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Introduction

Masatsugu Tsuji and Akifumi Kuchiki

Industrial clusters in Asia: analyses of their competition and cooperation

Why firms agglomerate has been a question in economics ever since the time of Marshall and Hotelling. In the 1990s, the success of Silicon Valley in California and Route 128 in the Boston area as IT clusters, among others, brought new insights to this field. Since then, owing to the development of new theoretical models such as those of Krugman and of Porter the notion of cluster has become the most important in terms of competitiveness and strategy for economic development. In order to set up policy measures to foster clusters, attempts have been made to identify the strategic factors involved, for example Porter's (1) demand condition, (2) competitive condition, (3) factor condition and (4) support condition. Cluster projects have been implemented in developing as well as developed countries, and it is said that the total number to date worldwide is more than 500.

Traditional or old industrial clusters such as Nishi-Mikawa (Eastern Aichi prefecture) and Yawata City in Japan, Manchester in the UK, or Silicon Valley in California, although the last belongs to the new IT industry, were formed through the competitive process. Anchor firms decided their location through optimizing behaviour by comparing economies of scale and transaction costs, and others agglomerated close to them. On the other hand, recent economic development in East Asia has been initiated and promoted mainly by foreign direct investment (FDI). Here, foreign firms selected their locations by considering the availability of not only cheap unskilled labour but also skilled labour and other economic resources. As a result, East Asia was referred to as the 'growth center in the world' in the early 1990s, then the 'factory of the world' in late 1990s. Behind this success story, we can find government support to attract firms to the regions. Good examples are industrial parks and export-processing zones in China and Vietnam. In China there are hundreds of these zones in Zhejiang and Jiangsu provinces in the Yangtze River Delta, for example,

established by all levels of government, local as well as central. They offer generous subsidies and tax exemption for profits, and provide infrastructure such as electricity, telecommunications, highways and water supply. In this sense, regions in East Asia have been competing with each other to attract not only foreign but also domestic firms. All understand that without agglomerating there is no hope for industrial development. On the other hand, firms established in one country have been shifting to others, and this implies that the network of outputs, inputs and other business activities such as R&D expands to other areas. Such activities are a natural outgrowth of globalization as the new areas concentrate and specialize while at the same time their interdependence increases more and more. Although, in reality, the competition among East Asian regions is emphasized, tighter interdependence should be noticed.

The aim of this book is to analyse competition and collaboration among East Asian industrial clusters, and to envision their future. In *Industrial Agglomeration: Facts and Lessons for Developing Countries* (2003), we compared agglomerations mainly in Japan, the USA, Italy and some East Asian countries. This book, on the other hand, focuses on East Asia, which has been attracting FDI and developing as a centre of industrial agglomeration, with the result that the production structure in the world has been transforming dynamically. This book aims to analyse this world trend and to provide the strategy framework that is required not only for Japanese local governments but also for firms to survive global competition.

Briefly, the conclusions of this volume are as follows. The success of these industrial agglomerations depends on (1) infrastructure (highways, ports, electricity supply, and so on), (2) institutional framework (legal systems, participatory actors, coordination among actors, and so on), and (3) government support in terms of laws, taxation and finance. As shown in this volume, the role of government is essential. In developing countries, the market mechanism to foster clusters does not function well owing to regulations, bureaucracy and the existing legal framework. Moreover, there is no proper market for capital and human resources. In such a case, the government must complement market mechanisms and prepare the above three conditions. The cases of northern Vietnam and China provide good examples of collaboration in these three areas working well.

This book is contributed by the following three teams: the US Team which analyses the case of Vietnam by recent theory, the China Team which examines the case of Tianjin, China, and the Japan Team which studies the case of Japan and other Asian economies. The text is divided into parts as follows: Part I provides a case-study of clusters in Vietnam, utilizing geographic information systems approach in particular. Part II presents a case-study of the Tianjin cluster by the Chinese Team, and attempts to make clear how clusters in Tianjin with various industries have been formed. Part II also includes two chapters by the Japan Team: Chapter 3

analyses the Tianjin cluster by applying a flowchart analysis to the Toyota production plant located there, and Chapter 4 the Chinese automobile industry, which examines how Chinese automobile assemblers and parts suppliers choose their locations. Part III consists of four chapters by the Japan Team: Chapter 6 focuses on the Malaysian electronics industry and analyses its competitiveness; Chapter 7 looks at Bangalore, India, and examines its local labour market as a basis for competitiveness; Chapter 8 introduces policy measures taken by the Okinawa prefectural government in promoting ICT cluster, and highlights the importance of policy coordination with central government; and finally Chapter 9 examines how IT-related firms choose their locations and suggests a strategy for a local region to vitalize its IT industry.

PART I: INDUSTRIAL CLUSTERS IN VIETNAM

Chapter 2: Competition and Cooperation: Vietnam

In both developing and developed countries, certain industries tend to agglomerate in one area in order to take advantage of knowledge creation and spillovers, access to inputs, human and social capital, lower costs and lower barriers to market entry in clusters. For example, in the USA, the information technology industry is concentrated in Silicon Valley in California, while the international financial market is based mainly in London and the semiconductor industry can be found in Hsinchu Park in Taiwan. Vietnam is no exception to clustering. As we note on p. 56, The Old Quarter in Hanoi is famous for its specialist shops and micro-household enterprises. Many of today's street specializations date back to the establishment of Hanoi's merchant guilds in the thirteenth century. Lan Ong Street is famous for herbs and traditional medicine, Lo Ren Street for blacksmiths and metalworking, Hang Gai Street for silk, Hang Bac Street for jewelry, and Hang Dau and Cau Go Streets for leatherwear and shoes.

Chapter 2 attempts to answer questions as to why firms choose some locations and not others for their factories and offices. Studies have identified four broad categories for industrial agglomeration, described on p. 102:

1. clusters where locally specialized items are produced or local product districts;
2. clusters where a large core firm has many subcontracting or parts makers surrounding it or the so-called industrial castle town;
3. clusters in large cities where lots of basic production processes are treated or urban processing clusters; and,
4. government-led industrial parks and estates often seen in developing countries.

The chapter focuses on the fourth type of cluster – industrial zones (IZs), industrial parks (IPs) and export-processing zones (EPZs). The zones are considered a proxy for public goods in a developed country, that is in a developed country, entrepreneurs would expect to have quality infrastructure and institutions, such as electricity, roads, telecommunications, water supply and sewerage, and so on. Our study revealed that the agglomeration of foreign-invested firms in Vietnam has been in large part owing to the infrastructure and administrative advantages available in the IZs. Besides the development of government-led industrial parks, other forms of clustering are also emerging in Vietnam. Therefore, the chapter builds on the previous study, but pays particular attention to the first three categories of industrial clustering by using a geographic information systems (GIS) approach to locational analysis.

Chapter 2 begins with an overview of the industrial competitiveness of Vietnam, before surveying the economic theories that explain industrial clustering and then reviewing the international empirical evidence of the theories. The chapter then looks at some of the recent work on cluster engagement in Vietnam, after which GIS analysis is applied to analyse 12 key industrial sectors of the Vietnamese economy. The chapter then reviews the roles of both business associations and also IZs, IPs and EPZs as potential ‘cluster facilitator’ mechanisms. It concludes with industrial policy recommendations.

Vietnamese competitiveness and the environment for business

Without a doubt, Vietnam has been an economic growth success story for a decade now. The transition to a market economy has occurred comparatively smoothly and with relatively strong growth and economic stability throughout most of the 1990s, despite institutional weaknesses and a policy bias against the private sector. However, as we note on p. 31, Vietnam remains a low-income country and the public sector still dominates the industrial economy of Vietnam, contributing some 50 per cent of GDP. The state’s share of output in the manufacturing sector has fallen somewhat over recent years from 59 per cent in 1995 to 51 per cent in 2001. Private domestic firms, by contrast, accounted for only about 9 per cent of manufacturing value added (GDP). Legal reforms in recent years have, however, greatly encouraged private sector development, and in early 2002 the status of the private sector was enhanced when a plenum of the ruling party resolved that the private sector is ‘an integral part of the national economy’. Stronger official endorsement of the private sector embodied in recent policy changes has helped build investor confidence.

Biases in favour of the public sector remain, but Vietnam is now beginning a period of rapid growth led by domestic businesses, rather than by FDI and commodity exports as occurred during the 1990s. The private sector’s contribution to national investment has risen from 21 per cent in

2000 to 29 per cent in 2002. Through international trade, Vietnam has begun to capitalize on its principal area of industrial comparative advantage – low labour costs. Currently, Vietnam's garment industry is the second most important market after the EU, and the country is now the second-largest shrimp exporter to Japan, after Indonesia.

However, Vietnam's competitive potential is weakened by state monopolies (or cartels), which have kept costs high in areas such as air transport, coastal shipping, railways, power and telecommunications. As we note, 'Vietnam is one of the most expensive countries in the world for both incoming and outgoing international telephone calls' (p. 36). Such infrastructure problems largely restrict FDI and new business activity to specially built investment zones. In the absence of private provision, government services tend to be driven by what officials think is important to supply, rather than driven by demand.

Theoretical literature review

Until quite recently, economists have paid only limited attention to the location of economic activity and to the choices firms and households make to decide where to produce or consume. Early works by Alfred Marshall and Harold Hotelling laid some basic premises for looking at the role of geography in economic decision-making. Marshall (1920) did some speculating on the subject with his observation that: 'Industries tend to cluster in distinct geographic districts, with individual cities specializing in production of narrowly related sets of goods.'

In more modern parlance, as summerized on p. 47, Marshall argued that industrial districts arise because of:

- knowledge spillovers ('the mysteries of the trade become no mysteries; but are as it were in the air');
- the advantages of thick markets for specialized skills; and
- the backward and forward linkages associated with large local markets.

Hotelling (1929) expanded on this idea by looking at location as a question of finding a stable equilibrium based on the location of the market under highly constrictive assumptions.

The work of Paul Krugman, Masahisa Fujita and Anthony Venables began a renaissance in geographically based economic analysis, which they dubbed 'the new economic geography'. The foundation of this analysis rests largely on monopolistic competition modelling with an emphasis on the interaction of increasing returns, transport costs and the movement of productive factors to understand the latent forces of economic agglomeration. First, economies of scale and transportation costs imply that firms prefer to locate close to a large market. Second, workers are also consumers, and would thus prefer to live close to a large market.

Michael Porter of the Harvard School of Business developed an alternative approach to economic geography. Porter defines clusters as:

geographic concentrations of interconnected companies and institutions in a particular field ... They include suppliers of specialized inputs, components, machinery and services. Clusters also often extend downstream to channels and customers and laterally to manufacturers of complementary products ... finally many clusters include governmental and other institutions.

This school of thought also stresses that nations succeed not in isolated industries, but in clusters of industries connected through vertical and horizontal relationships. This system has an implicit concept based on a 'critical mass' of specific influences that will improve knowledge, share resources and stimulate creativity, innovation and entrepreneurship. 'Porter-style' clusters in developing countries tend to be shallow and to rely primarily on foreign components, services and technology.

Industrial clusters in Vietnam

Agglomeration can occur at many different levels, serve large or small areas, and take place in a variety of industries.

This study looks at 4400 enterprises engaged in a wide range of sectors – automobiles, cement, electronics, garments, motorcycles, paper, rice, seafood, software, steel, sugar and textiles – and their potential for clustering. Within these 12 sectors, 3 (garments, seafood and textiles) have been chosen for further analysis. Using a basic definition of clustering based on firm density, our sample identifies the garment sector to have the greatest tendency to cluster, followed by textiles, rice, seafood and paper.

Our results show that there are some signs of industrial agglomeration in Vietnam; however, these results must be taken into perspective with the transitional nature of the Vietnamese economy. The ability of a particular cluster to form depends primarily on an environment conducive for private enterprises, that is institutional frameworks. Economic reform has been the principal driver of private-sector growth, and future efforts should be focussed on further implementation of the 2000 Enterprise Law. If clusters are dynamic centres of growth, then understanding the development, management and stability of clusters is a matter of great significance for the future of Vietnam's economy. Especially Japan, Korea and other leading East Asian economies can provide constructive examples for Vietnam. These countries demonstrate that a strategy of preserving core cultural values while being open to new ideas can be extremely successful in a knowledge-driven global economy. State-funded technological catch-up has decreased in importance, while private enterprises have become the international drivers of technological development.

The reforms necessary for the long-term and stable growth of the Vietnamese economy were noted at the Vietnam Business Forum (9 December 2002) and are listed on p. 100 as:

- introduce greater competition to reduce costs closer to the regional levels in sectors such as telecommunications, power and shipping;
- ease restrictions on technology transfers;
- make business policies and regulations more transparent in their formulation as well as using consistent enforcement to enhance predictability for investors;
- broaden the currently narrow tax base that puts a disproportionate burden on honest taxpayers and slows the growth in employment;
- accelerate deregulation and implement the Enterprise Law aggressively outside the main urban areas;
- correct misconceptions on the function of the private sector and enhance its role; and stress the importance of encouraging corporate social responsibility.

While Vietnam has taken steps in the right direction, there are still substantial institutional changes needed for continued growth. The lesson for Vietnam is that the government is no longer the principal actor in driving economic and technological development. Its role has changed from setting the stage and creating a conducive enabling environment to freely allowing entrepreneurship and innovation.

PART II: INDUSTRIAL CLUSTERS IN CHINA

Chapter 3: Industrial Clusters in the Tianjin Area

Development and spread of industrial clusters and studying-type regions in Tianjin

The strong power of industrial clusters and studying-type regions has been displayed in global competition. It is the best choice for supporting development of enterprises and strengthening competitive power of enterprises. As noted on p. 112, a so-called industrial cluster comprises both the industries that gather within a certain region and their supporting system. Porter generalized this supporting system as having the following four aspects: demand condition, competition condition, factor condition and support condition. Sustained competitive advantage can be produced only by mutual support and coordinated development of these four aspects. Industrial clusters include upstream industrial sectors that provide raw materials and means of production for core industrial sectors and those industrial sectors each of whose production technology affects each others (p. 112). To build mature industrial clusters, good regional economic environment is needed.

Good regional economic environments should include at least the following six factors.

1. *Rich technological resources and its distribution media.* Universities and private and government research institutes can provide industrial sectors with the research achievements they need to improve their competitive position, through fast and efficient distribution media.

2. *Human resources with high adaptability and organizations for development and training.* Economic development requires that regions provide lots of professional personnel and a skilled contingent of workers for enterprises. Also, 'through basic occupational education, higher education and continuous in-service education, regions should give human resources the knowledge and skill that allow them to adapt to competition and changes' (p. 113).

3. *Abundant fund sources.* From fo. 192: The competitive power of regional industries cannot do without the strong support of financial organizations. The functions of these financial organizations include raising enough funds for economic development and establishing investment mechanisms that can fully reflect guidance for market competitive power.

4. *Favourable macroeconomic environment with efficient management.* As shown on p. 113 this kind of management level is embodied in two aspects: one is that macroeconomic regulations can guide enterprises effectively and at the same time do not destroy the independence and competitive relation of enterprises; the other is that the tax system is beneficial to competition, and at the same time meets the needs of economic development and the public.

5. *Well-developed infrastructure for software and hardware.* The efficiency of regional economic activities is, to a large extent, affected by the condition of infrastructure.

6. *Fair-scale groups of customers with discriminatory ability.* 'Views of these customers and their requirements for products can reflect the basic trend of market changes and should be regarded as the basis for product innovation by enterprises' (p. 114).

There are many mature industrial clusters, such as the German chemical industry, the Italian shoe industry, the Swiss pharmaceutical industry, the semiconductor industry in the USA and Japan, the mobile phone industry in Scandinavia and so on. In Latin America, South Asia and a few African countries, industrial clusters, such as Leon shoe manufacturing in Mexico,

Santa Catarina ceramic tiles in Brazil and the Nnewi automobile components and parts cluster of Nigeria have attracted people's attention and developed to some extent. In Guangdong, Jiangsu, Zhejiang and other provinces in China, some traditional industries have also shown the characteristics of agglomeration. These industries include the garment industry, shoe manufacturing industry, hosiery industry and toy industry. Tianjin is demonstrating the fruits of its decades-long development by producing large-scale foreign-funded enterprises in the complete processing, manufacturing, and heavy industry areas. In the process of industrial agglomeration, high-tech industrial clusters and traditional industrial clusters have their respective characteristics in shaping process, features and development trends. In Tianjin, industrial clusters of high-tech industries such as electronic information and automobiles and traditional industries such as bicycles and garments have appeared in an embryonic form. The network system of study between industrial clusters has also appeared. Affected and encouraged by developed industrial clusters around the world, in the interaction and competition of domestic industrial clusters, Tianjin hopes to form its own industrial clusters with advantages and studying-type regions of high dynamic ability.

Industrial clusters in the Tianjin Area

In the process of industrial agglomeration, high-tech industrial clusters and traditional industrial clusters have their respective characteristics of formation processes, features and development trends. The success of the high-tech industries depends on: (1) infrastructure (highways, ports, electricity supply and so on); (2) institutional frameworks (legal systems, participatory actors, coordination among actors and so on); and (3) government support (or foreign assistance) in terms of laws, taxation and finance. As shown in Chapter 2, the case of northern Vietnam provides good examples where collaboration in these three areas worked well.

There exist the following industrial clusters in Asia: southern China, the Chu-Chiang River Delta in China, Johor, Selangor and Penang in Malaysia, Hanoi and Ho Chi Minh in Vietnam, Bangalore in India, Zhong Guan Cun in China, Hsinchu Science Park in Taiwan, and Leam Chabang in Thailand.

As new industries, here we chose the electronic information industry in Tianjin and the battery industry with its special feature of green environmental protection. For traditional industries, Chapter 3 chose the automobile manufacturing industry in Tianjin and the bicycle manufacturing industry.

The new motive force for the development of the electronic information industry in Tianjin

In recent years, the electronic information industry in Tianjin has developed very quickly and taken on a healthy look. The rapid formation and

development of the electronic information industry in Tianjin has the following obvious characteristics.

1. Exogenous industrial clusters. Electronic information clusters' exogeneity is evident from their dependence on foreign funding sources. The increasingly large scale of foreign funds in the electronic information industry, and the ratio of foreign funds in the electronic information industry to gross funds.

2. Industrial clusters have taken on the structural characteristics of a 'single core'. The average scale intensity of Tianjin's enterprises is comparatively high; enterprises are of relatively large scale, and 'single-core enterprises of industrial clusters are large-scale transnational corporations' (p. 118).

3. Rooting of industrial clusters and the foundation of local production network. Industrial clusters are primarily rooted in local socio-cultural characteristics and institutional advantages. These play an important role in the further development of high-tech industrial clusters.

4. Industrial clusters with product chain. 'Within electronic information industrial clusters in Tianjin, economic bodies connect with each other to form an inner value chain' (p. 119). It is a typical mode of product chain cluster. In this chain, three kinds of enterprises share work and cooperate with each other to form a product chain cluster with comparative power.

Some problems still exist in Tianjin's electronic information industry: the industry has comparatively strong dependence; institutional factors restrict the further development of industrial clusters; the local production network has not embedded deeply; the single-core structure of industrial clusters is fragile and unstable; and there is no knowledge connection which is favourable for innovation.

Regarding these characteristics and problems, Chapter 3 proposes a solution to the development of the electronic information industry in Tianjin in order to improve its competitive advantage and bring the clustering effect into full play. The solution is as follows. (1) Tianjin's electronic information industrial clusters should combine industrial advantage, policy advantage, low cost advantage and location advantage. (2) The structure of industrial clusters should develop from 'single-core' to 'multiple-core' to form a competitive pattern within the region and to transfer and improve electronic information industrial technology. (3) Local industrial clusters with self-strengthening mechanisms should be cultivated. Product chain clusters should be turned into innovation chain clusters so as to change regional comparative advantages into competitive advantages. (4) The process of reform for state-owned enterprises in the electronic information

industry and to further complete institutional network within industrial clusters should be speeded up. (5) The electronic information industry should develop toward specialization, interconnection, internationalization and clustering through the combination of technology, institute and market. (6) Investment should be promoted by favourable policy, sound infrastructure, convenient trade environment and improving the ecological environment in regional clusters.

The rise of the green battery industry in Tianjin

The Tianjin municipal government has listed new energy (taking the green battery as the dominant factor) in three pillar high-tech industries, so called pillar industries. Tianjin New-Tech Industrial Park also looks on new energy as a key field of development. These measures have led to the rise of the green battery industry. Tianjin has distinct advantages in developing this industry as follows: (1) The green battery industry in Tianjin has strong R&D facilities and a high production capacity. (2) Types of products are complete and the production chain has appeared in an embryonic form. (3) The industry has a vast range of prospects and great potential. Tianjin has been successful in opening up the market at home and abroad. After ten years' development, the green battery industry has achieved a certain scale. However, as a growing industry, it still has some problems that demand prompt solutions. Through analysis of the basic situation and industrial structure of the green battery industry, Chapter 3 makes suggestions for guidance.

Development environment, characteristics and direction of the automobile industrial clusters in Tianjin

On p. 141 we summarize the situation of Tianjin's automobile industry: The automobile industry in Tianjin is an important part of the national industry. Especially in the twenty years since reform and opening-up, the automobile industry in Tianjin has both risen and fallen. It is now facing the opportunity of starting a new undertaking. After decades of development, automobile industrial clusters have appeared in an embryonic form with several important development characteristics. These characteristics include: (1) The accumulated development basis of the industry provides an advantage in terms of human resources. (2) The unique product positioning under the national industrial policy has gained some pre-emptive advantages. (3) The industrial agglomeration of which Toyota is seen as the centre exists together with the original industrial agglomeration. (4) Tianjin's automobile industrial clusters participate in the formation of a domestic oligarchic market structure through its alliance with China's FAW Group Corporation. (5) Because the industry is in the key stage of change from comparative advantage to competitive advantage, the competitive advantage of the industry is not outstanding. (6) The competitive power of

enterprises manufacturing automobile components is in decline on the whole, but some enterprises have suddenly come to the fore. (7) The localization system of the R&D of products has yet to be formed. (8) The means by which government affects industrial development lies in facing the requirements of change.

Beginning from the background of the automobile industry at home and abroad, Chapter 3 analyses the industry's development characteristics; next it raises the construction direction of the automobile industry in Tianjin in order to strengthen and/or sustain competitive advantage and improve the clustering effect of this industry. The construction direction includes the following aspects: (1) constructing two interrelated systems of the production chain; (2) medium-scale and small-scale enterprises with quality management and innovative ability being the main factor in maintaining the competitiveness of the value chain; (3) promoting the change of the value chain from comparative advantage to competitive advantage and even to dynamic competitive advantage; (4) government plays a positive role in cultivating industrial dynamic competitive advantage.

Analysis of the formation and development of bicycle enterprise clusters in Tianjin

Tianjin is the birthplace of China's bicycle industry. Here the industry has experienced both rise and fall. In this process, unique bicycle enterprise clusters have been formed gradually, the clustering effect playing a significant role in encouraging industrial development. Taking the formation characteristics, factors and development mechanism of bicycle enterprise clusters in Wangqingtu as the starting-point, Chapter 3 analyses the development, structural features and competitive advantage of bicycle enterprise clusters and the structure of bicycle industrial clusters in Tianjin. The structural characteristics of Tianjin's bicycle industry are summarized on p. 156: first, the vertically integrated, rigid mode of production in state-owned enterprises has been adaptable neither to market demand nor to technical improvement. These enterprise clusters are, rather, the substitute for such a mode of production. Moreover, they are located in suburbs where it is easy to obtain a flexible labour force. Also, the convenient conditions of transport and communication make it possible for enterprises to communicate with each other in commodities, service, information, labour force and technology. Second, medium-scale and small-scale enterprises with a relatively high degrees of specialization have formed clusters, and the relationship between enterprises in the same industry or between related enterprises is one of dynamic competition and cooperation. This kind of relationship helps clusters to maintain their energy and competitive power.

From the above analysis, Chapter 3 concludes that the formation of Tianjin's bicycle enterprise clusters is the result of many factors, such

as geography, economy, society, humanism, institutions, technology, the market and history. It has not resulted simply from the action of enterprises, nor was it able to appear in a short time. Enterprises within the clusters have an obvious coordination effect. Once this kind of organizational structure is formed in a region, other regions have difficulty in copying it quickly. It should be considered a significant factor in the continuous improvement of the competitive power of Tianjin's bicycle enterprise clusters.

Conclusion: to cultivate Tianjin's new industrial clusters

In the process of industrial agglomeration, both high-tech industrial clusters and traditional industrial clusters have their respective characteristics in shaping processes, features and development trends. Regarding these four industrial clusters as our research object, through contrast and analysis on shaping process, features and development trends, Chapter 3 raises future characteristics and development trends for industrial clusters in Tianjin. The development trends are as follows: (1) A developed interrelated industrial cooperation system in which foreign-funded enterprises are the centre. Tianjin's industrial clusters regard large foreign-funded enterprises as the centre. This type of cluster, however, does not yet enjoy the benefits of an 'interrelated connection of innovation networks.' Rather, with local enterprises still dependent on core enterprises for funding and technology, these clusters still experience a hierarchical division of labour within the value chain. This is one reason why these clusters are inherently fragile, and why they are still largely at the bottom of or outside the global production system. (2) Being good at study, imitation and innovation, and to bring dynamic ability into full play. Through the alliance, medium and small-scale enterprises may form a certain kind of scale economy and maintain and strengthen their own competitive advantage of technology and also improve their core and dynamic ability. (3) With the tie of the market, industries in urban areas and industries in rural areas should be combined to form a rational structure of priorities. As described on p. 165, so far, Tianjin has formed a pattern of industrial clusters with the characteristic of distribution according to priorities in urban and rural areas. The enterprise clusters in capital-intensive or technology-intensive industries gather in economic-technological development areas, free-trade zones, new technical industrial parks and some development areas in counties. Traditional industrial clusters have appeared in some industrial parks in villages and towns. Relying on new technology and new concepts of management, these traditional industrial clusters are being reformed into new industrial clusters. (4) Support by a developed international supply chain and market network. On p. 167 we argue that cooperation in the international supply chain is the best choice for entry into the international market. However, the final goal is not the internationalization of enterprises. The final goal of

an enterprise is to occupy market share and gain profits. The market network can collect rich market information for enterprises and provide unblocked channels for selling. (5) Positive enterprising concept and clustering culture. It is our brief that 'Tianjin's future industrial clusters of the new type should maintain and develop a coordinated and open clustering culture. In addition, future industrial clusters in Tianjin should incorporate a foreign advanced culture and cultivate compound competitive advantage' (p. 167).

Chapter 4: A Flowchart Approach

The economic development of East Asia can be explained by an industrial cluster, or industrial cluster policy, and industrial agglomerations such as the export-processing zone in Kaousing, Taiwan, established in 1965, the free-trade zone in Penang, Malaysia, in 1971 and the export-processing zone at Tan Tuan near Ho Chi Minh, Vietnam, in 1993 are typical examples. Industrial Parks near Shanghai developed by central government as well as all levels of local government are other examples. Chapter 4 makes clear the conditions required for forming a cluster in developing countries, and attempts to present a new method referred to as a flowchart approach. The author applies this method to analyse the Toyota Motor Corporation cluster in Tianjin, China, as a case-study.

The flowchart approach proposed in Chapter 4 is used to extract the factors contributing to a cluster and to explain how these affect each other so as to form a cluster. The four factors proposed in this chapter are: (1) industrial zones, (2) capacity-building, (3) anchor firms, and (4) related firms. These are the key to industrial clustering in implementing industrial cluster policy. Capacity building means facilitation of physical infrastructure, institutional reform, human resource development, and preparation of living conditions. Institutional reforms include streamlining investment procedures and establishing one-stop services. The cross-dock logistics introduced in Shanghai of a just-in-time system contribute to value chain management but weaken an incentive to form an industrial cluster in Tianjin. The following three factors have positive effects on expanding an industrial cluster: a keiretsu relationship between an anchor firm and its related firms, scale economies, and modularity.

Chapter 4 presents two interesting theoretical models for analyzing the decision of an anchor firm to construct a new production plan in a cluster, and on the scope of the value chain, namely, a 'regional value chain network'. The author shows that, in the former, the crucial elements for the decision are scale economies and external economies of the anchor firm and that these are related to the size of the market (the amount of production), while those in the latter are the international vertical or horizontal division of labour and of parts, and outsourcing strategy.

After the theoretical formulation, the chapter applies the flowchart analysis to Toyota in Tianjin. The first step in forming an industrial cluster is to find the market for products. Here scale economies in China are crucial to forming an industrial cluster in Tianjin. The market in the case of Tianjin is domestic. The next step is to determine whether there are saucers for firms to build plants. Tianjin has (1) the Tianjin economic development area of 130 km² and other industrial zones established in 1992. Tianjin can also offer to firms as an incentive a good port, a physical infrastructure to be part of (2) capacity-building. Tianjin Port is effective in forming an industrial cluster. Tianjin's government has been criticized for slowness in reforming laws and regulations but it is now improving. Living conditions in Tianjin are favourable to foreign investors such as the Japanese since there is a Japanese department store and many Japanese restaurants. Tianjin offers to firms as a further incentive many university students as human resources. Toyota started to operate in October 2002 as (3) an anchor firm for a cluster in Tianjin. Toyota merged with Daihatsu and decided to establish a subsidiary, partly owing to Daihatsu's subsidiary located in Tianjin, though it had several candidate cities to invest in. Japan's keiretsu system was effective in inviting (4) related companies of Toyota. Inviting an auto assembly company as an anchor firm is effective in implementing industrial cluster policy, since a car is composed of some ten thousand components. Component firms move into a cluster where an anchor firm exists if they can have surplus by building a plant. Cross-dock logistics are characteristic of Toyota's Tianjin cluster. The just-in-time system there collects components in Shanghai and transports them to Tianjin. The logistics reduces transportation costs from Shanghai to Tianjin and weakens firms' incentive to move into Tianjin. After discussing these factors, Chapter 4 concludes that the crucial factor in the decision to build a factory in Toyota's case was economies of scale.

Chapter 5: Chinese Automotive and Parts Industries

This chapter analyses how Chinese automotive assemblers and their parts manufacturers choose their locations. There are approximately 120 automobile assemblers and 2201 registered parts suppliers, and the characteristic of locations is that concentrated areas of the industry show a wide dispersion all over the country. The economic grounds of this are the rational behaviour of each firm to maximize profits subject to various constraints such as costs of transportation, transactions and information, but also the size of the market. The more firms concentrate in a particular region, the larger the information flow such as managerial know-how and technological innovation, and all participants there receive benefits from this. This cumulative process attracts more economic resources to the region.

In addition to the economic factors, Chapter 5 emphasizes political factors in the Chinese automotive industry. The location of assembly plants was chosen mainly from the viewpoint of national security in such a way as to scatter factories around the country. Those locations of the assemblers became a core to attract other parts manufacturers, and this process created the agglomerate regions of the automotive industry such as Jiansu, Sichuan, Zhejiang, Jilin and Shangdon provinces, and Shanghai and Beijing cities. In 1987, the Chinese central government designated six large motor assembly plants as 'key firms' targeted for expansion with administration support. The six automotive corporations were given different market goals. Three were allocated to the large passenger car sector and three to the small passenger car sector according to the displacement, and the plan was referred to as 'three big, three small'. According to this plan, China's main vehicle manufacturers would be the First Auto Works (FAW) in Changchun, the Second AutoWorks (SAW) in Hubei and the Shanghai Vehicle Factory, which formed a joint venture with Volkswagen. The three small players would be joint ventures of Beijing Jeep, Guangzhou Peugeot and Tianjin Daihatsu. However, the plan was expanded to 'three big, three small, two mini' under pressure from the Central Military Commission.

As a result, the scales of production of the 'eight major large automotive firms' were very small, while other governments in the world imposed a strict concentration policy on the automotive industry. These eight key companies controlled only 28.7 per cent of total volume of terminal assembly plants and 7.5 per cent of components plants. Although they accounted for 66 per cent of vehicles production, their individual scale was very small by international comparison, with an average output volume of only 27,466, far below the efficient level of production, which is estimated to be between 250,000 and 300,000 vehicles. The eight majors accounted for less than half of total assets and investment made in the automotive sector in 1995, which indicates that the Chinese central government was unable to invest strategically.

The political issue can be found in the solution of the above problems. In order to obtain a sufficient level of production, the Planning Committee and the Ministry of Machinery Industry (MMI) determined to restrict severely the number of automobile plants. MMI had worked hard on sorting out the chaos in new entry acquisition to make some sense of its role in the broad development of the Chinese automobile industry. MMI, however, ran into much difficulty in performing its functions in control and coordination. Not only did its policy preference differ from the rational interests of most of the local governments and the defence industry, which have a bureaucratic stature equal or higher than MMI, but also its financial weakness rendered it unable to enforce its authority effectively. Moreover, this was due also to the governance of local governments in seeking their own strategy to develop their economy, and they made use of its political

power to nurture the automotive industry according to their local industrial policy. This resulted in a larger number of automotive assemblers and an inefficient level of production.

Next, Chapter 5 focuses on the city of Shanghai as a case-study, which shows the remarkable development of the automotive and its parts industry. Almost half of parts manufacturers in China are located in Shanghai and its nearby provinces such as Jiangsu and Zhejiang. The success lies in not only the historical background of the manufacturing industry and the largest amount of foreign direct investment (FDI), but also the organization of municipal governments such as the Shanghai Localization Office (SLO), the Shanghai Municipality Trans-bureau Localization Cooperation Office (SMTLCO), and the Municipal Automotive Small Group (MASG). The bureaucracy of the Chinese government is so strong that the different bureaux have their own authority and jurisdiction. They cannot surpass the authority of other bureaux. The organizations of Shanghai municipal government used strong leadership to nurture and promote its automotive industry.

Major Japanese automotive assemblers such as Toyota and Honda have already established plants in China, and Nissan will be producing soon. Chapter 5 briefly examines their relationship with their parts suppliers and make a comparison with that in Japan, and from field research on Toyota in Tianjin concludes that current Japanese automobile assemblers cannot exploit merits of agglomeration through the hierarchical production structure, since the amount they produce is far less than that required for economies of scale.

PART III: INDUSTRIAL CLUSTERS OF IT INDUSTRIES

Chapter 6: Can Malaysia's Growth Be Sustainable?

This chapter focuses on the Malaysian electronics industry, which has been successfully forming an industrial agglomeration since the mid 1980s, as a result of which Malaysia has been a leading producer of electronics products in the international market. However, owing to the recent rapid emergence of China as an industrial power, it may not be possible for the Malaysian electronics industry to sustain its current industrial growth. In order to analyse these issues, the chapter examines empirically the international competitiveness of the Malaysian electronics industry, using various analytical measures. With these methods, it analyses rigorously the Malaysian and Chinese electronics industries in the global market, examining whether the two industries are competitive or complementary. Finally, the chapter investigates whether the new rise of the ICT industry in Cyberjaya in Malaysia may constitute another industrial cluster to sustain the country's growth.

The Malaysian electronics industry is dispersed rather than concentrated all over the country, so that, the regional distribution of foreign and domestic investment tends to be dispersed among such states as Selangor, Penang, Perak, Johor, Negeri Sembilan, Melaka, Kedah, Pahang and Sarawak. This is shown by examining the Gini coefficients of foreign and domestic regional investment patterns in 1993 and 2002, which are 0.67 and 0.50, respectively, values significantly lower than those of China and Thailand, for example.

The recent flow of FDI into the Malaysian electronics industry went up enormously in 2000, after a short drop during the 1997 Asian crisis. The characteristics of the recent flow of FDI are aiming for the expansion and/or diversification of existing investment and projects, and concentrating on the production of high value added products such as plasma TVs. These seem to reflect the high level of confidence prevalent among foreign investors in Malaysia.

Chapter 6 analyses the competitiveness of the Malaysian electronics industry by calculating the RCA index, which indicates the comparative advantage of each commodity within a country compared with the world trade structure. The author shows that there is no change in that Malaysia continues to specialize in the production of electronics products in general, but some products such as office machines and computers raise the index, while others like radios and sound recorders tend to decline. This means that the industrial competitiveness of Malaysia shifts away from the production of low value added products to that of high value added ones. Despite the closure of some establishments and the shifting of their operations to lower-cost production countries such as China and Vietnam, many existing firms continue to engage in expansion or diversification of their investment projects in the production of relatively high value added products.

Chapter 6 also focuses on whether China is a threat to Malaysia, that is, whether the emergence of China as an industrial power may have a significant impact on the Malaysian electronics industry. The background of this argument comes from the flow of FDI into both China and ASEAN. It is very clear that ASEAN cannot compete with China in terms of the absolute value of FDI inflow. Moreover, the gap seems to have become even wider in recent years, as the entry of China into the WTO turned around the declining trend of FDI flow into that country, while the flow of FDI into ASEAN remains stagnant. In order to answer the above issue, the chapter again utilizes the RCA index. The procedure is as follows. The RCA indexes are calculated for Malaysia and China for electronics products. These indexes are ranked for each country respectively and the Spearman's rank correlation coefficient between the rankings of the two countries is calculated. If they show a high positive correlation, their trade structure is very competitive. That means that the emergence of China as an indus-

trial power may have a significant impact on Malaysia. On the other hand, if the coefficient is near zero or negative, their trade structures are rather dissimilar and could be complementary to some extent. The results of the analysis for the Japanese market show that in 1996 the coefficient was a little bit high (0.453), but statistically insignificant, while in 2000 the coefficient became even lower and close to zero (0.134). Considering the high degree of involvement of MNCs in the electronics industry in Malaysia and China, the Chapter 6 concludes that MNCs tend to produce different types of electronic products in China and Malaysia, that is, China and Malaysia *can* be complementary in the electronics industry.

Chapter 7: Bangalore's Software Cluster

It is widely recognized that capital, technology, information and human resources embedded in a region are essential factors for firms to agglomerate there. This chapter examines as a case-study Bangalore in India, one of the leading centres of software clusters in the world, by analyzing (p. 244): the conditions under 'which knowledge-intensive industrial clusters in developing countries build competitiveness, with particular focus on the dynamics of the local labour market. In other words, this chapter examines the characteristics of the local labour market, such as an institutional mechanism for promoting innovation and strengthening the competitiveness of its software industry'.

In the 1990s, Bangalore emerged as the largest software cluster in India, achieving tremendous growth particularly since 1997, mainly through exports of lower-end software and IT-enabled services to the US market. In more recent years, leading IT global players such as Motorola, HP, TI and IBM have started outsourcing their R&D to Bangalore, allowing the cluster to gradually move up the value chain by engaging in higher-end services such as embedded systems. Lower-end IT-enabled services have also grown rapidly. A question posed by this chapter is: Why did this phenomenal export growth occur, particularly in Bangalore? The answer is an affluent, skilled, IT-related labour force with proficiency in English in that region. As of 2001, approximately 80,000 IT professionals were working in Bangalore, accounting for about 20 per cent of the IT professionals in the whole country. Chapter 7 analyses the factors to explain this in the demand and supply sides of the labour market, the latter including educational institutions in the region. In 1998, Bangalore established the Indian Institute of Information Technology (IIIT) as a joint initiative between government and industry. The IIIT-Bangalore was located right in the centre of the International Technology Park (ITP), in order to improve the quality of training in IT-related courses and train IT professionals to meet industry needs. In addition, there were (as of 2001) 106 engineering colleges in Karnataka: two government-run and the rest privately funded. Private engi-

neering colleges in Karnataka accounted for 19 per cent of the 553 all private technical colleges nationwide. These institutions contributed greatly to the IT-skilled workforce for the software industry in the region. Moreover, in-firm training is a principal means to develop IT professionals' skills in Bangalore. Because technology changes so quickly, firms need to keep upgrading their skill sets, by retraining their employees in 'hot skills'. The average life of technical skills is only three years. Major firms frequently update the skills profile of their employees through in-firm training, in technical skills, domain knowledge and communication skills. It is said that firms spend about 5 per cent of total labour costs on in-firm training, and on average employees spend 10 to 12 per cent of their work time on such training.

Another characteristic of the local labour market for IT is found in its high mobility. Chapter 7 discusses the fact that the average IT professional works only 2 to 5 years at one firm. During the boom years between 1997 and 2001, the average labour turnover rate rose to 22 to 25 per cent, sometimes even up to 30 per cent, as engineers moved frequently to other firms offering higher salaries. After the IT industry slowed down in 2001, the industry average for labour turnover declined to 8 per cent.

The high turnover rate in search of higher remuneration brought about positive effects for the skills development of workers. Workers in the software and services industry are in a fast career trajectory. The author of Chapter 7 found an interesting fact through field research that in only 4 to 5 years software engineers reach the top level, becoming project leaders. Software design engineers must have at least 5 years of experience, while software programmers must have at least 3 years or more of experience, while junior engineers doing coding need only 1 year. Because of this fast-track career development, most leading firms have performance-driven and merit-based compensation schemes. This again causes high mobility in the local labour market.

The dynamism of the local labour market comes also from spin-offs, a phenomenon similar to that in Silicon Valley. Many workers in large MNCs such as HP and Motorola and in leading Indian firms leave to set up their own firms. Former Wipro employees, for example, have set up more than 100 companies with no assistance from the firm. These IT professionals use the knowledge and skills they acquired in large firms in their new startup firms. The relatively low capital requirements for such new startups, along with the growth of venture capital across the country, have facilitated this trend.

Chapter 7 also analyses successfully a so-called virtuous cycle that generated knowledge management in the region. The process was formed through the following mechanisms: (1) the state government quickly responded to the enormous growth in demand for skilled IT manpower through its manpower planning policies; (2) high intra-firm transnational

mobility as well as inter-firm mobility has helped firms to quickly deploy and mobilize the skill sets they require; (3) the emergence of local labour market intermediaries in terms of staffing agencies as well as the industry-wide collaboration in carrying out a periodic compensation survey helped facilitate the working of the local labour market; and (4) both MNCs and leading Indian firms actively promoted in-firm training to upgrade the skills of the workforce in their internal labour markets. These altogether have led the cluster to better mobilize the skills to meet the global demand and move up the value chain, and thus build competitiveness.

Chapter 8: The Local Economy: Lessons from Japan

Since the Plaza Accords in 1985, many Japanese manufacturing companies have moved production bases from Japan to overseas locations such as Southeast Asia and East Asia because of the sharp appreciation of the yen. In the 1990s, Japanese manufacturing companies shifted investment to factories to China owing to the low costs for production and a global management strategy. These drastic changes in firms' investment strategies, coupled with the economic deterioration following the bursting of Japan's 'bubble economy', have had a serious negative impact on the Japanese local economy. As a consequence, not only per capita incomes but also the number of factories in regions have decreased. For the latter, from 1985 to 1990, the number of factories decreased at the annual rate of -0.1 per cent; from 1990 to 1995 it was -2.2 per cent, and from 1995 to 2000 it was worse still, at -2.4 per cent.

Chapter 8 makes an attempt to analyse policy measures taken by local governments as well as central government, to cope with industrial transformation and globalization as stated above, by focusing particularly on IT and information, communications and technology (ICT) policies. The chapter analyses the case of Okinawa Prefecture, which aims to promote the IT industry through collaboration with the central government, and attempts to draw lessons from the case of Japan in order to contribute to stable IT development in the local economy. The chapter introduces the Industrial Cluster Plan of 2001, and learns how the local government has attracted firms to its prefecture in order to form industrial clusters. The Industrial Cluster Plan of 2001 consists of the following three core programs: (1) to support firms to collaborate with universities; (2) to assist technical innovations in the industrial sector; and (3) to establish institutions for promotion of startups and entrepreneurs. The government prepared about ¥476bn in funds for the plan.

Following the lead of the central government, the Okinawa government has implemented policies to promote and invite the ICT industry to the prefecture. Chapter 8 summarizes these into the following five policies: (1) Financial support for ICT companies established in Okinawa to reduce

telecommunication costs, (2) Development of the ICT industrial cluster. Since the Japanese government laid a special telecommunication cable between Tokyo and Okinawa in order to reduce costs for telecommunications, costs for telecommunications between Okinawa and Tokyo have become inexpensive as compared with to or from elsewhere. The government of Okinawa has taken full advantage and provided support for data centres with funds up to 50 per cent of the total cost incurred in transferring an existing facility to Okinawa. (3) Enhancement of job opportunities for the young. (4) Human resource development. This includes training courses for engineers to learn advanced IT knowledge and for people who are willing to work for call centres. (5) Tax deduction and tax exemption for ICT firms. As for policy achievements, the chapter shows that as of May 2003 there are 34 call centres, 17 software companies, 10 information service companies, 13 contents companies and 6 companies in other categories.

As lessons learned from the experiences of Okinawa, Chapter 8 points out that local governments should make a plan for forming industrial clusters in an effective way by cooperating with the central government; in other words, local governments should not duplicate policies implemented by the central government, but should supplement the disadvantages of their programs with the policies of the central government. The following two points are, however, suggested by the author for further development of the ICT cluster. First, local government should stimulate competition and promote cooperation among companies in the cluster. In the case of Okinawa, the prefectural government played an important role in inviting ICT companies to the area; however, it did not act as a promoter for competition and cooperation in the cluster. Second, the local government should keep a balance between support for vocational training and for new business. The government committed itself to support human resource development; however, it has not paid much attention to support for new businesses or venture businesses. To stimulate the local economy, it is also important to help entrepreneurs start new businesses. Thus, local governments need to maintain these balances.

Chapter 9: Japan: Remedies to Activate Local Cities

Silicon Valley and Multimedia Gulch in the USA, Bit Valley in Tokyo and Sapporo Valley in Hokkaido are typical examples of IT clusters. As of March 2002, approximately 30 per cent of establishments engaged in IT business were located in Tokyo. It is common all over the world that the IT industry tends to agglomerate in the larger cities. This chapter makes an attempt to explain empirically the factors that determine IT-related firms to agglomerate to a certain region. This issue attracts interest not only from academia but also from policy-makers, since while they have been

implementing so many projects to revitalize regions by promoting or attracting IT-related firms to them, in reality most of them seem to have failed. In this sense, the analysis of this chapter thus bears an important message.

The chapter identifies common characteristics that attract IT-related firms to a region by comparing the agglomerated regions listed above. In so doing, the author examines the supply and demand of information services. From the supply side, IT requires skilled engineers. Potentially skilled workers are most likely to exist near high-level educational facilities, and existing research also shows that industrial accumulation occurs near universities. This can be explained by the nature of information, that is, IT is related to embodied information such as experience accumulated in individuals which is difficult to transfer. Face-to-face meetings play an important role to sharing such information. An industrial innovation depends on the resources of fundamental scientific knowledge of universities, research institutes and so on. Firms, therefore, concentrate their resources of related research into areas where universities and research institutes are easy to access.

Regarding the demand side, it seems to be common all over the world that the IT industry tends to agglomerate in larger cities. Population density is a factor related to the size of consumer demand. In addition, another source of demand is other firms. Thus, existing industries are considered to increase demand for corporate services from the IT industry, and also to be a measure of economies of scale or industrial diversity as an element of accumulation. This is referred to as the accumulation effect.

In addition to supply and demand factors, Chapter 9 emphasizes social amenities as an important factor for the location of IT firms. Since talented high-skilled workers are key in this high-tech industry, they demand dense information exchange between them, which brings about positive information and knowledge spillovers. A good quality of social amenities around the workplace may also be related to location, as a stimulator of face-to-face communication. Lastly, government policy both central and local an important element in attracting IT industry enterprises.

After identifying the expansionary variables, the chapter constructs an econometric model to examine the effects of the above variables on the growth of the IT-related industries in the region, which are classified into the following three categories: (1) software business, (2) information-processing and (3) the internet. The result of the empirical analysis is summarized as follows. Empirical estimation proposes that the IT industry tends to accumulate in an area where there are many people, many establishments and many educational facilities. In particular, it can be shown that availability or easy access to educational facilities is the most influential factor. This is consistent with the idea that the IT industry is likely to rely heavily on knowledge workers to promote innovation.

The policy recommendations derived from Chapter 9 are therefore such that if local governments wish to attract IT industry they should have high-quality educational facilities such as universities and graduate schools as a minimum requirement. This requirement may become increasingly important in the information or knowledge economy of this century.

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