Comparative Advantage and Latecomer Advantage

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Abstract: *To achieve development, developing countries must capitalize on their relative advantages, including comparative advantage and latecomer advantages. A country must develop an industrial structure that is consistent with the comparative advantage of its factor structure in order to avoid the trap of "structural catch-up" that stifles development. The issue for developing countries is that their comparative advantage in core factors of production is unstable and tends to decrease and dissipate. Such a comparative advantage cannot provide adequate growth for convergence to occur. Developed countries, on the other hand, can sustain economic growth due to their comparative advantage in high-quality factors. Latecomer advantage refers to the ability of developing countries to increase their knowledge factor in a cost-effective manner by learning, importing, assimilating, and using knowledge and technology that already exist. Although comparative and latecomer advantages may have a combined effect, each has its distinct characteristics. Latecomer advantage is a special development factor that applies to latecomers. It is crucial at all stages of development, but especially so in the middle-income stage and beyond. Bringing latecomer advantage into full play is essential for developing nations to converge with the advanced countries.*

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Scholars of development economics generally agree on the following point of view: The only way for developing countries to progress is to capitalize on their relative advantages in order to transform their inferiority into cost competitiveness. The term "relative advantage" applies to both comparative and latecomer advantages. However, there has been a paucity of research and consensus on the following question: What are the roles of comparative and latecomer advantages in the economic growth of developing countries? How do they differ and connect? Which is more significant in terms of achieving convergence with the developed-country's industrial structure and income level? (Fan, 2020; Liu and Liu, 2020; Lin and Fu, 2022). This paper attempts to offer a systematic review and analysis of the above issues.

1. Limitations of Developing Countries' Comparative Advantages

David Ricardo proposed the concept of comparative advantage to explain how two countries producing two goods using one factor of production (usually labor), and different production technologies (productivity) might raise their relative welfare through trade. This is referred to as

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"technological comparative advantage" because the only differences between the two countries are technology or productivity disparities. This theory explains how countries with less advanced technologies and lower productivity (for example, England in Ricardo's model) can still specialize in making one good in which it is more productive; and how a country that is more developed in every way (Portugal in Ricardo's model) can also specialize in making one good in which it is more productive. Both may benefit from labor and trade division. This approach has been adopted by subsequent trade theories. Both Yang's comparative advantage theory of the division of labor and transaction cost (Yang, 2019) and Paul Krugman's comparative advantage theory of economy of scale (Krugman, 1995) have examined how countries benefit from trade by deepening their division of labor and increasing their economies of scale.

Eli Heckscher and Bertil Ohlin created the "factor abundance" comparative advantage theory (H-O model) to explain the division of labor and trade between two countries with two factors for two goods based on their respective levels of factor abundance under the condition of homogeneous production technologies (technology diffusion and convergence as a result of globalization) (Ohlin, 1967). In the study of production structure and economic growth (as opposed to trade) problems, contemporary economics has generally adhered to the factor abundance theory in the H-O model when referring to the concept of comparative advantage despite some subsequent developments. Like most academics of growth theory and economic development, we base our references to comparative advantage on the concept of factor abundance.

Historically, in economics, "production factors" or "growth factors" only referred to land and other natural resources, labor, and physical capital. With the advancement of theory, new factors such as human capital, knowledge stock, and innovation were introduced and will be discussed in greater depth in the subsequent sections of this paper. Our first topic for discussion is that the differences between developing and developed countries reside in their "factor structure" differences. Developing countries typically possess only some primary factors, such as natural resources or less-skilled labor, and are devoid of more valuable factors, such as physical capital that embodies advanced technology, human capital and ingenuity resulting from technological progress, as well as relatively effective institutional mechanisms (including managerial skills) that are established over the course of economic development. Developed countries are characterized by their abundance of high-quality factors that generate relatively high levels of income. The absence of these high-quality factors does not preclude economic growth in developing countries. These countries may develop labor-intensive industries based on their comparative advantage in primary factors, which is reflected in the abundance and low cost of labor, in order to increase profits and savings. Justin Lin et al. conducted comprehensive analysis of issues such as the mechanism of comparative advantage and the intrinsic rationale for factor structure in order to determine the "optimal industrial structure" (Lin and Fu, 2015)[1].

However, with a comparative advantage in primary factors, developing countries may not outperform developed countries in terms of growth rates in long run. The initial price of primary factors, which determines the initial cost advantage, and the abundance of primary factors, which determines the endurance of a comparative advantage, influence the economic growth rate and duration of developing countries.

[1] Lin et al. adopted the concept of "endowment" from the H-O model. This makes sense because, when discussing "future" economic growth at any moment in time, we can always use various factors left by our predecessors from yesterday or a minute ago, which can be viewed as the "endowment". However, there has been opposition to using the concept of endowment for the analysis of reproducible factors that are accumulated in the economic growth process, such as capital, including material and human capital, and "knowledge stock" in the new growth theory, because the term "endowment" generally refers to factors endowed by nature as opposed to those that can be produced, accumulated, and increased through human activity. For example, natural resources cannot be replicated (Edwards and Chris, 1985). In this paper, we employ "factor proportion" or "factor abundance" referred to in the economics literature when discussing the H-O model for analyzing the growth factor structure of different countries. Lin et al. themselves also recognized that "The concept or terminology of 'endowment' has not been termed as an entry in authoritative economics dictionaries and textbooks" (Lin and Fu, 2015).

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First, the initial price of primary factors. We presume a country has some low-skilled labor as a typical primary factor. In general, we can assume that a developing country begins its industrialization during the late stage of an agricultural society, when agricultural production technologies become sufficiently advanced to support a greater population, but the marginal output of labor is close to zero, i.e. there is an abundance of underemployed labor and the conditions are favorable for their migration to emerging industrial sectors. At this time, we can presume that the income of the agricultural workforce is a "subsistence wage" above which the emerging industrial sectors may attract an influx of labor. However, this assumption may not apply universally. In countries with fewer people and more desirable natural conditions, the threshold for an appealing wage could be much higher and not competitive in the global market. Particularly after a nation has experienced what Rostow termed the "preconditions for takeoff stage" (Rostow, 1960), it may not have a significant cost advantage given the high wage level in a society with adequate living standards, compared to other low income developing countries.

The significance of this factor is contingent on gains from comparative advantage, i.e. how much international comparative cost advantage will this factor generate at the current wage level using the predominant production technologies in order to create a specific amount of economic surplus for capital accumulation. At least in the beginning, when the quality of labor is a given, a lower wage will result in greater profits, greater surpluses for accumulation, faster economic development, and vice versa.

Second, the abundance of primary factors. Relevant variables for a labor force include a country's total labor force and its proportion of the global labor force. These variables will determine how long comparative advantages may persist, how long it will take to reach the Lewis turning point (Lewis, 2015), and when labor wages will begin to rise, and the low-wage advantage will vanish. In other words, the country's wage level will progressively increase until it reaches a point where it loses its comparative advantage in labor-intensive industries due to "factor price convergence" (Samuelsson, 1948). The greater the quantity of primary factors a nation possesses, the more likely it is to sustain relatively rapid growth over an extended period of time. In contrast, the circumstance differs for countries with a smaller population. Since its economic boom in the early 1980s, it has taken less than three decades for China to experience enormous wage increases and labor shortages, and it would take even less time for smaller countries to experience the same phenomenon. We cannot generalize from the unique circumstances of a few countries over a specific period of time (Fan and Lyu, 2013).

Regarding the relationship between comparative advantage and competitive strength, it is important to note that a country's labor cost competitiveness is measured against the wage levels of other developing countries in a similar stage of development that rely on the same comparative advantage of labor factor, rather than the wage levels in the developed countries. Labor-intensive industries are no longer a comparative advantage for developed countries, where salaries are paid as compensation for human capital rather than as remuneration for the primary labor force.

The limitations of the comparative advantage are a result of both the initial price and the abundance of primary factors. It may not sustain rapid expansion and tends to diminish and may be insufficient to generate the sustained rapid growth required for economic catch-up. A developing country may lose their comparative advantage as soon as their primary factors become less competitive (Cai, 2011). This means that if a nation only has the comparative advantage in primary factors, it would be difficult or even impossible to outpace the growth of developed countries. This dilemma will be explored in greater depth during our subsequent discussions on convergence.

There is an issue of optimal saving-investment rate which is related to the application of comparative advantage in the early stage of industrialization. Theoretically, companies are able to invest the profits they earn from the factor cost advantage: The greater the profits, the greater the potential for investment. However, there is a concern regarding the corporate savings rate[2].Even if companies earn a profit, if

[2] We employ the analytical approach of the general growth theory, assuming that when the income level is low, the majority of national savings comes from corporate profits, excluding household savings, for the simplicity of analysis.

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corporate and household savings rates are low due to institutional constraints, they may not save and invest much, resulting in sluggish economic development, which is precisely what many developing countries have historically experienced or currently do. That shows that comparative advantage is not a thing that guarantees the high growth outpacing the developed economies, although the labor-cost competitiveness is a precondition for the high growth in early stage. A higher corporate savings rate will certainly accelerate accumulation, economic expansion, and factor and industrial structural upgrades. In the early stages of China's development, high corporate profitability amid low wage levels and a significant portion of undistributed corporate profit for institutional and other reasons led to a high national savings rate, which fueled China's accelerated growth over a period of time. The fundamental issue is that high profitability does not always result in a high rate of savings, and vice versa. It is also illogical to explain China's high savings rate merely on the basis of its industry selection (Lin and Fu, 2015). At the same time, it is not the higher the rate of savings, the better. On the contrary, an excessive savings rate due to institutional factors can result in disequilibrium (Fan et al., 2009).

2. Latecomer Advantage and Knowledge Spillovers

2.1 Technology Diffusion and Latecomer Advantage

Alexander Gerschenkron, an American historian of Russian descent, was the first to propose the concept of "latecomer advantage" in 1951, which has since become widely recognized and employed to explain why latecomer countries outpace developed countries in their early stage of industrial development (Zhang and Zhang, 2009). The logic underlying the latecomer advantage is that when latecomer countries begin to industrialize, they can utilize developed countries' technology, knowledge, and business models without having to reinvent the wheel. Thus, these latecomer countries are spared enormous R&D and trial-and-error costs, and their economic growth is accelerated. It took decades or centuries for developed countries to amass institutional and managerial knowledge and expertise as a result of their numerous successes and failures. Such knowledge and expertise become readily accessible to countries that are lagging behind.

The latecomer countries can benefit from the diffusion of technology from developed countries in the following ways:

(i) International education and technology transfer. Knowledge gained in this manner may not immediately remedy some of the industrial development issues confronted by developing countries; in the long run, however, it will expand the knowledge structure of developing countries and increase their knowledge stock and innovativeness. Such transformations will hasten a country's technological advancement and industrial modernization in the long run.

(ii) Foreign direct investment (FDI) or the introduction of foreign-funded businesses. Through FDI, multinational corporations provide developing countries with much-needed capital, technology, and managerial expertise. While carefully guarding the secrecy of their core technologies, multinational corporations disseminate some technological and managerial know-how to local employees in order to make the business successful, who become the backbone of local businesses. They also transfer technologies to local manufacturers of parts and components, creating opportunities for local companies to observe and acquire technological and managerial knowledge.

(iii) Information gathering and reproduction. Prior to reaching the forefront of industrial technology, independent R&D is not the most cost-effective method for companies in developing countries to advance technology. Instead, it is simpler for them to gather diverse information and imitate cutting-edge technology, including a degree of imitative innovation. Legal imitation refers to the imitation of expired patents on technologies and product designs. It is also common for developing countries to engage in unlicensed imitation, as was in the similar cases in the early development stages of Germany, the United

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States, Japan and South Korea; China has an average level of imitation compared to other countries (Sachs, 2021).

(iv) It is expensive to purchase patents, import machinery and intermediate inputs, and employ foreign experts from developed countries. It would be more cost-effective for companies to acquire appropriate technologies based on their rational choice in accordance with the maximization of profits principle (the significance of such importation will be elaborated upon in the subsequent analysis). Before advancing to the technological frontier and developing indigenous innovation, it is necessary to learn how to use machinery and assemble components produced by others.

Some academics have attributed the latecomer advantage to access to technology, equipment, intermediate goods, and patents, which may reduce R&D and trial-and-error costs. The most crucial aspect of the latecomer advantage is acquiring extensive knowledge and cultivating innovativeness in an efficient and cost-effective manner. Although difficult to measure, this knowledge spillover may enhance the stock of knowledge and improve the factor structure of developing countries. The knowledge diffusion effect will be examined in greater detail in the subsequent sections.

The effects of the latecomer advantage on economic growth vary by country and by circumstance. For example, a country's education level and population size will determine its allure for foreign investors. Knowledge externalities benefit countries with a greater degree of economic openness and participation in international competition. The effects of latecomer advantage on economic growth also depend on whether government policies are conducive to technology importation and knowledge influx, as well as a country's historical abilities to assimilate foreign knowledge. These can be tested and analyzed based on the shared characteristics of economies that have attained a certain level of convergence. In the sections that follow, we will examine the manifestations of the latecomer advantage at various phases of development.

2.2 Latecomer Advantage, Knowledge Spillover and Factor Structure Improvement

Academics ascribe the progress of developing countries to the latecomer advantage; some have conducted empirical research on the relationship between trade, foreign investment, and technology diffusion (Gomulka, 1971; de Mello, 1996). For a long time, the concept of latecomer advantage appeared to be isolated from general economic theories, with only a hazy tie to fundamental theories. This situation did not change until the endogenous growth theory emerged.

The endogenous growth theory, also known as the "new growth theory", explains why developed countries can continue to grow free of the constraints of diminishing returns on capital and even enjoy the increase return on capital (Romer, 1986). It attempts to explain why developing countries find it difficult to grow, attract capital inflow and catch up with advanced economies (Lucas, 1990; Alfaro et al., 2008). Romer and Lucas et al. expounded the "knowledge-based endogenous growth" theory to demonstrate the reason for this by incorporating Adam Smith's specialization theory (Smith, Wealth of Nations, Chapter 1), Marshall's "knowledge externalities" (Marshall, 1890), Arrow's "learning by doing" (Arrow, 1962), and Romer's "knowledge spillover" (Romer, 1990; Aghion, 2004). According to these views, the ongoing invention of new knowledge and technology will boost productivity and keep the return on capital from falling to zero.

Romer's primary objective (Romer, 1990) was to generalize and broaden the concept of capital. Capital, in his opinion, is anything that can be created and collected for future use. Under the model of economic theories, any knowledge, including technology, may emerge in the form of capital. The first type of such capital is human capital. Knowledge imparted through the educational system accumulates into workers' abilities as a form of capital necessary for economic activity and progress (Lucas, 1988, 1990; Benhabib and Spiegel, 1994). Romer et al. proposed the idea of "knowledge stock" and stated that "knowledge shares the attributes of pure capital goods" and is one good that may be manufactured from an "R&D department" (Cassiman and Veugelers, 2002). Externalities or spillover effects of corporate

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knowledge will result in an increasing return on knowledge and an increasing wage in the production function (Zuo and Yang, 2007). All new knowledge arising from economic activity (learning by doing) and created by R&D activities is knowledge generated from the internal process of communication and exchange and spilled over within an economy, which constitutes the economy's knowledge increase over time (Romer, 1986, 1990). Thirlwall (2015) defines "K" in the "AK model" of endogenous growth as a "comprehensive indicator of capital such as physical capital plus other forms of regenerative capital" (Thirlwall, 2015). The value of material or financial capital changes with economic cycles, whereas knowledge grows and accumulates. That is to say, our posterity will certainly know more than our generation. With factor accumulation, we may expect economic growth to sustain and developed countries to avoid stagnation due to falling marginal returns on physical capital. Knowledge, being a form of capital, also becomes a factor of production or growth. Growth factors now comprise not only labor and physical capital, but also human capital and knowledge stock. Growth in human capital and knowledge stock, as well as physical capital, transforms the factor structure. Both the growth of physical capital and the growth of knowledge will transform and elevate the factor structure.

The juxtaposition of knowledge with other components of production, in my opinion, is an essential advancement of economic theories, reflecting the reality that knowledge expansion and technological progress are among the most important sources of economic growth in today's time. It also introduces a new theoretical factor for development economics research: The latecomer advantage, which allows developing countries to improve their factor structure by improving their knowledge capital and factor structure for faster growth through the mechanism of international knowledge spillovers,[3] in addition to improving their own education and scientific research capabilities.

On this basis, the distinctions between comparative advantage and latecomer advantage become clear: While comparative advantage requires countries to optimize their industrial structure based on their existing factor structure, latecomer advantage helps improve the factor structure itself by increasing knowledge and technology factors through learning, importation, and assimilation. The discrepancies between developing and developed economies can be boiled down to gaps in science, technology, and human capital, as well as gaps in the knowledge structure and innovativeness, as can be seen from the history of contemporary world economic development. A country might attain developed-country status in the 19th century by fostering a capital-intensive industrial structure through physical capital accumulation. However, in the 21st century, such a country would struggle to merely attain the level of a middle-income country unless it advanced to a more sophisticated stage in which high-tech sectors rich in human and intellectual capital hold sway.

The endogenous growth theory has been criticized for its lack of "measurability"[4]. Indeed, further theoretical and methodological breakthroughs are required for academics to quantify intangible yet critical aspects such as knowledge and technology. Theoretical advancement in natural or social science is always followed by subsequent developments in the methods of measurement to catch up with theoretical assumptions. Previous neoclassical growth theory could only explain the economic growth

[3] One possible reason Lin et al. devalued latecomer advantage or classified it as a part of comparative advantage is that in their understanding of the "factor endowment structure", there is only physical capital and no knowledge stock; and knowledge increment from learning and importation is not regarded as a component of the "endowment structure." They noted in the *Introduction to New Structural Economics* the contributions by the endogenous growth theory. They did not, however, perceive knowledge as an accumulable and renewable factor that, like physical capital, is a factor of production (Lin and Fu, 2015). As they wrote in a recent paper, "The upgrade of endowment structure may occur in any of the following ways, including the discovery of new natural resources, whose aggregate amount is limited, the exploitation of resources from other countries, such as the colonial movement of Western countries during primitive capital accumulation, which is obviously shameful and impractical in the civilized era, or the attraction of external resources by peaceful and fair means, such as China's rapid increase in the actual use of foreign capital from 2.3 billion US dollars in 1983 to 173.5 billion US dollars in 2001..." (Lin and Fu, 2022). The most significant gain from the latecomer advantage, in my opinion, is knowledge increment through learning and absorption through multiple channels, which contributes to the upgrade of the factor structure by boosting a country's knowledge factor.

[4] Krugman noted that "almost no meaningful empirical test may be performed (for this theory) because too many assumptions are about the impact of some immeasurable factors on some other immeasurable factors" (Krugman, 2013).

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effects of labor and physical capital and could only express the growth contributions of knowledge growth or technological progress using the "residual value" in econometric analysis, also known as "total factor productivity (TFP)". This approach represents a step forward in the empirical analysis method. Initially, we could only quantify and test the knowledge factor indirectly. For instance, indicators used to measure knowledge importation include the "human capital index" and "importation of equipment and intermediate goods" (Broda et al., 2017). However, theories must be aligned with the reality that our economy is driven by - and increasingly reliant on - knowledge and innovation. While industrialized countries rely on their comparative advantage in innovation to sustain prosperity, some developing countries have invested heavily in education and R&D and gained extensive knowledge from other countries, allowing them to capitalize on their latecomer advantage.

Another criticism leveled against the knowledge spillover hypothesis is that, when compared to the original exogenous growth theory based on technological progress, it appears to provide no additional explanation for the disparities between developed and developing countries (Parente, 2001). One possible explanation is that people are more concerned with knowledge creation in developed countries while overlooking the fact that developing countries can increase their knowledge capital through learning. As a result, they fail to apply the knowledge growth theory to the development issues of developing countries. The correct question here maybe is why some developing countries continue to progress after reaching the Lewis turning point and achieving convergence, while others remain trapped in primitive industries and fall victim to the comparative advantage trap

3. Convergence: How Developing Countries May Grow Faster than Developed Countries

Development economics is concerned with how developing countries may achieve economic growth by means of their relative advantages. The ultimate question is what makes it possible for developing countries to grow faster than and converge with developed countries despite their lagging behind in every respect?

Numerous theoretical and empirical studies have acknowledged the complexities of convergence. While conditional convergence is conceivable, for instance, between Europe and the United States, unconditional convergence is rare (Yao, 2015; Thirlwall, 2015). To provide developing countries with theory and policy advice for convergence, development economics must investigate what it takes for developing countries to grow faster than developed countries.

On the topic of convergence, two distinct theoretical approaches exist. One contends that growth in the developed countries will continue to decelerate as a result of a diminishing marginal return on capital.

Although developing countries are also subject to diminishing returns, a number of them are converging with the developed countries as a result of high returns and accelerated growth rates based on modest capital stock per capita. However, the above-mentioned endogenous growth theory attempts to demonstrate that return on capital can remain constant or increase as a result of endogenous knowledge growth and spillover effects, allowing for sustainable development in the developed countries. This dismisses the theoretical prospect of convergence through the "deceleration of developed countries" and explains why convergence has not occurred in practice.

Another line of thinking about the convergence is the "catch-up theory", which asserts that the less developed a country is, the greater its potential for rapid growth. On the question of why developing countries grow faster, most economists, except Lin et al., have reached a consistent conclusion: The latecomer advantage, rather than comparative advantage, has allowed developing countries to benefit from technology diffusion from the developed countries[5].

[5] See Michael P. Todaro and Stephen C. Smith, 2008; Zhang Peigang et al., 2019; A. P. Thirlwall, 2011; S. Gomulka, 1971, 1990; Moses Abramovitz, 1986; S. Dowrick, 1989; Amable, 1993.

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Countries must follow their comparative advantages in order to sustain growth and avoid stagnation. Theoretically, there is an optimal industrial structure for any country at any time point[6]. The problem is whether the optimal structure of latecomer countries will generate faster growth than the optimal structure of developed countries. As explained before, latecomer countries rely on their comparative advantage of an abundance of primary factors, which is fragile and tends to diminish soon when their wages reached "middle level". Meanwhile, it takes time for latecomer countries to cultivate relative advantages for other factors such as physical capital, human capital, knowledge stock, and innovativeness. As analyzed in Section 1, developing countries will experience a slowdown once their traditional comparative advantage becomes diminished and a new advantage has yet to take shape.

Comparative advantages are not unique to developing countries. Developed countries are also faced with the choice of an optimal industrial structure to make the most of their comparative advantages. In David Ricardo's model, Portugal is more efficient than England at producing both cloth and wine, but it has more to gain if it is specialized in producing wine and sells wine to England. In Leontiff's paradox, the United States has developed a knowledge-intensive export structure by virtue of its advantage of abundance in human capital[7]. More importantly, developed countries are able to sustain their economic growth by means of the continuous generation of accumulable and reproducible knowledge, which often leads to revolutionary innovations that turbocharge their economic growth. When developing countries reach a certain stage of development, there is a risk for their rapid economic growth to lose momentum due to the loss of the comparative advantage of factor abundance. In comparison, developed countries may have more enduring comparative advantages that make their economic growth more sustainable. As a general theory put forth by David Ricardo, comparative advantage is not a unique theory of development economics. It applies to both developing and developed countries.

In order for developing countries to sustain rapid growth and accomplish convergence, they must rely on their latecomer advantage rather than on their less durable comparative advantage of primary factors. Latecomer advantage requires not only independent efforts to develop education and conduct scientific research, but also the efficient and cost-effective acquisition, imitation, importation, and assimilation of knowledge and technology from the developed countries. If developing countries accumulate physical capital through primary factors without accelerating their convergence with developed countries, it would be unfeasible for them to achieve convergence with developed countries in terms of industrial and income structures, which are determined by their factor structure. Some economies, such as South Korea, have accomplished convergence over the past several decades by leveraging their latecomer advantage to learn from others and absorbing

[6] It should be noted that the realization of comparative advantage requires little policy design. According to Justin Lin, enterprises in a market-based economy fend for themselves and should be responsible for their own profits and losses (Lin et al., 2015). While some companies fail in the wrong industries, others flourish in profitable industries and maximize their comparative advantages. Government assistance is unnecessary because a good industrial structure can only be discovered and realized through the spontaneous adjustment of market supply and demand and trial and error, and cannot be predicted by government or academicians. Government-led campaigns such as the "Great Leap Forward", "Mandatory Planning", and "Industrial Catch-up Strategy" have lost their institutional justifications under the market-based economic framework established since reform and opening up in 1978. However, assisting companies in utilizing their latecomer advantage is more difficult. It requires a combination of development policies for technology importation and knowledge transfer to occur while opening up alone is insufficient. First, the government should investigate and maintain multiple channels for the transmission of knowledge and assure the constant flow of knowledge through institutional openness. Second, the government must actively promote technology imports. It may, for instance, offer tariff reductions for the importation of machinery, equipment, patents, and intermediate inputs; disseminate knowledge about strategic corporate management by introducing foreign capital and promoting joint ventures; implement the local content requirement to expedite technology transfer from foreign-funded enterprises and develop the local parts and components industry; and introduce companies of the same industry from different countries to foster international cooperation. These questions will be analyzed in detail in a separate paper so as not to cause distraction.

[7] Leontief (1953) found in a study that the United States, despite being rich in capital, exported a large amount of labor-intensive goods, which is inconsistent with the factor comparative advantage theory. This contradiction became known as the "Leontief paradox". Subsequently, P. B. Kenen (2000) et al. explained this paradox using the "human capital" theory. Namely, wage cost reflects compensation to the human capital of educated and skilled labor. As far as human capital is concerned, however, it can be construed that the U.S. exports of seemingly labor-intensive goods are still capital-intensive.

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a substantial amount of knowledge increase. In order to stimulate economic growth, the latecomer advantage theory suggests that developing countries should endeavor to benefit from knowledge spillovers, increase their knowledge, and encourage creativity.

4. Comparative Advantage vs. Latecomer Advantage: Their Roles at Various Stages of Development

In the initial phase of economic development, both comparative advantage and latecomer advantage are critical. A new industry or division of labor signifies the beginning of economic expansion. We presume that this new industry is consistent with the comparative advantage of a country. In the 1980s, for example, China's emerging industries were predominantly labor-intensive. But those labor-intensive industries were using the up-to-date technologies which now available for Chinese companies. The rapid growth was also due to the importation of foreign technology, experience (including institutional experience), and capital. This is in contrast to developed countries, which created new industries endogenously based on their domestic factors of production. The latecomer advantage allows them to grow without having to start from scratch.

In this sense, an industry becomes profitable under the joint effects of comparative and latecomer advantages. To some extent, high profitability represents a form of "TFP" and the joint effect of two factors rather than a single factor.

Next, we may assume that a country enters into a high-investment stage. Suppose a country still enjoys a comparative advantage of labor cost, a high profitability rate, a high savings rate, and a high investment rate. Capital accumulation leads to improvement in the factor structure and creates a demand for industrial upgrade through the development of capital-intensive industries. At this stage, developing countries will encounter the obstacle of missing "industrial specified" factors in the improvement of their industrial structure. The development of original industries allows us to accumulate capital and meet the needs of more capital-intensive industries. However, it takes physical and human capital of different technological attributes, or special knowledge and skills, to enter or "jump" into some other industries. Such factors of production cannot be endogenously derived from the existing industries. In other words, comparative advantages may provide the capital for factor and industrial upgrading, but cannot automatically generate the special skills and knowledge factor essential for industrial upgrade (Chang, 2000, Lin et al., 2015). To overcome such a bottleneck of prerequisites for further industrial development, latecomer countries must import, acquire, imitate and assimilate advanced technologies, equipment and intermediate inputs from developed countries. Without bringing their latecomer advantage into play, developing countries may not be able to complete industrial upgrade despite their capital accumulation. A manifestation of this is the declining input-output ratio. That is to say, more investment and more capital input may not lead to real upgrade of the industrial structure due to a bottleneck of industrial attributes, which curbs output efficiency. This is exactly what China and some other countries have more or less experienced. When specific factors present a bottleneck to industrial structural upgrade, the decisive role of the latecomer advantage comes into play. A country may upgrade to the right industrial structure only when it makes the most of its latecomer advantage by importing appropriate technologies and intermediate goods.

In this stage, we may observe a correlation between the two relative advantages. With comparative advantage, a country gains a low-cost advantage to produce capital value required for industrial upgrade. In comparison, the latecomer advantage means that a country may acquire technology and knowledge at a modest R&D cost by learning from others. That is to say, comparative advantage determines how a country should properly utilize the factors it has, while the latecomer advantage determine how the country should move forward to upgrade its industrial structure. If a late-comer country does not have the money to upgrading industries and relies on state subsidies or international debt, it means the on-

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going "upgrading" is inconsistent with its comparative advantage and unsustainable. And if a country has the money for upgrading, but relies much on its own R&D and engages in trade protectionism and so-called "import substitution" strategy before it reaches the technology frontier, it means it is not able to benefit of latecomer advantage and the growth will not be sustained long either.

Then, the country will enter the next stage of economic development, i.e. the "middle-income" stage. This development stage is characterized by the employment of primary factors beyond the "Lewis turning point". When labor price starts to increase, the comparative advantage of the primary factor starts to decline. Since the internationally competitive wage level for labor-intensive industries is determined by the labor income of "peer" developing countries, when a late-comer country loses the comparative advantage of low-cost labor as a primary factor and has yet to emulate the comparative advantage of developed countries for high-quality factors, what it deems as a "right industrial structure" cannot generate higher growth rates than developed countries despite having the same industrial structure. At this moment, the latecomer advantage becomes the key for the maintenance of rapid growth rates because further industrial upgrade at this stage is primarily contingent upon whether the knowledge factor continues to grow and bring about upgrade of the factor structure. Without endogenous progress in technology, a country would fall into the "middle income trap" and become locked into some low-end industries. Such a failure of industrial upgrade will be associated with economic stagnation.

A late-comer country may pursue indigenous innovation in the late stage of development using its latecomer advantage. In this case, the late-comer country still lags behind and has a lot to learn and needs to reduce its R&D cost. Over time, the late-comer country becomes more innovative, investing in education, developing scientific research, and conducting institutional reforms (those efforts at self-improvement are a decisive developmental factor; however, they are not the topic of this paper and not discussed in detail here). Latecomer countries will break new ground in innovation and approach the frontier in certain sectors before exploring other domains. In a word, from the beginning, economic development is influenced by both latecomer and comparative advantages. However, the role of comparative advantage is more significant in the inception and early stages of economic growth. After a country enters the middle-income stage, it starts to lose comparative advantage for primary factors and must rely more on the latecomer advantage to improve the factor structure and attain rapid growth, which is dependent on the increase of the knowledge factor. This stage may last for a long time. One hypothesis is that the more a country lags behind developed countries in terms of its factor structure and technological performance or the more distant it is from the industrial technology frontier, the longer it will stay within the frontier and rely on its latecomer advantage. Going forward, the latecomer advantage plays a more decisive role. The ultimate convergence depends on whether latecomer countries succeed in fostering ingenuity and make the most of their latecomer advantage to make more rapid progress by learning from developed countries.

The above analysis reveals the independent characteristics of the two relative advantages despite their occasionally simultaneous and correlative effects. Comparative advantage is not a prerequisite for utilizing the latecomer advantage.

5. Concluding Remarks

In this paper, we have reviewed the correlation between comparative and latecomer advantages. When developing countries have attained a certain level of development, some developed countries in a dominant position may also resort to non-market interventions to contain the further development of those developing countries. They do not take as a threat if the developing countries only use their comparative advantage to cultivate some primary industries. However, they may try all the means to prevent developing countries from using their latecomer advantage to learn, import, and assimilate advanced technology and knowledge. Supply chain sanctions, decoupling, trade wars, and termination

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of scientific exchanges are all intended to prevent developing countries from activating their latecomer advantage. This reminds us of the importance of the latecomer advantage.

Apparently, further empirical studies are needed to test the hypotheses provided in this paper.

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