many firms began to focus on raising their productivity. Cutting-edge process control technologies such as just-in-time manufacturing, quality control circles, integrated materials resource planning, and statistical processes were introduced (Rasiah 2015). Firms also began to switch from simple hand assembly to automated assembly and to some extent to process design and production design as well as supply chain management, especially among affiliates of multinational investors (Moran 2014). The 1990s saw firms entering the computer products market and increasing their presence in the consumer products market; exports in these two segments rose significantly.

The Malaysian government, during phase 2, focused mainly on fostering upgrading, workforce development, linkages, and economic clustering, as was formulated in the Action Plan for Industrial Technology Development (in 1990) and the Second Industrial Master Plan (in 1996). Several policy actions were taken, such as the establishment of the Human Resource Development Fund in 1992. Manufacturing firms with more than 50 employees were required to contribute 2 percent of their payroll to this fund, from which approved training expenses could be claimed (Rasiah 2015). Also, the Malaysian Technology Development

Corporation, a venture capital organization for the industry, was created in 1992. In 1993, the Malaysian Institute of Microelectronics Systems was corporatized. As a result, the government-owned wafer fabrication firms Silterra and 1st Silicon were established (Rasiah 2015). However, despite these initiatives, economic upgrading in the 1990s remained within lower-value-added activities. This focus changed only with the Industrial Master Plan 3 of 2006, which introduced research grants for foreign investors.

The government of Malaysia also began several successful linkage programs during this phase. The Vendor Development Program, launched in 1992 for the electronics sector, had limited success, primarily because of the limited capacity of the local small and medium enterprises (SMEs) selected to participate. At first, only suppliers owned by bumiputera were eligible to join. However, later versions of the program with less restrictive requirements proved more effective, underscoring the need to select participants for such programs with the capacity to produce high-quality products (UNCTAD 2011). Subsequent programs, such as the Industrial Linkage Program (launched in 1996) and the Global Supplier Program (launched in 2000) yielded better results because they gave MNCs a larger role in supplier selection and provided complementary support for SMEs to access finance, build their capabilities, and expand into new markets.[7] These programs influenced some firms, such as Intel, in their decisions to develop local SMEs as suppliers (OECD 2018; OECD Investment Committee 2005).

These national activities were effectively supplemented by state-level initiatives, especially in Penang. In particular, the Penang Skills Development Centre (PSDC), a tripartite, industry-led initiative involving the state government, the private sector, and academia, is an internationally recognized example of workforce development that proved instrumental to further developing Penang's E&E industry (see box 8.1). In many stakeholder interviews, the PSDC was mentioned as a prime example of the culture of Penang in the 1990s, in which various firms and the state government came together to exchange experiences, hold workshops and conferences, and learn from each other. According to an industry veteran, Penang is "the only place in the world where competition meets in a friendly manner."

With the help of these government programs, the E&E industry in the 1990s saw significant development of backward linkages with local suppliers, although not all of those suppliers were owned by Malaysians. In Penang, MNCs' share of procurement from local sources rose from 10 percent in the mid-1980s to 46 percent in 1996 (UNCTAD 2011), although this rise was uneven among industry segments. In 1998, the local sourcing rates of 10 major firms in Penang were found to be 40–50 percent for consumer electronics, 20–40 percent for other electronic components, 13–60 percent for computers, and 4–10 percent for semiconductor components (Best and Rasiah 2003). However, although many of these suppliers were located in Malaysia, a significantly smaller percentage were Malaysian-owned (Yean and Siang 2011). In fact, much of the technology deepening that occurred during this period took place within MNCs. This differs from the development experiences of Korea and Taiwan, China, where the percentages of locally owned firms were higher (Yean and Siang 2011). Many MNCs in Malaysia established their own

BOX 8.1 Penang Skills Development Centre

The Penang Skills Development Centre (PSDC) is frequently referenced and studied as a successful model for skills upgrading (OECD 2013; OECD and UNIDO 2019; UNCTAD 2011). Established in 1989, it was the first tripartite, industry-led skills training and education center in Malaysia. Initially, it concentrated on vocational training in electrical engineering and electronics to help the country advance into the production of standardized components. Subsequently, it ventured into higher-value-added products and components (such as those in the semiconductor, information technology, audio visual, and digital camera sectors). From 2000 onward, it continued along its upgrading path, adding programs in the life sciences, biotechnology, pharmaceuticals, and medical devices.

Since its inception, the PSDC has grown to become the leading vocational learning institution in the country. Its management board continues to be staffed by multinational corporation (MNC) representatives to induce a demand-led focus in its training curricula. Membership on this board rose from 25 MNCs and 6 local supplier firms in 1989 to 56 MNCs and 52 supplier firms in 2005. Over a period of 30 years, the PSDC has trained more than 233,000 participants through more than 10,000 courses, pioneered local industry development initiatives, and provided input on and assisted in the formulation of national policies pertaining to human capital development. To ensure that its vocational training programs stay abreast of industry trends, the PSDC has created several partnerships with universities in Australia, Germany, Malaysia, and the United Kingdom. Over the years, its focus has shifted from workforce transformation aimed at specific professions toward more broadly upgrading skill sets.

The PSDC's contributions to supplier development inspired the federal-level Global Supplier Program, which also supported customized small and medium enterprise training based on MNC criteria (and used the center as one of its registered training centers).

Sources: Interviews with relevant stakeholders conducted in February 2020; UNCTAD 2011.

suppliers, but others did train local firms to gradually take on more and more complex tasks (box 8.2).

Although Malaysian government programs to create linkages were generally successful, linkage creation also occurred outside official policy initiatives. The main drivers of this development were arguably MNCs. As exporters competing globally, Malaysia's MNCs were forced during this period to adopt new technologies, such as just-in-time manufacturing, that required them to source in close proximity to their production facilities (Rasiah 2015).

Spillovers from MNC operations in Malaysia can be observed in the form of former MNC employees establishing supplier firms. Such firms include Carsem, Eng Teknologi, Globetronics Technology, Unico Holdings, Unisem, and ViTrox (UNCTAD 2011). Some of the executives interviewed for this case study stressed that their experience working for MNCs in Malaysia had been essential to their success in creating their own companies by teaching the executives about modern management techniques and helping them build networks of contacts. According to the chief executive officer of a leading Malaysian company, "the experience of working more than

BOX 8.2 Intel in Malaysia

Intel's experience in Malaysia is a good example of firm-level upgrading. Following its first investment in an assembly plant in Penang in 1972 (100 million Malaysian ringgit [RM]), Intel gradually expanded its operations in the country: in 1978 it operated a test plant, and in 1990 it moved into product design and development. In 1996, the company opened its first plant, in Kulim engaged in system manufacturing, which evolved into a board design center and an assembly test plant in 1999. In 2000, it further located shared services and in 2017 programmable solutions to Penang. Over the years, Intel has invested more than RM 22 billion in Malaysia, and it now employs 10,800 workers involved in advanced manufacturing and research and development, as well as in software development, product design marketing, and other local and global shared services. It also spends RM 1 billion each year with local suppliers and has registered 460 patents generated by Malaysian engineers.

Facilitated by the Malaysian government, Intel was also successful in developing local suppliers. It was one of the founders of the Penang Skills Development Centre and extensively used and contributed to its services. It also relied on tax incentives and financial support such as the Global Supplier Program to develop its network of Malaysian suppliers. Intel saw these initiatives as benefiting multinational corporations as well as small and medium enterprises by shifting the production of low-level components to dependable local firms, allowing the transnational corporations to concentrate on upgrading and developing new technologies. Intel has helped develop a number of successful Malaysian small and medium enterprises, such as Eng Teknologi, Globetronics Technology, LKT Engineering, Metfab Engineering, Polytool Technologies, Prodelcon, Rapid Synergy, and Seng Choon Engineering.

Source: This analysis is based on interviews conducted by the authors between January and March 2020 with representatives of multinational corporations, domestic firms, and trade associations affiliated with the Malaysian electronics industry, as well as government officials, and UNCTAD 2011.

15 years for an MNC taught me an entrepreneurial spirit [and] the necessity of open communication, trust, and respect, as well as that institutions are governed by systems, not by people, which I successfully implemented in my company." As seen in Malaysia, MNCs may even encourage their staff to form supplier firms and may help nurture those companies as they develop and subsequently expand. From an MNC's perspective, there are mutual benefits in contracting out to former employees rather than taking chances on unknown firms.

Phase 3: Early 2000s to today

The current phase in the development of Malaysia's E&E industry is characterized by a decline in growth rates, a move toward higher-value-added activities, and a structural shift from personal computers (PCs) and parts to semiconductors. After 2000, the E&E industry's growth in exports, employment, and contribution to gross domestic product all slowed down. Although E&E exports still grew from about US$48 billion in 2000 to US$82 billion in 2018, Malaysia's share of the East Asia and Pacific region's exports, as well as the country's share of world exports, has been declining since 2000 (according to United Nations Comtrade data from 2020; see also figure 8.3). To a large extent, this decline can be explained by the emergence of competitors such as China and Vietnam. From the early 2000s until the 2008 financial crisis, Malaysia's

E&E industry was driven mainly by products and services related to PCs and their parts (such as testing and assembly for ICs and manufacturing of components). Subsequently, Malaysia was affected by the structural shift in consumer preferences from PCs to smartphones and tablets. This shift slowed the country's recovery from the crisis and led Malaysian firms to diversify away from the PCs and parts segment into other segments such as automotive semiconductors and cloud computing semiconductors (Bank Negara Malaysia 2016).

Although FDI inflows have been consistent throughout this period, the government's strategy for attracting FDI has become more targeted. Between 2013 and 2018, FDI inflows held steady at about RM 8 billion to RM 10 billion per year (MIDA 2020). According to both state and national investment promotion agencies, investment promotion has become more targeted, featuring active promotion efforts on the basis of the desirability of a specific project for the Malaysian economy. In 2012, MIDA adopted an "ecosystem approach" under which it continuously maps and analyzes the ecosystem of the Malaysian E&E industry. On the basis of this analysis, it focuses on promoting specific activities that are scarce, such as R&D and IC design. From 2000 onward, the government has also offered customized incentives (both fiscal and financial) for investment perceived as high quality and in sectors deemed strategic. Incentives have been tied less to economic performance metrics (such as exports) and more to innovation and responsible business conduct: training workers, conducting R&D, and protecting the environment (OECD 2013; Thomsen 2004). In addition, the government has focused on stimulating investment into less developed areas. For example, the Northern Corridor Economic Region was created to foster economic development in the states of Kedah, Perak, Perlis, and Pulau Pinang (Kharas, Zeufack, and Majeed 2010).

Significant upgrading has been achieved during this period by providing foreign firms with research grants and by liberalizing the import of foreign professionals. With its 2006 Third Industrial Master Plan, the Malaysian government built upon the previous master plans by targeting the E&E industry for further upgrading. Most notably, the plan provided for up-front research grants for foreign investors. Such grants had previously been confined to the government-owned firms Silterra and 1st Silicon. In 2006, Penang was approved for Multimedia Super Corridor status, which allowed firms in Penang to import human capital for their operations. As a direct result of these policies, a number of firms moved wafer fabrication, IC design, and R&D operations to Malaysia—the number of semiconductor firms performing these functions in Malaysia rose from 0 in 1999 to 11 in 2014 (Rasiah 2015). In addition, the number of patents registered in the United States by semiconductor firms from Malaysia rose significantly, from 7 patents in the period 1980–2005 to 309 in 2006–11 (Rasiah 2015). However, this upgrading occurred only in pockets of the industry, and it was concentrated among a small number of firms.

Phase 3 of the development of Malaysia's E&E industry also saw firms enter into new market segments. From 2000 to 2018, exports rose significantly in the industrial equipment and medical device component segments. This increase can be explained by a surge in global demand for these products as well as Malaysia's existing strength in other segments of the E&E GVC. The government also provided an impetus for

the industry to venture into new segments, especially in the downstream sector, by implementing the E&E 2.0 initiative in 2013. This initiative was the second phase of the industry's modernization program under the country's Economic Transformation Program. It focused on 20 new entry point projects clustered into five key areas: manufacturing services and design, advanced materials, industrial and integrated electronics, wafer technology, and advanced assembly. Also, under the Eleventh Malaysia Plan (2016–20), medical devices were identified as a sector with high potential for growth. Malaysia has in recent years become a hub for medical device exports, which involve an ecosystem of more than 200 firms (Bernama 2018). Exports of E&E-related medical devices thus increased as a part of the country's overall surge in medical device exports.

Successful Malaysian companies have begun to engage in SME development initiatives of their own. One example of such an initiative is the Penang Automation Cluster, which seeks to develop the local supply ecosystem in Penang (box 8.3). Although some SMEs have become exporting superstars, others are struggling to develop. Notably, some incentives in place may discourage foreign investors from increasing their local sourcing, such as exemptions from customs duties and sales taxes on imports without corresponding exemptions from local sales and service taxes when buying from local suppliers (World Bank Group 2020).

The transformation of production through the Fourth Industrial Revolution is widely regarded as the biggest opportunity for Malaysia to further develop its E&E industry. According to stakeholder interviews, Malaysian firms are seen to have special potential to advance in equipment technology and electronics manufacturing services. To promote Malaysia's role in the shift toward new technologies, in 2018 the government passed the National Industry 4.0 Policy (MITI 2018).[8] Further strategic decisions on how to promote the industry are expected in the Industrial Master Plan 4, scheduled to be released by the Ministry of International Trade and Industry in the fourth quarter of 2020.

BOX 8.3 Penang Automation Cluster

The Penang Automation Cluster (PAC) is an example of a small and medium enterprise development program created by successful Malaysian companies. Established in 2017 as a joint venture between three domestic companies (ViTrox Corporation, Pentamaster Technology, and Walta Engineering), PAC aims to build and manage the local supply chain ecosystem to support large local companies and multinational corporations. PAC is the first small and medium enterprise precision metal fabrication or automation cluster in Malaysia, and serves as a one-stop metal component supply chain hub. Its objective is to support and enhance the development of the existing supply chain ecosystem of industries and services in Penang, primarily those in semiconductor, electrical and electronics, medical devices, light-emitting diodes, and avionics segments. In addition to creating jobs, PAC also provides employees with the opportunity to attend German Dual Vocational Training.

Source: This analysis is based on a combination of interviews conducted by the authors between January and March 2020 with representatives of multinational corporations, domestic firms, and trade associations affiliated with the Malaysian electronics industry, as well as government officials, and the PAC website (http://pa-cluster.com/).

Current challenges

Although Malaysia's E&E industry has developed significantly since its inception, it currently faces several challenges that are impeding further upgrading. Both private sector and public sector actors see a lack of talent as the overarching challenge hampering the development of the sector. A significant proportion of firms reports difficulties in finding domestic talent with the advanced technical, entrepreneurial, communication, and job-specific skills required to propel the E&E industry forward. It is therefore not surprising that electrical, electronic, and mechanical engineers, whose talents and skills are the most sought after in the E&E sector, have been listed on Malaysia's Critical Occupations List[9] for five consecutive years since 2015, indicating continuing talent shortages in these critical occupations (CSC 2020). Compounding domestic talent constraints is the problem of highly skilled Malaysians migrating to other countries. This migration has been significant and geographically concentrated (the most common destinations are Australia, Singapore, the United Kingdom, and the United States), and it has a strong ethnic dimension. The key factors that motivate Malaysians to move abroad include differences in earning potential, career prospects, and quality of life and perceptions of social injustice in Malaysia (World Bank 2011). Insufficient R&D spending and a lack of local "superstar" firms compared with competitors like China, Korea, and Taiwan, China, are also seen as factors holding back development. On the investment front, although Malaysia's business investment in R&D as a share of gross domestic product has increased in recent years, it has remained lower than those of aspirational comparators such as the Czech Republic, Poland, and Turkey. The COVID-19 (coronavirus) pandemic led to a decline in Malaysia's E&E exports in early 2020, but from May onward exports largely recovered thanks to favorable government measures and the overall resilience of the global E&E GVC. In the medium to long term, the global pandemic and the ongoing trade tensions between China and the United States are widely seen as opportunities for Malaysia to further increase its E&E exports and attract investors diversifying away from China (box 8.4).

BOX 8.4 The COVID-19 (coronavirus) pandemic's impact on Malaysia's electrical and electronics exports

Malaysia's electrical and electronics (E&E) exports were first negatively affected by the COVID-19 (coronavirus) pandemic at the beginning of 2020. From January to February 2020, E&E exports declined by 20 percent, caused by a cyclical slowdown in the global technology cycle and by the sector being closely integrated into China-centric production networks (World Bank 2020). As a result of Chinese offices and factories closing, Malaysian companies relying on Chinese products experienced supply chain disruptions, especially in raw materials sourcing, assembly, testing, and shipping. In particular, contract manufacturers and electronics manufacturing services were affected (Teng 2020).

The experience of Pentamaster, a Penang-based automation manufacturing and technology solutions provider, illustrates the issues Malaysian companies were facing. One-fifth of Pentamaster's

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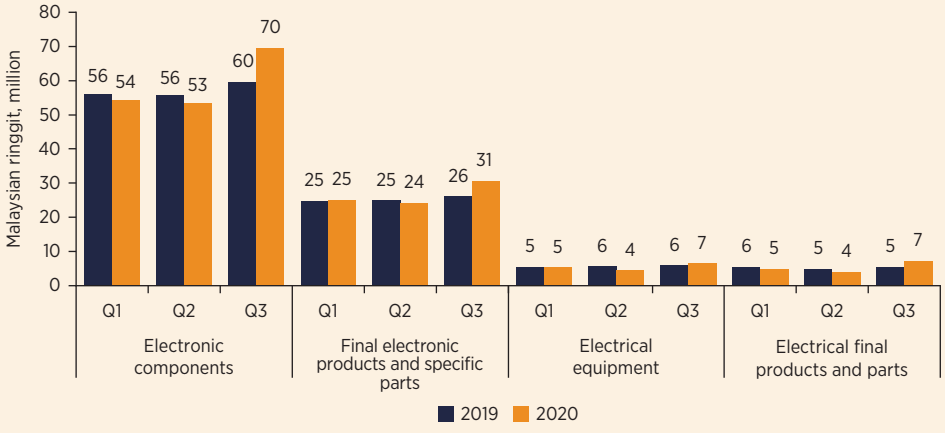
BOX 8.4 The COVID-19 (coronavirus) pandemic's impact on Malaysia's electrical and electronics exports *(continued)*

FIGURE B8.4.1 Malaysia electrical and electronics exports, January 2019–September 2020



Source: World Bank calculations based on Department of Statistics Malaysia (2020) Malaysia External Trade Statistics Online (METS Online), https://metsonline.stats.gov.my/.

components and parts are directly and indirectly sourced from China. In an interview in March 2020, Pentamaster cofounder and chairman, Chuah Choon Bin, acknowledged that "over the past one month, certain parts and components that we want to buy have been affected. When we called the suppliers, there was no response. Some of them told us that they do not know when they can supply to us" (Teng 2020). In addition, project delivery was delayed. Pentamaster's chairman added, "We sell machines to China. When the machines were sent there, we were not able to send our people to install and set them up. That affects our machine and project delivery" (Teng 2020).

In March and April, exports further declined, mainly because of supply disruptions in Malaysia. As the outbreak in Malaysia became widespread with higher community transmission, the government on March 16 announced a four-week movement control order (MCO), which included general prohibitions of mass gatherings, restrictions on travel, and closures of schools, universities, and government and private premises except those involved in essential services (Teng 2020). This order was extended a number of times, until from May onward businesses were allowed to gradually reopen under severe restrictions. Some companies in the E&E industry received approval to operate during all phases of the MCO because they were deemed essential in helping fight COVID-19, but this approval often only extended to 50 percent of the workforce (Hamdan 2020), so supply was affected.

From May 2020 onward, Malaysia's E&E exports have exhibited a strong upward trajectory. On the demand side, the industry profited from the overall resilience of the global E&E value chain, in which demand (even for nonessential products) never halted completely (OECD 2020). On the supply side, the partial allowance to operate during the MCO and the reopening from May onward supported Malaysia's E&E industry, as did other government measures such as interest rate cuts, economic stimulus packages, and the Short-Term Economic Recovery Plan (Hamdan 2020). Notably, the recovery has extended to all segments of the GVC, with the rebound being particularly strong in the third quarter of 2020 in comparison with 2019 (figure B8.4.1). Notably, medical device exports increased

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BOX 8.4 The COVID-19 (coronavirus) pandemic's impact on Malaysia's electrical and electronics exports *(continued)*

considerably, from 0.2 percent of Malaysia's total E&E exports in December 2019 to 2.9 percent in September 2020.

In the medium to long term, Malaysian policy makers have a positive outlook for the country's E&E industry. The ongoing global pandemic is expected to increase demand for devices that enable remote work, virtual learning, or e-commerce (Bernama 2020). Additionally, Malaysia will seek to benefit from firms looking to diversify their production away from China because of COVID-19-related risks and trade tensions with the United States. According to Malaysia's Ministry of International Trade and Industry, "many (firms) view that Malaysia can be a new alternative center for Asia, having the advantage [of] a strong E&E base, [a] good supporting local engineering cluster, and [a] talent base" (Reuters 2020).

Source: This analysis is based on a combination of literature reviews and interviews conducted by the authors between January and March 2020 with representatives of multinational corporations, domestic firms, and trade associations affiliated with the Malaysian electronics industry, as well as government officials.

Conclusion

Malaysia's experience shows how attracting a few superstar firms using active investment promotion can jump-start the development of an industry if the minimum conditions for foreign investment are in place. With an English-speaking, low-cost labor force complemented by the establishment of free trade zones and licensed manufacturing warehouses and the provision of generous investment incentives, Malaysia in the 1970s had the foundation in place to attract foreign investors. Through aggressive investment promotion with high-level political support, Malaysia succeeded in leveraging these advantages to attract FDI and thereby launch the development of its E&E industry. Crucial in this regard were a solutions-oriented attitude by the government and reassurances by higher political authorities to MNCs of the ability to seamlessly integrate into GVCs (Freund and Moran 2017). Information about investment conditions had to be backed up by a strong commitment to infrastructure reforms and the removal of any disruptions to foreign investors' operations, which could only be credibly provided by high-level political authorities, such as Penang's chief minister.

The information gap between foreign investors and potential host countries may be smaller in today's world, but recent research shows that investment promotion with high-level political support can still play a critical role in attracting FDI (Heilbron and Kronfol 2020). Other countries (for example, Thailand and Vietnam) show that it is still possible to enter the E&E GVC, but Malaysia's experience also shows that development of an industry by attracting FDI is easiest at inflection points, that is, at a point where internal and external conditions overlap. Although the Malaysian government's actions were crucial, the country also profited from the general trend at the time of developed countries' firms moving their labor-intensive manufacturing and assembly parts of their business outside their home countries.

Incentives proved key to attracting FDI and upgrading along the E&E GVC, but their role changed over time. In the 1970s, incentives were an important factor in Malaysia's attracting FDI into low-value-added, labor-intensive segments of the E&E GVC. However, although locational incentives can be useful when attracting efficiency-seeking FDI, governments may need to realign these incentives when development priorities shift, as did Malaysia's. In the early 1990s, both the tax holidays for the pioneer firms and the investment tax allowance were made less generous except for high-technology companies. After 1995, labor-intensive projects were no longer eligible for promotion incentives unless they were located in certain areas or satisfied other narrow conditions. Over time, Malaysia's policy focus shifted toward using behavioral incentives to stimulate linkages and inducing foreign firms to locate high-value-added R&D activities in Malaysia. The tax and financial incentives to both MNCs and SMEs as part of the linkage programs lowered the costs of linking for both sets of participants, thereby facilitating the creation of linkages. And the R&D grants that were extended to foreign companies from the mid-2000s onward (which had previously been limited to domestic companies) played an important role in convincing MNCs to move R&D activities into Malaysia.

The development of Malaysia's E&E industry also provides several lessons on the stimulation of supplier linkages. The different degrees of success of the various linkage programs (the Vendor Development Program, the Industrial Linkages Program, and the Global Supplier Program) show that it is important, when promoting linkages, that MNC representatives select the content of their specific training programs and that participants are chosen on the basis of the MNCs' criteria. Incentives to participate should be targeted at both MNCs and SMEs. Also, even with these programs, many local linkages in Malaysia occurred because the country's MNCs were forced by external pressures (such as the global trend toward just-in-time delivery in the 1980s) to source in close proximity to their production facilities. The track record of supplier development programs in Malaysia also shows that these programs are highly contingent on continuous human capital development. The PSDC is a good example of how this development can happen as a collaborative effort between the private sector, the government, and academia.

One of Malaysia's challenges has been to attract the highest-value-adding activities, such as frontier R&D and marketing, to the country. The country's recent experience has shown the importance of providing R&D grants to foreign companies to entice them to upgrade their functions in-country. However, so far none of Malaysia's MNCs has brought frontier R&D (for example, R&D related to miniaturization or the enlargement of the wafer diameter of semiconductor chips) into the country (Rasiah 2015). Although human capital development and grants may induce firms to locate some R&D activities in a country, the final stage of development often requires the development of homegrown lead firms. Ultimately, most of the value in the E&E GVC is captured by lead firms, and foreign MNCs can be expected to keep the highest-value-added functions in their home countries. Arguably, one of the reasons why countries and economies such as China, Korea, and Taiwan, China, have been so successful in capturing high-value activities in the E&E GVC is that they have been able to develop their own lead firms. Other reasons may include less severe brain drain and stronger linkages between their universities and industry.

Malaysia's experience also highlights the benefits that can be derived from different levels of government exercising complementary functions. In Malaysia, policy guidance at the federal level, in the form of planning and several incentive programs, was complemented by the proactive role of subnational agents, who proved pivotal in attracting investors into the country. Globally, subnational actors are growing in prominence: when promoting investment, subnational governments seek to leverage their deep knowledge of the local business environment and its value propositions to investors as well as their strong ties to local agencies that are more heavily involved in the day-to-day operational needs and issues of investors (Heilbron and Kronfol 2020). Although subnational agencies can have unique roles in a country's institutional framework for investment policy, it is essential that their tasks are clearly allocated and that effective collaboration mechanisms are in place to ensure complementarity between the different levels of government (Heilbron and Kronfol 2020).

One last lesson from the Malaysian experience is that strategies and policies should be adapted to the country's and the industry's specific phases of development. In the 1970s and 1980s, the focus of Malaysian policy makers with regard to the E&E industry was primarily on attracting FDI to create jobs. Beginning in the late 1980s, their focus gradually shifted toward the creation of linkages to maximize the benefits of existing FDI. A country's strategies and policies should always be based on its phase of development and the phase of development of the industry in question. Such a phased approach can help developing countries focus their resources on their most pressing needs while also keeping a long-term perspective. Malaysia's experience also shows that different structural characteristics and policy tools are important to attracting FDI at different phases of development. Whereas investment incentives had greater relevance when Malaysia was attracting FDI in the first phase of developing its E&E industry, they became less important in later phases, and Malaysia reacted by tailoring its incentives more and more toward special policy initiatives. In contrast, human capital was not as important in the early phases of the industry's development, but it became more important later on, when Malaysia was trying to attract highest-value-added activities such as R&D.

Notes

1. The analysis in this case study is based on a combination of literature reviews and interviews conducted by the authors between January and March 2020 with representatives of multinational corporations, domestic firms, and trade associations affiliated with the Malaysian electronics industry, as well as government officials; the interviews are the source for all direct quotations included in this chapter that are not otherwise attributed.
2. Examples include SilTerra and MIMOS (majority domestically owned) as well as Infineon, OSRAM, ON Semiconductor, and SunEdison (majority foreign owned).
3. Examples include Carsem, Aemulus, Unisem, Inari, and Globetronics (majority domestically owned) as well as Intel, Infineon, Texas Instruments, AMD, ASE Group, and Amkor (majority foreign owned).
4. Examples include ViTrox, Symmid, Key ASIC, and Oppstar (majority domestically owned) as well as Intel, UST Global, Whizz Systems, and Phison (majority foreign owned).
5. The Eight Samurai were Advanced Micro Devices (AMD), Clarion, Hewlett Packard (now Agilent Technologies), Hitachi Semiconductor (now Renesas), Intel, Litronix (now Osram

Opto Semiconductors), National Semiconductor (now Fairchild Semiconductor), and Robert Bosch.

6. The institution of licensed manufacturing warehouses was established under the provisions of section 65/65A of the Customs Act of 1967. A licensed manufacturing warehouse is a manufacturing unit (factory) granted to any person for warehousing and manufacturing approved products on the same premise. It is intended to cater primarily to export-oriented industries. Exemption from customs duties is given to all raw materials and components used directly in the manufacturing of approved products, from the initial stage of manufacturing until the finished products are packed and readied for export.
7. The Industrial Linkage Program seeks to build linkages by offering tax incentives for SME suppliers producing eligible products to improve their capacities as well as for MNCs that incur costs to help their suppliers upgrade, such as costs for training, product development and testing, and factory auditing. The Global Supplier Program covers 80 percent of SMEs' fees for courses at registered training providers, and it provides MNCs with financial and organizational support for sending specialists to local firms for upgrading purposes (UNCTAD 2011).
8. The National Industry 4.0 Policy aims to drive digital transformation of the manufacturing sector and related service sectors in Malaysia. It calls for tax incentives, efficient digital infrastructure, a regulatory framework to increase industry adoption of new technologies, investment in future skilled labor, and increased access to smart technologies.
9. This list is published annually by Malaysia's Critical Skills Monitoring Committee to identify shortages of labor in occupations associated with the country's growing knowledge-based economy.

References

Bank Negara Malaysia. 2016. "Bank Negara Malaysia Annual Report 2015." Bank Negara Malaysia, Kuala Lumpur.

Bernama. 2018. "Exports of Made-in-Malaysia Medical Devices Expected to Cross RM23b in 2019." Malaysiakini, December 6, 2018. https://www.malaysiakini.com/news/454998.

Bernama. 2020. "Malaysia Remains Competitive amid COVID-19 Pandemic – MIDA." June 17, 2020. https://www.mida.gov.my/mida-news/malaysia-remains-competitive-amid-covid-19-pandemic-mida/.

Best, M. H., and R. Rasiah. 2003. "Malaysian Electronics: At the Crossroads." Programme Development and Technical Cooperation Division, United Nations Industrial Development Organization, Vienna.

CSC (Critical Skills Monitoring Committee). 2020. "Critical Occupations List 2019/2020: Technical Report." Talent Corporation Malaysia, Kuala Lumpur.

Frederick, S., and G. Gereffi. 2013. "Costa Rica in the Electronics Global Value Chain." Center on Globalization, Governance & Competitiveness, Duke University, Durham, NC.

Frederick, S., and G. Gereffi. 2016. "The Philippines in the Electronics and Electrical Global Value Chain." Center on Globalization, Governance & Competitiveness, Duke University, Durham, NC.

Freund, C., and T. Moran. 2017. "Multinational Investors as Export Superstars: How Emerging-Market Governments Can Reshape Comparative Advantage." PIIE Working Paper 17-1, Peterson Institute for International Economics, Washington, DC.

Hai, Dato' Wong Siew. 2013. "The Malaysian Electrical & Electronics (E&E) Industry – At an Inflexion Point." *Jurutera* 2013 (7): 6–9.

Hamdan, Muhammed Ahmad. 2020. "E&E Sector Poised to Remain Firm Thanks to Govt Proactive Measures, Says MIDA." The Edge Markets, June 4, 2020. https://www.theedgemarkets.com/article/ee-sector-poised-remain-firm-thanks-govt-proactive-measures-says-mida.

Heilbron, Armando, and Hania Kronfol. 2020. "Increasing the Development Impact of Investment Promotion Agencies." In *Global Investment Competitiveness Report 2019/2020: Rebuilding Investor Confidence in Times of Uncertainty*. Washington, DC: World Bank Group.

Ismail, M. N. 2001. "Foreign Direct Investments and Development: The Malaysian Electronics Sector." CMI Working Paper 2001:4, Chr. Michelsen Institute, Bergen.

Kharas, H., A. Zeufack, and H. Majeed. 2010. *Cities, People & the Economy: A Study on Positioning Penang*. Kuala Lumpur: Khazanah Nasional Berhad and World Bank.

Malaysia, Office of the Prime Minister. 1971. *The Second Malaysia Plan 1971-1975*. Kuala Lumpur: Government Printers. https://www.pmo.gov.my/dokumenattached/RMK/RMK2.pdf.

MIDA (Malaysian Investment Development Authority). 2010. "Malaysia's Experience: Reform of Investment Incentives." MIDA, Kuala Lumpur. https://www.tepav.org.tr/upload/files/haber/1285937305-6.Country_Experience___Malasia__INDUSTRIAL_POLICY_1__edited_090910.pdf.

MIDA (Malaysian Investment Development Authority). 2020. "Malaysia Investment Performance Report 2019." MIDA, Kuala Lumpur. https://www.mida.gov.my/home/administrator/system_files/modules/photo/uploads/20200421151258_MIDA%20IPR%202019%20fullbook_FINAL.pdf.

MITI (Ministry of International Trade and Industry). 2018. "Industry*4WRD*: National Policy on Industry 4.0." MITI, Kuala Lumpur. https://www.miti.gov.my/miti/resources/STA%20Folder/PDF%20file/Industry4WRD_-_National_Policy_on_Industry_4.0_.pdf.

Moran, T. 2014. "Foreign Investment and Supply Chains in Emerging Markets: Recurring Problems and Demonstrated Solutions." PIIE Working Paper 14-12, Peterson Institute for International Economics, Washington, DC.

OECD (Organisation for Economic Co-operation and Development). 2013. *OECD Investment Policy Reviews: Malaysia 2013*. Paris: OECD Publishing.

OECD (Organisation for Economic Co-operation and Development). 2018. *OECD Investment Policy Reviews: Southeast Asia 2018*. Paris: OECD Publishing.

OECD (Organisation for Economic Co-operation and Development). 2020. "COVID-19 and Global Value Chains: Policy Options to Build More Resilient Production Networks." OECD Publishing, Paris.

OECD (Organisation for Economic Co-operation and Development) and UNIDO (United Nations Industrial Development Organization). 2019. "Integrating Southeast Asian SMEs in Global Value Chains: Enabling Linkages with Foreign Investors." OECD and UNIDO.

OECD (Organisation for Economic Co-operation and Development) Investment Committee. 2005. "Encouraging Linkages between Small and Medium-Sized Companies and Multinational Enterprises." OECD, Paris. http://www.oecd.org/daf/inv/investmentfordevelopment/35795105.pdf.

Rasiah, R. 1988. "The Semiconductor Industry in Penang: Implications for the New International Division of Labour Theories." *Journal of Contemporary Asia* 18 (1): 44–65.

Rasiah, R. 2015. "The Industrial Policy Experience of the Electronics Industry in Malaysia." In *The Practice of Industrial Policy Government—Business Coordination in Africa and East Asia*, edited by John Page and Finn Tarp, 123–44. Oxford, U.K.: Oxford University Press.

Reuters. 2020. "Malaysia Says Tech Firms, Hit by Pandemic and Trade War, Keen to Move to Country." Reuters, June 5, 2020. https://www.reuters.com/article/us-health-coronavirus-malaysia-investmen/malaysia-says-tech-firms-hit-by-pandemic-and-trade-war-keen-to-move-to-country-idUSKBN23C1K7.

Sturgeon, T., and M. Kawakami. 2010. "Global Value Chains in the Electronics Industry: Was the Crisis a Window of Opportunity for Developing Countries?" In *Global Value Chains in a Postcrisis World: A Development Perspective*, edited by Olivier Cattaneo, Gary Gereffi, and Cornelia Staritz, 245–301. Washington, DC: World Bank.

Sturgeon, T., and M. Kawakami. 2011. "Global Value Chains in the Electronics Industry: Characteristics, Crisis, and Upgrading Opportunities for Firms from Developing Countries." *International Journal of Technological Learning, Innovation and Development* 4 (1): 120–47.

Teng, Liew Jia. 2020. "The State of the Nation: Malaysian Manufacturers Feeling the Chill from China's Cold." The Edge Markets, March 6, 2020. https://www.theedgemarkets.com/article/state-nation-malaysian-manufacturers-feeling-chill-chinas-cold.

Thomsen, S. 2004, "Investment Incentives and FDI in Selected ASEAN Countries." In *International Investment Perspectives 2004*. Paris: OECD Publishing.

UNCTAD (United Nations Conference on Trade and Development). 2011. *Best Practices in Investment for Development: How to Create and Benefit from FDI-SME Linkages—Lessons from Malaysia and Singapore*. Investment Advisory Series B, No. 4. Geneva: United Nations.

World Bank. 2011. "Brain Drain." *Malaysia Economic Monitor* (April). World Bank, Washington, DC.

World Bank. 2020. "East Asia and Pacific in the Time of COVID-19." *World Bank East Asia and Pacific Economic Update* (April). World Bank, Washington, DC.

World Bank Group. 2020. "2019 Investment Policy and Regulatory Review: Malaysia." World Bank Group, Washington, DC. http://documents.worldbank.org/curated/en/952491586324182535/Malaysia-2019-Investment-Policy-and-Regulatory-Review.

Yean, T. S., and L. C. Siang. 2011. "Foreign Direct Investment and Spillovers in Malaysia." In *Foreign Direct Investments in Asia*, edited by Chalongphob Sussangkarn, Yung Chul Park, and Sung Jin Kang, 71–103. New York: Routledge.