

Creating your own path to move beyond the middle-income trap: lessons from Korea

Criando seu próprio caminho para ir além da armadilha de renda média: lições da Coreia

Paulo Henrique Assis Feitosa⁽¹⁾

⁽¹⁾ Universidade de São Paulo

Abstract

The development experience observed in Korea has been a symbol of successful catch-up for several decades. This process allowed its upward transition from middle income to high-income status and has drawn the attention of many streams of scholars. More recently, emergent research has improved our understanding of this experience and its policy implications for developing countries (Lee, 2013; 2016; 2019). This paper proposes a review of what this literature has to say about the mechanisms behind the successful path followed by Korea and a discussion of lessons to overcome the middle-income trap. It is argued that latecomers do not limit themselves to follow the path of technological development of the advanced countries and that alternative paths are possible. The main policy implication for latecomers is that a successful catch-up is possible yet difficult to achieve because it requires taking detours and leapfrogging into new technologies.

Keywords

catch-up, South Korea, middle-income trap.

JEL Codes O21, O14, D83.

Resumo

A experiência de desenvolvimento observada na Coreia tem sido um símbolo de catch-up bem-sucedido por várias décadas. Esse processo permitiu sua transição ascendente do status de renda média para a alta e tem chamado a atenção de muitas correntes de estudiosos. Mais recentemente, pesquisas emergentes têm melhorado a nossa compreensão dessa experiência e suas implicações políticas nos países em desenvolvimento (Lee, 2013; 2016; 2019). Este artigo propõe uma revisão do que esta literatura tem a dizer sobre os mecanismos por trás do caminho bem-sucedido seguido pela Coreia e uma discussão de lições para superar a armadilha da renda média. Argumenta-se que os países retardatários não se limitam a seguir o caminho do desenvolvimento tecnológico dos avançados e que são possíveis caminhos alternativos. A principal implicação de política para os retardatários é que um catch-up bem-sucedido é possível, mas difícil de alcançar, porque requer detours e leapfrog para as novas tecnologias.

Palavras-chave

catch-up, Coreia do Sul, armadilha da renda média.

Códigos JEL O21, O14, D83.

1 Introduction

The development experience undertaken in South Korea (hereafter Korea) is recognized as one of the most successful strategies of narrowing the gap with forerunning economies in terms of per capita income and avoiding a fall into the middle-income trap¹. It is argued that no nation has tried harder than Korea and come so far so quickly (Vogel, 1991) and this process led to the transition from a poor and technologically backward economy to a prosperous and modern country.

There are different interpretations of the rapid development achieved by Korea, yet the approaches that place learning and the mastery of new technologies at the centre of their analysis had a growing prominence and influenced the academic and policy debate (Amsden, 1989; Hobday, 1995; Kim, 1997; Pack; Westphal, 1986). More recently, emerging studies have further expanded these ideas to reveal that in the catching-up process the latecomer does not simply follow the path of technological development of the advanced countries (Lee, 2013; 2016; 2019). Thus, catch-up is more than a matter of relative speed in a race along a fixed track, and the technology is not designed into a cumulative unidirectional process.

Accordingly, the performance achieved by Korea is also explained by its ability to explore alternatives in the process of catch-up by skipping some stages and creating their own individual path, which differs from that taken by the forerunners. These findings reveal specific conditions for a successful transition to high-income status and have important implications for support policy design for countries that are stuck in the middle-income trap.

Although these new studies have expanded what we know about the successful Korean experience, the systematic attempts to take advantage of these advances in terms of policy lessons for latecomers are remarkably thin. This article fills this gap by offering a review of what this emerging view say about the successful path followed by Korea and critically discussing the policy recommendations that are derived to overcome the middle-income trap by less developed countries.

.....
 1 Situation in which middle-income countries deal with a slowdown growth as they get stuck between low-wage manufacturers and high-wage innovators. This trap exists because their wage rates are too high to compete with low-wage exporters and their level of technological capability is too low to allow them to compete with the advanced countries (Lee, 2013).

The review of this literature reveals that the income transition achieved by Korea was made possible by building capabilities and promoting business groups and that these efforts have enabled the creation of a development path that differs from the one taken by advanced countries. The main lesson for latecomers is that a successful catch-up is possible yet difficult to achieve because it requires taking detours and leapfrogging into new technologies.

The rest of the paper is structured as follows. Section 2 provides a brief historical overview of the upward transition process experienced in Korea. Section 3 describes the path that Korea has followed that has enabled it to achieve its results. A synthesis of lessons for latecomers taking detours and leapfrogging into new technologies is examined in Section 4. Section 5 summarises the conclusions and discusses their implications.

2 A historical perspective

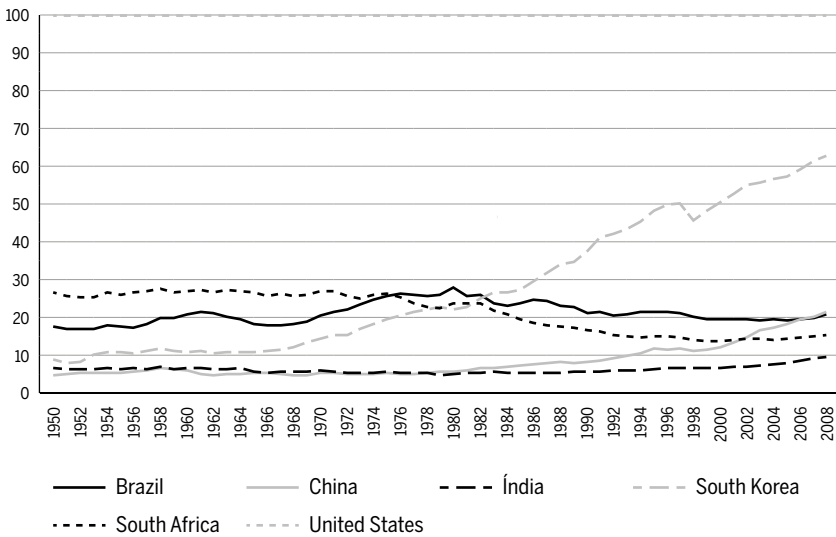
The concept of “catch-up” refers to the seminal work of Gerschenkron (1962) who describes the economic growth of continental Europe until it reached the United Kingdom at the end of the 19th century. Later on, Abramovitz (1986) popularized this concept by testing the hypothesis of convergence in productivity between industrialized countries and, consequently, influencing its adoption by several development scholars. Thus, catch-up is defined as the process of reducing the gap between the forerunning and latecomer economies. The narrowing gap vis-à-vis a leading country is measured in terms of productivity and income (Fagerberg; Godinho, 2005).

This definition is coherent with that proposed by Odagiri *et al.* (2010) when describing catch-up as the process by which a less developing country narrows its gap in income (“economic catch-up”) and technological capability (“technological catch-up”) in relation to the forerunner. Accordingly, the catch-up could be assessed by several indicators such as income, productivity, and technological capability and the measurement method depends on the objective and scope of the research.

Figure 1 compares the gross domestic product (GDP) per capita of select countries as percentages of US income levels between 1950 and 2008. In 1950, the per capita income of Korea was about 9% which was slightly

higher than China and India, respectively 5% and 6%, but was substantially lower than that of most other less developed countries such as Brazil (17%) and South Africa (27%). In the early 1980s, Korea reached the level of middle-income countries and by 1983 it had already surpassed the percentages of countries such as Brazil and South Africa². By the year 2000, the per capita incomes as percentages of US in countries such as Brazil and South Africa was only one-half or one-third that of Korea.

Figure 1 GDP per capita of select countries as percentages of the US income levels between 1950 and 2008



Source: Maddison (2010), author's elaboration. Per Capita GDP in 1990 International Geary-Khamis dollars.

An examination of this measure leads us to conclude that positive growth does not guarantee catch-up since Korea has also relied on faster growth in order to reduce its gap with its forerunners. Even in the 1980s, Korea had escaped the middle-income trap, unlike many comparable countries that were trapped at an income level of about 20–30 percent of the US level. This achievement is remarkable since between 1960 and 2008 as many as

2 These results are also observed by other measures. Lee (2013) presents a comparative view based on measures such as GDP per capita in constant dollars and purchasing power parity (PPP).

thirty upper middle-income countries fell into this trap and only twelve out of 101 economies joined the high-income club (World Bank, 2012).

Once these results are realized, an inevitable question is: how did Korea manage to escape the trap, and how did they continue to catch-up despite the odds? How were middle-income countries, based on this experience, able to make a breakthrough in this dismal situation, and build their own path in the upward transition to high-income status? This article attempts to answer these questions based on recent advances in research on how Korean catch-up was enabled by the country's creating its own individual path.

2.1 General and specific conditions

The review of the literature that attempts to explain the upward transitions from low to high-income status shows that some general conditions were common to the newly industrialized economies in Southeast Asia (Hobday, 2000). Based on the general conditions investigated, this article discusses three main ones. First, there was a relatively stable macroeconomic environment of which companies, workers and governments were able to take advantage (i.e. when compared to Latin American countries). This scenario was characterized by low interest rates, low inflation patterns and high savings rates. This relative stability provided an environment for long-term planning and investment (World Bank, 1993).

The second condition was the commitment of governments to eliminate illiteracy, ensure good quality basic education and provide vocational training for industry³. There is an apparent consensus on the rationale that the skilled workers (also in the public sector), are a critical element for creation and diffusion of the knowledge that fosters the catch-up with their forerunners. This human-centered perspective, providing universal education to the entire population, ensured an adequate supply of workers, technicians and engineers required by industrial development (Amsden, 1989; Wade, 1990).

The third condition was the industrial policies of each country that were outward-oriented and benefited firms through the promotion of ex-

³ In Korea, these efforts can be seen by the number of researchers who went from a mere 10,000 in 1975 to approximately 100,000 in 1993 (Kim, 1997).

ports. These interventions encouraged local firms to overcome their initial gap when compared to international markets and functioned as an instrument for learning and technological investments. In the case of Korea, this industrial policy is an example of a successful intervention since the exports went from a mere \$ 40 million in 1960 to \$ 125 billion in 1995 (Kim; Nelson, 2000). The country migrated from exports in labour-intensive industries such as garments, toys, wigs, footwear in the 1960s to computers, semiconductors, automobiles, and other technology-intensive industries in the mid-1980s.

The successful export promotion policies are also explained by the role of the equipment manufacturing (OEM) system. These systems are a specific form of subcontracting where the product is made to exact specifications and the latecomer firms do not add much value. The Korean OEM system in 1990 represented between 70% and 80% of the total exports of the electronic sector and the three largest *chaebols*⁴ depended on this system in 60% of their exports (Hobday, 2000).

The general conditions were also combined with specificities that are fundamental to understanding Korean evolution. According to Kim (1997), four main peculiarities are highlighted. First, the Korean War (1950-1953) generated consequences that transformed a rigid social class system into a more flexible and less classist society. Moreover, socio-cultural factors were shaped as a result of the War, such as perseverance in situations of conflict and deprivation, the organizational discipline inherited from compulsory military service, the learning opportunities arising from the management of complex logistical support systems and the reinforcement of a nationalist feeling.

Second, the existence of a strong government that led the industrialization process, setting ambitious targets and guiding the private sector with incentives and sanctions⁵. Firms received incentives and the export performance was the practical yardstick for assessing progress toward the objective of international competitiveness (Pack; Westphal, 1986). The decision-making process was centralized by the president but was relatively

4 Korean *chaebols* are large conglomerate business groups centered around diversified trading companies. Since the mid-1970s companies have been Korea's engine of exports and economic growth. On the other hand, the emergence of this organizational model also raises inequality indicators, since growth is driven by a few large companies.

5 In contrast to the industrial policy of many countries, for example in Latin America, that have typically used too much of the carrot and too little of the stick (Rodrik, 2004).

effective and efficient since it was supported by a competent bureaucratic apparatus who formulated and executed the development programs⁶.

The third specificity is the role of the government in using crises as a mechanism of learning and technological transformation. This strategy consists of the deliberate imposition of several crises on firms as a way to boost the adoption of ambitious goals. These crises generated intense pressure to create the urgency for changes by causing administrative coalitions to reach consensus on certain organizational goals and leading other members to accept them. Government agencies did not hesitate to impose these strategies by authoritarian means and also by adopting coercion, which made Korean firms understand that it would be better to agree to be able to continue to exist⁷. In addition, the creation of crises has generated an increase in the intensity of efforts in the search, both at the individual and organizational level, of alternative actions to transform them into creative ones. Consequently, the government has become an important facilitator of firm learning (Kim, 1997).

Finally, a fourth feature is the existence of skilled and dedicated workers who were responsible for running the engines of the Korean industry. These workers were hired for long workdays to make Korea's success a reality. For instance, workers in the manufacturing sector had an average workload of 53.8 hours per week in 1985, while in other OECD countries the average was between 33.1 and 42.8 hours. This determination of Korean workers can be explained by at least five circumstantial factors: obstinacy, which is a national feature; the *han* psyche⁸; conditioning during school life; the physical environment; the collective desire to "overcome Japan"; the experience of deprivation (Kim, 1997).

3 The Korean transition pathway

The existing literature addresses different reasons for explaining the path followed by Korea that enabled the rapid growth of its backward econo-

6 See Lee and Lee (2016) for a discussion of the role Confucian state in Korea.

7 In other words, the government was much more authoritarian in Korea than in Japan and Taiwan, especially in the 1960s and 1970s.

8 The Korean word *han* means "resentment" or "grudges" and defines a common feature of the mentality of Koreans that has multiple causes and was triggered for different reasons. For a detailed discussion see Kim (1997).

my⁹. According to authors such as Young (1995), Kim and Lau (1994) and Krugman (1994), the explanation lies in the high investment rates that allowed for rapid growth through movements throughout the production function¹⁰. Nelson and Pack (1999) classified these arguments as “accumulation theories” where the relevant portion of the growing production can be explained by the increase in physical and human capital, which almost automatically brings technology as a by-product. Furthermore, what this approach often omits is that such accumulation would have occurred in severely decreasing returns, had it not been for improvements in technological knowledge, ensuring that the available factors were used efficiently (Pack, 2000).

In contrast, another stream of research argues that physical and human capital accumulation is insufficient to account for this unprecedented growth. Accordingly, the learning of new technologies and how to master them is crucial in their analysis (Amsden, 1989; Hobday, 1995; Kim, 1997; Pack; Westphal, 1986). Nelson and Pack (1999) classify these arguments as “assimilation theories” since they stress, in addition to the investment rate, risk-taking efforts, effective learning and innovation itself.

More recently, following these assimilationist views, renewed efforts have been made to improve our understanding of this process and its policy implications in developing countries (Lee, 2013; 2016; 2019). These efforts are committed to finding “binding constraints” of countries according to their income levels and structural differences (Rodrik, 2006), in contrast to attempts of the mainstream to find a universal factor for economic growth. Based on the Asian experience, these studies have argued that catch-up is not a matter of relative speed in a race along a fixed track, and technology is not developed into a cumulative unidirectional process, as was assumed by previous studies¹¹ (Perez, 1988). Therefore, latecomers do not limit themselves to follow the path of technological development of the advanced countries and could skip some stages or even create their

.....
 9 As expected, this work is not able to fully cover the reasons faced by the literature and may not adequately deal with approaches such as those centered on the relative endowment of natural resources or geopolitics. An example of this lack is the debate concerning the role of the favourable external context faced by Korea in critical periods of its development.

10 Moreover, some claim this growth was not so remarkable and “mainly a matter of perspiration rather than inspiration-of working harder, not smarter” (Krugman, 1997).

11 An exception is Dahlman *et al.* (1987) who adequately recognize the specifics of the process of combining foreign and local technological elements.

own individual path, which differs from that taken by the forerunners (Lee; Lim, 2001).

The following sections explore in a historical perspective how overcoming obstacles such as the intrinsic difficulty of building innovation capabilities and the lack of world-class businesses have enabled Korea to cross the narrow transition path to high-income stage. From this experience, some lessons are also presented for the design of policies in developing countries to free themselves from the middle-income trap.

3.1 Building innovation capabilities

The crucial step in the Korean upward transition from middle income to high-income status was the building innovation capabilities at the firm, sector, and national level. The country was successful in dealing with an obstacle named “capability failure”, that is a consequence of the lack of opportunity for effective learning and capability building (Lee, 2013). This failure is a distinctive feature of latecomer context, where firms are endowed with extremely weak levels of capacity, which limits their ability to search and lead in-house R&D. Since incentives are absent, undertake R&D becomes an unsafe investment and with high uncertainty about its return (Lee, 2019). Thus, the Korean public intervention for promoting the enhancement of capabilities was able to offer different methods over their dynamic course of learning¹².

Another obstacle that deserved special action was the “system failures” that occur when missing or weak connections (and synergies) among actors produce a poor performance of an entire national innovation system (NIS) (Lee, 2013). In less developed NIS there is a lack of interaction between scientific and technological knowledge and institutions that catalyse this interaction are required to overcome specific thresholds (Bernardes; Albuquerque, 2003). Therefore, the system failure arises when the country builds up a certain level of capacity and the virtuous circle related to the functioning of dynamic complementarities is not able to work (Lee, 2019).

The main explanation for this failure is the increasing mismatches or misalignments in the accumulation of tacit knowledge among the NIS

12 An example of the results achieved by this policy is the number of business R&D units that expanded from 12 to 1,690 in less than two decades, between 1975 and 1993 (Kim, 1997).

agents, which result in an increase in their cognitive distance and a vicious circle of low interaction and learning (Lee, 2019; Nooteboom *et al.*, 2007). The possible evidence that Korea knew how to deal with system failure is that the main indicators of innovation activities such as spending on R&D and the number of researchers observed significant growth in the private and government sectors, albeit in different proportions (Lee, 2000).

There is a rich literature that demonstrates the Korean process of building capacities at sector level (Hobday, 2000; Lee, 2000; Westphal *et al.*, 1985) and also the national level (Kim, 1993). More recently, studies have focused on the role of Korean firms as a device for monitoring and assimilation of the knowledge produced abroad (Lee, 2019). Since the early 1990s, these firms began to establish overseas R&D posts as well as in-house R&D laboratories so as not to their access to knowledge through simple licensing. This active learning process involves the establishment of Co-Development Contracts and was crucial for the Korean Hyundai Motors in the joint venture with the Japanese Mitsubishi, where the former simply assembled the cars and the latter offered engines and other key components (Lee, 2019).

The firm-level accumulation of technological knowledge was also made possible by an adequate intellectual property regime (IPR) which protects both conventional and minor innovations. The 1961 revision of the Korean IPR enabled the intense exploration of utility models (Petit Patents) instead of regular innovation patents¹³. Since the utility models may function as useful alternative outlets for emerging innovation, this reform changed the incentives for innovation¹⁴. In a context where firms are lagging behind and heavily dependent on imported technology and reverse engineering, the reformulation of IPR was critical for learning from foreign technologies (Lee, 2019).

Other forms of intellectual property such as the trademark are also candidates to reveal the variety of capabilities used for Korean technological development. While patents are an indicator for inventive activities, trademarks are an effort to enhance quality and reputation in product markets. Since the 1960s, the change in the application patterns of intel-

13 For a more details about the Korean IPR evolution, see Lee and Kim (2016).

14 The adoption of such strategies is much more difficult today, especially after Trade-Related Aspects of Intellectual Property Rights (TRIPS), a multilateral agreement towards the global harmonization of IPRs that increased the level of IPR protection in developing countries.

lectual property (regular, utility model and trademark), when considering the sectoral differences, reveals the 1990s as the transition period for the Korean catch-up model from imitative to innovation-based technologies (Kang *et al.*, 2019).

Korean ability to build innovative capabilities is also explained by the time cycle of technologies that it has specialized in during different stages of the catch-up process. Since the knowledge becomes obsolete over time, the speed of this obsolescence tends to affect the chances of learning. Over the last three decades, these capabilities were built from specialization in short-cycle, less tacit, and high modularity technologies and made it possible to enter industries such as memory chips, cell phones, and digital televisions. This specialization enabled this country to increase the local creation of knowledge and thus local value-added, given the capacity of short-cycle technology-based sectors to broaden the chances of an economy to rapidly increase its degree of knowledge localization (Lee, 2013).

However, this is a game of “chasing a moving target” and once a certain level of technological diversification is achieved, new frontiers for building innovation capabilities are open for exploration. Since the 2000s, Korean firms like Samsung have been pursuing long-cycle technologies such as pharmaceuticals and medical equipment (Lee, 2019).

The way in which Korea has seized learning opportunities and build capacities from global value chains (GVC) is a process that deserves attention. The evidence reveals that the joining GVCs was successful because it was able to avoid getting stuck in performing low value-added activities without value upgrading. Moreover, this integration was based on “in–out–in–again” strategy, where at the initial stage, the participation in GVCs was undertaken to allow learning from outside, then a reduction in participation creates spaces for an increase of domestic value-added and finally a reintegration was promoted after the construction of its own chains (Lee, 2019; Lee *et al.*, 2018).

3.2 Promotion of business groups

The upward transition from middle to high income depends on business models of all sizes, however big businesses have a significant causal effect on economic growth compared with SMEs. According to the Schumpete-

rian framework, large and quasi-monopolistic firms are the organizational model capable to exploit economies of scale and scope in the catch-up process¹⁵. Korea is an example since the number of Fortune 500 companies has increased from eight in the early 1990s to fifteen in the mid-2010s. The econometric exercises proposed by Lee (2013) shows that this increase had a significant positive effect on the economic growth of that country¹⁶.

The lack of world-class businesses in developing countries is conceptually defined as “size failure”. Within these contexts, the market space that would be occupied by large companies (as in developed countries) is filled by small and medium-sized firms, which are perceived as an insufficient organizational form to free latecomers from the middle-income trap. Following this rationale, the catch-up process requires a certain number of big business and many emerging economies have a smaller number of big business than that predicted by their sizes, while many developed countries tend to have a larger number of BBs than that predicted by their sizes, as shown by Table 1.

Table 1 Number of global Fortune 500 firms by selected countries

Country	1994	1997	1998	2001	2005	2008	2009	2010	2014	2015	2016
Korea	8	12	9	12	12	14	10	14	17	15	15
Brazil	2	5	4	4	4	6	7	7	7	7	7
China	3	4	6	11	20	37	46	61	98	103	109
India	1	1	1	1	6	7	8	8	7	7	7
South Africa	0	0	0	0	0	0	0	0	0	0	0

Source: Lee (2019), author's elaboration.

The growth and consolidation of these large businesses are also critical factors that enable the building of innovative capabilities described in the previous section. As big businesses take the form of business groups (BGs) they become a mechanism by which countries achieve high levels of knowledge production and capacity to undertake R&D and marketing activities with higher value-added (Lee, 2019; Lee *et al.*, 2013).

15 Despite this, the benefits of big business are a controversial topic in literature. For instance, Fogel *et al.* (2008) find faster economic growth in countries where big business is less stable over time.

16 The elasticity of Fortune's BBs with respect to GDP per capita growth rate is about 0.01. Put differently, if the number of companies increases by 10%, then the GDP per capita growth rate increases by 0.1% points (Lee *et al.*, 2013).

The business group can be defined as collections of firms bound together in some formal and/or informal ways, characterized by an “intermediate” level of binding (Granovetter, 1995). In this business model, affiliated firms are encouraged to enter new markets and for this purpose they receive subsidies at different stages of business evolution, creating incentives for growth and mitigating the risks involved. Moreover, bind firms can enjoy the advantages of resource sharing and knowledge spillovers among themselves which increase their innovation capabilities (Cheong, Choo; Lee, 2010). One example is the case of Samsung when it entered the memory chip ventures in the 1980s. The group suffered seven years of losses that were only dampened by the profits of other affiliates (Lee, 2019).

Korean business groups, also known as *chaebols*, originated mostly from small businesses and expanded dynamically through rapid organizational learning¹⁷. Despite criticism for being one of the causes of the 1997 Asian financial crisis, are still seeing as symbols of economic growth. Many scholars investigate the reasons why many *chaebols* continued to prosper after surviving the crisis and their re-emergence in the 2000s. Since *chaebols* have a persistent family-controlled structure, a common argument for this post-crisis turnaround was the focus on corporate governance issues. However, a capability-based view tends to recognize the role of resources and seeks to explain this prosperity due to enhancing the technological capabilities of the *chaebols* (Choo *et al.*, 2009).

Big business in Korea was also boosted by the creation of state-owned companies (SOEs), although with different potentials to build innovation capacities, according to the technological intensity of the sectors in which they operate. These companies are nurtured by the state apparatus and privatized as they become more competitive by international standards. Leading Korean firms that were originally SOEs are POSCO (a global steel firm), Korean Air (a global air-carrier), Doosan Heavy Industry (a turbine producer) and SK-Telecom (a top telephone service firm).

3.3 Skipping stages and path-creating

The final stage of the Korean catch-up was reached after the 1980s when

17 For example, Samsung and Daewoo started as a small import and export business, Hyundai as a small construction company and LG as a face cream maker (Kim, 1997).

it virtuously entered into a newly emerging techno-economic paradigm, bypassing investment in an old one and leading the new paradigm era. This leapfrogging was possible due to its ability to promote radical reversals of market shares and occupy central spaces in industries dominated by high-income economies. This “long jump” into higher-end goods was the reason why this country was able to rise beyond middle-income status to become a high-income economy.

The leapfrogging was preceded by a long process of capacity building from the 1960s to the 1980s, in which the country adopted a safe mode of “path-following” catch-up. Since the final stage of the catch-up is surrounded/permeated? by high uncertainties about its results, firms and industries were only able to move in that direction when they had built a certain level of capabilities.

At this final stage, the country also registered turning points in innovation activity indicators. In the mid-1980s the share of the private sector in total R&D expenditure surpassed 50% and the R&D/GDP ratio surpassed 1% (Lee, 2016). Table 2 shows that in the early 1980s other potential candidates for the leapfrogging were investing more than Korea in R&D as a proportion of GDP, but this scenario was reversed in the 2000s when the country became a leader in these efforts.

Table 2 R&D/GDP ratios in selected countries (%)

Country	1965	1980	2000
Korea	0.5	0.56	2.65
Brazil	0.3 (1974)	0.6 (1982)	1.04
China		0.68 (1985)	1.00
India	0.4 (1968)	0.7 (1982)	0.85
South Africa		0.89 (1985)	0.62*

Source: Lee and Kim (2009), author's elaboration. R&D/GNP ratios are in bold. Note: *Average of 1988 and 2002.

The turning point is also seen from an outcome measure such as patent applications. Table 3 reveals that the selected countries had a small difference in the number of patent applications in the early 1980s and an expressive

gap emerges with the Korean leadership in the 2000s. Put differently, these differences represent the priorities that countries allocate to the enhancement of their long-term growth potential, particularly innovation capability.

Table 3 US patent applications from selected countries, 1965–2000

Country	1965	1980	2000
Korea	1	33	5,705
Brazil	33	53	137
China		7	469
India	10	23	438
South Africa	99	203	209

Source: Lee and Kim (2009), author's elaboration.

The capacity building and existence of business groups are necessary but not sufficient to achieve the leapfrogging, which also relies on changes in industry leadership. This dynamic is explained from the so-called catch-up cycle framework and deals with diverse factors at the firm, industry, and even national institution levels and the interactions among them (Lee; Malerba, 2017). According to the notion of “windows of opportunity” (Perez; Soete, 1988), the chances for late entrants can appear thanks to three factors: the rise of a new techno-economic paradigm that tends to threaten the advantage of existing first movers or incumbents; the business cycle and/or rapid change in market demand, including the increase in new consumers; and the government generating an asymmetric environment for incumbents and entrants through a range of regulations.

Following this framework, the Korean leapfrogging is also explained by taking advantage of the windows of opportunities associated with the rise of digital technologies (Lee *et al.*, 2016). Korean firms have benefited from the growing demand for consumer electronics. An example was the case of Samsung, that was able to take over the Japanese incumbent Sony¹⁸. The replacement of analogue technologies by digital ones in products such as digital televisions and cell phones provided the real chance to Korea to leapfrog ahead of Japan (Lee; He, 2016; Lee; Jung, 2016).

These results have been achieved in several “paths” along with the evolution of industries and countries. Latecomers firms have some options for

18 Lee *et al.* (2005) explain how the public-private R&D consortium was fundamental to Korea developed its own licensed digital TV technology from Western firms.

a possible entry or catch-up, such as path-following, stage-skipping, and path-creating, in which “path” means the trajectory of technologies and “stage” pertains to phases in trajectories (Lee; Lim, 2001). The path-following catching-up means that the latecomer firms follow the same path as that taken by the forerunners but in a shorter period. In the case of stage-skipping catching-up, the latecomer firms follow the path to an extent but skip some stages, and consequently save time. Finally, the path-creating catching-up option enables the latecomer firms to explore their own path of technological development.

Kim and Lim (2001) use this model to explain the different technological evolution of the selected industries in Korea and identify the path-creating catching-up in CDMA mobile phones, the path-skipping catching-up in D-RAM and automobiles, and the path-following catching-up in consumer electronics, personal computers and machine tools. These authors also recognize the first two case of catching up as “leapfrogging”¹⁹.

Another example is the steel industry in the late 1990s, when the state-owned enterprise POSCO was successful in surpassing the leadership of the Japanese Nippon Steel. Posco achieved this position in two phases, initially adopting a path-following strategy of importing mature technologies from Japan and then moving to the stage-skipping strategy by utilizing the price reduction caused by the economic downturn as an opportunity for increasing its facilities and updating its technologies (Lee; Ki, 2017).

4 Lessons for latecomers

The early stage of Korean development is one of the main experiences of catch-up based on learning and mastering ways of doing things that are in use in the leading countries. In advanced stages, the success came from its ability to go beyond merely following the path of technological development in advanced countries (Lee; Lim, 2001). This is due to the fact that although practices in forerunners usually provide a model, the needs of latecomer countries inevitably differ in various and important ways from the existing templates (Mazzoleni; Nelson, 2007). This is also illustrated by the paradox that states “to be similar, you’ve got to be different” which

¹⁹ See Lee and Lim (2016) for a more detailed analysis on the patterns of technological catch-up across Korean industries.

means that while catch-up means trying to be similar, the long-term success requires a different path from that adopted by developed countries (Lee, 2019).

The Korean upward transition from middle to high-income status was a narrow pathway since these are possible events but at the same time rare to occur. Despite this, lessons on possible paths for latecomers are increasingly needed in a world characterized by cumulative polarization between rich and poor economies in terms of innovative intensity (Castellacci, 2011) and persistent heterogeneity in R&D intensities among firms in the same sector (Coad, 2019).

One of the main messages of the model proposed by Lee (2013; 2016; 2019) is that the successful transition to high-income status in Korea was due to “detours” and “leapfrogging”, the former due to its ability to do different things from those done by the forerunners and the latter by doing something new ahead of the forerunners. Based on a comprehensive theory of catch-up economics, this approach consists of “late entry – detours – leapfrogging” and this elaboration is critical for latecomers since it deals with the paradox that is *“one can never catch up if they keep catching up, where the former “catch up” means closing the gap or overtaking and the latter “catching up” means imitation”* (Lee, 2019, p. 182).

The first detour is the establishment of an intellectual property regime that facilitates imitative innovation instead of following the rigid patent regimes in advanced countries. This goal would be achieved by promoting petit patents instead of regular invention patents, aiming to increase their innovation capabilities in the intermediate stage and generate patentable innovations of higher level in the later stage. This proposal is based on the notion that different forms of intellectual property regime have varying effects on different stages of economic development.

The promotion of trademarks rather than regular patents for invention is another promising strategy for latecomers. This registration effort is a brand strategy and can encourage firms to make high-quality products and adhere to a steady level of quality. Depending on the sector, a product made using tacit knowledge can be protected and distinguished from competitors in the market, which guarantees the establishment of market power that can be critical for the growth of firms.

The second detour consists in the specialization in short-cycle technology-based sectors and products (i.e., information technology) in the first

stages of development and, only at a later stage, in long-cycle sectors and segments (i.e., pharmaceuticals). In sectors such as information technology, the specific knowledge and technologies tend to be outdated quickly and frequently and therefore the extensive experience of firms in the frontier countries is no longer considered a great advantage. This directing of efforts towards short-cycle technologies is promising because the entry barriers are low and the possibilities for growth are greater due to the high innovation frequency that often disrupts the dominance of the incumbent.

Finally, the third detour refers to joining the global value chains (GVC) by the creation of domestic value-added and reducing the dependence on foreign value-added. There is a certain enthusiasm about the possibility of overcoming the middle-income trap from joining value chains (Baldwin, 2016). In contrast, scholars state that merely joining does not guarantee entry into higher value-added segments and involves the risk of being stuck in low value-added activities (Lee, 2019; Lee *et al.*, 2018). The review of experiences shows that Korea (also Taiwan and China) have been able to create more domestic value-added after learning through their participation in these value chains. In contrast, the integration model with a high degree of GVC participation pursued by Mexico and Thailand has resulted in performing low value-added activities without achieving success in escaping the middle-income trap.

Accordingly, policies for joining value chains in latecomers should pay attention to the Korean lesson on the importance of local creation of knowledge and thus local value-added. This detour is related to the former since the specialization in short-cycle technologies can augment the possibility for latecomers to increase their degree of knowledge localization. Latecomers can take advantage of the link between knowledge localization and short-cycle technologies since the adoption of such technologies suggests a reduced reliance on existing or old knowledge stock.

5 Concluding remarks

This article reviews emerging studies on the path followed by Korea in the upward transition to high-income status and critically discusses the resulting policy recommendations for less developed countries to overcome the middle-income trap. It is argued that this transformation required some

general conditions – such as macroeconomic stability, education system and industrial policies – be combined with circumstantial factors and particularities in Korea. However, these conditions were necessary but not sufficient to reduce the gap between the forerunning and latecomer economies since failures can arise during the process.

The review of emerging studies reveals that the income transition achieved by Korea since the 1980s was possible by building capabilities at the firm, sector, and national level and promoting big businesses in the form of business groups (Lee, 2013; 2016; 2019). These efforts have enabled the country to create a different path of development and not merely follow the path of technological development of the advanced countries.

For latecomers, the main lesson from Korea is that a successful catch-up is possible but rarely achieved because the transition path is very narrow and requires taking detours and leapfrogging into new technologies. Based on a comprehensive theory of economic catch-up comprising “late entry – detours – leapfrogging” (Lee, 2019), three distinct but complementary detours are proposed, namely: promote minor innovations instead of a high level of innovation via regular patents; specialize in short-cycle technologies rather than long-cycle technologies; and increase the share of domestic value-added rather than depend on GVCs with a low level of domestic value-added. Furthermore, it is also crucial for latecomers to pursue leapfrogging, which involves accomplishing something in advance of the forerunners.

References

- ABRAMOVITZ, M. Catching Up, Forging Ahead, and Falling Behind. *The Journal of Economic History*, v. 46, n. 2, p. 385–406, 1986.
- AMSDEN, A. *Asia's Next Giant: South Korea and Late Industrialization*. Oxford: Oxford University Press, 1989.
- BALDWIN, R. E. *The great convergence: information technology and the new globalization*. Cambridge, MA: Harvard University Press, 2016.
- BERNARDES, A. T.; ALBUQUERQUE, E. D. M. E. Cross-over, thresholds, and interactions between science and technology: Lessons for less-developed countries. *Research Policy*, v. 32, n. 5, p. 865–885, 2003.
- CASTELLACCI, F. Closing the Technology Gap? *Review of Development Economics*, v. 15, n. 1, p. 180–197, 2011.

- CHEONG, K. S.; CHOO, K.; LEE, K. Understanding the behavior of business groups: A dynamic model and empirical analysis. *Journal of Economic Behavior and Organization*, v. 76, n. 2, p. 141–152, 2010.
- CHOO, K. *et al.* Changing performance of business groups over two decades: Technological capabilities and investment inefficiency in Korean chaebols. *Economic Development and Cultural Change*, v. 57, n. 2, p. 359–386, 2009.
- COAD, A. Persistent heterogeneity of R&D intensities within sectors: Evidence and policy implications. *Research Policy*, v. 48, n. 1, p. 37–50, 2019.
- DAHLMAN, C. J.; ROSS-LARSON, B.; WESTPHAL, L. E. Managing technological development: Lessons from the newly industrializing countries. *World Development*, v. 15, n. 6, p. 759–775, 1987.
- FAGERBERG, J.; GODINHO, M. Innovation and Catching-up. In: *The Oxford Handbook of Innovation*. New York: Oxford University Press, p. 514–543, 2005.
- FOGEL, K.; MORCK, R.; YEUNG, B. Big business stability and economic growth: Is what's good for General Motors good for America? *Journal of Financial Economics*, v. 89, n. 1, p. 83–108, 2008.
- GERSCHENKRON, A. *Economic Backwardness in Historical Perspective: A Book of Essays*. New York: Belknap Press World, 1962.
- GRANOVETTER, M. Coase Revisited: Business Groups in the Moderns Economy. *Industrial and Corporate Change*, v. 4, n. 1, p. 93–130, 1995.
- HOBDAY, M. *Innovation in East Asia: The Challenge to Japan*. Hants, UK: Edward Elgar Publishing Co., 1995.
- HOBDAY, M. East versus Southeast Asian Innovation Systems: Comparing OEM- and TNC-led Growth in Electronics. In: KIM, L.; NELSON, R. R. (Eds.). *Technology, learning, and innovation: experiences of newly industrializing economies*. Cambridge, UK: Cambridge University Press, 2000.
- KANG, R.; JUNG, T.; LEE, K. Intellectual property rights and Korean economic development: the roles of patents, utility models and trademarks. *Area Development and Policy*, v. 0, n. 0, p. 1–23, 2019.
- KIM, J. IL; LAU, L. J. The sources of economic growth of the east asian newly industrialized countries. *Journal of The Japanese and International Economies*, 1994.
- KIM, L. National system of industrial innovation: dynamics of capability building in Korea. In: NELSON, R. R. (Ed.). *National Innovation Systems: A Comparative Analysis*. Oxford: Oxford University Press, p. 359–383, 1993.
- KIM, L. *Imitation to Innovation: The Dynamics of Korea's Technological Learning*. Boston: Harvard Business School Press, 1997.
- KIM, L.; NELSON, R. R. *Technology, learning, and innovation: experiences of newly industrializing economies*. Cambridge, UK: Cambridge University Press, 2000.
- KRUGMAN, P. The Myth of Asia's Miracle. *Foreign Affairs*, p. 62–78, 1994.
- KRUGMAN, P. *What ever happened to the Asian miracle?* Disponível em: <<http://web.mit.edu/krugman/www/perspire.htm>>.

- LEE, K. *et al.* Big businesses and economic growth: Identifying a binding constraint for growth with country panel analysis. *Journal of Comparative Economics*, v. 41, n. 2, p. 561–582, 2013.
- LEE, K. *Schumpeterian analysis of economic catch-up: Knowledge, path-creation, and the middle-income trap*. Cambridge: Cambridge University Press, 2013.
- LEE, K. *Economic catch-up and technological leapfrogging: The path to development and macroeconomic stability in Korea*. Cheltenham: Edward Elgar Publishing Ltd., 2016.
- LEE, K. *The Art of Economic Catch-Up*. Cambridge: Cambridge University Press, 2019.
- LEE, K.; HE, X. Samsung, created in Korea and replicated overseas. In: *Economic Catch-up and Technological Leapfrogging: The Path to Development and Macroeconomic Stability in Korea*. Cheltenham: Edward Elgar Publishing Ltd., p. 251–272, 2016.
- LEE, K.; JUNG, M. Moving factories overseas and impacts on domestic jobs: the case of Samsung. In: *Economic Catch-up and Technological Leapfrogging: The Path to Development and Macroeconomic Stability in Korea*. Cheltenham: Edward Elgar Publishing Ltd., p. 273–287, 2016.
- LEE, K.; KI, J. Rise of latecomers and catch-up cycles in the world steel industry. *Research Policy*, v. 46, n. 2, p. 365–375, 2017.
- LEE, K.; KIM, B. Y. Both Institutions and Policies Matter but Differently for Different Income Groups of Countries: Determinants of Long-Run Economic Growth Revisited. *World Development*, v. 37, n. 3, p. 533–549, 2009.
- LEE, K.; KIM, J. K. Intellectual property rights and technological catch-up in Korea. In: *Economic Catch-up and Technological Leapfrogging: The Path to Development and Macroeconomic Stability in Korea*. Cheltenham: Edward Elgar Publishing Ltd., p. 56–85, 2016.
- LEE, K.; LEE, H. Y. Historical origins and initial conditions for economic catch-up. In: *Economic Catch-up and Technological Leapfrogging: The Path to Development and Macroeconomic Stability in Korea*. Cheltenham: Edward Elgar Publishing Ltd., p. 15–29, 2016.
- LEE, K.; LIM, C. Technological regimes, catching-up and leapfrogging: Findings from the Korean industries. *Research Policy*, v. 30, n. 3, p. 459–483, 2001.
- LEE, K.; LIM, C. Catch-up and leapfrogging in six sectors in the 1980s and 1990s. In: *Economic Catch-up and Technological Leapfrogging: The Path to Development and Macroeconomic Stability in Korea*. Cheltenham: Edward Elgar Publishing Ltd., p. 182–206, 2016.
- LEE, K.; LIM, C.; SONG, W. Emerging digital technology as a window of opportunity and technological leapfrogging: Catch-up in digital TV by the Korean firms. *International Journal of Technology Management*, v. 29, n. 1–2, p. 40–63, 2005.
- LEE, K.; LIM, C.; SONG, W. Digital technology as a window of opportunity for leapfrogging: the display industry. In: *Economic Catch-up and Technological Leapfrogging: The Path to Development and Macroeconomic Stability in Korea*. Cheltenham: Edward Elgar Publishing Ltd., p. 207–230, 2016.
- LEE, K.; MALERBA, F. Catch-up cycles and changes in industrial leadership: Windows of opportunity and responses of firms and countries in the evolution of sectoral systems. *Research Policy*, v. 46, n. 2, p. 338–351, 2017.
- LEE, K. R. Technological learning and entries of user firms for capital goods in Korea. In: KIM, L.; NELSON, R. R. (Eds.). *Technology, learning, and innovation: experiences of newly industrializing economies*. Cambridge, UK: Cambridge University Press, 2000.

- LEE, K.; SZAPIRO, M.; MAO, Z. From Global Value Chains (GVC) to innovation systems for local value chains and knowledge creation. *European Journal of Development Research*, v. 30, n. 3, p. 424–441, 2018.
- LEE, W.-Y. The role of science and technology in Korea's industrial development. In: KIM, L.; NELSON, R. R. (Eds.). *Technology, learning, and innovation : experiences of newly industrializing economies*. Cambridge, UK: Cambridge University Press, 2000.
- MADDISON, A. *Online Database: Statistics on World Population, GDP and Per Capita GDP, 1-2008 AD2010*. Groningen Growth and Development Centre, 2010.
- MAZZOLENI, R.; NELSON, R. R. Public research institutions and economic catch-up. *Research Policy*, v. 36, n. 10, p. 1512–1528, 2007.
- NELSON, R. R.; PACK, H. The Asian Miracle and Modern Growth Theory. *The Economic Journal*, v. 109, n. 457, p. 416–436, 1999.
- NOOTEBOOM, B. *et al.* Optimal cognitive distance and absorptive capacity. *Research Policy*, v. 36, n. 7, p. 1016–1034, 2007.
- ODAGIRI, H. *et al.* *Intellectual Property Rights, Development, and Catch-up: An International Comparative Study*. Oxford: Oxford University Press, 2010.
- PACK, H. Research and development in the industrial development process. In: KIM, L.; NELSON, R. R. (Eds.). *Technology, learning, and innovation : experiences of newly industrializing economies*. Cambridge, UK: Cambridge University Press, 2000.
- PACK, H.; WESTPHAL, L. E. Industrial strategy and technological change. Theory versus reality. *Journal of Development Economics*, v. 22, n. 1, p. 87–128, 1986.
- PEREZ, C. New technologies and development. In: FREEMAN, C.; LUNDVALL, B.-Å. (Eds.). *Countries Facing the Technological Revolution*. London: Pinter Publishers, 1988.
- PEREZ, C.; SOETE, L. Catching up in technology: entry barriers and windows of opportunity. In: DOSI, G. *et al.* (Eds.). *Technical Change and Economic Theory*. London: Pinter Publishers, p. 458–479, 1988.
- RODRIK, D. Industrial Policy for the Twenty-First Century. *John F. Kennedy School of Government Working Paper Series*, n. September, p. 99–152, 2004.
- RODRIK, D. Goodbye Washington Consensus, Hello Washington Confusion? A review of the World Bank's Economic Growth in the 1990s: Learning from a Decade of Reform. *Journal of Economic Literature*, v. 44, n. 4, p. 973–987, 2006.
- VOGEL, E. F. *The Four Little Dragons: The Spread of Industrialization in East Asia*. Cambridge, MA: Harvard University Press, 1991.
- WADE, R. *Governing the Market: Economic Theory and the Role of Government in East Asian Industrialization*. Princeton: Princeton University Press, 1990.
- WESTPHAL, L. E.; KIM, L.; DAHLMAN, C. J. Reflections on Korea's acquisition of technological capability. In: ROSENBERG, N.; FRISCHTAK, C. (Eds.). *International Technology Transfer: Concepts, Measures, and Comparisons*. New York: Praeger, p. 146–171, 1985.
- WORLD BANK. *The East Asian miracle: economic growth and public policy*. New York: [s.n.].
- WORLD BANK. *China 2030: Building a Modern, Harmonious, and Creative Society*. Washington: World Bank, 2012.

YOUNG, A. The Tyranny of Numbers: Confronting the Statistical Realities of the East Asian Growth Experience. *The Quarterly Journal of Economics*, v. 110, n. 3, p. 641–680, 1995.

About the author

Paulo Henrique Assis Feitosa – pfeitosa@usp.br

Escola de Comunicações e Artes, Universidade de São Paulo, São Paulo, SP, Brasil.

ORCID: <https://orcid.org/0000-0002-2388-7543>.

The author would like to thank Eduardo Albuquerque and two anonymous referees who provided useful comments on an early version of this manuscript. Usual disclaimers apply.

About the article

Submission received on June 09, 2020. Approved for publication on October 10, 2020.