CHAPTER

2

Industrial Policies for Learning, Innovation, and Transformation: Insights from Outstanding Experiences

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1. Introduction

A resurgence of interest in industrial policies has been witnessed at a global level during the last decade. Goal 9 of the Sustainable Development Goals (SDGs), adopted by the UN General Assembly in 2015, is to 'build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation' (United Nations 2015). To achieve this goal effectively, industrial policies will be needed because 'promoting industrialization' is the fundamental aim of industrial policies. As such, it implies that UN member states adopting the SDGs inherently recognized not only the importance of industrial growth but also the importance of industrial policies with a stronger focus on inclusiveness and environmental sustainability. Primi (2015) stressed that 'the discussion on the post-2015 development agenda has revealed that neglecting the 'production and structure side' in the first generation of MDGs was a weakness that needed to be addressed in the next generation of development goals' (172). More recently, Aiginger and Rodrik (2020) emphasized that 'steering technological change in a direction that is friendlier to environment and labor must be a key element of new industrial policies' (5).

The 2013 OECD report, *Perspectives on Global Development 2013 – Shifting Up a Gear: Industrial Policies in a Changing Economic Landscape*, stated that, 'in the aftermath of the 2008 financial and economic crisis, OECD countries have re-opened a debate on industrial policies to address job and competitive challenges' and that, 'to face the new global economic context, developing countries are implementing industrial policies to upgrade and transform their production structures and keep growing' (OECD 2013, 10). In the same year, *World Development Report 2013: Jobs* argued that 'Industrial policy fell out of favor in the 1980s, but today it is getting recognition again. The emerging views, however, draw criticism

and have led to a new round of debate' (World Bank 2012, 218). However, as Page (2020) confirmed more recently, 'industrial policy is finally moving away from the longstanding but sterile debate.' Furthermore, as Aiginger and Rodrik (2020) note, 'interest in industrial policy is being further stimulated by disruptive technological change—from automatization to digitalization, Industry 4.0, and the Internet of things' (1-2).

This chapter aims to discuss types of industrial policies and industrial policy measures/instruments, as well as their effectiveness. It draws from the experiences of five countries in three regions—North East Asia, South East Asia, and Latin America—to obtain insights into an appropriate industry policy package for today's developing countries as they face a variety of new challenges of industrialization, transformation and growth.

I will discuss, first, some of the key issues and provide an analytical perspective of industrial policies and their instruments (Section 2). I will review typologies and essential aspects of these policies and instruments, with special reference to learning (Section 3). While keeping in mind these typologies to provide a comparative perspective, I will examine the industrialization process and industrial policies in five countries (Korea and Japan from Northeast Asia, Malaysia from Southeast Asia, and Brazil and Chile from Latin America).[1] To deepen the comparative analysis, I will elaborate on the cases of three relevant industrial sectors—the steel industry, automobile industry, and resource-based industry (Section 4). Based on the findings from Section 4, I will compare the experiences of the countries in terms of the essential aspects of industrial policies identified in Sections 3 and 4, from 'translative adaptation and effective local learning' perspectives, as discussed in the Overview Chapter (Chapter 1) (Section 5). Finally, I will present some concluding remarks.

2. Key Issues and Analytical Perspective

2.1. Broader scope of industrial policy

In recent discussions of development agendas, industrial policy is conceptualized to have a much broader scope than before. Although the fundamental aim of industrial policy is to promote industrialization, it also

[1] Japan, Korea, and Malaysia are representative countries that experienced the Flying Geese pattern of development in the Asian region. Brazil and Chile are forerunners of economic development in Latin America with very distinctive industrial policies. Regarding the Flying Geese pattern of development, see Chapter 1.

aims to achieve industrial sector upgrading and transform the structure of the sector. Rodrik (2007) uses the term industrial policy 'to denote policies that stimulate specific economic activities and promote structural change' (4). Greenwald and Stiglitz (2012) affirm that 'Industrial policies are what we call those policies that help shape the sectoral composition of an economy' (2). Lim (2012) also defines industrial policy in a similar way: 'Industrial policy is broadly defined as a nation's effort to influence sectoral development and, hence, the nation's industry portfolio' (71).

Consequently, the industry to be promoted by industrial policies is now a wider concept. Greenwald and Stiglitz (2012) explain that, together with the above definition of industry policies, 'The term is used more broadly than just those policies that encourage the industrial sector. A policy which encourages agro-business, or even agriculture, is referred to as an industrial policy' (3). As Ohno (2013) articulates, 'Our main focus is the productive sector of the economy which includes manufacturing, agriculture, services, and logistics [...]' (ix). Nevertheless, a large proportion of the literature on industrial policy focuses on manufacturing. This is because it is widely recognized that the manufacturing sector is the main source of technology-driven productivity growth in modern economies and that, because of its ability to produce productive inputs (e.g., machines, chemicals), what happens in the manufacturing sector is extremely important to the productivity growth of other sectors (Andreoni and Chang 2016, 5-6). More recently, Aigenger and Rodrick (2020) asserted that, 'As the world economy turns increasingly towards services, it is clear that we will need a conception of industrial policy that addresses the need to nurture and develop modern economic activities more broadly, including but not limited to manufacturing. The appellation 'industrial policy' may be even misleading insofar as it clouds this broader mission. Other alternatives such as 'productive development policies,' 'structural transformation policies,' or 'innovation policies' do exist' (3-4). They also use the term 'future- and welfare-oriented industrial policy.'

2.2. Changing policy rationales, agglomeration economies, global value chains, and purposes of industrial policy

As mentioned above, in the last decade, 'industrial policy space' has been widened and policy instruments have been diversified. Andreoni (2017) argues that industrial policy space depends, among other things, on the set of policy rationales that are dominant in a certain historical moment

(247). Through an extensive review of the literature, he concluded that the industrial policy space has been defined by two main sets of policy rationales throughout the first two industrial policy waves (namely, the first wave between 1940 and 1970 and the second wave from the 1990s to early 2000). 'These were *structural coordination problems* related to demand and technological complementarities; resource scarcity and production factor specificity; and market *failures* determined by information asymmetries, externalities, and public goods' (253, italics in original). Studies and experiences related to policy rationales for industrial policy space have become deeper and more comprehensive views have emerged in the last decades. Andreoni emphasizes that, 'in developing their vision and policy, governments in both developed and developing countries are increasingly relying on a new *policy rationale synthesis*. This combines classical market failures and structural coordination rationales with the new learning and systemic failures arguments developed in innovation and manufacturing systems studies' (256, italics in original). As discussed in Section 3 below, recent studies emphasize the importance of learning and enhancement of capabilities for industrialization.

Furthermore, studies have deepened on external economies or agglomeration economies (production-related scale economies), which include the benefits of localization (being near other producers of the same commodity or service) and urbanization (being close to producers of a wide range of commodities and services) (World Bank 2009, 129). World Bank (2009) affirmed that governments can do better by promoting the market forces that deliver both a concentration of economic production and a convergence of living standards, and augment them with policies to ensure affordable basic services everywhere. The document further stated that government can do this by helping people and entrepreneurs take advantage of economic opportunities wherever they arise and that the market forces that help most are agglomeration, migration, and specialization.

More recently, the expansion of global value chains (GVCs) has opened new opportunities for countries. World Bank (2020) states that 'national policies can boost GVC participation.' This report, based on an analysis of various types of GVC participation, identified the policies that promote integration into more advanced GVCs (4-5). It further states that 'proactive policies can enhance and upgrade GVC participation.' Among the proactive policies, the report highlights how 'Coordinating,

informing, and training domestic small and medium enterprises helps link them to GVC lead firms. Investment in education and improvements in management encourage upgrading. Special economic zones can be a shortcut on the GVC development path when they successfully address specific markets and policy failures' (160).

It is now widely recognized that there are additional critical policy issues for the industrialization of resource-rich countries. Processing of natural resources instead of exporting them in their raw form, diversification of the export base, and channeling windfall gains to productive investments in line with a consistent long-term development strategy are among the most essential policy issues in resource-rich countries (Ohno 2013, 20). Policies to address these issues could be considered as industrial policies for 'natural resource-based industrialization.'

Moreover, industrial policies need to address other aspects of changing rationales—such as environmental sustainability, resilience to natural disasters, and so on—all factors that are emphasized in the SDGs.

3. Industrial Policy Instruments/Measures and Their Formulation and Implementation

To undertake a comparative analysis of industrial policies and industrialization among countries, it is necessary to classify both industrial policy measures/instruments and processes in which these policies are formulated and implemented. This classification enables an examination of each country's industrial policy in terms of what package of instruments has been adopted and how they were formulated and implemented.

3.1. Critical role of 'learning' for industrial policy: An emerging consensus

Together with the resurgence of interest in industrial policies, attempts to overview, classify, and analyze these policies and their policy instruments/measures have been made. Many of these policies overlap on the importance of learning and enhancement of capabilities of governments, firms, and industrial human resources (workers, managers, and others) to successfully implement industrial policy, as well as achieving industrialization. Stiglitz and Greenwald (2014), in their volume *Creating a Learning Society: A New Approach to Growth, Development, and Social*

Progress, presented a systematic and holistic analysis of what constitutes a learning society, stating that 'the most important "endowment," from our perspective, is a society's learning capacities' (26). Noman and Stiglitz (2017) further noted that, 'broadly understood, industrial policy refers to public policy measures aimed at influencing allocation and accumulation of resources, and the choice of technologies,' and that 'a particularly important set of industrial policies comprises those targeted activities that promote learning and technological upgrading' (1). Cimoli and Dosi (2017), in their article "Industrial policies in learning economies," present a taxonomy of variables and processes that institutions and policies act on in general and with particular reference to technological learning. The above-cited authors emphasize learning and learning capacity for industrialization.

Furthermore, other authors argue that industrial policy itself is about learning. Agosin and Fernández-Arias (2014) highlight that the book *Rethinking Productive Development: Sound Policies and Institutions for Economic Transformation*, to which they contribute, 'builds on a new policy paradigm that is emerging, namely that productive development policies is a learning process' (28-29). Aiginger and Rodrik (2020) likewise affirm that 'The more ambitious the goals of industrial policy are, the less government knows about the techniques available to solve them. Industrial policy is therefore a search process in unknown territory, which should be open to new solutions, experiments, and learning.' In short, these authors argue that industrial policies are a learning process or a search process. Ohno (2013), in his book *Learning to Industrialize: From Given Growth to Policy-aided Value Creation*, proposes a 'way to learn pragmatic policymaking for developing countries that must cope with the strong pressure of market-orientation and globalization of our time' (ix). He notes that, 'in my book, government is the learner and I explore the way in which its capability can be strengthened' (xi).

3.2. Typology of industrial policy instruments/measures

From the above-mentioned perspectives, the cited authors identified and classified key areas or domains of industrial policies and their instruments. Ohno (2013), drawing mainly from East Asian experiences, lists a number of standard policy measures. He especially highlights 'measures that enhance industrial human resource and enterprise capability, an objective that should be at the core of a nation's industrialization strategy' (63).

Policy measures are classified into the following seven areas: legal and policy frameworks, industrial human resources, enterprise capability, finance, foreign direct investment (FDI) attraction, marketing and business linkage, and innovation (63-64). In addition, he states that there are also other important industrial measures concerning infrastructure, logistics and distribution, social and environmental issues, and regional development.

Stein (2014) classifies industrial policies into vertical policies (focusing on specific sectors) and horizontal policies (broad-based and not attempting to benefit any industry in particular). Each of these two categories of policies is further divided into public inputs and market interventions. Consequently, there are four groups of policies: horizontal public inputs, horizontal market interventions, vertical public inputs, and vertical market interventions (33-35). This classification takes into account the problems of rent-seeking and capture. For example, 'rent-seeking problems are likely to be more prevalent in the case of vertical interventions' (Stein 2014, 35). Crespi et al. (2014), based mainly on Latin American experiences, as well as the above-mentioned conceptual framework by Stein, discuss seven key areas: policies to foster innovation, policies in support of entrepreneurship, technical education and training for work, finance, cluster-based policies, internationalization (exports, FDI, and GVCs), and priority sectors for productive transformation (Chapters 3-9).

McMillan et al. (2017) discuss a set of conditions that are most crucial for effective industrial policy leading to economic transformation (45). They define economic transformation as a continuous process of (a) moving labor and other resources from lower to higher-productivity sectors (structural change) and (b) raising within-sector productivity growth. They provide a typology of policy approaches for supporting economic transformation: 'those [policies] intended to accelerate the relative growth of higher value-added sectors in the economy – in other words, policies to support structural change – and those intended to accelerate the pace of within-sector productivity growth.' Within each of these policy sets, they further distinguish 'between "horizontal" or enabling interventions and "targeted" interventions.' This produces a two-by-two classification matrix (ix; 26). They list 'targeted policies to support structural changes' comprising export push policies, exchange rate protection, selective industrial policies, spatial industrial policies, and national development banks. As 'horizontal policies to support structural changes,' they

include investment climate reforms, financial sector development, and strengthening state-business relations (26).

Andreoni (2017), through an extensive overview of literature on the typologies of industrial policies, presents a taxonomic approach. He distinguishes, first, between supply-side and demand-side measures. Then he subdivides supply-side measures into six specific factor-inputs policies: (i) innovation and technology infrastructure; (ii) higher education and workers' training; (iii) production capacity and advanced manufacturing operations that include conditional subsidies and incentives, with matching grant schemes; (iv) long-term financial capital; (v) resource access (energy and technology policies); and (vi) infrastructure and networks. Demand-side measures include internal demand and public procurement, and external demand and international market development (258-60).

3.3. Key areas and domains of industrial policy

Summing up, the typologies referred to above generally coincide in three essential, supply-side measures related to learning, capabilities, and innovation: (i) education, training, and nurturing industrial human resources; (ii) firms' capabilities; and (iii) technology and innovation. They coincide as well in two other supply-side measures: (iv) finance; and (v) infrastructure. Most of these industrial policy measures are intended to provide public goods for industrialization. The typologies also include policy measures related to internal markets, international trade, and foreign investment, which are normally related to both demand and supply sides, such as (vi) domestic market (size, protection, and competition); (vii) international trade, especially export promotion; (viii) FDI; and (ix) participation in GVCs.

In Section 4, I build on these nine types of industrial policy areas or domains to obtain insights for establishing an appropriate industry policy package for today's developing countries as they face a variety of new challenges of industrialization, transformation and growth.

3.4. Process of formulation and implementation of industrial policy and public and private relations

Most authors emphasize the importance of the relationship between

the government and the private sector, together with their institutions, in the process of formulating and implementing industrial policy. Ohno (2013) argues that, 'if effective channels of public-private partnership are established, government and private firms come to trust each other and can constantly share information on global and domestic situations as well as strengths and weaknesses of local industries' (34). Primi (2015) emphasizes that industrial policy works better when it has clear priorities and is capable of getting a constructive dialogue between the public and the private sectors (180).

Andreoni (2017) introduces a policy-governance model that is 'defined according to the way in which a country frames its industrial policy and the different actors involved in its design, implementation, and enforcement' (259). The key actors, according to Andreoni, are institutions such as government agencies and departments, development banks, intermediate R&D institutions, industry associations, and chambers of commerce. He argues that 'countries may frame their industrial policies either within *central plan-based strategies or within multiple decentralized initiative-based measures*' (259, emphasis in original). He further states that, 'to avoid industrial policy coordination problems, government that could rely on well-developed institutional settings adopted a multilayered policy model combining top-down and bottom-up policy measures' (259).

Stein (2014) concludes that 'modern productive development policies have become less of a top-down affair, and increasingly involve public-private collaboration in both policy design and implementation,' and that 'this collaboration is key, as the private sector has information about the sector's challenges and opportunities that is critical for effective policymaking' (58). Aiginger and Rodrik (2020) also highlight the importance of the public-private relationship. They argue that 'the contemporary conception and practice of industrial policy is much less about top-down incentives and much more about establishing a sustained collaboration between the public and private sectors around issues of productivity and social goals' (4). As mentioned above, they consider industrial policy a searching process. Therefore, they state that 'government and business should engage in an intensive dialogue' (14).

The roles of the public sector in the above-mentioned public-private relations appear to differ according to types of industries, purposes of industrial policies, industrialization phases, and so on. The government

undertakes the role of planner, catalyzer, coordinator, and rule maker as well as protagonist (in cases of state-owned enterprises) and partner (in cases of public-private joint ventures, actions, initiatives, and so forth) in the process of industrial policy formulation and implementation.

4. Country Experiences

This chapter has so far discussed key issues of industrial policies, including policy measures/instruments, the process of formulation and implementation, and public and private relations. These factors are summarized in Table 2.1. This section draws together these elements in examining the experiences of five countries, with special reference to the steel industry, automobile industry, and natural resources-based industries. These industries have been purposefully selected by taking into account different sector-specificities in terms of forward and backward linkages, participation in GVCs, and economies of scale. I will elaborate on the process of learning, adaptation, and innovation in reviewing each country's experiences while keeping in mind the contents of Table 2.1.

Table 2.1. Key Policy Areas and the Process of Industrial Policy Formulation and Implementation

Typology	Key Areas of Industrial Policy	Process of Industrial Policy Formulation and Implementation
Supply-side measures (related to learning, capabilities & innovation)	1. Education, training and industrial HRD	The role of government: public-private partnerships • Planner • Catalyzer • Coordinator • Rule-maker • Protagonist (SOEs) and biz. partner (JV etc.) Factors affecting the process • Types of industries • Purposes of industries • Phases of industrialization
	2. Firm capabilities	
	3. Technology and innovation	
Supply-side measures (biz. environment)	4. Finance	
	5. Infrastructure	
Demand & supply-side measures	6. Domestic market (e.g., size, protection, competition)	
	7. International trade (esp. export promotion)	
	8. FDI attraction	
	9. GVC participation	

Source: Elaborated by the author, based on comments by Professor Izumi Ohno.

4.1. Japan

The process of industrial policies and industrialization in Japan after the end of World War II can be divided into four distinctive phases: first, post-war reconstruction through to the mid-1950s; second, high economic growth through to 1970; third, the post-oil crisis phase through to the

mid-1990s; and fourth, the low economic growth phase (Okuno and Suzumura 1984; see Wada, Chapter 4). I will primarily discuss the first two phases because they correspond to the main process of Japan's catching up to advanced industrial countries through industrial transformation. Many of the industrial policies implemented and institutions established in these phases were essential for the prolonged industrialization process in Japan (Okuno and Suzumura 1984, 479).

'The Policy Concerning Industrial Rationalization' (*Sangyō gōrika ni kansuru ken*), adopted in 1949 by the Cabinet, was 'one of the most crucial milestones of postwar Japanese industrial policy,' because it contained the seeds of the Japan Development Bank (JDB), the Foreign Capital Law, the reform of the tax system to favor industrial growth, and the creation of the 'Industrial Rationalization Council' (*Sangyō gōrika singikai*) (Johnson 1982, 215). One of the most concrete results of this Cabinet's decision was the passing of the Enterprises Rationalization Promotion Law of 1952, of which the main policy measures were the tax system with preferential treatment, and the fiscal investment and loan program (FILP). Both of these were designed for strategic industries. Below, I will discuss the effect of this policy, focusing on the case of the iron and steel industry.

In 1954, the 'Comprehensive Policy for Economic Expansion' was agreed on, and based on this policy, the 'Outline of the New International Trade and Industry Policy' was announced. These documents reflected the view within the Ministry of International Trade and Industry (MITI) that the only way to break out of Japan's inevitable balance of payment constraints was through 'heavy and chemical industrialization,' by which was meant the building of an industrial structure whose export products would have a much higher income elasticity of demand than Japan's traditional light industries, even though it flew in the face of so-called comparative advantages (Johnson 1982, 228). The main industries promoted in this period were synthetic fiber, petrochemical, machinery and machine parts, electronics, and so forth. I will discuss the case of the automobile industry later in this chapter.

From the end of the 1940s through the 1950s, several core institutions for industrial development were created. JDB was established in 1951. It had the autonomy to decide its lending based on its own appraisal without political bias. It had 'two important principles: one was self-finance and the other was complementarity with private banks' (Shimada 2017,

166-67). In the export promotion area, the Supreme Export Council—composed of the Prime Minister, ministers of MITI, finance, agriculture, and so forth—was established in 1954. Another new institution, the Japan External Trade Organization (JETRO), was established in 1958.

In June 1960, the Cabinet adopted the 'Plan for the Liberalization of Trade and Exchange.' Six months later, it formally adopted the 'Long-term Economic Plan' (well known as the Income-doubling Plan). In 1961, the Industrial Structure Investigation Council (*Sangyo kōzō chōsakai*) was created. This council and the Industrial Rationalization Council were integrated into Industrial Structure Council (*Sangyō kōzō singikai*) in 1964. Johnson (1982) considers the concept of 'industrial structure' and creation of the Industrial Structure Investigation Council as 'the most important bureaucratic response to liberalization' (252-53).

The main objectives of industrial policies in the 1960s could be summarized as follows: (i) to establish a new industrial structure to address liberalization of trade and capital flow, (ii) to coordinate 'industrial plant and equipment investments' (*Setubi tōsi*), (iii) to promote coordination and specialization of production, especially of small and medium enterprises through the Law for Promotion of Modernization of SMEs, (iv) to establish an integrated energy supply system, and (v) to promote some strategic industries on the basis of laws enacted in the 1950s, such as the machinery industry, electronic industry, and so forth (Tsuruta 1984, 55-56).

4.1.1. Japan's steel industry

Japan's production of steel before the end of World War II peaked at 7.65 million tons in 1943. It recovered this level in the first half of the 1950s, before reaching 9.41 million tons in 1955. The expansion of production in the high rate growth period was remarkable: it peaked at 120 million tons in 1973, the year of the oil crisis. Steel was mainly produced for the domestic market in the 1950s. Japan's steel exports were 3 million tons in 1960. Exports increased rapidly, achieving the level of 34 million tons in 1975. The share of steel in the total exports of Japan increased from 9.6 per cent in 1960 to 18.2 per cent in 1975. Japan's share of world steel exports increased to more than 20 per cent at the beginning of the 1970s (Kohama 2001, 58-59, 62).

In this process, finance by JDB, special and accelerated depreciation,

and other industrial policy measures facilitated the steel industry's investment in plant and equipment. At the same time, three 'Steel Industry Rationalization Plans' (1951-55; 1956-60; and 1961-66) and licenses granted for the import of foreign technology facilitated the modernization and technological upgrades. These policies were considered effective for the steel industry's development and technological progress in its initial phase, especially in the 1950s, and for establishing the basis of the steel industry's growth in subsequent phases (Tsuruta 1984, 275). It should be emphasized that strong competition among steel companies was an important factor for the industry to achieve these results.

With these policies, investments were made in integrated steel mills. These financed new blast furnaces, strip mills, continuous casting methods, LD converters (BOF), and so forth, together with expansion of the scale of production. This modernization and technological progress, along with the location of these mills in industrial estates in coastal industrial areas, was advantageous for international trade. Moreover, the introduction of large-scale vessels specialized in transporting iron ore significantly improved the competitiveness of the Japanese steel industry. These factors enabled Japan to reduce the cost of steel production. The total cost were higher than the United States (US) in the mid-1950s (at 1.08 times the US cost in 1956), but were reduced to a level much lower than US costs by the mid-1960s (0.63 in 1966) (Yamawaki 1984, 263).

Essential and cutting-edge technologies for steel production, such as LD converters and continuous casting, were adapted and improved in Japan. The strategy of locating steel mills in coastal areas and the introduction of iron ore carriers was effectively indigenous. As such, the development of the steel industry of Japan was not just a catching-up process. It was rather an indigenous learning, adaptation, and innovative process.

4.1.2. Japan's automobile industry

Production of automobiles in Japan increased from 69,000 cars in 1955 to 1,876,000 cars in 1965 and 6,946,000 cars in 1975. It was led first by the domestic market in the 1960s, and export-led development started in earnest in the 1970s. Japan's export of automobiles was 7,000 cars in 1960 but had increased to 1,827,000 cars by 1975 (Kohama 2001, 152).

The main promotion policies for automobile industry development

were finance by JDB and the Japan Finance Corporation for Small and Medium Enterprise (JASME). These included, among other factors, special depreciation, licenses for the import of foreign technology, and exemption on tariffs for machinery and equipment imports. Restrictions of automobile imports and constraints on FDI in the car industry were the main protective measures, but they were gradually liberalized in the 1960s (the import of commercial vehicles in 1961, import of passenger cars in 1964, and foreign direct investment in 1971). Competition among Japanese automobile companies was fierce both before and after liberalization.

Efforts were made to adapt and develop technologies and to work out innovative solutions in order to address a series of challenges that faced the Japanese automobile industry. Some of the most important were development of supporting industries largely made up of small and medium enterprises and the introduction and dissemination of Japanese style management methods to improve quality and productivity—such as Total Quality Management (TQM), the Toyota Production System (TPS), and another systems commonly known as the Kaizen approach (Hosono, Page, and Shimada 2020). The Japanese automobile industry also needed to address low-quality roads and highways, as well as narrow streets in major urban areas, in the initial phase of motorization—and later, air pollution. In the 1950s through to the mid-1960s, buses and trucks led automobile industry development. As regards passenger cars, light vehicles (K cars), convenient and affordable for Japanese consumers, have been developed in earnest since the mid-1950s.

The Act on Temporary Measures for the Promotion of Machinery Industry, passed in 1956 (valid until 1970), was one of the major instruments for the development of a supporting industry for automobile production, consisting mainly of small and medium enterprises. The following three areas were promoted by this law: (i) basic machinery including machine tools, forging machines, cutting tools, molds, and electric welding machines; (ii) common parts including gears, screws, bearings, bulbs, and the parts necessary for material molding, such as die-casts and strong powder metallurgy; and (iii) specific purpose parts including automobile parts, sewing machine parts, watch parts, and railway vehicle parts. Many studies confirm that this law was very effective in the development of the machinery industry in general and the automobile parts industry in particular. Labor productivity of automobile parts production improved 21.4 per cent from 1956-61 (Odaka 2013, 15).

4.2. Korea

The industrialization process in Korea can be divided into four distinctive periods: light industry-centered import-substitution industrialization (ISI) in the 1950s, transition to export-oriented industrialization in the 1960s, a heavy and chemical industry (HCI) drive in the 1970s, and further industrial upgrading, including promotion of IT industries in the 1980s and onward. This chapter mainly focuses on the second and third periods.

Lim (2012) states that, 'if Korea's transition to export-oriented industrialization in the early 1960s had mostly to do with discovering its latent comparative advantage in labor-intensive manufacturing, Korea's subsequent development had more to do with upgrading its comparative advantage with a view toward increasing the domestic content of its exports' (76). Finance for strategic sectors, export promotion, and technology development were among the main instruments of industrial policy in this process. Yo (2016) notes that policy-based finance was the most important. The lending capacity of banks was strengthened in 1962. Several public banks for specific sectors were created in the 1960s. Policy-based finance comprised more than fifty per cent of the total lending of banks from the 1960s through to the mid-1980s (3). Export promotion was another important instrument of industrial policy in Korea. From 1964 President Park Chung Hee chaired monthly export promotion meetings. The interest rate of export finance was less than half of the market rate. Export finance constituted 62 per cent of total policy-based finance for the manufacturing industry in the period between 1962 and 1980 (4) (see Section 5 for more details on export promotion in Korea).

The HCI drive was formally launched in 1973 by President Park with the objective of firmly establishing 'a self-reliant economy' and achieving 10 billion US dollars in exports by 1981. Six industries were selected as leading industries: (i) iron and steel, (ii) nonferrous metals, (iii) shipbuilding, (iv) machinery, (v) electronics, and (vi) chemicals. Lim (2012) argues that the 'HCI drive helped to build the formation of many of Korea's leading industries. [...] It greatly strengthened backward and forward linkages among these industries as well as related industries such as automobiles, to increase the local content of exports' (79). The HCI share of total manufacturing production increased to a higher level than light industries in the mid-1970s and 59 per cent in 1985 (Yo 2016, 7). As regards technology development, the public sector played a dominant

role in R&D, mainly through newly established government labs in the 1960s and 1970s. However, as Korean firms came to realize that they should go beyond imitation and assimilation and do their own innovation to succeed in the global market, they began to drastically increase their R&D spending (Lim 2012, 79).

4.2.1. Korea's steel industry

Until 1973, Korea had no capacity for producing the iron needed for steel production. Consequently, scrap or crude iron was imported to produce steel using small electric furnaces. It was necessary for the government to depend on external finance and foreign technology when it commenced plans to establish the Pohang Iron and Steel Company (POSCO) and construct the first integrated steel mill at the beginning of the 1970s. The amount of production of POSCO increased from 2.1 million tons in 1976 to 9.5 million tons in 1986, when the company attained its status as one of the top steel mills in the world. The crucial factor which enabled this successful development of POSCO was very active support from the government, especially from the President. Through this support, POSCO was able to obtain external finance, favorable conditions for technological transfer, construction of related infrastructure, and so forth (Toda 1986). Another important factor was the intensive efforts of POSCO to develop its own engineering capacity through the four phases of construction of the plant. The availability of very high-quality labor and the low level of turnover was also important. Korea's high learning capacity was praised by Amsden (1989). Thanks to aggressive technology acquisition, it did not take long for POSCO to become technologically self-dependent. It implemented a lot of improvements and adaptation of absorbed technology at the Quality Control Department and production sites. It began to develop new products and finally decided to centralize R&D activities by establishing an R&D center in 1977. Furthermore, POSCO became an exporter of its own technology towards the end of the 1970s (Hosono and Hamaguchi 2001).

4.2.2. Korea's automobile industry

The law for the protection of the automobile industry was promulgated in 1962 by establishing restrictions on imports of automobiles and parts. Car production was started through technological contracts with foreign companies. However, due to the limited size of the domestic market, it was

difficult to achieve economies of scale of production required to achieve competitiveness. In 1973, the government announced an ambitious long-term plan for developing the automobile industry, establishing targets for integrated production of national cars based on original models, parts production and assembly with the competitiveness to export. Hyundai was the only company able to satisfy the requirements of the plan. In 1975, the company made a large-scale investment for constructing a new plant to produce the first national model, Pony, in a joint venture with Mitsubishi together with technology transfer (Mizuno 1996, 188).

The second oil shock of 1979 produced a serious recession in the automobile industry. Measures for the rationalization of this industry were announced in 1981. Production of automobiles (including trucks) increased from 123 thousand cars in 1980 to 2.5 million cars in 1995, Korea becoming the fifth largest country in car production. Export of cars increased from 25 thousand to 1.0 million during the same period. In this process, the main player was Hyundai, which attained economies of scale in increasing exports. It started to develop its own original model in 1990, achieving the production of original engines and transmissions in 1994.

4.3. Malaysia

Four phases can be distinguished in Malaysian industrialization after independence: the ISI-led process through the 1960s; export-oriented (EO) and inter-ethnic redistribution policies in the 1970s; heavy industrialization policies (1981-85) followed by economic liberalization in 1986-97 (First Industrial Master Plan, IMP I); and post-economic crisis management and IMP II and III. This chapter focuses on the second and third phases.

In the second phase, export orientation (EO) based on attraction of FDI was the main approach. Two main types of export-oriented industries developed. First, 'resource-based industries have involved the increased processing of older (e.g., rubber, tin) and newer (e.g., palm oil, timber) primary commodities for export.' Second, 'many non-resource based export industries have mainly involved the relocation of certain labor-intensive manufacturing processes to stable, low-cost environments, such as those offered by Malaysian free trade zones (FTZs) with the Free Trade Zone Act of 1971, and licensed manufacturing warehouses (LMWs). The most dramatic growth has involved electrical and electronic components' (Jomo 2007, 11). Foreign companies that operated their plants in FTZs

and benefited from LMWs were the main driver of EO. As such, EO and FDI attraction by the government institutions, including the Malaysian Investment Development Authority (MIDA), have been closely related.

In the third and fourth phases, heavy industrialization initiatives were implemented under the leadership of Mahathir with his 'Look East' vision. The Heavy Industries Corporation of Malaysia (HICOM) was set up in 1980 to further diversify manufacturing activity, develop more local linkages (which both ISI and EO failed to do), promote small and medium Malay enterprises and lead technological development by collaborating with foreign firms and investing in local R&D. Mainly involving joint-ventures with Japanese firms, ownership of these industries was dominated by the government before the sale of shares to the public from the mid-1990s (Jomo 2007, 13). Establishment of Proton, a national carmaker, in 1983, was driven by 'the economic motive of creating a broad industrial base as well as a social motive of assisting Malay workers and Bumiputra firms' (Ohno 2013, 221). The First Industrial Master Plan (IMPI, 1986-95) aimed at outward-looking industrialization, modernization of supporting industries, and strengthening of industrial linkages. A number of liberalization measures were undertaken in this process.

4.3.1. Malaysia's palm oil industry

In line with the transition to EO industrialization from the late 1960s, the government introduced various new sectoral policies, which included encouraging resource-based industrialization, such as palm oil refining. Since 1968, duty exemptions for higher value-added processed palm oil products were introduced. In 1978, a more complex export duty formula was established to better encourage more processing. 'The palm oil refining industry is probably the most successful story of Malaysian resource-based industrialization. With an estimated annual refining capacity of about 8 to 9 million tons, export of processed palm oil grew at a compounded annual rate of about 25 per cent over the past two decades, and accounted for 60 per cent of the world's refined palm oil products' (Hasan and Jomo 2007, 162). In order to support the refining industry, the government created institutions to assist with R&D, training, and market promotion: the Palm Oil Research Institute, Palm Oil Registration and Licensing Authority, Malaysian Palm Oil Promotion Council. The incentives and new institutions, together with enhancement of entrepreneurship and accumulation of skills, facilitated technological and

organizational development (indigenization) that enabled optimization of processing, bulk processing and exports, and economies of scale. All of these contributed toward strengthening the industry's competitiveness (Hasan and Jomo 2007, 175). Today, Malaysia leads worldwide R&D and innovation in the palm oil industry. The country is deepening the value chain and extending it to higher value-added products such as detergents, medicines, and bio-diesel. Local companies are the main players in the value chain (Goto 2019, 136-37).

4.3.2. Malaysia's automobile industry

The automobile industry's development process in Malaysia between 1970 and 2000 can be divided into two phases. The first phase started with a policy to promote an integrated automobile industry. The government targeted an increase in local content in production from 10 per cent to 35 per cent between 1971 and 1982. However, due to the excessive number of assemblers in the small local market, it was difficult to achieve economies of scale, which resulted in high prices of cars with low levels of local content limited to tires, batteries, paints, filters, seat belts, and glass items. The second phase started in 1982 with a state-led 'national car' project for the country to become a full-fledged car manufacturer. Perusahaan Otomobil Nasional (Proton) was established in 1983 as a joint venture between HICOM (with a 70 per cent share), Mitsubishi Motor Corporation, and Mitsubishi Corporation. This project 'became the most important instrument for heavy industrialization policy' (Ohno 2013, 235). With strong support from the state, Proton managed to capture 77 per cent of the domestic passenger car market and exported cars to 28 countries, accounting for 23 per cent of total sales as of 1995. The government also initiated a second national car project named Perusahaan Otomobil Kedua (Perodua) as a joint venture between state firms and foreign firms including Daihatsu (Hasan and Jomo 2007).

The learning and adaptation process and its role in establishing the Malaysian automobile industry is summarized as follows by Ohno (2013, 236): 'Unlike neighboring countries, Malaysia took a go-it-alone approach to automobile manufacturing. It hoped to build core capacity and compete squarely in the world market instead of attracting foreign giants to form an automotive industrial base as done in most other developing countries [...]. IMP II targeted the automobile industry as a vital sector in which internal development of technology and engineering know-how was

top priority [...].' Regarding Proton's achievements, he highlights that 'The existence of Proton as a hub of domestic car production enabled the development of local part and component makers through the Vendor Development Program. By the end of 2005, there were 4,865 automobile parts and components produced locally, and 286 suppliers in producing parts and components for Proton. [...] Proton's effort at internalizing core automotive capability was admirable but not good enough to compete with global giants' (Ohno 2013, 236).

4.4. Brazil

The process of industrial policy and industrialization in Brazil can be divided into four periods: the ISI-led process from the 1930s through to the mid-1950s, then a proactive industrial policy followed by heavy and chemical industries-led industrialization from the mid-1950s through the 1970s. In the 1980s and 1990s, there was increased liberalization with an emphasis on building technological capacity and competitiveness, and finally, there has been a return of industrial policies since 2004. This chapter focuses mainly on the second period.[2]

President Kubitschek's Plano de Metas (Plan of Targets) 1956-61 was the first comprehensive ISI plan aimed at national economic integration. It had 30 development goals to realize the '50 years of economic progress in 5 years.' The Plan of Targets focused on energy and transport infrastructure, which were considered to be bottlenecks to development. The plan included sectoral strategies for agriculture and food (wheat production, grain storage, cold meat storage, slaughterhouses, agriculture mechanization, fertilizer), basic materials (steel, aluminum, ferrous metals, cement, chlorine, paper and pulp, rubber, iron ore export), and capital goods (automobile industry, naval construction, heavy electric materials, and machinery). Kubitschek also launched the Executive Group of Automotive Industry (GEIA), which was intended to attract foreign assemblers to install full-fledged production units in Brazil.

Experiences of increasing fiscal deficits and inflation through the mid-1960s were followed by successful macroeconomic stabilization from 1964-67. Antonio Delfim Netto, the Finance Minister (1967–74), issued the Strategic Plan of Development (PED, 1968-70). The PED was the first to

[2] The following two paragraphs draw heavily on Chapter 3 of this volume.

recognize the role of the National Economic Development Bank (BNDE, later National Economic and Social Development Bank (BNDES)) as the leading institution of development policy. He considered that a government failure is more problematic than a market failure and approved the role of government in developing infrastructure and essential material industry. In the context of high economic growth in 1968-73, the first National Development Plan 1972-74 (I PND) was carried out. It focused on the construction of the infrastructure for transportation, telecommunications, and energy, created state-owned enterprises for naval construction, steel, and petrochemical industries, induced Brazilian enterprises to participate in strategic sectors, and paved the way to the triple alliance scheme of state, private, and foreign capital in industrial development. The second PND of 1974-79 focused on basic industrial materials (steel, nonferrous metal, petrochemical products, fertilizer, pesticide, paper and pulp, materials for the pharmaceutical industry, nonmetal mineral, products such as cement and sulphur), capital goods, food, and energy.

4.4.1. Brazil's steel industry

Brazil has a long history of charcoal iron production. The number of charcoal blast furnaces increased from 6 in 1925 to 134 in 1975, when iron production by charcoal amounted to 3.63 million tons. This was still higher than iron production by coke, in spite of the rapid increase of production by integrated iron and steel plants constructed in the 1950s and 1960s (Taniguchi and Serizawa 1982), as explained below. As such, Brazil had accumulated certain capabilities, knowledge, and specialized personnel related to iron production when the country started investment in the steel industry in earnest. Vargas created Companhia Siderúrgica Nacional (CSN), the first steel mill, in 1940, together with the Companhia Vale do Rio Doce (CVRD, later Vale), an iron ore mining firm, and a railway in order to transport iron ore from the center of Brazil to the Southeast, where the mill was going to be located. In the 1960s, BNDE financed about 70 to 80 per cent of all capital investments in the steel industry (Musacchino and Lazzarini 2014).

From the viewpoint of absorbing cutting-edge technology, the development of the steel industry by another state company, USIMINAS, is outstanding. Brazil and Japan agreed on the establishment of USIMINAS in 1957. BNDE provided the major part of the finance. The construction of the steel plant was carried out in cooperation between Brazil and Japan.

As production partly started in 1961, three Japanese steel companies jointly dispatched nearly 500 persons to USIMINAS over the five years until 1965. By 1967, all the responsibilities of plant operation had been transferred to Brazilians. According to Dahlman and Fonseca (1987), 'USIMINAS passed from know-how stage to know-why state' (163). In 1971, the National Plan for the Steel Industry was announced, and by the mid-1970s, USIMINAS had achieved blast furnace productivity comparable to that of Japan, which was the world leader in that period. USIMINAS's share of the total steel production of Brazil increased to 25 per cent in 1976. Most significantly, USIMINAS maintained a high share of flat sheet products, which contributed substantially to the development of shipbuilding and automobile industries in Brazil. Since the mid-1970s, USIMINAS has been in a position to provide technical assistance to other steel mills and downstream activities, such as capital goods industries. Brazil became the biggest exporter of steel products from the developing world, with a share of over 4 per cent of total world exports in 1985 compared with only about 0.2 per cent in the mid-1970s. USIMINAS was the first case of privatization of state enterprises in Brazil in 1991.

4.4.2. Food value chain in the Cerrado region

The major regional action of the second PND was the agricultural development of the Cerrado, an area of tropical savanna in Brazil. This was initiated by the Central-West Region Development Program (POLOCENTRO, 1975-79), followed by the Japanese Brazilian Cooperation Program for Cerrados Development (PRODECER, 1979-2001). Through these and other initiatives, Brazil achieved a major transformation to become a world top class exporter of grains and meat, strengthening food value chains in the Cerrado region considered unfit for agriculture before. For this process, it was essential that soil management technologies be improved and new crop varieties suited to tropical zones be developed (Hosono et al. 2016, 14-17). To address these needs, the Brazilian government judged that it was necessary to establish a public organization to foster the necessary technological innovations. The Brazilian Agricultural Research Corporation (EMBRAPA) was established in 1973, and EMBRAPA's Cerrado Agricultural Research Center (CPAC) achieved success very early. Financial resources were provided by the government and international cooperation programs (Hosono et al. 2019, 5). Together with the development of food value chains, the public-private partnership in learning and innovation eco-system in clusters of the value

chain networks has been strengthened, and involves farmers, providers of agricultural and agro-industrial inputs, food processing plants, traders, and other stakeholders.

4.5. Chile

Chile's industrialization process can be divided into at least three phases: government-led ISI from 1938 to 1973, a liberalization and export- and FDI-led process in the 1970s and 1980s, and a renewed horizontal policy-led process in the 1990s and onward. This chapter focuses mainly on industrial policies of the 1970s through to the 1990s.

According to Agosin et al. (2010), 'the import substitution stage of Chilean development (roughly from 1938 to 1973) saw an increasing emphasis on industrial policy.' Not only did the government protect domestic industry through high tariffs, but in addition, state agencies became the most important entrepreneurs in sectors such as steel, petroleum extraction and processing, sugar, electricity, and telecommunications. They consider that, 'contrary to conventional thinking, many of these proved profitable.' The Corporación de Fomento de la Producción (CORFO), a development agency established in 1939 with broad attributions including those of being a development bank, was in charge of implementing the industrial policy (5).

Since the mid-1970s, the government started liberalization of trade and FDI and privatization. The government removed practically all restrictions on FDI. DL 600 (a foreign investment law) was introduced in 1974. Under this law, foreign investors settled contracts with the Chile Foreign Investment Committee, which guaranteed the application of provisions of DL 600. The government recognized the important externalities of generic export promotion. Thus, early on, ProChile, an agency attached to the Ministry of Foreign Affairs, was set up to be in charge of such activities. However, most of the policies implemented in the second phase were of a horizontal nature. Since 1973 and until very recently, Chile basically eschewed vertical industrial policies with very few but significant exceptions (Agosin et al. 2010, 6).

In the period of the 1990s and 2000s, the government deployed myriad instruments of industrial policy mainly through CORFO, but also through other institutions such as ProChile and even the line ministries.

According to Agosin et al. (2010), most policy instruments, including those of CORFO, were horizontal programs involving market interventions (through taxes or subsidies). They further state that, since the early 2000s, this insistence on horizontality has been giving way to a more realistic appraisal of the need to achieve a critical mass in the provision of government support. Today, Chile's largest exported products, after copper, are salmon, forestry products, fresh fruits, and wine. This chapter discusses the salmon industry and forestry sectors, promoted mainly by vertical industrial policies.

4.5.1. Forestry products industry in Chile

One of the areas that the Chilean government has targeted most explicitly is the forestry sector, through a mix of policy interventions including laws, incentives, subsidized credit lines and other tools to attract private investments in the sector (Lebdioui 2019). The military government made a strategic bet on a non-existent but potentially profitable sector. It had long been known that radiata pine grew faster in certain parts of Chile than practically anywhere else in the world. The authorities in effect solved a coordination problem that made this sector take off. In 1965 the Chilean government created the Forestry Institute, a technological research institute attached to the Ministry of Agriculture and the country's first institution responsible for conducting R&D in the forestry sector, specifically in areas of forestry economics and wood-related technologies (Agosin et al. 2010; Lebdioui 2019, 7).

The Chilean authorities have successfully targeted the forestry sector through several tools and legal interventions. One of them was Decreto Ley 701, which granted cash subsidies amounting to 75 per cent of the costs of planting and the initial management of forests. The Central Bank provided incentives and subsidized credit lines for investments in the forestry sector between 1974 and 1979 (Lebdioui 2019, 19). Measures were also taken to ban the exploitation of forest trees younger than 18 years old, as well as the export of raw wood and debarked logs. These measures benefited the domestic cellulose and paper industries, which took advantage of low raw material prices. Another intervention, which is less vertical in its design but benefited the forestry sector in particular, was a program of debt-equity swaps introduced in 1985. Investments as part of the debt-equity swap stimulated the industrial processes needed to transform the developing forestry sector through value-added wood

products.

4.5.2. Chile's salmon industry

Agosin et al. (2010) affirmed that there was only one institution in Chile devoted to making strategic bets, Fundación Chile (FCh), in the 1970s and 1980s. Its most outstanding project was the salmon industry. Salmon did not exist in Chile until the 1970s. Today, Chile is one of the world's top salmon-exporting countries, on par with Norway. The salmon industry did not develop through voluntary private sector investments from the outset. Market failure was averted by FCh and Japan-Chile salmon project. FCh made an investment large enough to produce salmon through sea farming on a major scale (one-thousand-ton program) and recouped this investment. FCh thus demonstrated the commercial profitability of large-scale sea farming in 1988 (Hosono 2016, 51-52). Furthermore, as a public good, it provided the technology to farm salmon for free or for a fee so as to allow many companies to invest in the salmon industry without having to make a sizable investment in R&D.

FCh, following this successful achievement, decided to sell the venture through international bidding. Nissui, one of the major Japanese fisheries, won the bid and became a pioneer in introducing advanced salmon processing technologies. Chile, in its ascendance as a world producer, has formed a full-fledged, overarching salmon value chain covering each phase from the production of salmon farming and a whole system of upstream goods and services (especially R&D) to processed products, marketing and export. In 2008, processed products accounted for 63 per cent of total salmon exports of Chile. The Japan-Chile salmon project, implemented under an agreement between Chilean and Japanese governments for twenty years since 1969, provided technology and personnel trained by the project, which allowed private salmon firms to save on the cost of investment in R&D and training of industrial personnel.

5. Industrial Policies and the Learning, Adaptation, and Innovation Process: Insights from Country Experiences

Drawing on the case studies of Section 4,[3] as well as the related literature reviewed in Section 3, I will compare the five countries in terms of their

[3] Some findings not mentioned in Section 4 are also referred to in this section.

industrial policy instruments, policy formulation and implementation, public-private relations, and the process of learning, adaptation, and innovation. First, essential industrial policy instruments in these countries will be compared. As regards policies related to the supply-side, crucial areas covered in the literature are technology, long-term finance (development banks), and firm capabilities, particularly of SMEs for supporting industry. In relation to these, policies toward FDI will be discussed together, because FDI normally provides technology and finance. Second, regarding policies related to the demand side, competition in the domestic market, scheduled trade liberalization, and export promotion will be considered. Third, public-private relationships in the process of policy formulation and implementation will be compared. Fourth, the processes of learning, adaptation, and innovation will be examined from the perspective of 'translative adaptation,' discussed in Chapter 1 of this volume.

5.1. Technology, long-term finance, and FDI

Policies related to FDI, considered an effective vehicle for acquiring foreign technology and finance, differed widely between the countries. Korea and Japan were reluctant to count on FDI during the HCI drive, when FDI was not very widespread globally. ASEAN countries, which started HCI later, actively attracted FDI. Chile's process was FDI-led from the mid-1970s onwards. Brazil opted for a hybrid approach, both attracting FDI and promoting indigenous technology development together with establishing a powerful development bank. Combinations of these two were different among the diverse industrial sectors in Brazil.

Japan and Korea needed to import foreign technologies through licensing. Efforts to absorb such technologies with adaptation and proper innovation were comprehensive and far-reaching. Governments promoted and supported systematically indigenous technological development. For instance, in Korea, as Lim (2012) states, 'the government established the Korea Institute of Science and Technology (KIST) in 1966 and the Korea Advanced Institute for Science and Technology (KAIST) in 1971.' Following this, 'it passed the Technology Development Promotion Law in 1972, providing tax and other incentives to encourage private-sector R&D. It also established five industry-specific research institutes in shipbuilding, electronics, machinery, metal, and chemical industries according to the Specialized Research Institute Promotion Law of 1973'

(10). In Japan, in addition to a similar systematic approach by the central government, efforts to support the technological development of SMEs are worth mentioning. As Andreoni (2017) states, Kosetsushi (public testing/research laboratories) are run by regional governments (prefectures) and support local SMEs with a variety of quasi-public good technologies for testing, trial production, and scale-up, as well as training services. He further states that 'a number of sector-focused centers also support SMEs in the adoption of new advanced technologies and conduct joint applied research' (269).

In Brazil, the provision of technology has differed greatly between sectors—for example, automobiles, airplanes, and electronics. While FDI was the major driver in Brazil's automobile industry, as was the case for ASEAN countries, indigenous technological development was the main vehicle in the case of airplane production by EMBRAER, which became one of the world's top airplane manufacturers. On the other hand, the 'unfortunate case of the electronics and informatics industry illustrates an ineffective industrial policy where the government just provided companies with protected local markets but did not extend support to basic research or human resource development' (see Chapter 3, Section 4.4.3).

Regarding Malaysia, Jomo (2007) concludes that, 'through various generous incentives, the government has sought to encourage investments in higher value-added economic activities as well as research, design and developing activities. Government policy has also created a range of institutions and programs to promote research activities, especially in the public sector, besides facilities and incentives for private-sector research and development. Although such government efforts have met with limited success, there is evidence of significant technological progress in Malaysian manufacturing in recent decades' (xxiii).

The government role in R&D could be essential in the initial phase of development of new industries, particularly when it is risky and/or costly for private companies to invest in the R&D required for such industries. The cases of Cerrado agriculture with the food value chain in Brazil and the salmon industry in Chile are clear examples: R&D by EMBRAPA and a public-private entity, Fundación Chile, undertook the pioneering role to provide technology as a public good.

Regarding long-term finance, JDB played a crucial role in Japan. Commercial banks were important providers of finance as well. As Shimada (2017) highlighted, JDB had, among other aspects, the following critical features: (i) it 'had autonomy to decide its lending based on its own appraisal, and without political bias' (166-67); and (ii) because of the complementarity among industrial sectors financed by JDB, 'the loans were used as a kind of subsidy to the target industries with 'crowding-in effects' in mind... The complementarity or spillover effects among sectors are one of the important characteristics of the JDB loan' (167-68); (iii) a JDB loan sent 'an important signal to private banks (the *signaling effect* of the government's industry policy) to provide loans. JDB loans catalyzed loans from private banks by lowering the risk' (169; emphasis in original).

In Korea, the government established the National Investment Fund (NIF) to finance long-term investment in HCIs in 1973. Government-controlled banks also supported the HCI drive by providing policy-oriented loans on favorable terms (Lim 2012, 9). Gustafsson (2007) affirms that 'the Malaysia government has not used development banking as extensively as South Korea has' (48).

In Brazil, the role of BNDES (former BNDE) was pivotal to remedying private financial institutions' short-term and risk-averse attitudes: 'Private bank loans are not only scarce and volatile in terms of volume, but they are also high-cost, and their loans are strongly skewed to the short maturity segment.' Moreover, 'BNDES has been central to industrial policy formulation with qualified technical staff and technical autonomy' (Chapter 3, Section 5.5 of this volume). In this regard, Ferraz and Coutinho (2019) claim that 'BNDES had technical autonomy, namely a collective capacity to approve or reject projects based exclusively on an explicit project and credit evaluation criteria […] It is widely accepted that BNDES has high competency to examine the eligibility of borrowers on a purely technical basis' (Chapter 3 Section 5.5 of this volume).

5.2. Firm capabilities, especially of SMEs

Strengthening firm capabilities and nurturing industrial human resources are among the most critical aspects of industrial policies. In addition to presenting a standard policy menu for industrial capability enhancement (referred to in Section 3), Ohno (2013) highlights six industrial policy measures among the most popular policy instruments for enhancing

industrial capability in East Asia: *Kaizen* (quality and productivity improvement at factories), *Shindan* (enterprise management consultant system), engineering universities and technical colleges, TVET-industry linkages, industrial estates, and strategic FDI marketing (63-64, 65-80).

A small and medium enterprises (SME) policy is one of the most widely implemented policy packages for firm capability enhancement. In most East Asian countries, comprehensive SME support systems have been established. Both horizontal policies and vertical policies show effective results. Among the horizontal policies, a very widely applied approach is the introduction of the *Kaizen* method and several management systems based on *Kaizen* (Hosono et al. 2020).

Among vertical policies, initiatives to strengthen automobile parts industries consisting largely of SMEs are worth mentioning. For industries that are dependent on thousands of parts, such as the automobile industry (which can involve 30,000 to 40,000 parts) as well as other machinery industries, the capabilities of parts suppliers are essential. To enhance the competitiveness of the automobile industry, both horizontal policies to support SMEs and vertical policies to promote key sectors of supporting industry are required. In Japan, the Act on Temporary Measures for the Promotion of Machinery Industry was very effective in this regard, as discussed in the next subsection. In Malaysia, the government launched the Vendor Development Program (VDP), under which multinational and local 'anchor companies' would provide guaranteed purchasing contracts and technical assistance to local vendors, who would also receive subsidized finance from local banks and technical support from government institutes (Felker and Jomo 2007, 73-74).

5.3. Competition in domestic markets, scheduled trade liberalization, and export promotion

In cases of industrial sectors requiring economies of scale, including the steel industry, petrochemical industry, and automobile industry, the size of the market matters. Domestic markets, together with (or without) export markets, need to be large enough to take advantage of the economies of scale. Given sufficient size, even if the domestic market is protected, domestic firms will be encouraged to improve their competitiveness when they face competition in domestic markets and/or trade liberalization is reasonably scheduled.

Export promotion was one of the most widely implemented approaches of industrial policies among all the countries studied. Korea introduced a number of measures to facilitate export-oriented industrialization. The short-term export credit system had been streamlined as early as 1961, with the automatic approval of loans to those with an export letter of credit (L/C). This allowed businesses to have access to trade financing without having to put up collateral. The government established the Korea Trade Promotion Corporation (KOTRA) in 1962. The government also gave exporters various tax deductions, tariff exemptions, and concessional credits: 'These subsidies took the form of performance-based rewards in a competitive setting rather than handouts with no strings attached' (Lim 2012, 75). After 1964, then-President Park Chung Hee chaired monthly export promotion meetings.

In Japan, the mainstream vision in the mid-1950s was to promote both exports and domestic sales. Johnson (1982) cites a Japanese analyst, who argued that 'the only industries in which we have seen export increase induce a production increment—instead of the other way round—are transistor radios and perhaps cameras. [...] Export increases of all our other products have been induced mainly by expansion of the domestic market' (230). The Supreme Export Council and JETRO were created in 1954 and 1958, respectively. Scheduled trade liberalization and efforts to strengthen competitiveness to face it became one of the main agendas of industrial policies of the 1960s.

In Chile, ProChile has been one of the main instruments of Chile's horizontal industrial policies from the late 1970s and onward. Today, ProChile is considered one of the most effective institutions for export promotion in Latin America.

5.4. Formulation and implementation of industrial policies and the public-private relationship

In Japan, the Industrial Structure Council is the central body of industrial policy formulation. Under the umbrella of this council, many subcommittees for specific industrial sectors have been set up. For different issues of industrial development, specialized committees have also been established. Representatives of the government, normally of the MITI, enterprises, and academics participate in meetings of these organizations. Wada (Chapter 4 of this volume) states that the formulation and

implementation of sectoral industrial policy in the rapid growth period was carried out through collaboration with companies and industrial associations, instead of strong government-led power. Many policies have been formulated as an outcome of the collaborative work of the government, enterprises, and sector associations. They share knowledge of issues and challenges of each sector and collaborate in the process of implementation of policies. Sectoral industrial policies are formulated based on in-depth analysis of very distinct sector-specific challenges. In this regard, the case of the Act on Temporary Measures for the Promotion of Machinery Industry could be among the most representative. For the automobile parts sector, 42 main parts (26 at the inception) were selected and rationalization plans for each of the parts were prepared through the collaboration of public and private sectors. The participation of many stakeholders made the process of formulation and implementation of plans very transparent. The policies implemented by this law (1956-70) were successful due to the cooperation of the public and private sectors, as well as networks among firms working effectively (Odaka 2013, 14-15).

In Korea, where exports were one of the top priorities of industrial policy, export promotion meetings attended by President, high-ranking government officials, and business representatives functioned as an effective platform for public-private collaboration. Lim (2012) states that 'these meetings provided a forum to monitor progress and devise institutional innovations and solutions to emerging problems' (76). Export insurance was one of many institutional innovations that were introduced as a result of recommendations from monthly export promotion meetings. Lim emphasizes that, 'most importantly, Korea adopted an integrated approach to export promotion, with comprehensive and interrelated measures, policies, and institutions' (76). Regarding public-private coordination, Lim concludes that;

> the government formulated indicative plans at the national level but delegated much of their implementation to business groups, which in turn tried to coordinate productive activities at the group level in addition to engaging in market transactions. Based on close public-private consultations and performance-based rewards, this two-tier approach to coordination helped to address information and incentive problems. [...] Korea maintained an outward-oriented, bottom-up, and integrated approach, relying

> on close public-private consultation and international benchmarking. While continuing to pursue export oriented industrialization for its resource allocation, scale economies, and dynamic learning effects, the government and the *chaebol*[4] systematically studied what had to be done to fill the missing links in the domestic value chain and move up the quality ladder through technology acquisition, human resource development, and construction of optimal-scale plants aimed for the global market. (Lim 2012, 84)

Public and private collaboration through different types of partnerships provided a platform for learning about industrial policies due to the fact that government, public organizations, enterprises, their associations, and other stakeholders exchanged information and co-created innovative solutions. Learning, adaptation, and innovation are inherent in this process, as highlighted by Wada (Chapter 4 of this volume) in the case of Japan. Mainly due to public and private partnerships at different levels from deliberation councils to meetings of specific industry stakeholders, 'with the presence of vertical bureaus, MITI was able to understand the actual activities of each specific industry, and was capable in formulating and implementing effective industrial policies suited to each case. On the other hand, Japanese companies formed business groups by industry, region, or function, and they tended to work together to solve common problems.' In-depth information on sector-specific idiosyncrasies was indispensable to formulate industrial policy measures appropriate for specific industrial sectors. Wada also refers to the viewpoint of the horizontal bureaus as follows: 'it was thought that gathering the real issues of each industry and considering them as an overall industrial policy from the viewpoint of the horizontal bureaus in MITI, effectively grounded Japanese industrial policy.'

Page, one of the authors of the World Bank's *East Asian Miracle*, emphasizes the importance of formal deliberation councils established in five of the High Performing Asian Economies (HPAEs)—Hong Kong, Japan, Korea, Malaysia, and Singapore. He considers that they probably improved coordination among firms and the flow of information between businesses and government: 'Politically, they helped establish a shared

[4] A *chaebol* is a large family-owned industrial conglomerate with diversified affiliates in South Korea.

commitment to growth and reduced rent-seeking. Information sharing made it harder for firms to carry special favors from the government and for government officials to grant special concessions' (Page 1997, 49). He affirms that few Latin American economies have applied these lessons of institutional development. Based on experiences of these economies, Fernández-Arias et al. (2014) state that, 'In some countries, such as Costa Rica, business is expected to be near the policy design process on matters that affect it directly. In others, such as Chile, government (especially high-level officers) keeps a distance. As a result, policies in Chile tend to be top-down, while policies in Costa Rica tend to follow a more participatory, bottom-up approach' (377).

5.5. Learning, adaptation, and innovation from a 'translative adaptation and local learning' perspective

The literature coincides on the importance of learning and enhancement of capabilities of governments, firms, and industrial human resources (workers, managers, and others) to be successful in industrial policy implementation, as well as in industrialization, as stated in Section 3. In this regard, case studies revealed that the processes of learning, adaptation, and local innovation effectively took place in all ten cases of transformative industrial development.

The processes are characterized by (i) attention to uniqueness of each country and society, (ii) country ownership with the proactive roles of governments and private sector development, and (iii) process orientation through trial and error, and the establishment of systems that correspond to the stages of learning, adaptation, internalization, and scaling up. These are key ingredients of 'translative adaptation and effective local learning' identified in the Overview Chapter. As summarized in Tables 2.2-2.4, the countries were aware of their uniqueness from the perspective of the development of their respective industries. In all cases, ownership of the countries was conspicuous and the proactive roles of the governments were generally strong. A continuous process of learning, adaptation, internalization, normally through repeated trial and error, took place. Therefore, these processes could be considered cases of 'translative adaptation and effective local learning,' as discussed in the Overview Chapter.

It is worth mentioning that, in most of the above-mentioned cases, public

or semi-public institutions for promotion of new industries and/or for their technological development were established and they achieved significant success, as confirmed by the case studies. These cases reveal that reasonably good institutional 'islands' can be highly effective when created for specific purposes, as distinct from an overhaul of the entire institutional structure. In particular, R&D and innovation were achieved frequently by specialized institutions, with or without diverse incentives, as demonstrated by Tables 2.2-2.4.

Table 2.2. Steel Industry: Learning, Adaptation, and Innovation, and Key Ingredients of 'Translative Adaptation and Effective Local Learning'

	Attention to the country's uniqueness	Country ownership (proactive roles of the government and the private sector)	Process orientation with trial and error (stages of learning, adaptation, internalization, and scaling-up)
Japan	Need to introduce cutting-edge technology as well as attain economies of scale, and import iron ore at lower cost	Steel industry rationalization plans addressing the country's uniqueness; long-term finance; eagerness of the private sector	Substantial improvement of technology; location of steel mills in coastal areas and introduction of iron ore carriers
Korea	Need to catch-up from scratch; needs to play the role of one of the leading industries for HCI drive with linkages to other essential industries	Strong ownership of the country establishing POSCO with the President's leadership	Intensive learning through POSCO construction phase; improvement of absorbed technology
Brazil	Rich endowment of iron ore and technology of charcoal blast furnaces; need to introduce integrated steel plants and construct infrastructure for iron ore transport	Strong ownership of the country establishing CSN, USIMINAS, and other state steel plants, as well as CVRD; long-term finance by BNDES	Intensive learning of technology through USIMINAS construction phases and its dissemination to other state's steel plants

Source: Created by the author.

Table 2.3. Automobile Industry: Learning, Adaptation, and Innovation, and Key Ingredients of 'Translative Adaptation and Effective Local Learning'

	Attention to the country's uniqueness	Country ownership (proactive roles of the government and the private sector)	Process orientation with trial and error (stages of learning, adaptation, internalization, and scaling-up)
Japan	Need to attain higher quality and productivity for liberalization of imports and become competitive in international market; develop supporting industry; address low quality roads and highways	Scheduled liberalization of automobile imports and foreign direct investment in car industries; supporting industry promoted by the Temporary Measures for the Promotion of Machinery Industry; 'K cars'; long-term finance	Introduction and continuous improvement of TQM and other Kaizen-based management approaches, later achieving higher productivity than other automobile industry countries
Korea	Need to develop the car industry from scratch, attaining scale economy (limited size of domestic market) through exports from early development phase	Ambitious long-term plan with targets of integrated production of national cars based on original models, parts production and assembly with competitiveness in exports.	Intensive learning by Hyundai achieving scale economy and competitiveness for export.
Malaysia	Need to promote car industry to create a broad industrial base and assist Malay workers and Bumiputra firms; need to achieve scale economy and higher level of local contents.	Strong ownership of the country with a state-led 'national car' project to become a full-fledged car manufacturer; enhancing supporting industry through the Vendor Development Program.	Great efforts of Proton to 'internalize core automotive capability'; development of around 300 car suppliers to provide about 5,000 parts and components.

Source: Created by the author.

Table 2.4. Resource-based Industries: Learning, Adaptation, and Innovation, and Key Ingredients of 'Translative Adaptation and Effective Local Learning'

	Attention to the country's uniqueness	Country ownership (proactive roles of the government and private sector)	Process orientation with trial and errors (stages of learning, adaptation, internalization, and scaling-up)
Malaysia: Palm oil industry	Need to establish competitive palm oil refining industry and produce higher value-added products	Strong ownership creating institutions to promote the industry: Palm Oil Research Institute and others.	Leads worldwide R&D and innovation, and value chain of high value added products: detergents, medicines, and bio-diesel.
Brazil: Grain and food value chain	Need to promote sustainable agriculture in the Cerrado and to develop Central west region.	Strong ownership of the country establishing EMBRAPA, and providing long-term finance.	Development of soil management and new crop varieties suited to tropical zones and their dissemination; continuous R&D and innovation
Chile: Forestry products industry	Possibility of developing competitive forestry production based on radiata pine trees.	Strong ownership of the country establishing Forestry Institute for R&D, providing finance and several incentives, and discouraging export of raw wood.	Development of higher value-added wood products and expansion of their exports, as one of the most important non-copper export segments.
Chile: Salmon farming and processing industry	Possibility of developing competitive salmon farming due to favorable natural conditions.	A public-private joint venture, Chile Foundation's investment in R&D and in a pioneering company to produce at scale.	Improvement of salmon farming and processing technologies; establishing salmon value chain, and exporting processed products.

Source: Created by the author.

6. Concluding Remarks

Industrial policies can be classified according to their purposes, as discussed in Section 3. Bearing these classifications in mind, this chapter conducted case studies of the experiences of five countries from Asia and Latin America (Section 4). In all countries studied, industrial policies, such as those discussed in Section 3, have been extensively implemented. Furthermore, in all cases of the selected industries of these countries

that contributed significantly to their transformation, vertical industrial policies have been widely carried out.

From the experiences of these countries, it is highly evident that what matters for industrial development is which combination of industrial policy instruments is appropriate in different circumstances, given sector-specific characteristics (sector-specific idiosyncrasies) and challenges, and how these policies are formulated and implemented. Regarding the combination of policy instruments, horizontal and vertical instruments have been complementary, according to the experiences of these five countries. Furthermore, horizontal policy instruments have not always been neutral to all industries. They have very often had stronger impacts on some sectors than others. On the other hand, as each industrial sector has its own specialties, a sectoral (vertical) industrial policy can respond to each sector closely and enhance the effectiveness of the industrial policy (Hamaguchi, Chapter 3; Wada, Chapter 4). Regarding the formulation and implementation of industrial policies, public-private partnerships are extremely important, as discussed in Section 3, based on recent literature and confirmed by the case studies (see Section 5).

The steel industry in Japan, Korea, and Brazil, the automobile industry in Japan, Korea, and Malaysia, and four natural-resource-based industries in Malaysia, Brazil, and Chile have been supported by industrial policies, although their characteristics have been different. Development of these industries was not achieved in a laissez-faire market. In all cases, vertical (or selective) policies have been applied, in addition to horizontal (or neutral) policies applicable to all industrial sectors. Furthermore, the case studies of this chapter provide some valuable insights into the concept of the 'translative adaptation and effective local learning' discussed in the Overview Chapter (Chapter 1). Generally, in the process of development of the above-mentioned industries, public-private collaboration, through partnerships between the government, firms, their associations, research institutions, and other stakeholders, has been essential in learning, adaptation, and innovation. Many indigenous innovation initiatives have been carried out to address distinct challenges each country faced.

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