

Globalization and Divergent Paths of Industrial Development: Mobile Phone Manufacturing in China, Japan, South Korea and Taiwan

Joonkoo Lee ^a, Jong-Cheol Kim^b and Jinho Lim^c

^aSchool of Business, Hanyang University, Seoul, South Korea; ^bAsia Center, Seoul National University, Seoul, South Korea; ^cDepartment of Political Science and International Relations, Korea University, Seoul, South Korea

ABSTRACT

Globalisation has challenged the way industrial development takes place. Fragmented and decentralised global production and the rapid growth of consumer markets in emerging economies demand a more sophisticated framework to analyse development paths than does the dichotomy of export orientation and import substitution. This article proposes a typology based on (a) specialisation in the global value chain and (b) market orientation to distinguish different development trajectories and then applies the typology to mobile phone manufacturing in four East Asian countries. This study finds that globalisation does not lead to the convergence of development paths, but promotes cross-national divergence depending on countries' positions in the value chain and market niches. Both Korea and Taiwan emerge as key players in global markets, yet in different parts of the global value chain. Their common orientation toward global markets strikingly contrasts the inability of Japanese firms to translate their domestic success overseas. Finally, Chinese firms concurrently engage in different development paths, making the country's multi-path approach unique. The implications of these findings are discussed in terms of industrial development in East Asia in an era of globalisation.

KEYWORDS

Globalisation; industrial development; global value chains; development path; East Asia; mobile phone manufacturing

Economic globalisation has challenged how industrial development takes place. Over the last few decades, cross-national flows of trade and investment have been liberalised, with many barriers lowered and new neo-liberal norms, regulations and institutions established. Particularly, the emergence of global value chains (GVCs) has transformed the context in which industrial development occurs in a global economy (Gereffi et al. 2001). Production activities have been fragmented into value-adding tasks and are conducted across national boundaries through offshore outsourcing (Arndt and Kierzkowski 2001; Milberg and Winkler 2013). A GVC refers to “the full range of activities that firms and workers perform to bring a specific product from its conception to its end use and beyond” (Gereffi and Fernandez-Stark 2011, 4). Similar concepts have been introduced to understand the growing fragmentation and geographic dispersion of

production, notably the “global production network” (Coe and Hess 2013; Henderson et al. 2002). Earlier, the “new international division of labour” had been used by Fröbel and colleagues (1980). Despite their differences these concepts commonly regard the emergence of the new form of fragmented production as one of the defining features of economic globalisation (see Sturgeon 2001). A new generation of industrialising countries, notably China, India, Brazil and South Africa, has entered global production networks as major suppliers, changing competitive dynamics in global industries. Nowadays, industrial development can be pursued through multiple entry points in the value chain by engaging in specific segments of the chain and moving to higher value activities (Kaplinsky 2000; Lee 2010).

An earlier debate on globalisation and development, centred on whether or not neo-liberal economic globalisation would lead to the convergence of development models across countries (Fourcade-Gourinchas and Babb 2002; Guillén 2001b), has evolved into how increasingly fragmented and decentralised production shapes development paths and outcomes (Gereffi 2009; UNCTAD 2013). Some value chain activities have a more positive impact than others on exports and employment, and the country’s position in the value chain can determine development outcomes. The question about the effects of GVC participation on development has become complicated in the post-recession global economy (Cattaneo et al. 2010; Neilson et al. 2014). The growing consolidation of production into a few large emerging economies and the increasing importance of developing country markets as end markets could further generate divergent prospects for industrial development.

In East Asia, the major industrialised economies – Japan, Taiwan and South Korea (hereafter Korea) – while often considered together under the umbrella of an East Asian development model, exhibited marked differences in the ways they organised industrial development during the post-war high growth era (Biggart and Guillen 1999; Fields 1997). The question is whether and how the patterns of industrial development have changed as these economies have confronted globalisation over the last few decades. Are the countries converging or diverging, and how have their linkages to global industries changed? Answering these questions is made more intriguing by the integration of China with global industries. This integration has affected the choices of China’s neighbouring countries, which in turn have influenced China’s responses, highlighting the interactive aspect of industrial development in the region (Baek 2005).

This article attempts to address these questions by examining the development paths of China, Japan, Korea and Taiwan in mobile phone manufacturing. Drawing from a GVC approach, the study proposes an analytical framework to discern different trajectories of industrial development, focusing on the position of a country’s firms in the mobile phone GVC and their orientation toward global markets. Mobile phone manufacturing is particularly interesting. It is one of the highly technology-intensive, advanced manufacturing sectors in which many countries are eager to excel. Also, in East Asia, mobile phone manufacturing is part of the electronics sector, which has played a key role as a major source of exports, jobs and innovation for each of the countries in different periods of history (Hobday 1998). As shown below, the countries remain the forerunners in the global mobile phone industry, and their positions have been strengthened in recent years (Lee and Gereffi 2013).

Our findings first point to a significant divergence among the four East Asian countries. A striking difference is found among Japan, Korea and Taiwan. Firms in each country are successful in some chain segments or geographical markets but less successful in others, thereby positioning themselves in different market niches of the value chain. We also find that the development trajectory of China, in comparison to those of the other three countries, is more complex and internally diversified. Despite some commonalities with its neighbours, China also has a unique element that points to the possibility of a multi-path strategy of industrial development in mobile phone manufacturing.

The rest of the article is organised as follows. The next section examines theoretical issues regarding globalisation and industrial development in general and in East Asian contexts with an introduction to our analytical framework. After outlining our data and methods, we discuss how globalisation has changed mobile phone manufacturing and the trajectories of the four East Asian countries from a comparative angle. The final section discusses the implications of our findings in terms of the future of industrial development in East Asia.

Globalisation and Industrial Development: Theoretical Considerations

Economic globalisation over the last few decades has revived a long-standing debate on industrial development in the global economy (Guillén 2001a; Held et al. 1999). An earlier debate centred on whether lowered cross-national barriers in trade and investment and the rise of neo-liberal economic norms and regulations would lead to a similar pattern of industrial development across countries. The convergence perspective held that nation-states would follow a common path, notably neo-liberal prescriptions like the Washington Consensus, as a “best practice,” influenced by powerful nations and international organisations (Gore 2000; Petras 2006). The divergence view, in contrast, highlighted the persisting influence of distinctive national institutions, contending that countries respond differently to globalisation, generating divergent development paths across countries (Fourcade-Gourinchas and Babb 2002; Weiss 2005).

Despite these differences, both convergence and divergence perspectives have a common limitation in that they largely regard global and national economies as separate, paying little attention to the interaction and linkage between the two. The former views national economies as subject to a common set of challenges and choices presented by globalisation regardless of the differences in their positions in global industries as well as domestic capabilities. The latter emphasises the enduring impact of national institutional and organisational patterns on development paths, although globalisation reshapes the manner in which local industries are linked to a global economy. Both approaches fail to pay sufficient attention to the changes in the world economic contexts in which industrial development occurs as a result of economic globalisation and the global recession of 2008–09 and how those changes have reshaped opportunities and constraints for industrial development.

A recent debate is, therefore, centred more on how increasingly fragmented and decentralised production affects development paths and outcomes (Cattaneo et al. 2010; Neilson et al. 2014). The rise of the GVC has significantly transformed the context and manner of industrial development in a global economy (Gereffi et al. 2001; UNCTAD

2013). Production activities, once contained in a single company or country, have become fragmented and sliced up into multiple value-adding stages located in different countries (Krugman 1995, 333–334). Facilitated by the rise of offshoring and outsourcing, production tasks are conducted in different countries as intermediate goods travel across borders multiple times for further processing (Arndt and Kierzkowski 2001; Milberg and Winkler 2013). A series of geographically dispersed value-adding tasks is integrated and governed by multinational enterprises (MNEs) through various governance mechanisms to regulate buyer–supplier relations (Gereffi et al. 2005; Humphrey and Schmitz 2001). Countries or firms specialise in specific value chain functions (for example, design, production, marketing, branding) although gains from each activity may not be equal, with some activities more value-added than others and having a more positive impact on economic growth and employment. The way global lead firms govern supply chains significantly affects where value is created, how it is distributed, and who captures it in the chain (Gereffi et al. 2005; Pietrobelli and Saliola 2008).

One of the key implications of this new form of production system is that industrial development can be pursued through multiple entry points. Industrial development involves less selection of a sector or end product or nurturing vertically integrated firms as a national champion; also, the linkage to the global economy is not simply reduced to the degree of export-orientedness. Rather, industrial development is more associated with which segment of the GVCs to engage in and how much value to capture from it (Kaplinsky 2000; Lee 2010). Different GVC nodes provide countries and firms with distinctive opportunities and constraints for participation and value capture in the global economy. For example, while almost all of Apple's iPod and iPhone products are manufactured and exported in China, contract manufacturers and suppliers in China, whose roles are limited to assembly and production of low-end components, account for only a small fraction of the total value generated by the products. The majority of the value is captured by Apple for its research and development (R&D), marketing and branding and other high-end component suppliers in countries like Japan, Korea or Germany (Linden et al. 2009; Xing and Detert 2010).

Post-recession dynamics have complicated the debate on industrial development as GVCs underwent significant changes (Cattaneo et al. 2010; Gereffi 2014). First, development prospects have diverged across countries as key segments in many GVCs became more concentrated in a handful of large emerging economies with robust supply bases and are now controlled by fewer global lead firms. While the geographic concentration created “manufacturing hotspots” in countries like China, India and Brazil, where exports and jobs exploded, many other – both developing and developed – countries suffered from a series of deindustrialisation and job losses (Lee and Gereffi 2013). Also, global lead firms now have greater power in shaping development paths as fewer MNEs control a larger share of the market through mergers, acquisitions and the exit of many rivals.¹ These lead firms are increasingly served by a smaller number of more capable mega-suppliers and transnational intermediaries, such as Foxconn in electronics and Li & Fung in apparel, through streamlined supply chains located in major emerging economies like China, Brazil and India (Appelbaum 2008; Gereffi 2014).

Second, the rise of developing economies as a new end market presents a new pathway for industrial development (Kaplinsky et al. 2011; Morris et al. 2011). The

export-oriented industrialisation (EOI) model was essentially based on advanced economies as final markets, implying that developing countries would be better off by producing for advanced industrial markets than for their home markets (Hamilton and Gereffi 2009). While advanced-economy markets remain important for developing country exporters, the rise of emerging economies as a new end market has become prominent as a result of a decade of urbanisation, rising income and the growing middle class, particularly in countries with large domestic markets like Brazil, Russia, India and China (Nederveen Pieterse 2012). These countries have fared better than many advanced economies in the recent global recession, emerging as alternative end markets of many GVCs (Cattaneo et al. 2010). The resulting growth of trade and value chain linkages among developing countries presents new opportunities for industrial development that may not be available in the trade with advanced economies (Kaplinsky et al. 2011). Lower entry barriers in many developing country markets can increase the opportunity for small- and medium-sized enterprises (SMEs) to participate in exports to those markets, which also provides more favourable conditions for upgrading into more value-added functions such as design and branding.

Some of these changes raise the question of whether they have made it more difficult for countries to achieve industrial development. Large mobile phone assembly factories, for instance, may generate a great number of new jobs but the value captured by those jobs is likely very limited and fragile nowadays given the uneven distribution of value in GVCs and frequent factory relocation and closure (Lee and Gereffi 2013). But, at the same time, the new developments demand researchers pay closer attention to new opportunities and constraints for industrial development and the way countries and firms respond. While it is not new for development to entail inequality and unevenness (McMichael 2012), what drives the processes constantly changes, with the rise of GVCs being the latest driving force. In this sense, the changes in the global economy highlight the need for a new framework to understand a country's industrial development path, particularly in conjunction with its position in and linkage to GVCs.

We propose an analytical framework to distinguish the development paths of countries in the mobile phone industry. As shown in [Figure 1](#), the framework is based on two dimensions: value chain positioning and global market orientation. The four boxes in the figure represent primary niches for industrial development, although the actual development path is likely more complex.

The first dimension (the vertical axis in [Figure 1](#)) is a country's position in the value chain. There are multiple different nodes in the mobile phone value chain: pre-production (such as R&D), main production (parts and component manufacturing and final assembly) and post-production (sales, branding and so on). Each node requires different skills and capabilities, and the amount of value captured varies; it is generally higher in pre- and post-production than in main production (Mudambi 2008). The most important division in the value chain is between producing parts and components and/or conducting assembly as a supplier for branded producers, also known as original equipment manufacturing (OEM), and producing and selling final products with proprietary brands, or original brand manufacturing (OBM). A current mobile phone consists of hundreds of parts and components manufactured by as many different suppliers. While some of the suppliers are quite large and technology-intensive, a great number of suppliers are much smaller, with lesser-known brand names (if any),

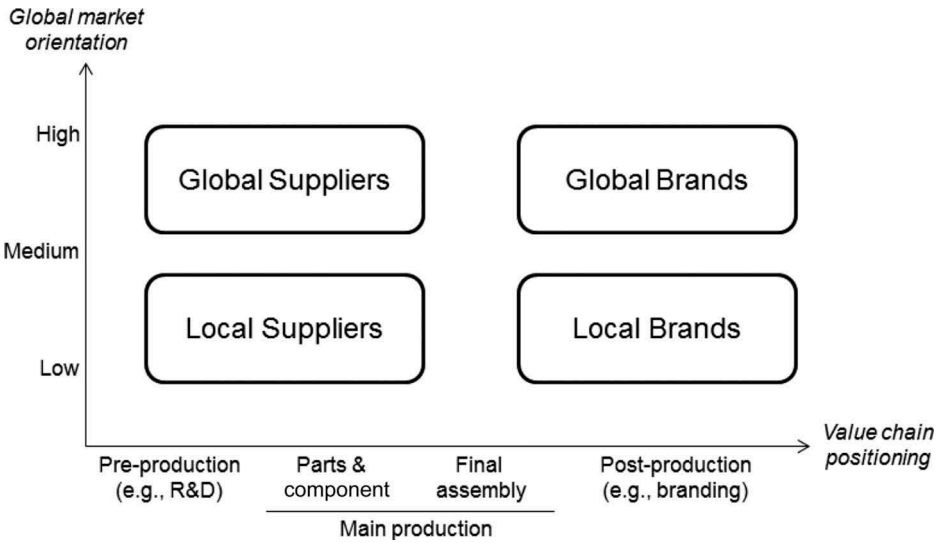


Figure 1. A framework of industrial development paths. *Source:* The authors.

compared to brand manufacturers such as Apple and Samsung that sell products with their own design and brands to the end consumer. Branded manufacturers tend to capture much more value than their suppliers (Ali-Yrkkö et al. 2011; Dedrick et al. 2011).

The second dimension in the framework is global market orientation, that is, the extent to which a country's firms are oriented toward competing in global markets relative to its domestic market. Engaging in foreign markets enables firms to take advantage of larger market demand and economies of scale, as well as providing opportunities for learning and upgrading (Baldwin and Gu 2004; Schmitz and Knorrnga 2000). Nowadays, the notion of market orientation is less simple than is suggested by the distinction of EOI and import-substituting industrialisation (ISI). Most notably, export markets are no longer unitary, as developing countries have emerged as alternative markets for developing country exporters. For many mobile phone firms, emerging markets have increasingly become an important growth engine thanks to the rapid expansion of mobile phone users in these markets (*Wall Street Journal*, February 26, 2014). Furthermore, developing country markets have different dynamics than advanced economy markets, challenging the existing business models of MNEs mostly based in the latter (Sinkovics et al. 2014). For example, the presence of a large population of low-income consumers, or the so-called "bottom of the pyramid," has generated a strong demand for low-end, more affordable mobile phones with relatively basic functions. The supply of such phones, such as unbranded "Shanzhai" product from China, has fuelled the explosion of mobile users in many developing countries in Asia and Africa.

The proposed framework thus highlights distinctive GVC niches in which a country can be positioned. It is not straightforward to identify and interpret a country's development path. There are likely more variations in actual development paths than the four primary niches. A country can occupy multiple niches simultaneously, with

firms in the country located in different niches. However, the framework provides an analytical lens through which to understand the path of industrial development in a more sophisticated yet concise manner compared to the dichotomy of EOI and ISI, as well as in the context of a global economy with fragmented production systems.

Data and Methods

This study uses a case-based comparative method, following a well-established tradition of the literature that examines the development trajectories of East Asian countries from a comparative perspective (see Evans 1995; Hamilton and Biggart 1988). The literature has compared the patterns of development across East Asia and how they were affected by the rise of China, the Asian economic crisis, post-crisis dynamics and other changes (Baek 2005; Hsieh 2011; Lee and Kwak 2009). This article combines this country-level comparison with GVC analysis, which typically focuses on in-depth examination of a single sector and countries' and firms' value chain position therein (see Lee 2010).

The study used mainly the UN Comtrade data set to collect the trade figures of mobile phones.² Mobile phone subscription data were compiled from the World Development Indicators database.³ Market share data were obtained from various publications, including market research reports. Trade journals, government reports, newspaper and magazine articles and other secondary data sources were also used.

The Globalisation of Mobile Phone Manufacturing and East Asia

The mobile phone industry has changed significantly as a result of globalised production and consumption over the last two decades. Mobile phone production has shifted geographically from advanced economies, its traditional centre of production and consumption, to emerging economies (Lee and Gereffi 2013). In 2001, the majority of mobile phones (52%) were exported from five developed countries: Germany, the United Kingdom, Korea, the United States and Finland. In 2011, the top five exporters consisted of China, Korea, Hungary, Hong Kong and Mexico, accounting for 73% of the world's mobile phone exports. Only Korea has managed to stay at the top as developing and transitional economies have emerged as major exporters.

This shift is based on a growing level of fragmented production and the rise of global value chains (Hess and Coe 2006; Lee and Gereffi 2013). Mobile phone production used to be vertically integrated by branded manufacturers, such as Nokia and Motorola, with most of the production tasks from design to assembly conducted in a single – mostly industrially advanced – country. Now, as a result of rising offshoring and outsourcing, more mobile phones are produced by third-party contract manufacturers, so-called OEM suppliers and electronics manufacturing service (EMS) providers. These third-party manufacturers specialise in manufacturing and assembling parts and components for branded manufacturers. This trend, which offers labour cost advantages to manufacturing sectors, is mostly conducted in developing countries (Lüthje 2002). For instance, iPhones are designed by Apple in the United States but are assembled almost entirely in China by Foxconn, a Taiwanese contract manufacturer, with hundreds of components imported from Germany, Korea and other advanced economies. This form

of international division of labour is now common in the manufacturing of consumer electronic devices (Dedrick et al. 2010).

As the production of mobile phones has changed, so has consumption. The most notable change is the increase of mobile phone use in developing countries. In 1995, high-income countries accounted for 87% of the world's users. In 2010, by contrast, 77% of users lived in middle- or low-income economies, indicating a shifting end market toward developing countries. The number of mobile phone users has increased much faster in developing countries. From 2005 to 2010, the number of mobile phone users increased by 706% and 659% in low-income and less-developed economies, respectively. Meanwhile, growth has remained stagnant in many advanced markets, with the number of mobile phone users increasing by just 37% in high-income markets.

This global expansion of mobile phone production and consumption has generated new competitive dynamics. First, as a result of the fragmentation and decentralisation of production, there are multiple different paths through which countries and firms can be integrated into global industries. While the international division of labour is nothing new, the process has become more sophisticated at the level of value-adding tasks, giving rise to a new form of international trade known as "trade in task" (WTO and IDE-JETRO 2011). And, some countries or firms capture more gains than others by conducting higher value-added tasks (Ali-Yrkkö et al. 2011). In the iPhone case, China assumes largely labour-intensive tasks like the final assembly of the product with relatively small economic gains, and the overwhelming majority of the value from the iPhone is captured in the form of brand, marketing and technology rents by the United States (most by Apple) and Japan, Korea and Germany, where high-end component suppliers such as Toshiba, Samsung and Infineon are headquartered (Dedrick et al. 2010).⁴ Second, the performance of mobile phone producers increasingly relies on their competitiveness in global markets. In the past, mobile phone producers dealt with a small number of advanced-country markets, mostly their own domestic and regional markets. Now, competition takes place at a global level, particularly in rapidly growing emerging-economy markets. This poses a challenge, even for leading global firms, to adapt strategies to market dynamics in foreign, particularly developing, countries (*Wall Street Journal*, April 19, 2012).

Overall, East Asia has emerged as a strong centre of global mobile phone production as a result of increasing production in China and the strong performance of East Asian firms in global markets. Well-developed regional supply chains provide a strong incentive for global firms to move production to the region. In 2011, China and Korea accounted for 52% of the world's exports, and more than two of every five mobile phones exported worldwide were manufactured in China. On the consumption side, mobile phone users in East Asia increased in number from 25 million to 1.7 billion between 1995 and 2010, representing 31% of the world's mobile phone users in 2010. The growth was particularly astonishing in China, where mobile phone users increased in number nearly six-fold between 2001 and 2010 (see Table 1).

Amid the rise of East Asia in the global mobile phone industry, striking differences among these four countries became apparent, also shown in Table 1. On the production side, while each of the four countries touted prowess in manufacturing mobile phones and other electronic devices, their export performance diverged as Japan failed to keep pace with the others. In 2011, Japan accounted for less than 1% of global mobile

Table 1. Mobile phone exports and subscribers in East Asia.

	Mobile phone exports (US\$) ^a			Mobile phone subscribers ^b		
	2001	2011	2011 global market share	2001	2010	Per 100 people ^d
China	4.6 billion	63.2 billion	41.7%	145 million	859 million	64
Japan	1.8 billion	27.1 million	0.02%	75 million	121 million	95
Korea	7.5 billion	15.1 billion	10.0%	29 million	51 million	104
Taiwan ^c	2.7 billion ^d	10.6 billion	7.0% ^e	22 million	27 million	118

Sources: (a) compiled from United Nations Comtrade; (b) The International Telecommunication Union's *World Telecom Indicators*; (c) Taiwan's Bureau of Foreign Trade (<http://www.trade.gov.tw/>) for export data; (d) based on data from the year 2000; (e) based on the world's total exports (\$151.5 billion).

exports, a surprisingly low figure for the one-time giant in the electronics industry. Meanwhile, China, the world's leading producer and exporter of mobile phones, increased its superiority over the other countries. Second, China's domestic market grew significantly, overwhelming the other three countries. The mobile market in China is yet to be saturated, with only 64 mobile phone users for every 100 people as of 2010. Compare this to Japan, Korea and Taiwan, where nearly everyone has at least one mobile phone and a full array of advanced mobile services is offered.

Divergent Paths of Mobile Phone Manufacturing in East Asia

A further examination shows that Japan, Korea, Taiwan and China took strikingly distinctive trajectories in response to globalisation in mobile phone manufacturing. The difference is illustrated in Figure 2, based on the proposed framework above and our quantitative and qualitative assessment of each country's mobile phone industry. Korean and Taiwanese firms emerged as key players in global markets but in different parts of the value chain: Koreans more as branded manufacturers and Taiwanese

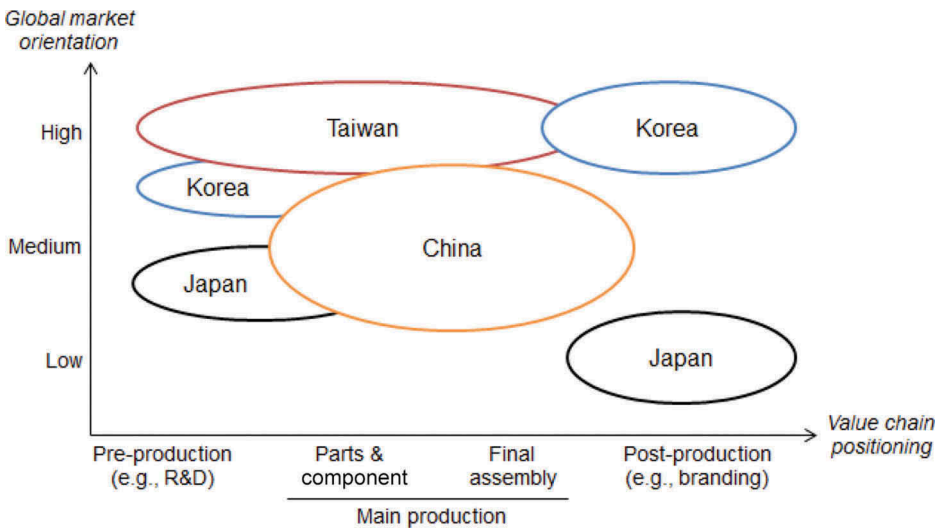


Figure 2. Development trajectories in mobile phone manufacturing Note: The positions of the countries in the diagram are based on the authors' qualitative and quantitative assessment of each country's competitive strength. Source: The authors.

mainly as specialised suppliers. Their common orientation toward global markets is in striking contrast to the strong position of Japanese branded manufacturers in the domestic market and their inability to translate this local success overseas, which contrasts with the very strong position of Japanese component suppliers in foreign markets. Finally, firms in China have concurrently engaged in different parts of the GVC and different end markets, a unique multi-path industrial development.

Korea and Taiwan: two different pathways to going global

Korea and Taiwan have been frequently compared with regard to post-war export-oriented industrial development, in which electronics manufacturing was one of the key sectors that drove exports and employment (see Evans 1995; Feenstra and Hamilton 2006; Sato 1997). While their strong orientation toward global markets and success therein continued in the manufacturing of mobile phones, Korean and Taiwanese firms responded differently to the globalisation of mobile phone production, engaging in different segments of the mobile phone GVC. Korean mobile phone manufacturing was driven by large branded manufacturers backed by conglomerates, known as *chaebol*. Korean firms quickly established global production and marketing prowess based on an initial success in a virtually protected domestic market for mobile phones. In contrast, globalisation in Taiwan was spearheaded by specialised manufacturers and SMEs, while the domestic market was dominated by foreign brands. Duplicating their success model with other electronics such as computers, Taiwanese firms were introduced as key suppliers to major foreign buyers and capitalised on their geographic and socio-cultural proximity to supply chain bases in China.

Korea was a latecomer in mobile phone manufacturing. When Korea tried to join the trend in the early 1990s, the sector was dominated by United States (US) and European firms, which were little interested in transferring technology to Korean firms that had already challenged Western firms in consumer electronics such as televisions and microwaves. Facing this obstacle, the Korean government and local firms decided to adopt a digital cellular technology called Code Division Multiple Access (CDMA), then little known and initially developed by Qualcomm, a US start-up company. A state-led consortium was formed by a major government research institute and a handful of large domestic electronics makers, notably Samsung and LG, to facilitate Korea's technological learning (Park 2013). By awarding CDMA-only mobile service licenses, the government protected local producers in the domestic market from competition with global brands, such as Nokia and Ericsson, most of which had opted for Global System for Mobile Communications (GSM) standard technology (Kushida 2008).⁵ The dominance of local producers in the Korean market has little changed. As shown in Table 2, of the four countries in this study, the share of domestic brands in the local market is highest in Korea (Euromonitor International 2013a). Japan is the only other country wherein domestic brands have the majority share in the local market. In Taiwan and China, the situation is quite the opposite, with domestic brands holding a much weaker position than foreign brands.

Building upon accumulated domestic capabilities and the secured home market, Korean firms first exported CDMA phones to mostly North American markets, but quickly caught up by learning and utilising GSM technology and expanding their

Table 2. Mobile phone market shares in selected East Asian markets.

Country	Korea		Taiwan		Japan*		China	
	2006	2011	2006	2011	2006	2011	2006	2011
Domestic brands	87.5%	83.1%	14.4%	10.0%	64.7%	62.7%	17.6%	23.9%
Foreign brands	6.0%	14.0%	68.7%	82.0%	3.4%	16.7%	75.7%	62.4%

Note: The sum is not equal to 100% because the category of "Other" is not counted. *Sony-Ericsson, a Japanese-Swedish joint venture, is considered a domestic brand (7.5% in 2011).

Source: Euromonitor International (2012a, 2012b, 2013a, 2013b).

exports to a much wider range of foreign markets. This expansion contrasts with Japanese firms embracing their own local standard, called Personal Digital Cellular (PDC), which limited their ability to export.⁶ Korean firms had little experience in offshore outsourcing for foreign mobile phone buyers, unlike Taiwanese firms. Instead, they started as branded manufacturers. By 2001, Samsung and LG, two major Korean conglomerates, represented 9.6% of the world's mobile phone market, respectively ranked fourth and tenth worldwide. As shown in Table 3, their combined global share increased to 19.4% in 2005, and in 2010, Samsung and LG became the world's second and third largest mobile phone brands, respectively, in unit sales, with a combined share of 24.7%. In 2012, Samsung unseated Nokia as the largest mobile phone producer in the world.

These leading Korean producers are highly export-oriented in sales and are globalised in production. The Korean market only accounts for about 5% of Samsung's and LG's mobile phone unit sales, respectively (Samsung Electronics 2011; LG Electronics 2010). Given the small size of the domestic market (1.5% of total global unit sales in 2010), the rapid growth of these companies is mainly attributable to their active engagement in global markets through exports. Furthermore, the production of Korean firms is increasingly conducted outside Korea. In 2011, 77% of Korean firm phones were produced abroad, mainly in China and Vietnam (Ministry of Knowledge Economy 2012). Korean firms have also invested in overseas R&D capabilities in order to absorb advanced technology and market trends (*Chosun Ilbo*, January 18, 2004).

In addition to their strong global orientation, Korean leading mobile phone producers are highly vertically integrated. In 2011, LG was estimated to outsource only 13% of its mobile phone production, and Samsung produced all of its mobile phones in-house. This contrasts with the average for industry-wide outsourced production, which is approximately 30% (NIPA 2011). Furthermore, many of the key components in Samsung and LG mobile phones are supplied by their related companies. For example, Samsung Electronics and its associated firms under Samsung Group manufacture a wide range of high-end components, from memory chips to mobile displays, for Samsung-branded mobile phones.

Table 3. Top five leading mobile phone producers and their global market shares (%).

2005	2007		2010		2012		
Nokia	32.5	Nokia	37.8	Nokia	28.9	Samsung	22.0
Motorola	17.7	Motorola	14.3	Samsung	17.6	Nokia	19.1
Samsung	12.7	Samsung	13.4	LG	7.1	Apple	7.5
LG	6.7	Sony-Ericsson	8.8	Apple	2.9	ZTE	3.9
Sony-Ericsson	6.3	LG	6.8	Sony-Ericsson	2.6	LG	3.3

Note: Firms based in East Asia in bold (including joint ventures).

Source: Gartner (2006, 2008, 2012, 2014).

Table 4. The world's leading contract electronic manufacturers (EMS/ODM), 2006.

Rank	Company	Headquarters	Total revenue (US\$ mil)
1	Hon Hai Precision	Taiwan	40,527
2	Flextronics	Singapore	17,708
3	Asustek	Taiwan	17,196
4	Quanta Computer	Taiwan	16,503
5	Solectron	United States	11,200
6	Sanmina-SCI	United States	10,955
7	Jabil	United States	10,300
8	Celestica	Canada	8,800
9	Inventec	Taiwan	7,890
10	TPV Technology	Hong Kong	7,176
11	Wistron	Taiwan	6,800
12	BenQ	Taiwan	6,094

Source: EDN Staff (2007).

However, this strong tendency toward vertical integration through the *chaebol* network has led to the relative underdevelopment of local contract manufacturing. Many local component suppliers are under a dependent relationship with these domestic buyers, which are much bigger, more globalised and in a dominant market position. Contract manufacturers in Korea are not only very few in numbers with weak global profiles (see Table 4), but also struggle with a dearth of opportunity in a market dominated by vertically integrated manufacturers like Samsung and LG.

Taiwan firms also entered into global mobile phone manufacturing in the 1990s. Unlike the Koreans, however, many Taiwan firms began as outsourcing suppliers for foreign firms. Many started as small component producers for mobile phones, from cases to keypads, and some firms later became OEM suppliers for foreign buyers by assembling mobile phones according to the designs and specifications of buyers. Some Taiwan firms evolved into higher value-added segments of the chain by further accumulating capabilities in technology and scale, either by becoming EMS providers specialising in large-scale manufacturing and supply chain management for global brands or by adding product design functionality to become original design manufacturers (ODMs) that provide full-package services from design to assembly. Many of the rest of the firms continue to focus on supplying a variety of high value-added components based on strong R&D competency. The increase of offshore outsourcing in the early 2000s increased the growth of Taiwan's mobile phone exports, from 4.7 million to 36 million units in 2000 and 2005, respectively (Ministry of Economic Affairs 2008). The overwhelming majority of Taiwan's exports in the mid-2000s was based on GSM/GPRS standards, widely adopted in global markets (KOTRA 2006).

Taiwan's distinctive path is evident in the strong competitiveness of Taiwan firms in the global contract manufacturing market, including both EMS and ODM firms. As shown in Table 4, three Taiwanese firms have been ranked among the world's top five contract manufacturers. The combined revenues of seven Taiwan firms at one point accounted for 54% of the total revenue of the world's top 20 contract manufacturers. No Korean firms made it into the top 100 contract manufacturers list, in stark contrast to the 11 Taiwan firms on the list. Taiwan firms, in particular, have benefited from the shift of mobile phone manufacturing to China. By leveraging their geographical proximity and combining high-tech R&D capabilities in Taiwan and large-scale, lower-cost manufacturing in China, Taiwan firms have become key players in mobile telecom

production networks in East Asia, linking suppliers in Taiwan and China to global brands in the United States and Europe. The rise of Foxconn (Hon Hai Precision's trade name) as the leading EMS provider is illustrative of Taiwan's global importance. With origins as a little-known component supplier in the 1970s, Foxconn introduced an EMS model in 2001 to serve major global electronics makers such as Dell, Hewlett-Packard and Apple. Building on its lengthy experience in manufacturing and supply chains in mainland China, the company rose to be the world's largest EMS provider in 2005. In 2010, Foxconn managed to capture 44% of the global EMS market and became the largest private employer in China.

The rise of Taiwan as a specialised supply base, however, contrasts with the country's difficulty in nurturing a global brand. Despite their prowess in manufacturing, Taiwan firms have failed to produce a globally competitive mobile phone brand. One notable example of this difficulty is the story of BenQ Corporation. With beginnings as an ODM spin-off of Acer, a well-known personal computer (PC) maker, BenQ made an aggressive move to become a global brand manufacturer by acquiring the then struggling Siemens mobile phone unit. The move caused BenQ Mobile, the company's mobile phone business unit, to quickly become the world's sixth largest mobile phone maker by the mid-2000s. The upgrading effort, however, could not be sustained in the face of financial difficulty. BenQ Mobile eventually filed for bankruptcy in 2006. In the absence of local manufacturers with strong global brands, the domestic market in Taiwan is now dominated by foreign brands, unlike the Korean market, which is dominated by strong local brands (see [Table 2](#)).

In sum, while mobile phone firms in Korea and Taiwan have had a common strong orientation toward global markets, there was a critical difference between the two countries. In Korea, globalisation was driven by branded manufacturers that were supported by large and highly diversified conglomerates like Samsung and LG. The manufacturers were successful in leveraging their dominance in an insulated domestic market to globalise sales, as well as production and brands, although their strong control over supply chains undermined the opportunity for growth of local SMEs specialising in components and contract manufacturing. In Taiwan, by contrast, globalisation was driven by specialised suppliers, which were successfully inserted into several different production nodes in the value chains of foreign brand manufacturers. The flip side of this success among Taiwan firms has been their difficulty in establishing globally recognised brands and a domestic market dominated by foreign brands.

Japan: lost in globalisation?

In comparison to Korea and Taiwan, a major difference of the Japanese mobile phone industry is its strong orientation toward the domestic market and the near absence of Japanese brands in global markets. The difference is all the more striking because consumer electronics brands such as Sony and Panasonic have long been known for their global success. The fact is also astonishing because the Japanese mobile telecom market is famous for early adoption of innovative mobile technologies and services, such as 3G mobile broadband services.

By 2010, Japan represented less than 1% of the world's mobile phone exports after continuous slippage from 3.3% in 2003 (see [Table 1](#)). As in Korea, several major global electronics makers, including NEC, Panasonic and Toshiba, dominated mobile phone production in Japan. These mobile phone producers were globally competitive in the analogue era; in 1990, five of nine of the world's largest manufacturers were Japanese. Over the next two decades, however, their global profile shrank. One reason for this is that the adoption of PDC as Japan's 2G standard significantly hampered global competitiveness. By 2006, the world market share of the five leading Japanese phone makers was less than 5%, lower than the individual share of Samsung or LG. Since the early 2000s, the majority of Japanese mobile phone makers have retreated from overseas markets – including China – instead relying heavily on the home market ([Kushida 2008](#)). However, even domestic demand, once robust, has begun to decline, as Japanese consumers have remained tight-fisted. In 2013, 22 million units of mobile phones were shipped for sales in Japan by domestic manufacturers, 58% lower than in 2007 (see [Figure 3](#)).

The failure of Japanese phone makers in their efforts to globalise is evident in the following two examples. The first example is the attempt to globalise i-mode, a mobile internet service provided by NTT DoCoMo, the largest mobile network operator in Japan. In 2000, NTT DoCoMo acquired 15% of KPN Mobile, a Dutch mobile network operator, in an effort to export its i-mode service, one of the world's first 3G mobile broadband services, to European markets and beyond. This move heightened the expectation that, after their failure to globalise because of the adoption of the isolated local standard in 2G, Japanese phone makers could pre-empt overseas markets with their internet-enabled devices ([NEC 2002](#)). The hope, however, did not materialise amid the burst of the dot-com bubble and the lukewarm reception of the i-mode service in Europe. In 2005, NTT DoCoMo finally retreated from the overseas venture with a huge loss and great disappointment for Japanese vendors.

Another example of failed attempts was Japanese manufacturers' Chinese venture ([Marukawa 2009](#)). Japanese firms encountered a market dynamic different from that in Japan. Unlike Japan, where 80% of mobile phones sold in 2010 were bundled with monthly subscription contracts and are branded by the operator and sold through the sales outlets of operators, in China, 84% of phones were sold separately from contracts ([Euromonitor International 2011, 2012b](#)). In comparison to Japan, where operators

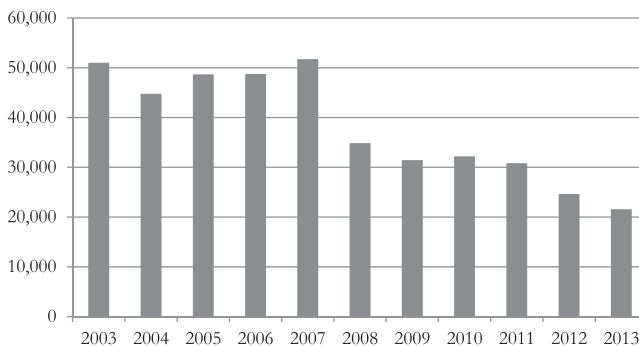


Figure 3. Mobile phone domestic shipments in Japan (thousand units). *Source:* JEITA (2014).

strictly control competition, the unbundling system of China reduces entry barriers for phone makers and intensifies competition. By 2006, after years of difficulty gaining ground, all Japanese phone makers withdrew from China, the world's largest mobile phone market. This blow further increased Japanese reliance on a stagnant home market.

Compared to mobile phone production, Japanese firms remain much stronger in production of components, although their dominance has weakened recently. According to a study in 2000 by Deutsche Bank Research, 29 of 36 component makers supplying nine key enabling components for mobile phones were Japanese (cited in *Forbes*, August 24, 2012). Japan's share in global exports of mobile phone components decreased from 6.4% to 1.9% between 2007 and 2012. Also, Japanese firms account for just 0.5% of the total retail value of the iPhone, compared to 4.7% for Korean firms (Kraemer et al. 2011).

In sum, Japan's trajectory in mobile phone manufacturing has been different from those of Korea and Taiwan because of its heavy reliance on the domestic market. In particular, Japanese phone makers, despite their globally recognised brands and proven manufacturing prowess, have failed to translate their advanced domestic products into global success and maintain the same level of success abroad as their Korean competitors.

China: multiple trajectories of industrial development

Compared to the other three countries, China is a late-latecomer to mobile telecommunications. In 2004, only one in four Chinese people had a mobile phone, while more than 70% of people in Korea and Japan were using mobile phones.⁷ In the same year, China's exports accounted for just less than 15% of total world exports; today, the country is the largest mobile phone exporter in the world, accounting for 42% of the world's exports.

Like Japan, China has a large domestic market and is a major exporter like Korea (albeit on a much larger scale); however, unlike the other countries, China is characterised not by a singular development path, but by multiple paths. As shown below, China shares commonalities with each of the other three countries, which represent China's three development paths. However, increasing mobile phone exports to developing countries, particularly in low-end market segments, illustrates its fourth development path.

First, its large domestic market allows China to follow the Japanese path with a strong orientation toward the domestic market. One notable example is China's effort to develop its own standards. Motivated by the idea of reducing its dependence on foreign technology, logic suggests that the domestic market of China is large enough to sustain proprietary standards, even if the standards prevail only in the Chinese market. In 3G, the Chinese government has been working with domestic and foreign vendors to facilitate the development of TD-SCDMA, its home-grown 3G standard, as an alternative to W-CDMA, the most widely adopted global 3G standard. The government has granted a TD-SCDMA 3G license to China Mobile, the country's largest mobile network operator, in order to ensure that the indigenous standard was sufficiently backed with financial and technological resources to be competitive with the more mainstream

standards supported by foreign firms. The Chinese 3G scenario was not exactly the same as when Japan selected its own 2G standard or when Korea opted for CDMA instead of the mainstream GSM. Regardless, the idea of having proprietary home-grown standards would be inconceivable without the existence of a massive domestic market, and the venture could incentivise even foreign vendors to develop TD-SCDMA handsets, although there is little chance of success outside China.

Second, the recent expansion of Chinese mobile phone manufacturers to global markets indicates that China may have locally-branded manufacturers that are as successful in global markets as Samsung or LG. The notable examples are ZTE and Huawei. Over several years, these two firms posted strong growth in the Chinese market despite the fierce competition of major foreign brands (see [Table 3](#)). In 2011, ZTE and Huawei were tied for third place after Nokia and Samsung in China's mobile phone sales with each representing 7.5% of the domestic unit sales, up from 2.5% and 2.9%, respectively, in 2006 (Euromonitor International 2012a). Building upon the rapid growth at home, these firms have significantly advanced their standings in global markets with their own brand phones. While many of these sales occurred within China, the share of global sales has steadily increased. In 2010, 53% of the mobile phone unit sales of ZTE and 43% of the unit sales of Huawei came from overseas markets, compared to 42% and 34% in 2009 (Euromonitor International 2011; Gartner 2012). In 2012, ZTE and Huawei accounted for 3.9% and 2.7% of global mobile phone sales (unit-based). These firms are particularly aggressive in developing country markets, as well as in low-end segments of advanced economy markets, typically neglected by big global brands. For example, Huawei ranked seventh among the top 10 smartphone sellers in the US market in 2011 by supplying low-cost smartphones to smaller, regional mobile network operators, which tend to target low-end markets (*Wall Street Journal*, April 6, 2012).

A third trajectory in China's integration to global mobile phone production is its strong presence in component production and assembly, somewhat similar to Taiwan's path. China is strong in exporting mobile phones but also in exporting parts for mobile phones. The inflow of foreign contract manufacturers and component suppliers, particularly from Taiwan and other Asian countries, has turned China into a hotspot for global mobile phone manufacturing with strong supply bases in China. Many components are imported to and assembled in China and then subsequently exported all over the world. [Table 5](#) shows the key role of China in the global trade of mobile phone parts. China leads the world in both the export and import of mobile phone parts, followed by Hong Kong, which plays a gateway role for China's international trade. In

Table 5. Leading exporters and importers of mobile phone parts, 2011 (US\$ million).

Exporters	Trade value	Share	Importers	Trade value	Share
China	38,246	38.6%	China	22,245	25.0%
Hong Kong	21,493	21.7%	Hong Kong	18,144	18.7%
Korea	8,959	9.0%	United States	6,222	6.4%
Mexico	4,760	4.8%	Mexico	5,210	5.4%
United States	4,581	4.6%	Hungary	3,914	4.0%
Others	20,965	21.2%	Others	39,228	40.5%

Note: Based on HS code 851770 (parts of telephone sets, including telephones for cellular networks/for other wireless networks); Taiwan is not included in the UN Comtrade database.

Source: UN Comtrade.

2011, China and Hong Kong together accounted for 60% of exports of global mobile phone parts and 44% of the imports.

Each of the three aspects of China's mobile phone manufacturing has some similarity with the strategies of Japan, Korea and Taiwan, resulting in a much more complex and internally diverse development model. Compounding the complexity is that China is not only integrated in the value chain targeted at advanced-economy markets, but is also linked to the value chain for emerging markets.

The growing importance of emerging markets is illustrated by the changing destinations of China's mobile phone exports. As shown in Table 6, most of China's exports in 2007 were concentrated in the United States and other high-income Organisation for Economic Co-operation and Development (OECD) countries, with only the non-high-income countries of India and Hungary among the top 10 export destinations. In 2011, additional emerging markets joined the list of China's major export destinations, which included India, Mexico and the United Arab Emirates, as well as Hong Kong. The shift was more obvious in the mobile phone export of Hong Kong.⁸ In 2007, the United States accounted for 27% of Hong Kong's mobile phone exports, with only India and the Philippines representing non-high-income economies in the top 10 export destinations of Hong Kong. By 2011, many of Hong Kong's exports headed for India, the United Arab Emirates, Indonesia, Mexico, Bangladesh, Paraguay and other emerging economies, indicating the increasing importance of these markets for the exports of China and Hong Kong. The exporting destinations of China, and particularly its exports via Hong Kong, contrast with those of Korea and Taiwan. In 2011, the percentage of non-high-

Table 6. Mobile phone export destinations of China and Hong Kong in 2007 and 2011.

China exports to:			
2007	Share	2011	Share
USA	26.4%	China, Hong Kong SAR*	39.3%
China, Hong Kong SAR*	17.3%	USA	15.7%
Germany	7.1%	Rep. of Korea	6.4%
India	5.8%	Japan	4.2%
Singapore*	5.7%	United Kingdom	2.5%
Hungary	3.3%	Netherlands	2.3%
Finland	2.9%	India	2.1%
United Kingdom	2.7%	Germany	1.7%
France	2.1%	Mexico	1.6%
Australia	1.9%	United Arab Emirates*	1.5%
Hong Kong exports to:			
2007	Share	2011	Share
USA	26.8%	China	21.6%
Japan	13.2%	India	14.9%
United Arab Emirates*	9.4%	USA	13.7%
Singapore*	7.0%	United Arab Emirates*	5.6%
France	4.8%	Indonesia	4.3%
Spain	3.2%	China, Macao SAR*	2.8%
India	3.0%	Singapore*	2.4%
China, Macao SAR*	1.9%	Mexico	2.4%
Philippines	1.8%	Bangladesh	2.3%
Other Asia, not elsewhere specified	1.8%	Paraguay	2.1%

Note: Countries and administrative regions not classified as "high-income OECD countries" according to the World Bank's classification list are in bold ("high-income countries" are marked with an asterisk) (<http://data.worldbank.org/about/country-and-lending-groups>, Accessed February 25, 2014).

Source: UN Comtrade.

income OECD markets in the exports of the two countries was 17% and 24% respectively, while the percentage for Hong Kong was 53%.⁹ In both Korea and Taiwan, the share of the US market, the largest importer of mobile phones for each, increased from 27% to 54% and from 42% to 50%, respectively, between 2007 and 2011.¹⁰

What further distinguishes China from its neighbours is that Chinese firms actively cater to a growing market for low-end mobile phones in emerging and low-income countries. Illustrating this point is the success of so-called “Shanzhai” mobile phones in China and, to an increasing extent, abroad (Gao 2011; Zhu and Shi 2010). Most of these phones are unbranded, targeting low-end markets. They are produced by a large number of fragmented producers in dense inter-firm networks in order to meet the rapidly changing consumer appetites for affordable mobile phones in many low-income countries. Originating as a local phenomenon in China, the unbranded “white-box” manufacturers have quickly expanded beyond China. The rapid expansion has even threatened established brand manufacturers like Nokia in developing country markets (Gartner 2010).

In sum, the trajectory of China’s mobile phone manufacturing shows a much more complicated picture than the development trajectories of its East Asian neighbours, showcasing the possibility of simultaneous industrial development through multiple different paths. Similar to Japan, China has an inward orientation based on its large domestic market and proprietary standards. It also has manufacturing capabilities established by foreign firms in both assembly and component production (similar to the model in Taiwan). Lately, Chinese firms have increased their export profiles on the merits of their own brands, similar to the success of some Korean firms. Finally, unlike Taiwan and Korea, the Chinese mobile phone industry also actively utilises its unique domestic experience to pursue growth opportunities in emerging economies and low-end market segments.

Conclusions

This article has examined how globalisation has affected the development paths of mobile phone manufacturing in China, Japan, Korea and Taiwan. Significant divergence among the countries was found with regard to both the position in the global mobile phone value chain and market orientation. The study shows that the rise of a fragmented production system, specifically GVCs, provides countries and firms with the opportunity to hold differentiated roles in the chains, leading to the divergence of development paths. Even within the same industry, the East Asian countries have taken different paths, focusing on different parts of the value chain and market niches. A growing specialisation in mobile phone manufacturing, for instance, has offered firms a unique chance to engage in the GVC as specialised suppliers of global brands with little concern for sales and branding. The opportunity has been well utilised by Taiwanese firms whose path is distinctive from those of many Korean and Japanese firms, as branded manufacturers.

In addition, the findings confirm that a more sophisticated framework – such as the one we have proposed – is needed in a global economy where production is increasingly organised through GVCs. Our framework can differentiate the trajectories of industrial development within and across countries, moving beyond a simple dichotomy of

whether or not a country is open to foreign investment or whether it follows EOI or ISI. Some Chinese firms have been successfully capitalising on their domestic experience with low-end consumers to take advantage of the rapid expansion of mobile phone demand in other developing countries. The outward-oriented path is distinctive from the EOI of many Korean or Taiwanese firms whose key export markets are advanced economies. The framework also allows us to identify the simultaneous development of multiple trajectories in China's mobile phone industry and to compare them with those of neighbouring countries.

At the same time, this study highlighted the importance of a more nuanced understanding of industrial development paths. It illustrates the difficulty of comparing countries in terms of simple success or failure in industrial development. For example, similar to a recent debate surrounding the post-1989 Japanese economy (Westra 2012), Japanese firms' weak profile in global mobile phone markets and the increasing disconnection between global and local markets – coined the “Galapagos” syndrome (Kushida 2011) – may not be simply understood as the firms' failures given the fact that Japanese consumers are enjoying some of the worlds' most advanced mobile services, enabled by the mobile handsets manufactured by domestic firms, in addition to the strong presence of Japanese component suppliers in global markets. Also, while the embrace of globalisation by Korean and Taiwanese firms has led both countries to notable success in different areas, each country appears to be constrained by its own success. Korea's *chaebol*-driven path has marginalised many SMEs specialising in components, whereas Taiwanese firms, with limited financial resources and branding experience, are still struggling to upgrade to OBMs, as exemplified by BenQ Mobile and HTC (*Wall Street Journal*, April 6, 2012).

This growing complexity of development paths and often contrasting outcomes has significant implications for various aspects of industrial development, such as technological capabilities and employment. While these topics are not fully addressed in the article, uneven gains across countries with different paths and sub-sectors in different GVC nodes are exhibited in our analysis. Although East Asia is the centre of mobile phone manufacturing, largely benefitting from the globalisation of the mobile phone GVC, the increasing concentration of production in China (and Vietnam lately) has generated a series of concerns about the “hollowing-out” of local industrial bases and job losses in other Asian countries, as exemplified by the fact that two-thirds of Korean mobile phones are produced abroad. Moving up the value chain to capture rents from higher value-added activities such as R&D is a constant challenge in the GVC characterised by rapidly changing technological, geographical and corporate terrains. The East Asian countries succeeded in some areas but not in others.¹¹

Another question that is important yet not explored systematically in this article is which drivers and mechanisms generated the observed cross-national differences. Why was Korea successful in nurturing a handful of highly capable global brands while Taiwan and Japan failed to do so? How does a country's relative strength in one segment of the value chains relate to its weakness in others? What has driven the internal divergence of development paths in China? To answer these questions, more in-depth analysis is necessary, with a focus on the institutional and organisational aspects of each country, as well as the strategic decision-making of various economic actors, including key domestic and foreign firms, within and outside of the mobile phone sector.

Finally, this study identified the concurrent development of multiple trajectories in China's mobile phone industry with some overlap in value chain niches with its neighbouring countries. One question is whether such parallel development is transient – meaning it will eventually disappear – or whether it will remain a distinctive characteristic of China's industrial development. Although it is too early to answer, both options seem plausible at this point. The rise of established local brands such as ZTE and Huawei, for example, may undermine the popularity of low-end “Shanzhai” phones, which would eventually decrease the diversity of these concurrent paths. However, given the significant regional and social disparity of economic growth within China, low-end markets may persist even after these major local brands become more prominent at home and globally. Moreover, diverse forms of institutional elements and corporate organisations in China, from large state-owned enterprises to foreign-owned firms and private start-ups, together with the country's strategy of combining different forms of competitive advantages for the sake of comprehensive economic improvement, might enable the co-existence of multiple different forms of development strategies (Appelbaum et al. 2011; Rasiah et al. 2012).

Another uncertainty is the impact of China's multi-path development. The economic divergence of Korea, Taiwan and Japan generates little competition among these countries because firms in these countries are positioned in relatively distinct market niches. Indeed, the entry of China on the scene has thus far helped many of these firms in different ways, due to the fact that China provides lower-cost production locations and a large number of new consumers for its neighbours to utilise to improve their global competitiveness. This structural diversity at the regional level has so far created a somewhat complementary relationship in the East Asian mobile phone production network at large, consistent with other findings based on a broader set of sectors and countries (WTO and IDE-JETRO 2011). The question for the future is whether such complementarity will persist as Chinese firms try to move up the value chain. The rise of ZTE and Huawei as global brands may threaten the positions now held by Samsung or LG in global markets. The upgrading of Chinese suppliers is likely to generate more direct competition with Taiwanese SMEs. The increasing power of China's proprietary standards could likewise undermine the position of foreign firms in the Chinese market in favour of local firms. Thus, the question of the future of industrial development in East Asia warrants further research.

This article contributes to the literature of industrial development in East Asia by highlighting a diverging pattern of development paths in the region as well as the internal complexity of the Chinese trajectory. It underscores the importance of a sophisticated framework informed by the GVC literature in understanding diversity across and within countries in fragmented and decentralised global industries. There are limitations, however, that should be addressed in future research. While we use international trade and market data, researchers can further benefit from utilising more primary data, such as interviews with key corporate actors, particularly to delve into the drivers and mechanisms of path divergence across and within countries. Also, firm-level analysis combined with an inquiry of national institutional and organisational configurations can help to better explain the persistence and change of global-local linkages and development paths.

Notes

1. For example, in smartphones, Apple and Samsung accounted for nearly half of global sales and nearly all of the industry's operating profits (Dediu 2012). Two smartphone operating systems (OS), Google's Android and Apple's iOS, accounted for over 90% of the mobile phones sold in 2013 (Gartner 2014).
2. For mobile phones, we used Harmonized System (HS) code 851712 (telephones for cellular networks/other wireless networks, other than line telephone sets with cordless handsets) in the 2007 classification and 852520 (transmission apparatus for radio-telephony incorporating reception apparatus) in the previous HS classifications. For mobile phone components, we used HS code 851770 (parts of telephone sets, including telephones for cellular networks/for other wireless networks) in the 2007 classification.
3. For more on these databases, see the relevant websites: <http://comtrade.un.org>; and <http://data.worldbank.org/data-catalog/world-development-indicators>. These databases are the sources for the statistical data that follow.
4. According to Kraemer and colleagues (2011), the total wholesale price of the iPhone (\$549) in 2010 was split as follows: Apple profits (58.5%); cost of labour in China (1.8%) and outside China (3.5%); cost of material inputs (21.9%); profits for firms in Korea (4.7%), the EU (1.1%), Japan (0.5%), Taiwan (0.5%), non-Apple American firms (2.4%); and unidentified profits (5.3%).
5. CDMA, or IS-95 to be precise, is a second-generation (2G) digital cellular standard developed by Qualcomm. In 1995, Korea became the world's first country to deploy a CDMA-based commercial mobile network. Meanwhile, GSM is the widely adopted 2G digital cellular standard, developed by the European Telecommunications Standards Institute (ETSI). By 2005, GSM networks accounted for more than three-quarters of the worldwide cellular network market, serving 1.5 billion subscribers.
6. PDC is one of the second-generation digital mobile telecom standards, similar to GSM and CDMA. It was exclusively adopted in Japan, unlike the other two standards, which had a global presence.
7. In actual number of users, China, with 334 million users, was four times larger than Japan in 2004. By 2010, China had 859 million mobile phone users, 64% of its population, making it by far the largest mobile phone market in the world.
8. Hong Kong's mobile phone exports were almost entirely re-exports (99.99% in 2011), and the majority of them were from China (57% in 2011), according to the UN Comtrade data set.
9. The share of non-OECD markets in China's mobile phone exports decreased from 30% to 18% between 2007 and 2011, but it appears to be in part because an increasing number of mobile phones from China to non-OECD markets were exported through Hong Kong, which accounted for almost 40% of China's mobile phone exports in 2011.
10. This is also affected by the relocation of production by many Korean and Taiwanese mobile phone firms to countries like China and Vietnam, which is particularly the case for the products targeting developing countries.
11. For the points made in this and the next paragraph, we are indebted to our two anonymous reviewers. Despite the importance of the topics, it is beyond the scope of our current article, a task we leave for future research.

Acknowledgements

We are grateful to Cornelia Storz, Hang Young Lee and anonymous reviewers for their valuable comments on earlier versions of the article. We also would like to express our thanks to Myoungsoo Kim and Jongseok Yoon for their research assistance in data collection. An earlier version of the article was presented at the 2012 Society for the Advancement of Socio-Economics (SASE) Annual Meetings in Boston. The usual disclaimers apply.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

We acknowledge the financial support provided by the Samsung Economic Research Institute (SERI) for this research. The research was also supported by an Asia Research Foundation Grant funded by the Seoul National University Asia Center [grant number SNUAC-2014-009].

ORCID

Joonkoo Lee  <http://orcid.org/0000-0001-5772-397X>

References

- Ali-Yrkkö, J., P. Rouvinen, T. Seppälä, and P. Ylä-Anttila. 2011. "Who Captures Value in Global Supply Chains? Case Nokia N95 Smartphone." *Journal of Industry, Competition and Trade* 11 (3): 263–278.
- Appelbaum, R. 2008. "Giant Transnational Contractors in East Asia: Emergent Trends in Global Supply Chains." *Competition & Change* 12 (1): 69–87.
- Appelbaum, R., R. Parker, C. Cao, and G. Gereffi. 2011. "China's (Not So Hidden) Developmental State: Becoming a Leading Nanotechnology Innovator in the Twenty-First Century." In *State of Innovation: The U.S. Government's Role in Technology Development*, edited by F. Block and M. Keller, 217–235. Boulder: Paradigm Publishers.
- Arndt, S., and H. Kierzkowski, eds. 2001. *Fragmentation: New Production Patterns in the World Economy*. Oxford: Oxford University Press.
- Baek, S.-W. 2005. "Does China Follow 'the East Asian Development Model'?" *Journal of Contemporary Asia* 35 (4): 485–498.
- Baldwin, J., and W. Gu. 2004. "Trade Liberalization: Export-Market Participation, Productivity Growth, and Innovation." *Oxford Review of Economic Policy* 20 (3): 372–392.
- Biggart, N., and M. Guillen. 1999. "Developing Difference: Social Organization and the Rise of the Auto Industries of South Korea, Taiwan, Spain, and Argentina." *American Sociological Review* 64 (5): 722–747.
- Cattaneo, O., G. Gereffi, and C. Staritz, eds. 2010. *Global Value Chains in a Postcrisis World: A Development Perspective*. Washington, DC: World Bank.
- Coe, N., and M. Hess. 2013. "Global Production Networks, Labour and Development." *Geoforum* 44: 4–9.
- Dediu, H., 2012. "The Phone Market in 2012: A Tale of Two Disruptions." ASYMCO. Accessed January 14, 2015. <http://www.asymco.com/2012/05/03/the-phone-market-in-2012-a-tale-of-two-disruptions/>.
- Dedrick, J., K. Kraemer, and G. Linden. 2010. "Who Profits from Innovation in Global Value Chains? A Study of the iPod and Notebook PCs." *Industrial and Corporate Change* 19 (1): 81–116.
- Dedrick, J., K. Kraemer, and G. Linden. 2011. "The Distribution of Value in the Mobile Phone Supply Chain." *Telecommunications Policy* 35 (6): 505–521.
- EDN Staff. 2007. "2007 Top 100 Contract Manufacturers." EDN Network. Accessed August 14, 2015. <http://www.edn.com/electronics-news/4315992/2007-top-100-contract-manufacturers>
- Euromonitor International. 2011. *Mobile Phones in China*. London: Euromonitor International.
- Euromonitor International. 2012a. *Mobile Phones in China*. London: Euromonitor International.
- Euromonitor International. 2012b. *Mobile Phones in Japan*. London: Euromonitor International.
- Euromonitor International. 2013a. *Mobile Phones in South Korea*. London: Euromonitor International.

- Euromonitor International. 2013b. *Mobile Phones in Taiwan*. London: Euromonitor International.
- Evans, P. 1995. *Embedded Autonomy: States and Industrial Transformation*. Princeton: Princeton University Press.
- Feenstra, R., and G. Hamilton. 2006. *Emergent Economies, Divergent Paths, Economic Organization and International Trade in South Korea and Taiwan*. New York: Cambridge University Press.
- Fields, K. 1997. "Strong States and Business Organization in Korea and Taiwan." In *Business and the State in Developing Countries*, edited by S. Maxfield and R. Schneider, 122–151. Ithaca: Cornell University Press.
- Fourcade-Gourinchas, M., and S. Babb. 2002. "The Rebirth of the Liberal Creed: Paths to Neoliberalism in Four Countries." *American Journal of Sociology* 108 (3): 533–579.
- Fröbel, F., J. Heinrichs, and O. Kreye. 1980. *The New International Division of Labor: Structural Unemployment in Industrialised Countries and Industrialization in Developing Countries*. Cambridge: Cambridge University Press.
- Gao, B. 2011. "The Informal Economy in the Era of Information Revolution and Globalization: The Shanzhai Cell Phone Industry in China." *Chinese Journal of Sociology* 31 (2): 1–41.
- Gartner. 2006. "Market Share: Mobile Terminals, Worldwide, 4Q05 and 2005." Stamford: Gartner, Inc., Report, February 26.
- Gartner. 2008. "Gartner Says Worldwide Mobile Phone Sales Increased 16 Per Cent in 2007." <http://www.gartner.com/newsroom/id/612207>
- Gartner. 2010. "Gartner Says Worldwide Mobile Phone Sales Grew 35 Percent in Third Quarter 2010; Smartphone Sales Increased 96 Percent." Gartner Press Release. Accessed January 12, 2015. <http://www.gartner.com/it/page.jsp?id=1466313>
- Gartner. 2012. "Gartner Says Worldwide Smartphone Sales Soared in Fourth Quarter of 2011 with 47 Percent Growth." Gartner Press Release. Accessed February 12, 2015. <http://www.gartner.com/it/page.jsp?id=1924314>
- Gartner. 2014. "Gartner Says Annual Smartphone Sales Surpassed Sales of Feature Phones for the First Time in 2013." Gartner Press Release. Accessed June 2, 2015. <http://www.gartner.com/newsroom/id/2665715>
- Gereffi, G. 2009. "Development Models and Industrial Upgrading in China and Mexico." *European Sociological Review* 25 (1): 37–51.
- Gereffi, G. 2014. "Global Value Chains in a Post-Washington Consensus World." *Review of International Political Economy* 21 (1): 9–37.
- Gereffi, G., and K. Fernandez-Stark. 2011. *Global Value Chain Analysis: A Primer*. Durham, NC: Center on Globalization, Governance & Competitiveness. http://www.cggc.duke.edu/pdfs/2011-05-31_GVC_analysis_a_primer.pdf
- Gereffi, G., J. Humphrey, R. Kaplinsky, and T. Sturgeon. 2001. "Introduction: Globalisation, Value Chains and Development." *IDS Bulletin* 32 (3): 1–8.
- Gereffi, G., J. Humphrey, and T. Sturgeon. 2005. "The Governance of Global Value Chains." *Review of International Political Economy* 12 (1): 78–104.
- Gore, C. 2000. "The Rise and Fall of the Washington Consensus as a Paradigm for Developing Countries." *World Development* 28 (5): 789–804.
- Guillén, M. 2001a. "Is Globalization Civilizing, Destructive or Feeble? A Critique of Five Key Debates in the Social Science Literature." *Annual Review of Sociology* 27 (1): 235–260.
- Guillén, M. 2001b. *The Limits of Convergence: Globalization and Organizational Change in Argentina, South Korea, and Spain*. Princeton: Princeton University Press.
- Hamilton, G., and N. Biggart. 1988. "Market, Culture, and Authority: A Comparative Analysis of Management and Organization in the Far East." *American Journal of Sociology* 94: S52–S94.
- Hamilton, G., and G. Gereffi. 2009. "Global Commodity Chains, Market Makers, and the Rise of Demand-Responsive Economies." In *Frontiers of Commodity Chain Research*, edited by J. Bair, 136–161. Stanford: Stanford University Press.
- Held, D., A. McGrew, D. Goldblatt, and J. Perraton. 1999. *Global Transformations: Politics, Economics and Culture*. Stanford: Stanford University Press.

- Henderson, J., P. Dicken, M. Hess, N. Coe, and H. Yeung. 2002. "Global Production Networks and the Analysis of Economic Development." *Review of International Political Economy* 9 (3): 436–464.
- Hess, M., and N. Coe. 2006. "Making Connections: Global Production Networks, Standards, and Embeddedness in the Mobile-Telecommunications Industry." *Environment and Planning A* 38 (7): 1205–1228.
- Hobday, M. 1998. "Latecomer Catch-up Strategies in Electronics: Samsung of Korea and Acer of Taiwan." *Asia Pacific Business Review* 4 (2–3): 48–83.
- Hsieh, M. 2011. "Similar Opportunities, Different Responses: Explaining the Divergent Patterns of Development between Taiwan and South Korea." *International Sociology* 26 (3): 364–391.
- Humphrey, J., and H. Schmitz. 2001. "Governance in Global Value Chains." *IDS Bulletin* 32 (3): 19–29.
- JEITA. 2014. *Mobile Phone Domestic Shipment Statistics*. Tokyo: Japanese Electronics and Information Technology Association. Accessed July 1, 2014. <http://www.jeita.or.jp/japanese/stat/cellular/2014/index.htm>
- Kaplinsky, R. 2000. "Globalisation and Unequalisation: What Can Be Learned from Value Chain Analysis?" *Journal of Development Studies* 37 (2): 117–146.
- Kaplinsky, R., A. Terheggen, and J. Tijaja. 2011. "China as a Final Market: The Gabon Timber and Thai Cassava Value Chains." *World Development* 39 (7): 1177–1190.
- KOTRA. 2006. "Report on Taiwan's Information Technology Industry: Mobile Phones." Globalwindow Industry, Product and Technology Report, Seoul, Korea Trade-Investment Promotion Agency [In Korean].
- Kraemer, K., G. Linden, and J. Dedrick. 2011. "Capturing Value in Global Networks: Apple's iPad and iPhone." Personal Computing Industry Center, University of California, Irvine.
- Krugman, P. 1995. "Growing World Trade: Causes and Consequences." *Brookings Papers on Economic Activity* 1995 (1): 327–377.
- Kushida, K. 2008. "Wireless Bound and Unbound: The Politics Shaping Cellular Markets in Japan and South Korea." *Journal of Information Technology & Politics* 5 (2): 231–254.
- Kushida, K. 2011. "Leading without Followers: How Politics and Market Dynamics Trapped Innovations in Japan's Domestic 'Galapagos' Telecommunications Sector." *Journal of Industry, Competition and Trade* 11 (3): 279–307.
- Lee, J. 2010. "Global Commodity Chains and Global Value Chains." In *The International Studies Encyclopedia*, edited by R. Denemark, 2987–3006. Oxford: Wiley-Blackwell.
- Lee, J., and G. Gereffi. 2013. "The Co-Evolution of Concentration in Mobile Phone Global Value Chains and Its Impact on Social Upgrading in Developing Countries." Capturing the Gains Working Paper 2013/25, University of Manchester.
- Lee, Y., and S. Kwak. 2009. "Neo-Liberal Korea and Still Developmentalist Japan: Myth or Reality?" *Global Economic Review* 38 (3): 277–295.
- LG Electronics. 2010. *LG Electronics Annual Report 2009*. Seoul: LG Electronics. Accessed August 10, 2014. <http://www.lg.com/global/pdf/annual-report-2009.pdf>
- Linden, G., K. Kraemer, and J. Dedrick. 2009. "Who Captures Value in a Global Innovation Network?: The Case of Apple's iPod." *Communications of the ACM* 52 (3): 140–144.
- Lüthje, B. 2002. "Electronics Contract Manufacturing: Global Production and the International Division of Labor in the Age of the Internet." *Industry and Innovation* 9 (3): 227–247.
- Marukawa, T. 2009. "Why Japanese Multinationals Failed in the Chinese Mobile Phone Market: A Comparative Study of New Product Development in Japan and China." *Asia Pacific Business Review* 15 (3): 411–431.
- McMichael, P. 2012. *Development and Social Change: A Global Perspective*. 5th ed. Los Angeles: Sage.
- Milberg, W., and D. Winkler. 2013. *Outsourcing Economics: Global Value Chains in Capitalist Development*. Cambridge: Cambridge University Press.
- Ministry of Economic Affairs. 2008. *Zhong hua min guo tai wan di qu gong ye sheng chan tong ji nian bao* [Yearbook of Industrial Production Statistics, Taiwan Area, The Republic of China]. Taipei: Republic of China Government.

- Ministry of Knowledge Economy. 2012. "Press Release – IT Products Export & Import Statistics." Seoul, Ministry of Knowledge Economy [In Korean].
- Morris, M., C. Staritz, and J. Barnes. 2011. "Value Chain Dynamics, Local Embeddedness, and Upgrading in the Clothing Sectors of Lesotho and Swaziland." *International Journal of Technological Learning, Innovation and Development* 4 (1–3): 96–119.
- Mudambi, R. 2008. "Location, Control and Innovation in Knowledge-Intensive Industries." *Journal of Economic Geography* 8 (5): 699–725.
- NEC. 2002. "NEC to Supply i-mode Mobile Handsets for KPN Mobile Group." Press Release, February 25. Accessed October 25, 2014. <http://www.nec.co.jp/press/en/0202/2501.html>
- Nederveen Pieterse, J. 2012. "Twenty-First Century Globalization: A New Development Era." *Forum for Development Studies* 39 (3): 367–385.
- Neilson, J., B. Pritchard, and H. Yeung. 2014. "Global Value Chains and Global Production Networks in the Changing International Political Economy: An Introduction." *Review of International Political Economy* 21 (1): 1–8.
- NIPA. 2011. "The Rise of EMS/ODM Industry and Its Implications." NIPA Insight Report 2011-01, Seoul, National IT Industry Promotion Agency [in Korean]. Accessed January 2, 2015. <http://itfind.or.kr/itfind/getFile.htm?identifier=02-001-110708-000021>
- Park, T.-Y. 2013. "How a Latecomer Succeeded in a Complex Product System Industry: Three Case Studies in the Korean Telecommunication Systems." *Industrial and Corporate Change* 22 (2): 363–396.
- Petras, J. 2006. "Past, Present and Future of China: From Semi-Colony to World Power?" *Journal of Contemporary Asia* 36 (4): 423–441.
- Pietrobelli, C., and F. Saliola. 2008. "Power Relationships Along the Value Chain: Multinational Firms, Global Buyers and Performance of Local Suppliers." *Cambridge Journal of Economics* 32 (6): 947–962.
- Rasiah, R., Z. Miao, and K. Xin Xin. 2012. "Can China's Miraculous Economic Growth Continue?" *Journal of Contemporary Asia* 43 (2): 295–313.
- Samsung Electronics. 2011. *2010 Samsung Electronics Annual Report*. Seoul: Samsung Electronics. Accessed August 10, 2014. http://www.samsung.com/us/aboutsamsung/ir/financialinformation/annualreport/downloads/2010/SECAR2010_Eng_Final.pdf
- Sato, Y. 1997. "Diverging Development Paths of the Electronics Industry in Korea and Taiwan." *The Developing Economies* 35 (4): 401–421.
- Schmitz, H., and P. Knorringa. 2000. "Learning from Global Buyers." *Journal of Development Studies* 37 (2): 177–205.
- Sinkovics, N., R. Sinkovics, and M. Yamin. 2014. "The Role of Social Value Creation in Business Model Formulation at the Bottom of the Pyramid – Implications for MNEs?" *International Business Review* 23 (4): 692–707.
- Sturgeon, T. 2001. "How Do We Define Value Chains and Production Networks?" *IDS Bulletin* 32 (3): 9–18.
- UNCTAD. 2013. "Global Value Chains and Development: Investment and Value Added Trade in the Global Economy." Geneva, United Nations Conference on Trade and Development.
- Weiss, L. 2005. "Global Governance, National Strategies: How Industrialized States Make Room to Move under the WTO." *Review of International Political Economy* 12 (5): 723–749.
- Westra, R. 2012. "The Japanese Economy in the Crossfire." *Journal of Contemporary Asia* 42 (4): 697–706.
- WTO and IDE-JETRO. 2011. "Trade Patterns and Global Value Chains in East Asia: From Trade in Goods to Trade in Tasks." Geneva and Tokyo, World Trade Organization and Institute of Developing Economies.
- Xing, Y., and N. Detert. 2010. "How the iPhone Widens the United States Trade Deficit with the People's Republic of China." Manila: Asian Development Bank Institute Working Paper Series 257.
- Zhu, S., and Y. Shi. 2010. "Shanzhai Manufacturing – An Alternative Innovation Phenomenon in China: Its Value Chain and Implications for Chinese Science and Technology Policies." *Journal of Science and Technology Policy in China* 1 (1): 29–49.

Copyright of Journal of Contemporary Asia is the property of Routledge and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.