6 The Roles of Government in Development Detours

6.1 INTRODUCTION

Over the past decade, a new trend toward de-globalization has emerged that has been triggered by a series of events, including the 2008 global financial crisis, the rise in US–China tensions since 2019, the COVID-19 pandemic, and the Russia–Ukraine War. Moreover, this trend is now being accompanied by the increasing and changing role of national governments, not only in developing but also in developed economies. In particular, industrial policy, which was once taboo in mainstream economics, has continued to evolve, producing diverse variations, such as innovation policy (Edler & Fagerberg, 2017; Soete, 2007), industrial innovation policy (Nelson & Langlois, 1983), and mission-oriented innovation policy (Mazzucato, 2018). Recently, it has finally reemerged as a major topic of discussion in economics. In academia, this revival has been most prominently dealt with in the works of Stiglitz et al. (2013), Mazzucato (2011), and Chang and Andreoni (2020). Such a revival is unsurprising given that although there have been many cases where industrial policy has failed, no latecomer economy has achieved sustained catch-up without relying on some form of industrial policy or public intervention. Classical works, such as that by Johnson (1982), defined industrial policy as any policy that improves the structure of a domestic industry in order to enhance a country's international competitiveness. In recent decades, however, its meaning has changed and evolved to deal with the pressing concerns of the twenty-first century, including environmental degradation and sustainable development (Radosevic et al., 2017; Larrue, 2021).

https://doi.org/10.1017/9781009456234.007 Published online by Cambridge University Press

The neo-Schumpeterian approach to industrial and innovation policy tends to focus on capability building and improving innovation systems (Lee, 2013a, 2013b, 2013c). This approach emphasizes that industrial policy must not only correct market failures but also overcome capability failures in emerging economies and system failures in advanced economies. The market failure approach tends to assume that firms are already capable of innovation and thus need to be provided with more monetary incentives. However, firms in developing countries are poorly equipped to conduct in-house R&D. Correcting such failures requires more than the simple provision of R&D subsidies; rather, various methods for cultivating R&D capability are necessary. In comparison, system failure can occur when missing or weak connections (and synergies) between actors constituting innovation systems result in poor performance in innovation.[1] The concept of system failure is consistent with the concept of coordination failure, in that its correction requires coordinated action among relevant actors, which can be facilitated by public agencies as intermediaries.

In their article on policy matrixes for inclusive growth, Rodrik and Stantcheva (2021) argue that governments should intervene during the production stage using various means, including industrial policy. In contrast, the conventional view has been to intervene during either the pre-production or post-production stages using such means as education or welfare schemes. Proponents of this approach argue that if a government fails to intervene during the production stage and successfully promotes the international competitiveness of its domestic industries, its firms may fail and workers will lose their jobs, placing a burden on welfare systems.

Beginning with a discussion on the three types of failure (capability, market, and system failure) that considers the wider context

[1] An early discussion of this concept can be found in Bergek et al. (2008) and Dodgson et al. (2011). System failure arises due to cognitive distance (Nooteboom, 2009) among actors, which is associated with the tacitness of knowledge resulting in cognition failure. Policy interventions often pursue transitioning toward a new system.

of government intervention, this chapter advances the discussion on the role of government while also focusing on the emerging economy context. It develops the concept of "detour" by elaborating on the government's role in managing global–local interfaces to promote the growth of domestically owned big businesses and their coevolution with SMEs and startups.

The preceding chapters have proposed and elaborated on the idea of multiple or nonlinear development pathways (detours) for latecomers at the national and firm levels. More specifically, in the preceding chapters, this book has presented the theory of innovation–development detours, focusing on building technological capabilities in big businesses while managing global–local interfaces. However, previous chapters have not been explicit in their discussion of the role of government in innovation–development detours. Thus, this chapter concludes the book by discussing the role of government and specific policies in achieving detour. One of the initial focuses is the question of whether the idea of detour or nonlinearity is applicable to the role of government.

Section 6.2 discusses the provocative idea that the level of government intervention should not decrease in a linear fashion during the development process; rather, I assert that the role of government must increase as the country approaches the upper middle-income stage and then decrease as it reaches the high-income stage, forming an inverted U-shaped curve. The theory of comparative advantages holds that during the low-income stage, economic growth does not necessitate direct government intervention in the affairs of firms. However, for a country to enter high value-added sectors and catch up with leading countries already in the upper middle-income stage, governments may need to undertake more direct forms of intervention, such as pursuing public–private R&D initiatives.

Section 6.3 addresses the role of government in global–local interfaces. This section elaborates on two modes of government involvement – that is, a slow and fast mode of catch-up – for overcoming the challenge of strategically managing global–local interfaces. In

the slow but steady mode of catch-up, public intervention primarily focuses on re-skilling and up-skilling local labor forces so that FDI and MNCs remain in the same localities and pursue high-valued activities and hire local workers. The fast, aggressive mode of catch-up, in contrast, involves asymmetrical intervention to nurture domestically owned firms and their R&D instead of prioritizing MNCs and foreign-owned firms. Section 6.4 focuses on the role of government in fostering big businesses and their coevolution with startups and SMEs, and Section 6.5 discusses how countries can make a successful transition from short- to long-CTT sectors. The final section provides a summary and concluding remarks.

6.2 A DETOUR IN THE ROLE OF GOVERNMENT: THE INVERTED U-SHAPE OR "LESS, MORE, AND LESS"

This section explores whether the concepts of detour and nonlinearity are also applicable to the role of government. The conventional view holds that the role of government should decrease as a country's development progresses and that government intervention should be phased out as an economy matures into a high-income economy. Such statements about the decreasing role of government intervention over time are a reflection of the fact that in advanced economies, the role of government tends to be limited to the provision of basic civil services. Although it is undeniable that the role of government decreases in the high-income stage, I suggest that this decrease may not be linear. Instead, I hypothesize that during the middle-income stage, the role of government must temporarily increase rather than steadily decrease. That is, the necessary degree of government intervention may not be a linear or downward slope but rather an inverted U-shape. In short, government intervention may need to increase before it eventually decreases.

This hypothesis can be rationalized as follows. For countries at the low-income stage, a typical development policy is to attract FDI in order to capitalize on the comparative advantages related to a country's respective resource endowment. Growth achieved through

such comparative advantages does not necessitate direct or vertical intervention by the government, and any government intervention is often restricted to providing tax exemptions or other financial incentives to attract FDI, as well as various indirect and horizontal interventions meant to improve investment climates associated with legal structures and physical infrastructure.

However, as an economy reaches the middle-income stage and strives to enter high value-added or high-end sectors and activities, it may find that there is little room for entry and that technology transfers are difficult and expensive, as incumbents are concerned with possible boomerang effects and a rise in new competitors from the Global South. Simply put, incumbents often do not want latecomers to advance along value chains; they want them to adhere to low-value-added activities. Incumbents may even try to establish entry barriers by initiating IPR disputes and accusing latecomer countries of copying or stealing the IPR of certain products and technologies. Incumbents may also attempt price dumping or lower the price of their product to drive out new entrants. I have elaborated on these barriers to catch-up in Chapter 3 of this book and in previous studies (Lee, 2019).

In order to strategically manage the global–local interfaces first discussed in Chapter 3, countries must generate a critical mass of local firms after learning from foreign firms. The necessary knowledge for this process may require not less but more intervention and support on the part of the government. The need for national governmental intervention arises primarily due to power asymmetries between latecomers and incumbents in GVC governance. Additionally, given that market structures are typically oligopolistic or nearly entirely monopolized by a few incumbents at high-end segments, public intervention can be justified in terms of correcting market failures to ensure higher economic efficiency by reforming oligopolistic markets to be more competitive. I will illustrate the above point regarding the need for more government involvement at the upper middle-income stage by using the example of Samsung and drawing on previous research conducted with a colleague (Lee & Lim, 2001).

In the 1970s, several Korean firms began wafer fabrication for semiconductor manufacturing by absorbing low-level technologies. These Korean firms were original equipment manufacturers, and their facilities were imported from foreign firms. These firms received no systematic government assistance. Without government help, Samsung began producing 64-kilobit DRAM chips in the early 1980s. Samsung was able to buy 64-kilobit DRAM design technology from Microelectronic Technology, a small American venture company, and it purchased the necessary manufacturing technology from the Japanese company Sharp. A few years after producing DRAM using borrowed manufacturing technology, Samsung began to develop their own circuit design technology, first developing and producing 256-kilobit memory chips in the mid-1980s. Samsung chose to develop its own design technology for 256-kilobit or higher DRAM, as it was not easy or cheap to buy the design for these chips (Kim, 1997a). Therefore, Samsung decided to develop its own designs rather than pay high prices (Kim, 1997b). It was only after Samsung independently developed a 256-kilobit DRAM chip that some foreign companies were willing to sell their 1-mega DRAM design technology to Samsung. Additionally, it was around this time, in January 1986, that Texas Instruments brought a patent infringement lawsuit against Samsung.[2]

It was only in 1986, when the target size of chips to be developed reached a larger capacity (namely 4-mega bit or higher), that the government initiated the formation of a semiconductor R&D consortium with private firms, including Samsung. This public–private consortium was necessary, as the amount of R&D expenditure and the involved risk of developing high-capacity chips was much larger than during past generations of smaller capacity chip production. The final product of this public–private enterprise was the world's first

[2] The United States International Trade Commission placed a ban on Samsung's exports to the United States. After extensive litigation, Samsung settled with Texas Instruments by entering into a new patent licensing agreement worth more than $1 billion. See Lee and Kim (2010) for details.

256-megabit chip. Since then, Korean firms have become world leaders in memory chip manufacturing, and the role of public research institutes was phased out as private firms were able to be self-reliant. This history of Samsung's memory chip manufacturing is a clear demonstration of the inverted U-shaped path of public intervention; that is, the public sector became more directly involved during the later stage of the industry's development in the form of public–private R&D.

The story of the digital TV and display industry in South Korea is quite similar to that of memory chips in terms of the nonlinear, inverted U-shaped pattern of public intervention. In the 1970s, Korean firms began producing black-and-white TVs using technology licensed from Japan. In the 1970s and 1980s, the government intervened to ensure general market protection, enforcing very high tariffs (as high as 80%) on imported TVs. It was only in the 1990s that the Korean government began intervening more directly to create public–private R&D consortiums, as around this time, the government had decided not to follow Japan into analog-based high-definition TV production and instead leapfrog into digital TV development ahead of Japan. This consortium included the participation of the Ministry of Industry and Resources, the Ministry of Information and Communication, and the Ministry of Science and Technology, as well as seventeen institutions, including private firms, government research institutes, and universities. This consortium set out on a five-year project (June 1990–July 1994) to develop high-definition TVs. This public–private coalition encouraged private firms to commit to a risky R&D project by channeling R&D funds and forming a knowledge-sharing network connecting researchers from various firms, universities, and governmental research institutes. The consortium's success in developing and producing the world's first digital TV was the turning point that enabled South Korea to overtake Japan in the display market, as Japan fell into the incumbent trap of trying to develop analog-based high-definition TVs.

One can observe a similar story of an increasing degree of government intervention in Taiwan. Up until the 1980s, the key product of the Taiwanese electronics industry was the compact electronic calculator (Amsden & Chu, 2003, pp. 28–32). Without government help, young and educated Taiwanese engineers contributed to the rise of the industry beginning in the 1970s by taking existing designs and modifying them slightly. However, upgrading from compact calculators in the 1980s to PC laptops in the 1990s could not be accomplished by small- and medium-sized enterprises (SMEs) alone, and therefore this process required more direct invention by public-sector institutions, primarily government research institutes like the ITRI. The government initiated an ITRI-led, public–private R&D initiative that lasted for a year and a half from 1990 to 1991 (Mathews, 2002b). This consortium developed a "common machine architecture" as a prototype that could easily be translated into a series of standardized components, which SMEs then mass produced. In the context of several previous failures, the consortium represented a watershed moment, indicating the potential of R&D consortiums to help establish new "fast follower" industries (Mathews, 2002b).

In terms of per capita income relative to US levels, the upper middle-income stage corresponds to 20–40% of US levels. South Korean per capita income reached 30% of the US level by the late 1980s and 40% by the mid-1990s (Figure 2.2). Indeed, it is during this period from the late-1980s to mid-1990s that the Korean government began intervening more directly to facilitate public–private R&D initiatives. In the 1960s, 1970s, and early 1980s, industrial policy mainly took indirect forms, including import tariffs and loans from state-controlled banks. In other words, government intervention shifted from indirect intervention in the low or lower middle-income stage to direct intervention at the upper middle-income stage.

Until the early 1980s, private R&D constituted less than half of the total R&D in South Korea. Beginning in the mid-1980s, the government began encouraging private firms to establish in-house R&D centers by granting tax exemptions for R&D expenditures and

by initiating public–private joint R&D. As a result of these initiatives, the share of private R&D surpassed half of total R&D in the late 1980s and reached 70% by the mid-1990s. In this sense, the rise of private R&D was not simply a result of private-sector actions but also government initiatives. Public-sector involvement in the form of public–private joint R&D did not crowd out private R&D; rather, the private and public sectors evolved together in a relationship of beneficial mutual feedback.

Such government intervention into private R&D did not occur in Southeast Asia until later. For example, in the Malaysian semiconductor sector, such intervention did not occur until the late 1990s, more than a decade after South Korea. South Korea's per capita GDP started to surpass that of Malaysia beginning in the mid-1980s (Figure 2.2). The lesson from this discussion may be that it is not the degree of government intervention that is important but rather the nature of the changing role played by the government during different stages of development. Nevertheless, public–private joint R&D is more of a direct form of involvement than financial incentives and horizontal market protection via tariffs, which are indirect.

6.3 THE ROLE OF GOVERNMENT IN GLOBAL–LOCAL INTERFACES

Given latecomers' lack of capital, skills, and technologies, they must rely on foreign resources and capabilities. This presents the eventual challenge of how to create innovation systems that support the local creation of value-added and knowledge to thereby generate a critical mass of domestically owned enterprises. That is, as discussed in Chapter 3, the challenge is how to strategically manage global–local interfaces to strengthen a domestic base for innovation and entrepreneurship. Such a need for domestically owned firms and corresponding innovation systems arises for two reasons. First, because any successful economic growth that relies on foreign sources tends to cause wage rates to rise accordingly, FDI firms and MNCs tend to look for cheaper labor costs in "next-tier down" countries that

may displace the concerned country's position in GVCs. Second, as latecomers achieve successful catch-up and approach a technological frontier, they find it increasingly difficult to receive technology transfers from incumbents.

Facing this challenge, latecomers find themselves having to choose between two possible responses; these two responses can be generalized as a slower and faster mode of catch-up. The slow and hopefully steady mode of catch-up largely corresponds to the history of the IT cluster in Penang, Malaysia, and the auto sector in Thailand, which were discussed in Chapter 3. Within this mode, the main focus of public intervention is not on generating domestically owned firms but rather on re-skilling and up-skilling the local labor force to prevent FDI firms and MNCs from relocating and, in turn, to encourage them to engage in high-value activities and continue hiring local workers at higher wage rates. The faster catch-up mode, in contrast, closely corresponds to the situation of Shenzhen, China, and the Chinese auto sector, which are discussed in Chapter 3. In this mode, the focus of public intervention is on creating domestically owned firms as opposed to foreign-owned firms. Next, I elaborate on these two different modes of catching up.

6.3.1 A Slow but Steady Mode of Catch-Up

As discussed in Section 3.4 of Chapter 3, Penang, Malaysia, has long been recognized as a productive cluster capable of hosting MNCs that produce electronic parts and components. MNCs began operating in Penang in 1972 following the establishment of a free trade zone in that year. In the 1970s, MNCs were attracted to Penang because it was one of the few locations that offered attractive incentives, such as cheap labor costs and low taxes. Although Penang has not been as successful as Shenzhen at generating domestically owned firms, it does not represent a failed attempt at catch-up; rather, Penang is a decent case of steady catch-up. Penang's per capita income level is much higher than the average level in Malaysia. Due to rising wage rates, some MNCs in Penang have downsized their manufacturing

operation, moving low value-added operations to lower wage countries. However, many MNCs have maintained operations in Penang, as they benefit from privileged access to strong supply chains enabling them to produce and provide cutting-edge technology products and services. Further, a new cycle of firms emerged and performed high value-added activities, including high-value engineering tasks, such as prototyping and services. For instance, Motorola oversees a full cycle of engineering operations for its telecommunication business, from R&D to prototyping, production, and engineering services (Lee et al., 2020).

In summary, Penang has evolved from a labor-intensive manufacturing center into a cluster that provides software, engineering design, R&D, and industrial system-based services. Consequently, low value-added manufacturing has largely disappeared from Penang. Notably, a new cycle of development is emerging, and Penang has diversified into high value-added servicing activities and industries, such as medical tourism, education, shared service centers, and R&D (Penang Institute, 2015, pp. 10–15). Next, I will discuss the key local institutions that have facilitated such value chain upgrades at MNCs.

Policy intervention in Penang aimed at upgrading social capital and state-of-the-art skills useful in GVCs. The key vehicle for this upgrading was the Penang Skill Development Centre (PSDC), a public agency established to cultivate production-related skills among the blue-collar workforce, as explained in detail in Lee et al. (2020). Established in 1969, the Penang Development Centre (PDC) was a state agency that supported the development of industrial parks in Penang and employment creation. The PDC also cooperated with MNCs, such as HP, Intel, and Motorola. Together, they founded the PSDC in 1989, a nonprofit institution that provided technical knowledge and training programs to technicians and engineers within the industrial park. The center has an established network of industry partners and a robust knowledge base, and it can teach specialized knowledge useful for advanced industrial operations. Approximately 200 company members of the PSDC contribute to its technical

knowledge base and enjoy access to a stable supply of labor power. The PSDC also hosts several laboratories that provide shared services to members. In 2016, the PSDC trained and certified 7,048 individuals as skilled workers in the industrial park, a ratio of 35 workers per company in Penang. The PSDC also runs training programs to develop the necessary human competencies for Industry 4.0.[3]

6.3.2 *A Faster Mode of Catching Up*

Although both Penang and Shenzhen began as FDI-led growth economies at their initial stages, Shenzhen came to adopt a faster mode of catch-up. The discussion in Section 3.4 of Chapter 3 demonstrates that one important source of the different speeds of catch-up between Penang and Shenzhen has been the emergence of domestically owned and globally successful firms in Shenzhen. Therefore, the important question is to determine how this was possible in Shenzhen and other regions of China. The answer is a strategy that combines firm-level R&D efforts with supportive industrial and innovation policies by the government, including public–private collaborations (Lee et al., 2021; Yang, 2015). This strategy can be further demonstrated by several cases of catch-up in China, in particular, the case of Huawei in Shenzhen.

Huawei was established in 1987 by Ren Zhengfei, a former communications officer for the People's Liberation Army, and five of his fellow PLA members with a starting capital of Renminbi 20,000 (about $3,000).[4] Huawei began from nothing in the city of Shenzhen. The firm began as a telecommunication equipment distributor operating out of a barn on a farm in Shenzhen that was used as an office. From here, the founders sold telephone switches imported from Hong Kong. In 1990, Huawei decided to attempt to transform itself

[3] The titles of offered programs include I4.0: The Idea, Architecture, Demand, and Approach; Embedded Systems for IoT; Cloud Architectures & Technologies; Cybersecurity Fundamentals for Industry 4.0; Big Data: Methods and Solutions; and The Robot Operating System. All of this information relies on the author's work (Lee et al., 2020).

[4] Information about Huawei is mostly from Mu and Lee (2005).

into a telecommunication equipment manufacturer by relying on in-house research and development rather than forming a joint venture with a multinational firm, which was the typical strategy of most Chinese manufacturers at that time. This constituted a significant risk, as Huawei had neither the relevant knowledge nor sufficient money to develop the capacity to manufacture telecommunications equipment. Despite this, Huawei evolved to become a global player in both telecom systems and cell phones. What were the sources of the stunning growth of this private startup company?

A subsequent driver of growth of this company had been the spillover and diffusion of knowledge; knowledge began by spilling over from the FDI firm Shanghai Bell to a public–private R&D consortium and then finally to Huawei (Mu & Lee, 2005). In the 1980s, the telecom equipment market in China, particularly fixed-line telephone switch manufacturing, experienced an unmet demand surge following the opening and growth of the Chinese economy. In response, the Chinese government invited several foreign firms to form joint ventures with Chinese partners to produce and sell goods in the Chinese market. Shanghai Bell was one such joint venture, with the Chinese holding a majority stake of shares at 60%. This joint venture was an exemplar case of the Chinese strategy of "trading market for technology" (Mu & Lee, 2005), with the Chinese government leveraging its ability to grant access to the massive Chinese market as a bargaining tool to induce foreign firms to transfer important technology and know-how to their Chinese partners.

The Chinese government did not stop at facilitating joint ventures. Soon after, they initiated a public–private R&D consortium designed to take advantage of knowledge spillover from joint ventures. This consortium eventually developed a large-capacity digital telephone switch (model HJD-04) in 1991, which was first installed in rural markets in 1992. This indigenously developed digital switch technology was transferred to four local manufacturers, including three state-owned enterprises (SOEs) and one private firm (Huawei). As we now know, Huawei was the ultimate winner in the market

among these four companies, and its success was due to its aggressive corporate culture and commitment to in-house R&D. Huawei also continued building up its technological capabilities by recruiting engineers with experience and knowledge of the development of the HJD-04 system. Huawei rapidly increased its market share by spearheading an aggressive marketing campaign and taking advantage of the Chinese government's support, as exemplified by its "buy local" policy and preferential loans.[5] In 1998, Huawei became the largest digital switch supplier in China (Mu & Lee, 2005).

The above history of Huawei demonstrates that there would have been no Huawei today if the Chinese government had not taken the initiative to establish a public–private R&D consortium for the development of domestic telephone switch manufacturing. Government policies supporting local manufacturers were also crucial to this success. As these cases show, inviting FDI is not the end but just the beginning of the long-term process of economic development. However, the type of government intervention that is most effective is dependent on contextual factors, such as time and place. For instance, in the case of Tencent, another pioneering firm that is also based in Shenzhen, the primary assistance provided by the local government came in the form of guaranteeing funding by attracting venture capital (with public capital involvement) and other financial investors during the initial growth stage (Breznitz & Murphree, 2011, pp. 175–178; Yang, 2015). There has been an impressive rise in local innovators in Shenzhen, which is reflected in the list of the top ten patent assignees in the region. In 2002, foreign firms dominated the list. However, by 2015, all of the top ten assignees were Chinese firms, including Huawei, ZTE, Tencent, and BYD.

The basic role of the public sector in China's telecom sector and in Shenzhen was similar to that of FCh in the Chilean salmon

[5] The Chinese Government started to impose tariffs on imported telecommunications equipment, and extended Huawei CNY 3.9 billion in buyer's credit from the China Construction Bank. It also provided CNY 3.5 billion of revolving credit from the Bank of China and Industrial and Commercial Bank of China.

sector, as discussed in Section 3.2 of Chapter 3. FCh, however, is not a public–private consortium but a nonprofit organization. Salmon is not native to Chile and thus Chile has no comparative advantage in the salmon business. However, FCh was dedicated to fostering the salmon business and its growth, and it was instrumental in importing Norwegian technology and experimenting with farming various species under different conditions, eventually proving that cultivating salmon was commercially viable. Salmones Antártica, a salmon production and processing company created by FCh, successfully demonstrated the economic potential of salmon cultivation as an industry, and subsequently, more entrepreneurs have entered the salmon business.

6.3.3 Transitioning from Slow to Fast Catch-Up: The Auto Sector in China

The Chinese auto sector is a typical example of shifting from a slow mode of catch-up that relies on FDI or joint ventures to an eventually faster mode of catch-up that relies on domestically based firms[6]. China initiated economic reforms and an open-door policy in the late 1980s, and subsequently, it sought to establish its own automotive industry. In the initial stages, this industry was to rely on foreign joint ventures. The Chinese government anticipated benefiting from technology transfers by forming joint ventures and pursuing a policy strategy of leveraging the "market for technology." This approach was also applied to other industries, such as telecommunication equipment (Mu & Lee, 2005).

One of the first joint ventures was the Beijing Jeep Company formed in 1983, followed by a joint venture between Shanghai Auto Industry Corporation (SAIC) and Volkswagen in 1984 and Guangzhou-Peugeot in 1985. More joint ventures followed in the 1990s (Chu, 2011). In these joint ventures, foreign ownership was capped at 50% (Liu et al., 2014), and foreign joint ventures were required to

[6] This section utilizes information from a previous publication of colleagues and mine (Lee, Qu & Mao, 2021).

establish R&D centers (Yu et al., 2008). However, this strategy of relying on FDI and joint ventures did not yield the anticipated benefits in terms of technology transfer and the eventual enhancement of the technological capabilities of Chinese automakers (Chu, 2011). In the early stages of the industry, the size of China did not constitute a considerable advantage; rather, it was a source of information and coordination failure due to the complex politics involving the central and local governments, which made it difficult to conduct Japan–Korea-style centralized industrial policy (Lee et al., 2021).

Although the central government attempted to achieve economies of scale by limiting the number of firms in the auto industry to three major and three minor automakers, provincial governments often circumvented such regulations and allowed entries by local firms and foreign joint ventures. Consequently, China ended up with over 110 automobile assembly plants, with nearly half being foreign joint ventures (Chu, 2011). The problems of the Chinese auto sector have been summarized as "outdated products, high prices, and no R&D capabilities," as well as "too many production sites, indiscreet project approval, redundant investment, and slow localization" (Chu, 2011). Joint venture firms tended to adopt old, mid-market designs from foreign partners and concentrated on fulfilling government-mandated localization requirements rather than developing their own engines or undertaking R&D (Thun, 2018). Guangzhou-Peugeot Automobile Company, which closed in March 1997, is a representative example of a joint venture that failed in China (Lassere & Zeng, 2002). Peugeot was unwilling to promote local value chains and instead continued to rely on foreign imported parts, which ultimately raised the final cost of products (Harwit, 1994). Thus, the Chinese partner believed that Peugeot was focusing on obtaining short-term profits from quickly selling knock-down kits without facilitating localization.

It is domestically owned companies that secured the success of the contemporary Chinese auto sector, and these domestic firms only entered the market after China joined the WTO in 2001. Before 2000,

joint ventures dominated the Chinese market. Beginning in 2001, domestically owned manufacturers, such as Great Wall, Chery, and Geely, began emerging rapidly, and they continued to increase their market share, reaching 30% in 2009 (Tian et al., 2010). These new companies pursued slightly different strategies from those of foreign joint ventures in building their technological capabilities and acquiring foreign technology. They conducted in-house R&D activities, filed more patents than foreign joint ventures,[7] and relied on active licensing and international M&As. For example, Chery bought a used assembly line from SEAT, a Volkswagen subsidiary in Spain, and an engine factory from a Ford plant in England in 1997 (Lee et al., 2009). After importing this assembly line, they recruited engineers from foreign joint ventures. For example, Chery CEO Tongyao Yin was a former manager at FAW-Volkswagen, and over 100 engineers of FAW-Volkswagen also left to join Chery. Moreover, thirteen key engineers moved to Chery from Dongfeng-Nissan. They joined the development team for the famous QQ model, the success of which resulted in the rapid growth of Chery (Lee et al., 2007).

Given the strong motivation for success associated with private or nonstate ownership and the pressures of tough market competition, indigenous firms, including Chinese conglomerate BYD, invested aggressively in new facilities and technologies to build their technological capabilities.[8] Chery acquired Jaguar Land Rover to enhance its brand reputation and technological capabilities. In 2007, Geely established an overseas factory and bought a stake in the UK cab firm Manganese Bronze Holdings. In 2009, Geely acquired the Australian company Drivetrain Systems International, the world's second-largest gearbox manufacturer, and Geely further improved its technological capabilities through an acquisition of Volvo. The

[7] According to previous research I conducted with colleagues (Lee, Qu & Mao, 2021) in 2007, both Shanghai-GM and Volkswagen filed fewer than 10 patents each, whereas Chery filed 107. The number of utility model patents (petty patents) filed by these joint ventures between 1998 and 2007 was only 24 for Shanghai-Volkswagen and 31 for Shanghai-GM. In contrast, Chery filed 254, and Geely filed 128.

[8] Information in this paragraph relies on Lee et al. (2009).

rise of indigenous firms also created more competition between local firms and joint ventures, which further contributed to the deepening and widening of local supply chains in China, which was also facilitated by the local contents requirement policy.

While one may emphasize the unique Chinese advantage of large market size, the story of the auto sector in China suggests that market size can only be utilized as such when government has an effective plan and the will to promote local industry. Thus, the so-called "trading market for technology" strategy was effectively utilized in the case of telecommunication switch development in China. However, this was not the case in the auto sector because the government, during the industry's early stages, failed to implement a similar strategic vision and did not begin providing effective coordination for the promotion of a part–supplier network until the 2000s (Chu, 2011).

Furthermore, there were several policy measures that contributed to the successful rise of domestically owned firms in China. In addition to the local contents requirement policy, which was eventually canceled in accordance with WTO demands, there were three other policy initiatives: import restrictions, entry controls, and market discrimination. First, since the promulgation of the Automotive Industry Policy Law in 1994, import quota licenses have been used to regulate the import of auto parts and assembled cars. Even the types of cars allowed for import are regulated in accordance with nationwide policies meant to promote the automotive sector. Therefore, the importation of both used cars and parts for car assembly is forbidden, which implies that automotive manufacturers are not allowed to import semi-knock-down kits to produce cars (Chen & Han, 2007). Second, foreign enterprises are not allowed to establish more than two joint ventures producing the same type of car in China. For investment projects related to completely built units and engines, foreign automotive manufacturers are required to collaborate with domestic manufacturers (Nan, 2005). Third, foreign cars face higher registration fees and taxes in the market than domestic cars (Chen & Han, 2007).

6.3.4 *The Key Takeaways*

The takeaway of this chapter is not that the same measures should be applied to all contexts and countries but rather that latecomers require some forms of tailored asymmetric support, as they are unable to compete against incumbent foreign firms. Without such asymmetric support, latecomer economies and industries will continue to be dominated by foreign firms and FDI firms, and given the existing asymmetry in power and technologies, domestically owned firms will fail to emerge. For domestic firms, there is no such thing as a peaceful rise to prominence; their emergence always entails some form of rivalry and tension with incumbent firms. This is because any effort to establish and strengthen domestic firms is often met with hostile reactions or counterattacks by incumbents and existing joint venture partners. In such cases, public intervention is justified to correct market imperfections and inefficiency because incumbents often abuse their market power and the market structure to maintain their monopolistic power. Power and technology asymmetries in GVCs are the source of latecomers' failure to upgrade. I will now elaborate on this point while providing several examples.

The three modes of original equipment manufacturer (OEM), original design manufacturer (ODM), and original brand manufacturer (OBM) are examples of GVC participation where flagship firms from advanced economies, such as Nike, sit at the top of value chains due to their brand power (or power as OBMs), while latecomer firms serve brand owners by producing for them as OEMs and ODMs. Although OEMs and ODMs strive to become OBMs and capture a larger share of global profit, upgrading from one mode to the next is neither automatic nor easy. Transitioning into an OBM involves several risks, including weathering counterattacks from incumbents and flagship firms in existing GVCs. This finding was noted in a previous essay of mine discussing how Korean SMEs try to become OBMs (Lee et al., 2015), as well as in another

case study on the footwear and furniture sectors in Brazil (Navas-Alemán, 2011). The aversion of former buyer firms toward suppliers that are trying to transform into OBMs was also documented in earlier studies on Latin America (Giuliani et al., 2005; Navas-Alemán, 2011). Thus, this transition can be prolonged by a slowdown, which may even lead to a decline in sales or market shares for latecomer firms trying to upgrade. And eventually, this can cause a possible crisis for such firms. For instance, as I noted in an earlier essay (Lee, 2019, Chapter 4), in the consumer goods sector, former vendor companies (brand owners) often cease their patronage of OEMs that begin to sell their competing brands in order to destroy the former OEM firms. In the case of capital goods, when an incumbent realizes that a latecomer firm has become successful in developing products that can compete with the incumbent, they often begin charging predatory prices in the market.

The pervasiveness of such interference tactics by leading incumbent firms in GVCs implies that functionally upgrading to an OBM requires a latecomer to fight with leading firms for their independence in GVCs. To some extent, this argument contradicts several studies in the GVC literature that tend to emphasize collaborations between flagship firms in the Global North and firms in the Global South (e.g., Ernst & Kim, 2002; Sturgeon & Lester, 2004). Latecomer firms in the South have the option of choosing "no fight and no associated risk"; however, they can also choose to remain dependent on one or several MNC vendor firms, or a single client firm. This strategy of dependent or path-following catch-up is not always detrimental because it may lead to temporary growth during the low or lower middle-income stages. However, in the long term, it is not certain that this strategy can guarantee long-term survival, as new late-entrant firms will emerge from the next tier of catch-up countries and offer lower wages and costs.[9] The footwear sector in

[9] The limitations of these dependent catch-up strategies have been demonstrated in the cases of other countries reported in previous studies, such as Van Dijk and Bell (2007) and Rasiah (2006).

southern Brazil is an example of a cluster that was once prosperous but subsequently declined after the rise of China as an alternative site of production (Lee et al., 2018).

6.4 THE ROLE OF GOVERNMENT IN THE DETOUR FROM BIG BUSINESSES TO SMEs

The preceding chapters, in particular Chapter 5, emphasized the role of big businesses in fostering growth beyond the middle-income stage. The next issue to tackle is how to first generate big businesses, and then SMEs and startups at a later stage. In what follows, I first discuss how to promote big businesses and then how to grow SMEs and startups.

6.4.1 How to Generate Big Businesses

In a country like the United States, which has a large market size and a higher degree of market efficiency, there is no need for intervention via public policies to promote big businesses. Many startups in the United States tend to grow quickly into "unicorns" within a short period of time.[10] Therefore, it is important to ask why other countries fail to generate such unicorns.

One answer could be that a typical emerging or developing country faces a high degree of market failure while also having to overcome its smaller market size. In such situations, productive ideas by individuals or startups tend not to be financed either by venture capital or bank loans. When making a loan, banks typically require some form of collateral, regardless of expected return on investment projects. The literature on business groups and conglomerates in emerging economies tends to identify market failures as a factor influencing the rise of conglomerates (Lee, 2019, Chapter 4). That is, business groups and family-owned conglomerates are understood as entities that emerge to fill institutional voids or to correct market failures by utilizing internal capital markets and labor markets.

[10] A unicorn company is a privately held startup company that is valued at more than $1 billion.

When business groups and family-owned conglomerates have started new businesses or entered new sectors, they have tended to secure initial capital not via regular capital markets but through funds received from sister companies within the business group. The government or public agencies often participate in this process by issuing debt guarantees when the private firms try to obtain loans from domestic or foreign banks.

In advanced economies, market failures tend to refer to entire sectors becoming oligopolies or monopolies. In contrast, in developing economies, market failures are more fundamental in nature, as they involve the very absence of a market or the thinness and smallness of markets, which can give rise to an inability to finance large or long-term projects. This, in turn, results in an inability to generate big businesses. In such cases, an alternative method for growing big businesses is for the government to create them directly. In many cases in the Global South, governments are directly involved in creating SOEs. Governments can grow SOEs quickly by mobilizing all domestically available resources and competencies, allowing the enterprises to go public via an initial public offering (IPO), and finally pursuing gradual privatization. There are various examples of governments building SOEs to eventually be converted into big businesses.

One example is POSCO in South Korea, which is one of the top five steel companies in the world. As Korea lacked any private capitalists who could take on such a project, only the government was positioned to create the beginnings of a Korean steel-making industry. From 1958 to 1968, the Korean government tried six times to construct an integrated steel mill but failed each time. The World Bank and the United States Agency of International Development refused to provide loans for the project over doubts that Korea could repay them; they also doubted the necessity of a large-capacity steel mill in a small developing economy (D'Costa, 1994, p. 64; Song, 2002, p. 57). Instead, these agencies suggested that Korea develop steel-consuming industries, such as machinery, automobiles, and shipbuilding (Song, 2002, p. 57). However, the Korean government

insisted that the construction of steel-consuming industries was not a prerequisite for the successful development of the Korean steel industry and that the steel industry should first expand and supply quality steel at competitive prices, after which steel-consuming industries would follow (Song, 2002, p. 58).

Former President Park Chung-Hee made this steel project a top priority of the second Five-Year Economic Development Plan (1967–1971). The Korean government established POSCO as an SOE in 1968. The government held 56.2% of the company's shares, and the remaining 43.8% were held by the state-run Korea Tungsten Co. In retrospect, the plan to construct a steel mill before the development of steel-consuming industries turned out to be valid, as evidenced by the subsequent strong growth of steel-consuming industries in Korea since the 1970s, such as the automotive and shipbuilding industries. Since the 2000s, POSCO gradually become privatized, and the government distributed a portion of its shares to all Korean citizens free of charge.

Another example is TSMC, the world's largest semiconductor foundry. As discussed in Section 4.4 of Chapter 4, TSMC was created in 1986 as a spin-off of a government research institute known as ITRI and started as a joint venture with Philips, as well as other fabless firms. Further, the rise of the semiconductor industry in Taiwan was not simply a natural process; rather, it was the product of a policy of targeted industry promotion. With a clear and calculated vision, the government in Taiwan first allocated robust resources to ITRI and two other research institutes in Hsinchu to develop the capabilities needed for the foundry businesses, in particular fabrication services (Yeung, 2016, p. 138). TSMC's rise to global prominence occurred ten to fifteen years after its spin-off from the ITRI, which could be attributed to firm-specific innovation efforts undertaken after the initial government promotion of the industry in the 1980s (Yeung, 2016, p. 140).

Chapter 3 discussed several resource-based sectors in Malaysia that served as a growth engine for the country past the middle-income

stage. The oil and gas company Petronas is the only Malaysian company that ranks in the Fortune Global 500. This SOE has gradually developed its capabilities and upgraded into higher-value activities, and it is now a fully integrated international oil and gas company that operates in over thirty countries. The public sector also played a critical role in the early stages of the Malaysian rubber and palm oil sector. Malaysia nationalized several domestic firms to consolidate them into a larger firm, and in 1981, it also executed a hostile takeover of three British palm oil and rubber plantation conglomerates listed on the London Stock Exchange (Lebdioui et al., 2021). Such initiatives were important for the growth of these resource-based sectors.

SOEs are not necessarily inefficient as long as they are subject to global market discipline and are run by competent managers. There are multiple examples of successful SOEs, such as Singapore Airlines, Aramco, and Ethiopian Air. For instance, Saudi Arabian Oil Company, or Aramco, has overtaken Apple as the world's most valuable company, worth about $2.43 trillion compared to Apple's $2.37 trillion as of May 2022.[11] Some SOEs have also proven to be extremely innovative, such as the State Grid Corporation of China, which was thoroughly analyzed by Rikap (2022). The State Grid Corporation of China is a leading firm in artificial intelligence applications for the energy sector, and it became an innovator by relying on China's national innovation system, particularly its public research organizations, public funding, and innovation and energy policies. It is unique for not having relied on technology transfers from global leaders, unlike other large firms from developing or emerging countries.

It is no surprise that many of the Fortune Global 500 firms located in emerging economies tend to be SOEs, such as POSCO in South Korea and many SOEs in China. This contrasts sharply with the case of advanced economies, where most Fortune Global

[11] https://edition.cnn.com/2022/05/12/investing/saudi-aramco-becomes-most-valuable-company-intl-hnk/index.html (retrieved on 2023-10-20).

500 firms are not SOEs. A similar contrast can be observed when looking at related sectors; for example, the French energy and petroleum company Total Energies and the US company Shell are private corporations, whereas the Saudi Arabian company Aramco and the Malaysian company Petronas are SOEs. Such a contrast has to do with the different origins of these firms. There exists a high degree of market failure in emerging economies, and therefore, big businesses tend to be either SOEs or business groups, like Korean chaebols. It takes time for them to become privatized or for a new generation of private firms to emerge. China provides a typical example. The Chinese firms on the Fortune Global 500 list were at one time mostly SOEs. Currently, however, many of the Chinese companies on the list are not SOEs. Even though China is a state-led economy, it has been able to generate dynamic non-SOEs, like Huawei, Alibaba, Baidu, and Tencent, some of which are listed on US stock exchanges.

In general, policymakers in emerging economies face two alternatives. They can adopt a slow mode and continue to deploy their resources to a large number of SMEs and startups with the objective of growing them into big businesses, or they can adopt a fast mode, concentrating their resources in a few big businesses to achieve rapid growth. A practical compromise between these two approaches would be to start with a certain number of firms and then focus on a few among them. The Korean experience, as discussed in Chapter 5, is consistent with such a compromise, in that all present-day big businesses in Korea used to be small companies, particularly when judged by international standards. However, they grew into large corporations through a cumulative process that involved screening candidates for privileged support, evaluating firms based on performance, and then selecting the best-performing firms for new projects.

6.4.2 Transitioning from Big Businesses to SMEs and Startups

Once a country achieves success in generating a critical mass of big businesses, these big businesses tend to serve as an umbrella and

https://doi.org/10.1017/9781009456234.007 Published online by Cambridge University Press

generator of startups and SMEs in diverse ways, including enabling spin-offs, providing venture capital, and purchasing the products of SMEs. In other words, in emerging economies, it is big businesses that tend to facilitate the growth of startups and SMEs, whereas in an environment absent of big businesses, SMEs and startups take more time and have more difficulty growing into big businesses. In China, large tech giants, such as Alibaba and Tencent, served as vital sources of venture capital for many startups. For instance, Tencent is reported to have invested in over 730 startups from 2006 to 2022, including seven in 2012, forty-two in 2015, ninety-seven in 2018, and ninety-six in 2021.[12] It is well known that in Shenzhen, China's most innovative city, the role of public–private collaborative venture capital has played a central role in fostering many startups. In South Korea, the tech giants Naver and Kakao, which are the Korean equivalents to Google and Facebook, respectively, were founded by former employees of Samsung. Startups and SMEs tend to grow into big businesses only when the public sector offers critical assistance in correcting market, capability, or system failures.

In fact, one study on entrepreneurship sponsored by the Asian Development Bank found that while the presence of big businesses in a low- or middle-income economy tends not to harm the emergence of startups with any statistical significance, it tends to lead to more startups in high-income economies.[13] Such results can be explained by the fact that big businesses tend to have both negative and positive effects on startups. That is, they have a negative effect on startups by discouraging them from offering job opportunities to talented young individuals and possible entrepreneurs while

[12] www.crunchbase.com/search/funding_rounds/field/organizations/num_investments/tencent (retrieved on 2022-12-15).

[13] Several papers were produced as a result of this project, and they are available at www.adb.org/documents/asian-development-outlook-2022-update-background-papers; retrieved on 2023-10-20. The specific paper focusing on the linkage between big businesses and entrepreneurship is by Xin and Lee (2022); it can be found at the following link: The Role of Big Businesses in Entrepreneurship: A Cross-Country Panel Analysis using the GEM Data (adb.org).

also positively affecting them by serving as sources of funds and producing employees who, after leaving the corporation, start their own businesses. These opposing effects offset each other in low- and middle-income economies; in contrast, the net effect is positive in high-income economies. In a low- or middle-income economy with a higher degree of market failure, especially in capital markets, the risk of starting a new business is higher, and therefore, people tend to prefer being hired by a big business. In contrast, in a high-income economy with a lower degree of market failure, the risk associated with startups is lower than in low- or middle-income economies. In this context, it makes sense to promote the growth of big businesses in low- or middle-income economies with the anticipation that such big businesses will generate more startups at later stages of development.

However, these linkages between big businesses and SMEs are not automatic and, therefore, may require policy intervention. South Korea, like other countries, has tried many policies to promote SMEs and startups; many of them, however, were unsuccessful. Nevertheless, there are several policy initiatives that have proven to be effective. As is explained below, their common success factor is that they have all tried to mobilize synergies and spillover between SMEs and large firms to correct various failures in markets, systems, and capabilities.

In South Korea, one such successful intervention was the so-called AMC (advance market commitment) R&D program, which involved supporting the R&D programs of SMEs so that SMEs could develop parts and supplies on the advance commitment by big businesses and state-owned enterprises to use and purchase them once they are developed successfully.[14] The nature of the program is similar to the AMC used to develop vaccines.[15] Such a program is advantageous, as it is designed to overcome coordination and system

[14] Information about this program is based on Korea-ITEP (2009), Shin (2016) and Shim and Seo (2015).

[15] Please refer to the information about AMC available at https://fiftrustee.worldbank.org/en/about/unit/dfi/fiftrustee/fund-detail/amc (retrieved on 2023-10-20).

failures. The nature of coordination failure is as follows. On the one hand, SMEs do not want to take the risk of launching R&D projects to develop parts and supplies without a guarantee that large assembly companies will purchase their products. On the other hand, large assembly companies tend to purchase high-tech parts and components from foreign suppliers because they are uncertain about the quality of comparable products made by domestic SMEs. Given the South Korean government's mandate to promote local value chains and domesticate the production of formerly imported parts and components to save dollars, the government intervened between supplier SMEs and large client firms and devised a scheme to overcome this coordination failure by mobilizing public R&D.

According to South Korea's AMC R&D program, products to be developed are first proposed by either large user firms or supplier SMEs; subsequently, a government agency evaluates the request and decides whether to support it. Once approved, the SME receives an R&D subsidy for two to three years, which covers 55% to 75% of the total R&D expenses. Once an SME is able to generate revenue, it must pay back up to 20% of the received subsidy as a royalty. This program began in 2002 on an experimental basis. Support was provided to thirteen SMEs, with an average subsidy amount of 70 million won. Since then, it was expanded in scale and scope. In 2005, eighty-seven SMEs received an average subsidy of 110 million won (about $110,000) each. In 2010, this had expanded to 214 SMEs receiving an average annual subsidy of 280 million won, involving 177 large user firms. As of 2022, this program is still in operation, indicating its success relative to other programs that were suspended due to ineffectiveness. This initiative was successful because it was designed not only to correct coordination failures but also to promote R&D collaborations between large user firms and supplier SMEs, thereby enhancing the know-how and capabilities of SMEs.

The second policy initiative designed to promote SMEs in South Korea was the opening of a secondary stock market to handle market failures facing new firms in financing their investment in

capital market. On this secondary stock market, the requirements for a startup or SME to be listed for an initial public offering were less strict than those for the primary stock markets. This secondary market established by the South Korean government is known as the KOSDAQ (Korean Securities Dealers Automated Quotations) and it is equivalent to the NASDAQ (National Association of Securities Dealers Automated Quotation) in the United States.[16] Since opening in 1996, the KOSDAQ has grown rapidly. At the end of 1997, there were 359 firms listed in the market, and by February 2000, there were 469 firms listed. The market value of the KOSDAQ has grown from 7 billion won (about $6 million) at end of 1997 to 105 trillion won (about $100 billion) by February 2000. If we compare the KOSDAQ with the Korean Stock Exchange (KSE), the number of the listed firms is not small, since there are only 725 firms listed in the KSE in 2000. In terms of market value, the aggregate market value of KOSDAQ firms is currently below that of the KSE; however, when KOSDAQ reached its peak in 2001, its market value approached that of the KSE, with as many as 153 new firms listed in 2002.

The KOSDAQ market mainly targeted so-called "venture companies," which are technology-oriented startups that spend more than 5% of their sales on R&D and receive venture capital investment. Out of the 469 firms listed on the KOSDAQ in 2000, 150 were officially classified as venture companies. These companies were specifically promoted via a law enacted in 1997 to promote startup and venture companies. It is also notable that beginning in December of 1997, South Korea suffered a financial crisis and bankruptcies of some chaebol firms, which led to the IMF bailout. Many of the entrepreneurs who founded these companies were former employees of big businesses and chaebols, where they had built up their experiences, skills, and technological know-how. Moreover, the 1997 crisis was an important trigger factor, as one-third of the top thirty chaebols

[16] Information about KOSDAQ and the related startups is all from Lee and Kim (2000) unless noted otherwise.

declared bankruptcy and had to fire many employees. Subsequently, in 1999, venture companies experienced their first boom, which coincided with the post-crisis turnaround of the Korean economy, which witnessed 9% real growth.

This growth was not simply natural; rather, it should be partly attributed to the policy commitments made by the new Kim Dae-jung government, which promised to transition from a "chaebol-led" to a "venture-led" economy. In 1998, the Korean government promulgated the Five-Year Plan for the Vitalization of Venture Companies. Being labeled a "venture" company benefited South Korean firms, as it guaranteed firms substantial tax benefits and exempted them from the strict requirement for being listed in the KOSDAQ. According to the Office of the SME, the number of venture companies grew from a mere 304 in May 1998 to 6,004 in March 2000. The value of the products of these venture companies accounted for about 4.8% of GDP in 1999, and these companies hired a cumulative total of 180,000 workers.

The KOSDAQ experienced a phenomenon similar to overheating in 2001 due to many individual investors rushing to purchase stocks in expectation of quick capital gains. In the early 2000s, even big businesses expressed concern as they witnessed many of their former employees quit their jobs to create startups. Furthermore, in July 2013, the Korean government created a third stock market called the Korea New Exchange (KONEX), which was to offer public listing opportunities for less qualified firms than those on the KOSDAQ. As of 2022, there are about 130 firms listed on the KONEX.

China has also created two secondary stock markets. The ChiNext, which was formed in 2009, is a NASDAQ-style subsidiary of the Shenzhen Stock Exchange. The Shanghai Stock Exchange Science and Technology Innovation Board (SSE STAR Market) was formed in July 2019. It was launched with an ambition to rival the NASDAQ, and by July 2020, it was ranked second globally for capital raised via IPOs. As of October 2022, it

Table 6.1 *Platform companies' year of establishment and stock market listing: The United States, China, and South Korea*

Company	Founded	Listed	Origin	Exchange market	Years taken for listing
Google	09-04-98	08-19-2004	USA	NASDAQ	6.0 years
Amazon	06-05-94	05-15-1997	USA	NASDAQ	2.9 years
Facebook	02-04-04	05-18-2012	USA	NASDAQ	8.3 years
Baidu	01-01-00	08-05-2005	China	NASDAQ	5.6 years
Alibaba	06-28-99	09-19-2014	China	NYSE	15.2 years
Tencent	11-11-98	06-16-2004	China	HKEX (Hong Kong)	5.6 years
Naver	06-02-99	10-29-2002	Korea	KOSDAQ	3.4 years
Kakao	02-16-95	11-11-1999	Korea	KOSDAQ	4.7 years

Source: Announced documents of each stock exchange market (USA, China, Hong Kong, and Korea)

had 480 listed firms, including some multi-listed firms, such as SMIC, China's fast growing semiconductor foundry.[17] Although the amount raised via IPOs on Chinese stock markets (approx. $35 billion) was more than double that raised on Wall Street (approx. $16 billion) as of June 2022, much of the fundraising occurred on the Star Market and ChiNext Market, with the majority raised by companies in the fields of renewables, semiconductors, and other high-end manufacturing sectors.[18]

These secondary stock markets have served as a key vehicle for startups to grow into big business and have enabled venture capital to quickly recoup their investments. Table 6.1 shows the number of years it took several startups to be listed on various stock markets, such as NASDAQ in the United States, KOSDAQ in South Korea,

[17] http://star.sse.com.cn/star/en/infodisclosure/newsrelease/c/c_20221103_5711260.shtml (retrieved on 2022-12-17).

[18] "China IPO fundraising doubles US total to top global ranks." *Financial Times*, 2022-06-20. www.ft.com/content/752f69f2-393e-4f32-ad15-798b9a6e8b0a (retrieved on 2022-06-20).

Table 6.2 *Cumulative numbers of unicorns created by country, 2012–2021*

Country	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
USA	11	19	52	102	129	169	240	324	415	728
China	1	1	7	39	66	98	143	173	189	217
India	1	2	3	5	7	8	15	24	40	88
UK	0	0	0	3	7	13	22	29	36	58
Germany	0	1	2	4	5	6	11	16	17	35
Israel	0	1	1	2	2	2	6	12	19	34
France	0	0	0	1	1	1	1	4	8	20
Korea	0	0	3	4	5	8	10	14	15	19
Brazil	0	0	0	0	0	0	2	5	7	19
Singapore	0	0	2	2	2	2	4	7	9	18
Canada	0	1	2	2	2	3	4	5	7	17
Australia	0	0	1	1	1	1	3	3	6	10

Source: Author's tabulation using CB insights and Tracxn data; www.cbinsights.com/research-unicorn-companies/; https://tracxn.com/d/unicorn-corner/home

and the Hong Kong Stock Exchange. It took 3 years for Amazon to be listed, 6 years for Google, and 8.3 years for Facebook. Therefore, it is interesting to note that the years taken for comparable platform firms in Korea are not that different from US platforms. Indeed, it took Naver, the Korean equivalent of Google, 3.4 years to be listed on the KOSDAQ, and it took 4.7 years for Kakao, the Korean equivalent of Facebook, to be listed. Similarly, Baidu, the Chinese equivalent of Google, took 5.6 years, compared to Google's 6 years, to be listed on the NASDAQ. Tencent, the Chinese equivalent of Facebook, took 5.6 years to be listed on the Hong Kong Stock Exchange, whereas it took Facebook 8.3 years to be listed on the Nasdaq.

Further, Table 6.2 presents the number of "unicorns" generated by each country from 2012 to 2021. Not surprisingly, as of the end of 2021, the United States has generated the largest number at 728. China and South Korea have demonstrated comparable performances,

https://doi.org/10.1017/9781009456234.007 Published online by Cambridge University Press

generating 217 and 19 unicorns, respectively; Germany and France have generated 35 and 20, respectively.

The third example of successful policy intervention by the Korean government is the so-called "creative economy innovation center" program, which was instituted in 2014 to promote SMEs and startups.[19] Interestingly, this program was designed not only to handle market failures in financing but also to solve capability failures by SMEs by assigning a top business group to the respective innovation center in each of South Korea's seventeen provinces. Of course, not every province has achieved success, as success has been dependent on the commitment of the individual business groups. The most successful cases were Samsung in Gyongbuk Province and GS Group in Jeonnam Province. As of April 2021, this program had generated 9,854 startups. In 2016, the base year, 1,221 startups were created. In 2018, the program created 1,796, and in 2020, it created 3,432. These startups worked in partnership with 458 different facilitators, including universities, angel investors, venture capital, and public agencies, generating 25,508 jobs. In many cases, the initial commitment or investment by each assigned big business motivated other entities to join as investors or partners.

For the Gyongbuk Center, Samsung contributes 4 billion won (about $3 million) per year for equity investment into startups.[20] Samsung runs this center in conjunction with its Creative-Lab (C-Lab) Outside program, which is a Samsung program designed to support independent startups. In contrast, Samsung's Creative-Lab Inside program supports intra-Samsung ventures. Samsung's C-Lab program first began in 2012 to promote intra-Samsung ventures; it was expanded in 2015 to include a spin-off program. Finally, in 2018, the C-Lab Outside program was created to promote independent

[19] This information comes from the Ministry of SMEs and Startups website (www.mss.go.kr/), as well as www.korea.kr/special/policyCurationView.do?newsId=148865474 (retrieved on 2022-12-17).

[20] This information about C-Lab was retrieved on December 17, 2022, from: www.ftoday.co.kr/news/articleView.html?idxno=246484 (in Korean), and from www.ftoday.co.kr/news/articleView.html?idxno=246484 (in English).

startups outside of Samsung. The C-Lab Outside program provides selected startups with cash grants of up to 100 million won (approx. $80,000), office space, mentoring, and consultation services. The C-Lab Inside program offers current employees one year to pursue independent business ideas that may later evolve into a C-Lab spin-off. C-Lap spin-off founders are offered monetary grants and the option to return as an employee within five years.

Over the ten years from 2012 to 2022, a total of 846 startups were generated, including 385 inside Samsung and 460 outside Samsung, and many of them were awarded the Innovation Prize at the CES Convention. For instance, twenty-nine startups won this award in 2023. These startups have attracted equity investments of about 1.34 trillion won (approx. $1.34 billion) and have created about 8,700 jobs. Competition to be selected as a C-Lab startup is high, with approximately only 1 in 38 startups being selected.

This policy intervention designed to nurture startup hubs in the Creative Economy Center was more successful when it was instigated alongside another startup program called TIPS, or Technology Incubator Programs for Startups, which also started in 2013.[21]

6.5 THE ROLE OF GOVERNMENT IN THE DETOUR FROM SHORT- TO LONG-CYCLE TECHNOLOGIES

One important component of the innovation–development detour is the detour from short- to long-CTT sectors. This detour presents an intriguing question: Did policymakers in successful catch-up economies in Asia consciously prioritize short-cycle technologies when they developed their industrial development strategies? The answer to this question is "no"; however, they did constantly ask themselves, "What's next?" They keenly observed which industries and businesses were most likely to emerge in the near future and concentrated on developing strategies to enter them. New or emerging industries and businesses are often in short-cycle technologies because such sectors rely less on

[21] Information about TIPS came mostly from its website. Source: www.jointips.or.kr/global/.

https://doi.org/10.1017/9781009456234.007 Published online by Cambridge University Press

existing technologies. Therefore, without any specific planning, policymakers were, in effect, always pursuing short-cycle industries.

In the past, latecomer economies tended to enter new industries at later or mature stages. However, by replicating this practice of constantly seeking entry into new industries, emerging economies have begun entering new industries at increasingly earlier stages. In other words, the emerging economies discussed here evolved from being late latecomers to simply latecomers. And eventually, they are no longer latecomers at all, but rather competitors trying to become first movers in emerging industries. Another term for this process of latecomers achieving increasingly earlier entry compared to incumbents is leapfrogging (Lee, 2021b).

Moreover, with the accumulation of a high level and wide scope of technological capabilities, latecomers may try to enter long-CTT sectors during the post-catch-up stage, which follows the short-CTT specialization catch-up stage. In South Korea, the government has overseen the targeted promotion of biotechnology since the 1990s; this strategy is part of the shift from short- to long-CTT sectors in South Korea. Rather early on in 1994, the Korean government promulgated the Basic Plan to Promote Biotechnology. This plan was initially implemented from 1994 to 2007 under the name "Bio-Tech 2000," and it was based on the Law on Promotion of Bio-Technology.[22] In December 2001, the National Science and Technology Council approved the Basic Plan for the Third Stage for the Promotion of Biotechnology (2002–2007), which included public R&D investment worth 5 trillion won (approx. $5 billion) during the six-year period. The proportion of biotechnology investment to total government R&D was planned to increase from 8% in 2001 to 14% in 2005 and 20% in 2010. This plan was mostly realized. Public R&D investment reached 3.3 trillion in 2016, or 18.8% of total government R&D, and 3.5 trillion won in 2018, or 19.2%.[23]

[22] Information on this initial promotion of biotechnologies relies on Choi and Jung (2002).

[23] Based on Joint Task Forces for Innovative Growth, the Government of Korea (2020).

This promotion of biotechnology can also be understood as an example of always looking for "what is next" as a part of industry promotion and targeted specialization. In the 1990s, the Korean government funded R&D initiatives in an effort to attract participation from the private sector, and by the 2000s, just a decade later, an estimated 500 large enterprises and SMEs had entered the industry. In August 2003, the Korean government designated biotechnologies as one of "ten future growth strategy sectors."[24] However, although Korea started to file an increasing number of patents in this long-cycle sector as early as the early 2000s, the commercial success of these biotech initiatives did not become apparent until the 2010s. Additionally, in 2008, Samsung selected biotechnology as its one of the top five future business areas; however, it did not achieve meaningful success in this field until the end of the 2010s. This slow progress is not surprising, given the long cycle time and high barriers to entry typical of biotechnologies.

Therefore, there were two important windows of opportunity that enabled the growth of the biotechnology industry in South Korea by building on the initial efforts of the government. The first window was the arrival of new recombinant DNA technology, which enabled an innovation known as "biosimilar" (also known as "follow-on biologic" or "subsequent entry biologic"). Biosimilar is an almost identical copy of an existing product, the patents of which have expired. This theoretical knowledge and technology had been discovered earlier by researchers in advanced economies. However, the Korean firm Celtrion, which was established in 2000, was the first to develop the technology and commercialize it into an antibody biosimilar. The first biosimilar product was a medicine which was marketed under the brand name Remsima as a drug for autoimmune diseases. This world-first biosimilar was approved by the European Medicine Authority in May 2013, and from 2020 to 2022, it captured

[24] On this designation, refer to the information accessible at www.korea.kr/news/policyNewsView.do?newsId=20003234 and https://m.dongascience.com/news.php?idx=-49130 (retrieved on 2023-10-20).

60% of market share in the European market. Samsung Group had also entered the biotech field by establishing two subsidiaries. In 2011, it created Samsung Biologics, a contract manufacturing organization (CMO), and in 2012, it founded Samsung Bioepis. Samsung Biologics has already become a top global CMO firm with a total capacity of 364,000 liters among its three factories.

The second window of opportunity was the COVID-19 pandemic, which swept across the planet in 2020. The pandemic suddenly lowered entry barriers to biotechnology, medicine, and medical devices. Indeed, these sectors had long been high barrier-to-entry sectors subject to long clinical trial times and strict safety regulations. Taking advantage of this window, Korean firms made some progress as new contract suppliers of COVID-19 vaccines and medications, as well as various medical devices, including COVID-19 testing kits.

Witnessing these successes, eight of the ten top Korean chaebols entered the biotech and pharmaceutical sectors. Therefore, these sectors are expected to emerge as the next growth engines of the Korean economy following the IT sector. It is important to note that if there had been no initial public promotion of biotechnologies in the form of R&D initiatives, these two windows of opportunity might not have been taken advantage of by Korean firms.

6.6 SUMMARY AND CONCLUDING REMARKS

This chapter addressed the question of whether the concepts of detour and nonlinearity are applicable to the role of government. It presented the argument that the role of government should not decrease in a linear fashion during the development process but rather must increase at the upper middle-income stage, with the level of government intervention forming an inverted U-shaped curve.

Economic growth at the low-income stage is based on a country's comparative advantages and, therefore, does not require considerable direct government intervention in the affairs of firms. However, upgrading to enter high value-added sectors and catching up with the frontier during the upper middle-income stage may

require more direct intervention by the government, such as intervention to foster public–private R&D consortiums. Such intervention becomes necessary and is justifiable because firms at this stage face increased difficulty in terms of entry barriers, IPR disputes, and technology transfers. Normally, at this stage, the target markets tend to be oligopolistic, as incumbents enjoy near-total monopolistic domination in these markets.

To overcome the challenge of strategically managing global–local interfaces, two modes of government involvement, described here as slower and faster modes of catch-up, are possible. The slow but steady mode of catch-up corresponds to the case of the IT cluster in Penang, Malaysia, and the auto industry in Thailand, where the main focus of the public intervention was on re-skilling and up-skilling local labor forces so that FDI firms and MNCs would choose to stay put and engage in high value-added activities and hire local workers. The faster mode of catch-up more closely corresponds to the situation of Shenzhen and the Chinese auto sector. In both cases, asymmetric intervention was mobilized to foster domestically owned firms, as opposed to foreign-owned firms, and promote their R&D activities. The automobile sector in China also demonstrates that it is possible for a country to switch dynamically from the first mode, which is slower and prioritizes FDI firms, to the second mode, which is faster and prioritizes nurturing domestically owned firms while enhancing capabilities over time.

A final question addressed by this chapter was how to generate big businesses as an engine for growth beyond the middle-income stage, as well as how to promote the coevolution of big businesses and SMEs. This is a serious challenge for latecomers, given their high degree of market failure and the thinness and smallness of markets. Under such conditions, it is not surprising to see the emergence of business groups and conglomerates, which often accompanies public support in the form of debt guarantees for their loans from banks. Another alternative is to create and nurture state-owned enterprises by mobilizing all domestically available resources and competencies, and subsequently allowing these enterprises to go public through

IPOs. Then, at a later stage, these state-owned enterprises can be gradually privatized.

Finally, the coevolution of large and smaller firms may also require diverse forms of public intervention to overcome failures in markets, systems, and capabilities. Thus, this chapter has discussed useful examples of how to promote SMEs and startups. The policy interventions mentioned included establishing secondary stock markets to handle market failures, implementing AMC R&D programs to handle system failures, and operating startup incubating programs to solve capability failures via three-party commitments involving angel investors, subsidy-granting public agencies, and large firms.