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To cite this article: Justin Yifu Lin (2017) Industrial policies for avoiding the middle-income trap: a new structural economics perspective, Journal of Chinese Economic and Business Studies, 15:1, 5-18, DOI: [10.1080/14765284.2017.1287539](https://doi.org/10.1080/14765284.2017.1287539)

To link to this article: <http://dx.doi.org/10.1080/14765284.2017.1287539>



Published online: 09 Mar 2017.



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## Industrial policies for avoiding the middle-income trap: a new structural economics perspective\*

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### ABSTRACT

Economic development is a process of structural transformation with continuous technological innovation and industrial upgrading, which increases labor productivity, and accompanied improvements in infrastructure and institution, which reduces transaction costs. The middle-income trap is a result of a middle-income country's failure to have a faster labor productivity growth through technological innovation and industrial upgrading than high-income countries. Industrial policy is essential for the government of a middle-income country to prioritize the use of its limited resources to facilitate technological innovation and industrial upgrading by overcoming inherent externality and coordination issues in structural transformation. The industries in a middle-income country may be classified into five different types, depending on their distance to the global technology frontier: catching-up industries, leading-edge industries, comparative advantage-losing industries, short innovation cycle industries, and comparative advantage-defying strategic industries. Industrial policy should be designed accordingly.

### ARTICLE HISTORY

Received 14 November 2016

Accepted 4 January 2017

### KEYWORDS

New structural economics;  
economic development;  
middle-income trap;  
industrial policy

To become a modern, high-income country is a dream shared by all developing countries. According to the World Bank, of 101 middle-income economies in 1960, only 13 of such economies moved up from middle to high income by 2012 (Agenor, Canuto, and Jelenic 2012). This means that most middle-income economies have not been able to escape the middle-income trap in spite of a half century's efforts.

Modern economic growth is a process of continuous technological innovation, which raises labor productivity in the existing industries, and industrial upgrading, which moves an economy from low value-added industries to higher value-added ones and thus raises labor productivity as well (Kuznets 1966). Taking advantage of the potential of technologies and new industries requires well-functioning hard infrastructure to get products into large domestic and foreign markets. As the scale of trade increases, market exchanges are at arm's length, thus requiring contracts and contract-enforcing legal systems. Moreover, as the scale and risk of investment increase with the upgrading of technology and industries, the financial

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\*The paper drew on 'New Structural Economics and Industrial Policy for Catching Up countries,' included as a chapter in *Advances in the Theory and Practice of Smart Specialization* published by Elsevier.

structure has to adapt too. Improvements in hard and soft infrastructure reduce transaction costs for investment and trade (Kuznets 1966; Lin and Nugent 1995; Harrison and Rodríguez-Clare 2010). While modern economic growth appears to be a process of rising labor productivity, it is actually a process of continuous structural changes in technologies, industries, and hard and soft infrastructure.

A developed country's high income and labor productivity indicate that its technology and industry are on the global frontier. As such, it requires the indigenous invention of new technology and industry to achieve technological innovation and industrial upgrading. Inventions of new technology and industry are costly and risky. Like most developing countries, a middle-income country's technological innovation and industrial upgrading occur mostly behind the global technological and industrial frontier. Most of its innovation and upgrading can rely on the adoption of technology and industry new to the country but mature elsewhere in the world, and thus have a lower cost and risk compared with an advanced country. In other words, a middle-income country enjoys the latecomer advantage in technological innovation and industrial upgrading in most of its industries. Potentially, a middle-income country can grow faster than an advanced country and catch up with it. The middle-income trap is a result of a middle-income country's failure to have a faster labor productivity growth through technological innovation and industrial upgrading than high-income countries.

As Keynes said, 'It is ideas, not vested interests, which are dangerous for good or evil.' Most developing countries' inability to escape the middle-income trap reflected the failures of development ideas. In this paper, I review the ideas embodied in two previous waves of development thinking, introduce new structural economics as the third wave, and propose a practical guide for formatting industrial policies in a middle-income country to accelerate technological innovation and industrial upgrading so as to escape the middle-income trap.

## 1. Why we need to rethink development economics

Economic theories help us understand the underlying causalities of observed economic phenomena. More than logic exercises, theories have practical relevance: economic agents – governments, firms, households, and individuals – use them to guide their actions so as to achieve the desired results. If existing theories fail to help us understand the underlying causalities of the observed phenomena or if decisions based on these theories fail to achieve their intended goals, we have to rethink them. Development economics is in need of rethinking.

Development economics is a young field in modern economics. It emerged after the WWII to guide the reconstruction of war-ravaged countries and the nation building of newly independent former colonies.

The first wave of development thinking was structuralism. It posited that, if a developing country wants to catch up with developed countries in income, it needs to have the same labor productivity as developed countries. In turn, this requires developing countries to build up modern capital- and technology-intensive industries similar to those in developed countries. Yet those industries never emerged in developing countries. Why not? Economists blamed market failures arising from structural rigidities for the failure of such industries to develop spontaneously (Arndt 1985). Structuralism recommended that governments adopt import substitution strategies to overcome market failures through mobilizing and allocating resources to directly build those industries (Rosenstein-Rodan 1943; Prebisch 1950).

Capitalist as well as socialist countries pursued, after WWII, the strategies advocated by structuralism (Chenery 1961). However, countries that adopted import substitution strategies typically experienced a pattern of rapid growth driven by large-scale investments, followed by economic crises and long periods of stagnation (Krueger and Tuncer 1982; Lal 1994; Pack and Saggi 2006).

The failure of structuralism as a catching-up guide for developing countries led to the emergence of the second wave of thinking, neoliberalism, in the 1980s. At that time, government intervention was pervasive in developing countries, leading to rent-seeking, bribery, and embezzlement, as well as to multiple economic distortions and inefficient resource allocation. To improve economic performance and close the gap with developed countries, developing countries were advised to build a well-functioning market economy by implementing the measures referred to collectively as the 'Washington Consensus': privatization, marketization, and liberalization (Williamson 1990). Governments were advised not to pick winners to support technological innovations and industrial upgrading.

Again, the logic seemed sound. Yet countries that applied this shock therapy often experienced economic collapse, stagnation, and frequent crises, and the gap between developing and developed countries widened further (Cardoso and Helwege 1995). Growth rates were lower and economic crises became more frequent under Washington Consensus policies in the 1980s and 1990s than under the structuralist policies of the 1960s and 1970s. Some economists referred to this period as the 'lost decades' for developing countries (Easterly, Loayza, and Montiel 1997; Easterly 2001).

During this time, some economies in Asia were pursuing an entirely different development approach. From the 1950s to 1970s, Japan and the four Asian tigers – Korea, Taiwan, Singapore, and Hong Kong – grew rapidly by adopting an export-oriented development strategy, by developing initially labor-intensive, small-scale industries, and by gradually climbing the industrial ladder to larger, more capital-intensive industries with proactive government support (Amsden 1989; Wade 1990; Chang 2003).

In the 1980s and 1990s, under the sway of the Washington Consensus, economists branded planned economies as less efficient than market economies and called for transforming them into market economies through shock therapy: removing all economic distortions by ending government interventions and by leaping in a single bound from a planned to a market economy. However, China adopted a dual-track transition, continuing to protect and subsidize nonviable state-owned firms in the old prioritized capital-intensive industries, while liberalizing the market entry for the previously repressed labor-intensive industries. Many economists predicted such an approach would lead to rampant rent-seeking and to deteriorating resource allocation. In reality, however, economies that experienced stability and rapid growth, like Cambodia, China, and Vietnam, all followed the dual-track transition approach.

Policies based on structuralism and neoliberalism not only fail to achieve their goals, but also failed to explain the rare economic development and transition successes that did occur. A third wave of development thinking is in order.

## 2. What is new structural economics?

New structural economics as a third wave of development thinking uses a neoclassical approach to study the determinants of economic structure and its evolution in a country's economic development, which is the nature of modern economic growth (Lin 2011).<sup>1</sup>

## **2.1. What is the core hypothesis of new structural economics?**

In brief, a country's economic structure at any given time is endogenous to its factor endowments – the amounts of capital, labor, and natural resources at that time. Countries at different development stages vary in their relative abundance of factor endowments. In developing countries, capital is generally relatively scarce, while labor and often natural resources are comparatively abundant. In developed countries, capital is relatively abundant, while labor is comparatively scarce. Although an economy's factor endowments are given at any particular period, they can change over time. New structural economics posits an economy's factor endowments as the starting point for development analysis because they determine an economy's total budget and relative factor prices at that time, which are two of the most important parameters in economic analysis.

Relative factor prices determine a country's comparative advantage. For example, countries with both relatively abundant labor and scarce capital would have a comparative advantage in labor-intensive industries because production costs will be lower than in countries with relatively scarce and more expensive labor. A prerequisite to achieving competitive advantage is for a country to develop its industries according to its comparative advantages determined by factor endowments (Porter 1990).

In developed countries, income and labor productivity are high because the countries' relative capital abundance means that their industries and technologies are capital intensive. If a developing country wants to catch up to the income and industrial structure of developed countries, it first needs to increase the relative abundance of capital in its factor endowment structure to the level in advanced countries. The ultimate goal of economic development is to raise a country's income, the intermediate goal is to develop capital-intensive industries, and the immediate goal should be to accumulate capital quickly, so that the country's comparative advantages change to more capital-intensive industries. In other words, boosting a country's income requires industrial upgrading, which in turn requires changing a country's endowment structure (Ju, Lin, and Wang 2015).

How can a country accumulate capital quickly? Capital comes from saving economic surpluses. If a country's industries are all consistent with its comparative advantages, as determined by its endowment structure, the country will be competitive in both domestic and international markets and generate the largest possible surplus. If all investments are made in industries that are consistent with the comparative advantages determined by a country's endowment structure, the returns to investment will be maximized and the propensity to save will be at its highest. With the largest possible surplus and the highest incentives to save, capital will be accumulated in the fastest way possible. The changes in endowment structure and comparative advantages pave the way for changes in industrial structure and the accompanying hard and soft industrial infrastructure.

Yet comparative advantage is an economic concept. How is it translated into the choices of technologies and industries made by entrepreneurs? Entrepreneurs care about profits. They will invest in industries in which a country has a comparative advantage if relative factor prices reflect the relative scarcities of factors in the country's endowments (Lin 2009; Lin and Chang 2009). If capital is relatively scarce, the price of capital will be relatively high; if labor is relatively scarce, the price of labor (wages) will be relatively high. If the price system reflects the relative factor scarcity, profit-maximizing entrepreneurs will use a relatively inexpensive factor to replace a relatively expensive factor in their choice of production technologies, investing in industries that require more of a relatively inexpensive factor and less of a

relatively expensive factor. A price system with these characteristics can arise only in a competitive market. Therefore, a well-functioning market is essential for the success of economic development.

Economic development is a process of structural change with continuous technological innovations, industrial upgrading, and improvement in infrastructure and institutions. When the factor endowment structure changes, it requires first movers to enter new industries that are consistent with changing comparative advantages. The risks for first movers are high. If they fail, they bear all the losses, and if they succeed, other firms will follow them into the industry. The resulting competition will eliminate any monopoly profit (Romer 1990; Aghion 2009). There is an asymmetry between the losses of failures and the gains of successes for the first movers (Hausmann and Rodrik 2003).

No matter whether the first movers succeed or fail, they provide society with useful information. The government should encourage first movers and compensate them for the information externality they generate. Otherwise, there will be little incentive for firms to be first movers in technological innovation and industrial upgrading (Rodrik 2004; Lin 2009; Harrison and Rodríguez-Clare 2010; Lin and Monga 2011). In addition, the success or failure of first movers also depends on whether improved hard and soft infrastructure match the needs of the new industries. Improving infrastructure and institutions is beyond the capacities of individual firms. The government needs to either coordinate firms' efforts to improve infrastructure and institutions or to provide those improvements itself. Therefore, a facilitating state is also essential for economic development to happen dynamically.

New structural economics helps to understand why structuralism failed. The import substitution strategy advocated by structuralism advised governments to give priority to capital- and technology-intensive industries in capital-scarce developing countries, thus defying developing countries' comparative advantages. Firms in those industries were not viable in open and competitive markets. Without government protection and subsidies, entrepreneurs would not voluntarily invest in those industries. After their establishment, the nonviable firms had to rely on the government's subsidies and protection to survive as well.

New structural economics also helps to understand why neoliberalism failed. In developing countries, market distortions were endogenous to the government's need to protect and subsidize nonviable firms that had been promoted by the government's previous import substitution strategies. Eliminating protections and subsidies would doom nonviable firms, resulting in large-scale unemployment, and social and political unrest. To avoid those consequences and to continue to prop up nonviable capital-intensive industries that were still considered the cornerstone of modernization, governments had no choice but to continue its protection and subsidies. Even if the firms were privatized, soft budget constraint problems would continue. The subsidies to the nonviable firms could even increase due to the private owners having greater incentives to lobby for subsidies and protection (Lin and Li 2008). The new protections and subsidies were usually less efficient than the old ones, especially in the transition economies of the former Soviet Union and Eastern Europe (World Bank 2002). In addition, neoliberalism threw the baby out with the bathwater, vehemently opposing any role for governments in facilitating structural change. Chile was a typical example. A model student of Washington Consensus reform, Chile diligently implemented the Washington Consensus reforms in the 1980s and then removed all government protections and subsidies. Chile ranks high among developing countries on the World Bank's Doing Business Index, based on indicators of the ease of doing business and investing. However, Chile has not seen

dynamic structural change for more than 30 years, and as a result unemployment is high, income gaps have widened, and Chile remains mired in ‘the middle-income trap.’

New structural economics also justifies the gradual, dual-track approach to reform that conventional economic thought labeled the wrong approach to transition. Dual-track reform maintains stability by providing transitory protections to nonviable firms in the old priority sectors and achieves dynamic growth by removing restrictions to entry and facilitating the development of previously repressed industries that are consistent with the country’s comparative advantages. The dynamic growth of sectors consistent with comparative advantages helps the economy rapidly accumulate capital and changes the factor endowment structure. That makes some formerly nonviable firms in capital-intensive industries viable. Once firms in the new sectors are viable, the transitory protection and subsidies can be eliminated, bringing the transition to a market economy to a smooth end (Naughton 1995; Lau, Qian, and Roland 2000; Subramanian and Roy 2003; Lin 2009, 2012, 2013).

### **3. New structural economics and smart industrial policies for a middle-income country**

Economic theories are intended not only to help people understand but also to change the world. How can the government in a developing country apply new structural economics to achieve dynamic structural change and catch up with high-income countries? To leverage the government’s limited resources for the largest possible impact on structural change and economic growth, the government needs to know which new industries are consistent with the country’s latent comparative advantages. In other words, the government should know in which industries it has low factor costs of production based on the country’s endowment structure but lacks global competitiveness due to high transaction costs. Moreover, the government should know which infrastructures and institutions require improvements to reduce transaction costs so as to enable those new industries to thrive.

In other words, new structural economics suggests that government should identify industries of latent comparative advantages and then provide incentives for the first movers to overcome coordinating failures in improving infrastructure and institutions to turn them into the nation’s competitive advantages. Theoretically, industrial policy should be a useful instrument for the government to achieve its facilitating role. In practice, industrial policies have largely failed in developing countries, tainting their reputation in mainstream economics. But if the government does not facilitate the development of industries in line with the country’s comparative advantage, old industries may die due to loss of comparative advantages, while new industries are unlikely to emerge spontaneously due to the lack of first movers and appropriate hard and soft infrastructure. One result would be deindustrialization. Without new industries, countries cannot achieve robust economic growth, solve the job-generation challenge, and escape the low-income or middle-income trap.

To reject all industrial policy because of past failures is to miss the opportunity to understand why most industrial policies failed and to improve them in the future. They failed because in many cases the government in a developing country, with the best intentions and unaware of the endogeneity of industrial structure, tried too ambitiously to support advanced industries before the economy had the right endowment structure to make these industries into the country’s comparative advantages. The firms in targeted industries were not viable in open and competitive markets, so governments had to protect and subsidize

them, granting them monopoly rights, providing low-price capital, raw material, and land, or giving preferential taxes. Such distortive interventions created economic rents that stimulated rent-seeking, embezzlement, and corruption (Krueger 1974; Krugman 1993).

A desirable industrial policy should aim instead to facilitate the growth of industries with a latent comparative advantage, enabling them to become the country's competitive advantage in the market quickly. The latent comparative advantage refers to an industry with low factor costs of production relative to the rest of the world, which is determined by the economy's endowment structure, and transaction costs too high (due to poor hard and soft infrastructure) to be competitive in domestic and international markets. Firms will be viable and the sectors competitive once the government helps the firms reduce transaction costs by overcoming coordination and externality issues to improve hard and soft infrastructure.

In addition to facilitating the growth of industries with latent comparative advantage, an industrial policy may also help firms exit from industries in which the country loses comparative advantages, or relocate to other countries with lower income and wages.

The industries in a middle-income country may be classified into five different types, depending on their distance to the global technology frontier: (1) catching-up industries, which have lower technology and value-added than similar industries in higher income countries; (2) leading-edge industries, which are global technology frontier industries; (3) comparative advantage losing industries, which the country is about to exit due to changes in endowment structure and comparative advantages; (4) 'corner-overtaking' industries, which have short innovation cycles, allowing a middle-income country to compete directly with high-income countries; and (5) strategic industries, which go against the country's comparative advantages but are developed due to the need for national security. I will discuss how the government may play a facilitating role in each of the above five types of industrial policy.

### **3.1. Type I: catching up industries**

How can governments identify industries with latent comparative advantages in the process of catching up with industries in higher income countries? History offers many lessons of what to do and what to avoid.

Since the sixteenth and seventeenth centuries, successful economies have shared a common feature: industrial policies in these countries aimed to help firms enter industries that had flourished in dynamically growing and slightly more developed countries. They were able to exploit the latecomer's advantage. For example, the Netherlands was the most developed country in the world in the sixteenth and seventeenth centuries, with a highly developed wool textile industry. Britain's wool textile industry was immature by comparison. The British Government implemented policies to encourage the imports of machinery and skilled workers from the Netherlands. Those policies worked. At the time, per capita income in Great Britain was 70% of the Dutch level. Data for per capita income in Great Britain, Netherlands and other countries in this section are from Maddison (2006). That meant that their endowments and comparative advantages were quite similar.

Following the Industrial Revolution, Great Britain became the most advanced economy in the world. In the late nineteenth century, France, Germany, and the United States used similar policies to catch up with Great Britain. Their per capita incomes at that time were already about 60–75% of Britain's (Gerschenkron 1962). In the 1950s and 1960s, Japan

imitated industries in the United States at a time when its per capita income exceeded 40% of that of the U.S. Later, the four Asian tigers (Korea, Taiwan, Singapore, and Hong Kong) succeeded by imitating Japan's industries. Their per capita incomes were about 30–40% of Japan's at the time (Akamatsu 1962; Ito 1980; Kim 1988; Chang 2003).

Other countries also targeted and tried to imitate industries in the United States after the WWII but failed. One reason was that their income levels were less than 20% of that of the U.S. For example, in the 1950s China targeted and tried to imitate U.S. industries even though its per capita income was just 5% of the U.S. level. With the government's efforts to build up advanced industries, China was able to test atomic and hydrogen bombs in the 1960s and launch satellites in the 1970s. These achievements came at a very high price to the economy. In 1979, when China began its transition to a market economy, its per capita income was less than one-third the average of Sub-Saharan African countries.

Drawing on the experience of successful economies and the theory of comparative advantage, I propose a new growth identification and facilitation framework for the catching-up type of industrial policy. This framework has two tracks and six steps (Lin and Monga 2011).

### ***3.1.1. Step 1: identifying tradable goods industries***

When the government of a developing country seeks to facilitate industrial upgrading in non-resource manufacturing, it should identify the tradable goods industries in countries that have been growing dynamically for the previous 20–30 years and whose per capita income is about 100–200% higher than its own. Although experience suggests that 100% has been a successful reference point, a larger leap could be justified because technology and industrial upgrading happen much faster today.

The tradable goods and services produced in the target countries have a good chance of being those in which the pursuing country has a latent comparative advantage. If a country has grown rapidly in the last 20–30 years, the industries in its tradable sectors must be consistent with its comparative advantage. Yet, because of rapid capital accumulation and wage increases, the industries that were consistent with the comparative advantages of the targeted country's previous factor endowment structure will soon lose their comparative advantage. The sunset industries that are about to lose their comparative advantage in the targeted country will become the sunrise industries because of latent comparative advantage in the catching-up country, which has a similar endowment structure and a somewhat lower per capita GDP.

### ***3.1.2. Step 2: identifying obstacles***

Among the industries identified in step 1, the government may give priority to those in which some domestic firms have already entered spontaneously, and identify the obstacles impeding these firms from upgrading the quality of their products and the barriers limiting entry by other private firms. The usual barriers are related to high transaction costs. Is the primary impediment deficient infrastructure, poor logistics, inadequate financial support, or a limited pool of skilled workers? Obstacles can be identified using value-chain analysis or the growth diagnostic framework suggested by Hausmann, Rodrik, and Velasco (2008). The government can then take steps to ease those binding constraints, using randomized controlled experiments to test the effectiveness of these measures before scaling up policies at the national level (Duflo 2004).

### ***3.1.3. Step 3: encouraging firms in other, more advanced economies to relocate to the country trying to catch-up***

Some of the industries identified in Step 1 may be new to the country. The government could adopt measures to encourage firms in the targeted higher income countries to relocate to its country so as to take advantage of lower wages. The government could also establish incubation programs to catalyze the entry of domestic private firms into these industries.

### ***3.1.4. Step 4: paying attention to successful businesses in new industries***

Technology changes fast, which means that there are industries today that did not exist 20 years ago. Some domestic entrepreneurs may discover new profitable opportunities that were not identified in step 1. Consider information services in India in the 1980s. In the beginning, Indian firms outsourcing to U.S. companies used satellite communication, which was extremely expensive. The Indian Government built fiber-optic systems that greatly reduced communication costs, helping Indian information service companies gain a competitive advantage over other companies in the world. When new technology brings new opportunities and domestic private firms have already discovered them, the governments should pay close attention to their success and provide support to scale up those industries. Each country may also have some unique endowments. If entrepreneurs in the country discover opportunities to use such endowments profitably, the government may also provide support to scale up those opportunities to become competitive industries.

### ***3.1.5. Step 5: using special economic zones to attract domestic and foreign companies***

In developing countries with poor infrastructure and an unfriendly business environment, budget and capacity constraints prevent governments from making necessary improvements to benefit every industry in all locations of the country within a reasonable timeframe. Instead, the government can use industrial parks, export processing zones, or special economic zones to attract private domestic and foreign firms to invest in the targeted industries. Improvements in infrastructure and the business environment within these special areas can reduce transaction costs and facilitate the development of industries with latent comparative advantage. The special economic areas also have the advantage of encouraging industrial clustering, which can lower logistical costs.

### ***3.1.6. Step 6: compensating pioneering firms for the externalities they generate***

The government may provide limited incentives to pioneering domestic or foreign firms that invest in industries identified in steps 1 and 4 to compensate them for the public knowledge created by their investments. The incentives should be limited in time and budget allocations because the targeted industries should have a latent comparative advantage that enables them to become competitive in domestic and foreign markets once transaction costs fall. The incentives may be in the form of a corporate income tax holiday for a limited number of years, priority access to credit (in countries with financial repression), or priority access to foreign reserves for importing key equipment (in countries with capital controls). To minimize the risk of rent-seeking and political capture, the incentives should not be in the form of monopoly rent, high tariffs, or other distortions. The government may reward the firms that discovered successful new industries by themselves (see step 4 above) with

a prize or other forms of special recognition for their contributions to economic development.

This kind of compensation for externalities differs from the protections and subsidies of the old import substitution strategy that aimed to help nonviable firms in priority industries stay in business. Under this new framework, the firms encouraged have low factor costs of production and are viable in the market, so their profitability can be ensured by improving their management once soft and hard infrastructure are enhanced and transaction costs lowered.

### **3.2. Type II: leading edge industries**

When a country reaches the middle-income stage, some of its industries may enter into areas which high-income countries have exited due to limited value-added (from these high-income countries' viewpoint). In such cases, the former country becomes the highest income country in the industry worldwide and it possesses leading edge technology. One example is household appliances – such as color TVs, refrigerators, microwave ovens, and other electronic white goods – in China. For the country to maintain leadership and competitiveness in these industries, it is necessary that the firms in these industries engage in indigenous R&D for new technologies and products.

Two different kinds of activities are involved in indigenous R&D: the development of new products and new technologies, and delivering the breakthroughs in the basic science needed for the new technologies and products. A firm can be rewarded by a patent if its efforts to develop a new product or technology are successful. Therefore, the development of new products and technology should be the firm's responsibility. However, research in basic science requires large capital inputs and is very risky, while its outputs are typically in the form of academic papers, which are public goods. Individual firms may be reluctant to do basic research.

In advanced countries such as the U.S., most of the industries are leading-edge industries worldwide. The basic research related to those industries is mainly carried out by either universities or research institutions, funded by the National Science Foundation, the National Institutes of Health, the Defense Department, and other government sources (Mazzucato 2013). Similarly, basic research in other advanced economies like Japan and some European countries is also carried out by government-funded institutions. All these facts suggest that, in order to maintain global competitiveness and leadership in its leading-edge industries, a middle-income country should adopt a similar approach to support the basic research required to catalyze the innovation of new technologies and products. The government should also strengthen the protection of intellectual property rights.

To be more specific, governments of middle-income countries can promote the development of new products and technologies by using fiscal allocations to set up research funds to support research institutions in related fields or to encourage cooperation between research institutions and firms in the industries. The governments can also financially support firms in the industry to set up joint research platforms, which can be used to tackle common technical bottlenecks. Firms may develop new products or technology separately, based on breakthroughs in the common technology. Lastly, the government can use procurement to help firms rapidly scale up production so as to reduce unit costs and increase international competitiveness.

In order to expand the market globally, it is essential for firms in the relevant industries to establish worldwide networks for sales, processing of products, and after-sale services. The government may help firms in these types of industries go abroad by providing personnel training, legal service, and consular protection.

### **3.3. Type III: comparative advantage-losing industries**

For labor-intensive industries, wage is one of the most important components of the cost of production. In a rapidly growing developing country, such as China, wages will rise very quickly. Labor-intensive industries will turn from the country's comparative advantages to its sunset industries. In the face of such change, some of the firms in the labor-intensive export processing industries may upgrade to the two ends of a 'smile curve' where the added-value is higher, such as branding, R&D, quality control, marketing, sales, etc. However, for most firms the way out is to relocate their production to countries with lower wages, as the textile, garments, and electronic firms in Japan did in the 1960s and firms in similar industries in the Four Asian Tigers did in the 1980s. Relocating allows the firms to put their tacit knowledge in technology, management and marketing to continual use and it also changes these firms' production from the country's GDP to the country's gross national product. Moreover, the overseas success of these firms can speed up the industrial upgrading in their home country by releasing resources for new industries and generating demand for intermediate parts or machineries used in the labor-intensive industries, which are in general more capital/technology intensive and of higher added value.

Most of the labor-intensive export processing firms are clustered. The government may use two types of policies to help these firms. The first one provides training on design, R&D and marketing which can help some firms move up to the two ends of a 'smile curve.' The second policy facilitates processing firms going abroad. Specific measures include offering information on host countries and training personnel needed for overseas operations, or establishing export processing zones together with the host governments so as to provide adequate infrastructure and business environments for the firms. Examples of export processing zones include Singapore's Industrial Park in Suzhou, China.

### **3.4. Type IV: 'Corner overtaking' industries**

The coming of the information age creates opportunities for a developing country to compete directly with developed countries in certain industries, such as software and mobile devices, where innovations rely mainly on human capital and where the innovation cycle is relatively short (Lee 2013). The innovation of a new medicine may take decades and will require billions of dollars, whereas the design of a piece of software or a mobile phone may take only a few months and be accomplished by a small team of engineers. Since the required capital input to support the innovation is relatively small, the disadvantage of a relatively capital-scarce developing country in the innovation of such types of products is, compared to a relatively capital-abundant developed country, not insurmountable. Such industries provide a developing country with the opportunity to overtake developed countries on a corner. The government in a developing country can facilitate the development of such industries by investing in the education of related human capital, setting up incubators, reinforcing the protection of property rights, encouraging venture capital, providing

preferential taxes, facilitating start-ups run by creative talents at home and abroad, and using government procurement to support the production of new products.

### **3.5. Type V: strategic industries**

Every country needs national defense. National defense industries are usually characterized by high capital-intensity, long R&D cycles, and large-scale economies. In general, such industries are not compatible with a country's comparative advantages, and especially so in the case of developing countries. However, some of those industries may be essential for national defense and the country needs to own them domestically. Firms in such industries will not be viable in an open, competitive market. Subsidies and protections from government are indispensable. The structuralist perspective discussed in section 1 of this chapter proposed the use of distortions in factor prices and of market monopolies as means of subsidies/protection for comparative advantage-defying advanced industries. A better approach is to subsidize these firms directly by R&D grants or indirectly through procurement of products. This is similar to the practices in the U.S. and other advanced countries. In a developing country, the government's fiscal capacity to subsidize strategic industries is limited. Therefore, the choice of strategic industries should be very selective and their number should remain small. In effect, only those industries essential for national defense with a large externality to civil industries should be chosen.

## **4. Concluding remarks**

This chapter reviewed the evolution of development economics since its formation in the wake of the WWII and proposed new structural economics as an alternative approach. Every developing country has the potential to grow dynamically and avoid the middle-income trap. However, that can only happen if the government plays an appropriate facilitating role in a market economy by supporting the development of industries connected to the country's latent comparative advantages.

Achieving such a result will require a change in mindset. In the first two waves of development thinking, economists used high-income countries as the reference. They examined what those countries had (capital-intensive industries) and what they could do well (well-functioning market) and recommended that developing countries follow suit. New structural economics turns this model upside down. It recommends that developing countries look at what they have at the present time (their endowments) and at what they can do well based on what they have (their comparative advantages) and create conditions to scale up what they can do well. Governments should compensate for the externalities generated by the first movers to the industries in which the country has latent comparative advantages, and coordinate or provide improvements in hard/soft infrastructure to reduce transaction costs so that the industries in question become the nation's competitive advantages and, thus, profitable. Competitiveness will create the foundation for sustained growth, income generation, poverty reduction, and fast upgrading of endowment/industrial structure leading to catch-up with high-income countries. I hope that the industrial policies for the five types of industries discussed in this paper will help governments in middle-income countries to tap their growth potentials, achieve development success, and become high-income countries.

## Note

1. By convention, the name for such studies should be 'structural economics.' The 'new' is added to distinguish it from structuralism. This practice has precedents in modern economics. For example, Douglass North, who used the neoclassical approach to study institutions in the 1960s, referred to it as 'new institutional economics' to distinguish it from the 'institutional school,' which flourished in the United States in the early twentieth century.

## Disclosure statement

No potential conflict of interest was reported by the author.

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