ICTSD
International Centre for Trade and Sustainable Development

WORLD ECONOMIC FORUM
COMMITTED TO IMPROVING THE STATE OF THE WORLD

The E15 Initiative

STRENGTHENING THE GLOBAL TRADE SYSTEM

Industrial Policies for Upper-Middle-Income Countries

Keun Lee

March 2015

E15 Expert Group on Reinvigorating Manufacturing:
New Industrial Policy and the Trade System

Think Piece

Co-convened with

北京大学国家发展研究院
National School of Development

ACKNOWLEDGMENTS

Published by

International Centre for Trade and Sustainable Development (ICTSD)
7 Chemin de Balexert, 1219 Geneva, Switzerland
Tel: +41 22 917 8492 – E-mail: ictsd@ictsd.ch – Website: www.ictsd.org
Publisher and Chief Executive: Ricardo Meléndez-Ortiz

World Economic Forum
91-93 route de la Capite, 1223 Cologny/Geneva, Switzerland
Tel: +41 22 869 1212 – E-mail: contact@weforum.org – Website: www.weforum.org
Co-Publisher and Managing Director: Richard Samans

Acknowledgments

This paper has been produced under the E15Initiative (E15). Implemented jointly by the International Centre for Trade and Sustainable Development (ICTSD) and the World Economic Forum, the E15 convenes world-class experts and institutions to generate strategic analysis and recommendations for government, business and civil society geared towards strengthening the global trade system.

For more information on the E15, please visit www.e15initiative.org

The Expert Group on Reinvigorating Manufacturing: New Industrial Policy and the Trade System is co-convened with the National School of Development at Peking University. www.en.nsd.edu.cn/

With the support of:

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Canada

And ICTSD's Core and Thematic Donors:

Department for International Development

SWEDEN

Ministry of Foreign Affairs

Ministry of Foreign Affairs of Denmark

Ministry for Foreign Affairs of Finland

Norwegian Ministry of Foreign Affairs

Citation: Lee, Keun. *Industrial Policies for Upper-Middle-Income Countries.* E15Initiative. Geneva: International Centre for Trade and Sustainable Development (ICTSD) and World Economic Forum, 2015. www.e15initiative.org/

ISSN 2313-3805

ABSTRACT

The middle-income trap is a situation in which middle-income countries face a slowdown of growth. It tends to occur when middle-income countries get caught between low-wage manufacturers and high-wage innovators—their wage rates are too high to compete with low-wage exporters and their level of technological capability is too low to enable them to compete with advanced countries. So, this paper suggests various ways to cultivate the innovation capabilities of middle-income countries so that they advance out of the trap. The first thing is establishing in-house research and development laboratories, and firms may then explore diverse channels of learning and access to foreign knowledge. These include public-private joint R&D; co-development contracts with foreign R&D specialist firms; promoting spin-offs from academia; promoting domestic firms by learning from FDI firms; and initiating international mergers and acquisitions. Many of these schemes, such as R&D subsidies, have not been restricted (or classified as green light subsidies) under World Trade Organization rules. So, developing countries are well advised not to use the WTO restriction on industrial policies as an excuse for not trying anything because the space for such policies still exists.

CONTENTS

LIST OF ABBREVIATIONS

ASCM	Agreement on Subsidies and Countervailing Measures
ASICs	application specific integrated circuits
CRT	cathode ray tube
FDI	foreign direct investment
GNI	gross national income
GRIs	government research institutes
IC	integrated circuit
IT	information technology
ITRI	Industrial Technology Research Institute
M&As	mergers and acquisitions
MICs	middle-income countries
MIT	middle-income trap
MNCs	multinational corporations
OBM	Own Brand Manufacturing
OEM	original equipment manufacturing
PCs	personal computers
R&D	research and development
SOEs	state-owned enterprises
UK	United Kingdom
US	United States
VC	venture capital
VCRs	video cassette recorders
WTO	World Trade Organization

INTRODUCTION

The middle-income trap (MIT) is a situation in which middle-income countries (MICs) face a slowdown of growth (World Bank 2010). The risk of the MIT is not limited to a select group of countries but is applicable to many countries in the world. The World Bank (2012) has compared the income levels of several countries (compared with that of the United States [US]) in 1960 with those in 2008. This analysis reveals that at least 30 countries have fallen into the MIT. Specifically, income growth has more significantly slowed in upper-middle-income countries, or those with an income level of 20 percent to 30 percent of that of the US, which is the income level of China today.

We consider innovation and high education as the most important causes of the MIT because numerous studies show it occurring as middle-income countries get caught between low-wage manufacturers and high-wage innovators—their wage rates are too high to compete with low-wage exporters and their level of technological capability is too low to enable them to compete with advanced countries (Lee 2013; World Bank 2010, 2012). In other words, the MIT phenomenon is a growth slowdown because of weak innovation. More specifically, Lee and Kim (2009) find from a country panel analysis that basic institutions and secondary education are significant for low-income and lower-middle-income countries, whereas innovation and high education are significant and binding for upper-middle-income and high-income countries.[1]

So, this think-piece suggests various ways to cultivate the innovation capabilities of MICs, so that they advance out of the trap. The next section discusses the nature of economic challenges MICs face and the two kinds of upgrading in capabilities they need, while Section 3 deals with how to go about it.

ECONOMIC CHALLENGES OF UPPER-MIDDLE-INCOME COUNTRIES AND WHAT IS NEEDED

DILEMMAS AND THE CRISIS OF THE 'STANDARD DEVELOPMENT' MODEL

In the early days of their take-off, Asian firms faced at least two important competitive disadvantages—their isolation from major international sources of innovation, and their distance from advanced markets and the user-producer links essential for innovation. Original equipment manufacturing (OEM) was one of the chief institutional mechanisms used to overcome these entry barriers and enable technological learning (Hobday 2000). OEM is a specific form of subcontracting in which finished products are made to the precise specifications of particular buyers, who then market the products under their own brand name and through their own distribution channels. In Taiwan and Korea, OEM accounted for a significant share of electronics exports during the 1970s, 1980s, and even the 1990s (Hobday 2000: 133).

While latecomer firms readily achieve an early stage of development through producing products designed by others (the so-called OEM model), they face uncertain long-term prospects—potential technology suppliers refuse to sell designs or licenses, or switch production orders to lower-wage sites or countries (Lee 2005). The fundamental reason for the unfolding of an "OEM crisis" has been rising wage rates that follow successful production and the difficulty firms have in paying higher wages when they upgrade to higher value-added segments. However, upgrading requires the acquisition of design capabilities. In the Korean case, firms could find products to imitate, but no designs were forthcoming from incumbent producers who were reluctant to transfer design technology to potential rivals. In Taiwan, the crisis made foreign vendors switch their OEM orders to firms in other lower-wage economies such as Malaysia. Taiwanese firms then realized that they had to upgrade their design capabilities if they wanted to keep their customers.

1 According to the World Bank, as of 2015, the upper-middle-income group includes 55 countries with a gross national income (GNI) per capita of $4,126 ~ $12,745 in 2013. It includes Argentina, Brazil, Panama, South America, Thailand, Malaysia, Mauritius, and Mexico. For the full list, see http://data.worldbank.org/about/country-and-lending-groups#Upper_middle_income.

Specifically, they had to design an "imitative" product by themselves and sell this product under their own brand name. However, design capability is not acquired simply by continuing as a subcontractor or through networking with local producers. The case of Acer in Taiwan shows how difficult it is to move out of the OEM phase, and to move into "Own Brand Manufacturing," or OBM (Khan 2002).

WHY ARE SUCCESSIVE UPGRADING AND ENTRY NECESSARY?

The Korean and Taiwanese cases reveal that upgrading in the same industry and entry to promising new industries occurred over the course of industrial development. My proposition is that the chances for successful and sustained catch-up are slim unless both these kinds of upgrading are pursued. There are two issues involved here—one from the perspective of the latecomer, and the other from that of the front-runner, or incumbent firm.

First, from the latecomer perspective, it should be noted that while the current success of the OEM strategy leads to a rise in wage rates, new, cheaper labor sites in "next-tier-down" countries will emerge to replace a country's position in global value chains. This condition forces domestic firms to move up to higher value-added activities in the same industries. Second, innovators in the front-runner countries tend to generate new higher value-added industries. As innovations arise, established industries mature and may degrade into lower value-added activities, forcing firms in advanced countries to enter newly emerging industries and higher valued-added activities.

In East Asia, examples of upgrading in the same industries are numerous. For example, semiconductor firms in Korea and Taiwan started from integrated circuit (IC) packaging or testing (low value-added activities), then moved to IC fabrication and eventually to IC design (highest valued-added). Likewise, there are many cases of successive entry to higher value-added activities. For instance, the Tatung company in Taiwan has made successive entries to new activities since the 1960s, starting with black and white TVs in 1964; color TVs in 1969; video cassette recorders (VCRs), personal computers (PCs), and hard-disk drives in the mid-1980s; TV chips/application specific integrated circuits (ASICs) in the late 1980s, and workstation clones in 1989 (Khan 2002). The Samsung group in Korea is well known for its successive entry to new industries in its 60-year history. Samsung began with being involved in light manufacturing industries, such as textiles, then entered consumer electronics, followed by semiconductors, telecommunications equipment, and flat panel displays.

The question that naturally arises from these success stories is how to make double upgrading happen. Upgrading and structural transformation do not occur automatically even if a country is open to trade and foreign direct investment (FDI). Rather, they always involve deliberate learning and risk-taking by companies and other public actors, combined with exogenously open windows of opportunity. The market mechanism serves not as a triggering factor, but as a facilitating factor that stimulates risk-taking and rewards successful actors.

For example, Taiwan's successful entry to higher value-added industry segments would have taken a longer time had there been no public-private research and development (R&D) cooperation, the first successful example of which was a consortium to develop laptop computers (Mathews 2002). It should be noted that there were several attempts and failures prior to this achievement. Such public-private joint effort does not guarantee immediate success, but is the only way out of the old specialization in low-end goods sectors, and hence, out of the MIT. In Korea, the first case of a successful public-private R&D consortium was the development of digital telephone switches (Lee et al. 2012). This marked the beginning of the country's emergence as a leader in telecommunication and information technology (IT) devices. Given that this success was a source of learning and confidence, it, in turn, led to further public-private cooperation in the production of memory chips, mobile phones, and digital TVs.

SPECIFIC POLICY TOOLS FOR UPPER-MIDDLE-INCOME COUNTRIES

To begin with, a requirement for upgrading is firms establishing and initiating their own in-house R&D centers. Independent R&D efforts are required because foreign firms will become increasingly reluctant to grant technology licenses to rising latecomer firms, especially if the latter attempt to enter the skill-intensive markets dominated by them. But setting up domestic in-house R&D is not easy in contexts with few financial or human resources (such as very low human capital due to weak education systems). With the establishment of in-house R&D laboratories, firms may explore diverse channels of learning and access to foreign knowledge. Arranging access to foreign knowledge and trying new modes of learning is critical because isolated in-house R&D efforts are often insufficient to build indigenous R&D capabilities. Alternative modes of learning are diverse, including co-development contracts with foreign R&D specialist firms and/or with public R&D institutes; gaining mastery of the existing literature; setting up overseas R&D outposts; and initiating international mergers and acquisitions (M&As). In what follows, these alternatives will be elaborated, and they are summarized in Table 1.

FORMING AND PARTICIPATING IN A PUBLIC-PRIVATE R&D CONSORTIUM

Forming and participating in a public-private R&D consortium can be an effective school for private firms when their capability is low. Given their low R&D capabilities, private firms cannot take the lead in such a consortium, where public research agencies play key R&D roles and teach and transfer the outcomes to participating private firms. We can see many examples of this process in Korea, Taiwan, and other catching-up countries.

A noteworthy example are the government-led R&D consortia in the telecommunication equipment industry, specifically the local development of telephone switches. This led to the successful localization of telephone switches in the 1980s and 1990s in several latecomer countries, including China, Korea, India, and Brazil (Lee et al. 2012). Most of the developing countries had serious telephone service bottlenecks in the 1970s and 1980s; they had neither their own telecommunication manufacturing equipment industry nor their own R&D programs. As a result, they used to import expensive equipment and related technologies, and local technicians merely installed foreign switching systems into domestic telephone networks. With industrial and commercial bases developing rapidly—along with population growth—a number of countries decided to build their own manufacturing capabilities.

Starting with Brazil in the 1970s, followed by Korea and India in the mid-1980s, and finally by China in the late 1980s, a state-led system of innovation in the telecommunication equipment industry was crafted, with a government research institute (GRI) at the core. The research institute developed more or less "indigenous" digital telephone switches that were then licensed to public and private domestic enterprises. In these four countries, a common pattern in the indigenous development of digital switches was a tripartite R&D consortium with GRIs in charge of R&D functions; state-owned enterprises (SOEs) or a ministry in charge of financing and coordination; and private companies in charge of manufacturing at the initial or later stages. However, subsequent waves of industry privatization and market liberalization in Brazil and India, and consistent infant industry protection in Korea and China, have differentiated the trajectory of the industries in these four countries (Lee et al. 2012). At one extreme, indigenous manufacturers in China and Korea have taken over from importers and multinational corporations (MNCs). Their enhanced capabilities in wired telecommunication, which had accumulated over the preceding decades, led to the growth of indigenous capabilities in wireless telecommunication as well. At the other extreme, Brazil and India have increasingly become net importers of telecommunication equipment, and their industries are now dominated by affiliates of MNCs.

As noted by Lee and Mathews (2012), examples from Taiwan include the production of calculators and laptop PCs. In the case of calculators, the acquisition of more fundamental design capabilities and a basic design platform was made possible with the help of government entities such as the Industrial Technology Research Institute (ITRI). Another example is the public-private R&D consortium that developed laptop PCs from 1990 to 1991 (Mathews 2002). This developed a common mechanical architecture for a prototype that could easily translate into a series of mass-produced standardized components. The consortium represented an industry watershed, and after several failed attempts, succeeded in establishing new "fast follower" industries in Taiwan.

CO-DEVELOPMENT CONTRACTS WITH FOREIGN/ R&D SPECIALIST AGENCIES OR FIRMS

A good example of this mode (co-development) is the case of Hyundai Motor Company in Korea. The main business of the Hyundai group used to be construction, a long-cycle, technology-based sector. Hyundai entered the business of automobiles in the early 1970s as an assembly maker for Ford, the US car manufacturer. Such a story is common in developing countries. However, Hyundai Motor and Korea's current status as a stronghold of the automobile business would not have been possible without the company's brave decision to cut its ties with Ford and sell its own brand of automobiles equipped with its own engines. Hyundai then became a joint venture with Japanese car maker Mitsubishi, where the Japanese company provided engines and other key components, which Hyundai assembled. In that partnership, Hyundai was a licensed producer but not an OEM producer, as it used its own brand in the local and export markets. However, when Hyundai wanted to develop its own engines, Mitsubishi (which held 20 percent of the equity) refused to teach it how to design and produce them on its own. Most developing country businessmen would have given up at that point, but Hyundai's founding chairman, Chung Ju-yung, did not. He decided to spend an enormous amount of money on R&D, with efforts focused on engine development. Fortunately, Hyundai was able to gain access to the external knowledge of specialized R&D firms, such as Ricardo of the United Kingdom (UK). The process was not easy. Ricardo provided an engine design, but the two companies basically co-developed a completely new design. In fact, the partners had to try more than 1,000 prototypes until they finally succeeded seven years after the project was launched in 1984 (Lee 2013: ch. 7).

PROMOTING INDIGENOUS FIRMS BY LEARNING FROM FDI FIRMS

Developing countries all tend to invite FDI. Although this strategy has not been entirely successful, there are cases in which it has worked and contributed to technological catch-up, an excellent example being the telecommunication equipment industry in China (Mu and Lee 2005). China took advantage of its large market size to pressure its foreign partner to transfer core technology to the local partner. Shanghai Bell and other joint venture (JV) establishments fostered the diffusion of technological know-how on digital telephone switches across the country. Thus, indigenous manufacturers emerged and began competing directly with JVs in the mid-1990s, initially in rural markets and subsequently in urban markets. Although a similar diffusion of knowledge occurred in Southeast Asian countries, China was more successful in turning the diffusion into promoting indigenous companies. A key lesson is to use a JV as a channel through which learning about technology can take place. Thus, even after its entry to the World Trade Organization (WTO), the Chinese government has made no commitment on lifting the upper limit on foreign shares (usually 50 percent) in JVs in key industries, including automobiles, telecommunications, and banking. This continuing restriction on foreign shares is in sharp contrast to opening the market, exemplified by a lowering of tariffs at about 10 percent or less on average, which is lower than the average in most developing countries.

PROMOTION OF ACADEMY-RUN ENTERPRISES IN FORWARD ENGINEERING

In China, since the reform and open door policy, many firms have been established by academic institutions or are affiliated to them. These academy-run enterprises are widespread in the country, and their importance in key high-tech regions is substantial. The direct involvement of academic institutions in industrial business is called "forward engineering" (Eun et al. 2006). In the "reverse engineering" strategy, latecomer firms acquire technological principles by conducting autopsies on final (typically imported) products. Reverse engineering is a bottom-up mode of technological development, whereas forward engineering is a top-down mode of it. Here, the creators (academic institutions), who already possess scientific knowledge, further process nascent knowledge till it can be put to commercial uses. Taiwan and Korea have rarely exploited their academic institutions for technological development, with these mainly supplying engineers to local firms. By contrast, Chinese universities and research institutes, such as those under the banner of the Chinese Academy of Sciences, have played an active role in commercializing new technologies using the results of their research projects.

TABLE 1:

Industrial Policy in Upper-Middle-Income Economies

Category	Examples	Policy instruments	Implications for WTO rules
Public-private R&D consortium	Telephone switches in Korea and China; laptop architecture in Taiwan	Provision of public funding for public part of R&D	Okay, but potentially problematic if too specific
Co-R&D with foreign/R&D specialist firms	Hyundai Motor in Korea (engine development)	No government involvement, unless arranged or funded by the government	Should be okay
Promoting indigenous firms by learning from FDI firms	Telephone switches in China	Sometime policy restriction on maximum foreign shares; often tariff on imported goods	Potential challenge if a cap is set for foreign shares in FDI firms, as in China
Academy-run enterprises in forward engineering	Many such firms in China since the 1990s	Public funding of research by academia	No restriction on Research funding
Acquisition of foreign technologies and brands	Many by China (Lenovo's purchase of IBM PC; TCL's M&A of Schneider: Geerly's M&A of Volvo)	Maybe lending of money for M&A deals	No problem, unless targeted lending by the government

ACQUIRING FOREIGN TECHNOLOGIES AND BRANDS BY MERGERS AND ACQUISITIONS

Until the 1990s, Chinese outward direct foreign investments were highly regulated compared with those of other major source countries for FDI. However, a significant shift in policy was made in 2002 when the premier announced a new strategy encouraging Chinese companies to "Go Global" by investing overseas. The policy change seemed to reflect a desire on the part of the Chinese government to acquire foreign technologies and brands, as can be seen from many M&As targeting foreign companies in the manufacturing sector. This strategy serves the objective of saving time for catch-up, considering the amount of time and effort it takes to build original brands and technologies (Lee 2013: ch. 8). A well-known case is Lenovo's purchase of the PC division of IBM in 2004 and TCL's acquisition of a European company (Schneider) for electricity technology. Chinese cathode ray tube (CRT) maker BOE's move to acquire Korean company Hynix's thin-film-transistor liquid-crystal display (TFT-LCD) division had more to do with the technology than the brand. Similar cases of targeting foreign technologies include Geerly's acquisition of Volvo, D'rong's acquisition of German passenger airplane maker Fairchild-Dornier, and Shanghai Automobile's acquisition of Korean automaker SsangYong.

POLICY SPACE UNDER WTO AND CONCLUDING REMARKS

It is our view that developing countries would be well advised to not take the WTO restriction on industrial policies as an excuse for not trying industrial policy because there still exists space for such policies under the WTO (Lee et al. 2014). Although subsidies on exports are prohibited, those on production are "green light subsidies" or have not been prohibited unless they are deemed specific and causing adverse effects to other member countries, as noted by UNIDO/UNCTAD (2011). Moreover, the Agreement on Subsidies and Countervailing Measures (ASCM) does not prevent governments from subsidizing activities, particularly through regional, technological, and environmental policies, provided they have sufficient ingenuity to present such subsidies as WTO compatible. In general, developing countries may attempt to take advantage of the fact that many rules in the ASCM have loopholes or room for flexible interpretation, as the term "yellow light" for certain types of subsidies shows.

Upper-middle-income countries that need innovation as a binding factor for further economic growth to go beyond the MIT should note that several policies to cultivate innovation capabilities, such as R&D subsidies, have not been restricted (or classified as green light subsidies). This paper illustrated various alternatives, such as public-private joint R&D; co-development with foreign R&D entities; promotion of indigenous firms' learning from FDI firms; promotion of academy-run enterprises; international M&As; and the setting up of overseas R&D outposts.

In general, developing countries may be able to use some "non-specific" subsidies because these are not prohibited by the WTO. In other words, when subsidies are not limited to "certain enterprises or industries" but are available on the basis of "objective criteria or conditions," they are regarded as not specific.[2] In accordance with this idea, a new "evolutionary industrial policy" has been proposed by Avnimelech and Teubal (2008). This is based on the example of the development of an Israeli high-tech cluster between the time an office of the chief scientist and a horizontal R&D grant program was created in 1969 and the end of the cluster emergence process in 2000. The proposed evolutionary targeting is an alternative approach to firm-specific targeting and focuses on the specification of the selection mechanisms, involving the design and implementation of targeted programs for the emergence of a multi-agent structure.[3]

2 See ASCM Annex 2.

3 The processes included (i) the development of innovation capabilities in the business sector, a process associated with dynamic economies of scale, which required the timely expansion of a horizontal R&D grant budget and the implementation of new programs while restructuring existing ones; (ii) a virtuous co-evolution process between science and technology infrastructure, on the one hand, and business sector R&D, on the other hand (a push and pull effect); (iii) coordination of policies at a point of time and through time, for example, between direct horizontal support of innovation in an early phase and venture capital (VC) targeting in a later phase; and (iv) a continuous process of endogenization of business sector R&D, that is, embeddedness of R&D within the business sector and a decline in the share of such activity financed by the government. See Avnimelech and Teubal (2006).

REFERENCES

Avnimelech, G. and Teubal, M. 2008. "Evolutionary Targeting." *Journal of Evolutionary Economics*, 18 (2), pp. 151–66.

Avnimelech, G. and Teubal, M. 2006. "Creating Venture Capital Industries which Co-evolve with High Tech Clusters: Insights from an Extended Industry Life Cycle Perspective to the Israeli Experience." *Research Policy,* 35 (10), pp. 1477–98.

Eun, J., Lee, K. and Wu, G. 2006. "Explaining the 'University-run Enterprises' in China." *Research Policy*, 35 (9), pp. 1329–46.

Hobday, Michael. 2000. "East versus Southeast Asian Innovation Systems: Comparing OEM- and TNC-led Growth in Electronics." In L. Kim and R. Nelson (eds.), *Technology, Learning and Innovation*, Cambridge University Press.

Khan, Haider. 2002. "Innovation and Growth: A Schumpeterian Model of Innovation Applied to Taiwan." *Oxford Development Studies*, 30 (3), pp. 289–306.

Lee, Keun, Shin, Wonkyu and Shin, Hochul. 2014. "How Large or Small is the Policy Space? WTO Regime and Industrial Policy." *Seoul Journal of Economics*, No. 3: 307-348

Lee, Keun. 2013. *Schumpeterian Analysis of Economic Catch-up: Knowledge, Path-creation and Middle Income Trap*. Cambridge: Cambridge University Press.

Lee, Keun. 2005. "Making a Technological Catch-up: Barriers and Opportunities." *Asian Journal of Technology Innovation,* 13 (2), pp. 97–131.

Lee Keun, Jee, M. and Eun, J. H. 2011. "Assessing China's Economic Catch-Up at the Firm Level and Beyond: Washington Consensus, East Asian Consensus and the Beijing Model." *Industry and Innovation*, 18 (5), pp. 487–507.

Lee, Keun, and Kim, B. Y. 2009. "Both Institutions and Policies Matter but Differently at Different Income Groups of Countries: Determinants of Long Run Economic Growth Revisited." *World Development*, 37 (3), pp. 533–49.

Lee, Keun, and J. Mathews. 2012. "Firms in Korea and Taiwan." In J. Cantwell and Ed Amann (eds.), *The Innovative Firms in the Emerging Market Economies*, New York: Oxford University Press.

Lee, Keun, Mani, S. and Mu, Q. 2012. "Divergent Stories of Catchup in Telecom." In F. Malerba and R. Nelson (eds.), *Economic Development as a Learning Process,* Cheltenham, UK: Edward Elgar.

Mathews, John A. 2002. "The Origins and Dynamics of Taiwan's R&D Consortia." *Research Policy*, 31, pp. 633–51.

Mu, Qing, and Lee, Keun. 2005. "Knowledge Diffusion, Market Segmentation and Technological Catch-up: The case of the Telecommunication Industry in China." *Research Policy,* 34 (6), pp. 759–83.

UNIDO/UNCTAD. 2011. *Economic Development in Africa Report 2011*. Geneva: United Nations.

World Bank. 2012. *China 2030: Building a Modern, Harmonious, and Creative High-Income Society*. Washington, DC: World Bank.

World Bank. 2010. "Exploring the Middle-Income-Trap." In *World Bank East Asia Pacific Economic Update: Robust Recovery, Rising Risks*, Vol. 2, Washington, DC: World Bank.

Implemented jointly by ICTSD and the World Economic Forum, the E15Initiative convenes world-class experts and institutions to generate strategic analysis and recommendations for government, business, and civil society geared towards strengthening the global trade and investment system for sustainable development.