

The Flowchart Model of Cluster Policy: The Automobile Industry Cluster in China

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**The Flowchart Model of Cluster
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Abstract

This paper proposes a general model of the flowchart approach to industrial cluster policy and applies this model to Guangzhou's automobile industry cluster. The flowchart approach to industrial cluster policy is an action plan for prioritizing policy measures in a time-ordered series. We reached the following two conclusions. First, we clarified the effects of Honda, Nissan, and Toyota on agglomeration in Guangzhou's automobile industry cluster. Second, we established that local governments play a crucial role in successful industrial cluster policy, and that the mayor of the local government should be offered incentives in order to target industrial clustering and implement cluster policy.

Keywords: Prioritization of cluster policy, Linearization of policy measures, Flowchart model, Inductive method, Anchor firm, Capacity

JEL classification: G18, O18, R11

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1. Introduction

There are various types of industrial clusters in Asia. Cluster policy is mainly undertaken, not by central governments as national policy, but by local governments as regional policy, partly because economies all over the world are decentralizing. One important question is whether cluster policy can be effective in forming a cluster.

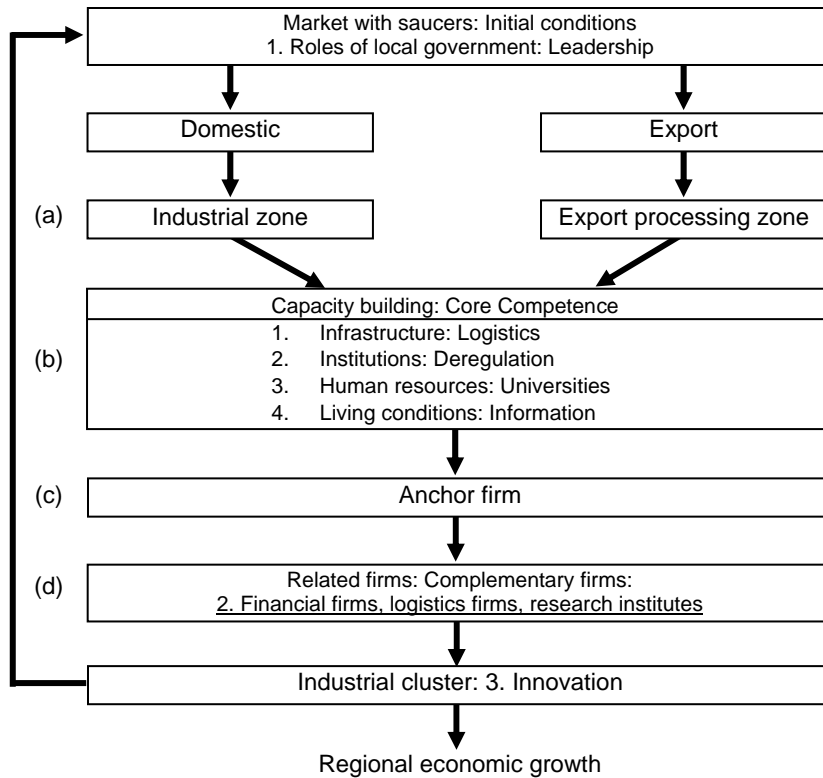
According to Fujita (2003), the central issue in the field of spatial economics is to clarify the mechanisms of industrial agglomeration, while the issue in the study of industrial clustering is to find how firms in industrial clusters become more innovative as a result of locating in the cluster. Here, an industrial cluster is defined as an industrial agglomeration that induces firms to innovate and create knowledge and technology in order to be competitive with other firms.

Porter (1998) proposed a “diamond approach” for a cluster to achieve competitive advantages over other clusters. The approach explains that, after a cluster is formed, the cluster becomes innovative if four conditions are satisfied. This approach, however, is not a model of how to create a cluster by implementing industrial cluster policy. Baldwin (2003) discussed cluster policy, not practically, but theoretically. The question that remains is whether cluster “policy” is effective in forming industrial clusters.

Porter (1998) constructed a diamond model in which the four factors of demand conditions, factor conditions, firm strategy, and related and supporting industries are conditions for an industrial cluster. But it is not easy to satisfy the four conditions at the same time. Our flowchart model will prioritize the four factors, not in a diamond form, but in a linear form. Markusen (1996) classified the three types of industrial districts as Marshallian ID, hub-and-spoke and satellite platform. It found the relationship between anchor firms and their related firms in the case of hub-and-spoke. But Markusen (1996) neither showed the process of a forming industrial cluster nor ordered the factors for the condition. As a practical method, our flowchart model proposes cluster policy that prioritizes policy measures in linear form; that is, by ordering policy measures in a line.

As shown in Figure 1-1, Kuchiki (2005a) proposed a “flowchart approach to industrial cluster policy,” theorizing that industrial cluster policy is effective in forming industrial clusters by establishing industrial zones, building capacity, and inviting anchor firms. Capacity includes infrastructure, institutions, human resources, and living conditions.

Figure 1-1. Flowchart Approach to Industrial Cluster Policy



Source: Author's

The purpose of this paper is to propose a general model of our flowchart approach to industrial cluster policy and apply it case of the automobile industry in Guangzhou, China.

We reach the following two conclusions: First, we make it clear that the role of the anchor firms of Honda, Nissan and Toyota is a key to cluster policy-driven industrial agglomeration. We show the effects of Honda, Nissan and Toyota on the success of the policies. Second, the leadership of the government of Guangzhou Municipality has played crucial roles in the success of its industrial cluster policy.

The appropriate roles of the local government are (1) management of industrial zones, (2) promotion of joint ventures between state-owned enterprises and foreign investors, (3) promotion of joint ventures between Guangzhou Automobile and foreign investors such as Honda, Nissan, Toyota, Isuzu and Hyundai, and (4) support for foreign investors. It is local rather than central governments that play comprehensive and crucial roles in compensating for market failures, such as coordination failure and provision of public goods, in implementing industrial cluster policy. In sum, local

governments play a key role in industrial cluster policy, while central governments play the key role in industrial policy.

The flowchart approach in this paper indicates the following two points. First, a careful prioritization of policy measures is needed to implement industrial cluster policy. That is, governments must consider the prioritization, i.e. the timing and order of policy measures, if they are to succeed with their industrial cluster policy. Second, we must recognize the roles of economic agents outside the central government such as local governments, actors such as NGOs in the quasi-public sector, and private firms, in building the capacity required to implement industrial cluster policy.

This paper is organized as follows. Section 2 explains the basic model of the flowchart approach to industrial cluster policy. Section 3 applies this model to the automobile industry in Guangzhou and illustrates the effects of Honda, Nissan and Toyota as anchor firms in the industrial cluster policy of Guangzhou City in China. Section 3 also examines the technological innovations in the automobile industry cluster in Guangzhou City and the constraints on the city's further development. Section 4 emphasizes the importance of the role of local government in industrial cluster policy. Section 5 concludes the paper.

2. A General Model of the Flowchart Approach

(1) From the diamond model in the form of a plane to the flowchart model in the form of a line

Holt (2004) designed a method called branding genealogy by studying several thousands of advertisement on several major brands such as Coca-Cola and IBM. The model of Holt (2004) was derived by both inductive and deductive methods. Our flowchart model tries to sample a model of successful cluster policy by inductively studying the cases of cluster policy.

We cannot prove our hypothesis of the flowchart approach by inductive or deductive methods. We try to propose sufficient conditions for success in industrial cluster policy. That is, we can form an industrial cluster if we follow our flowchart that satisfies the condition.

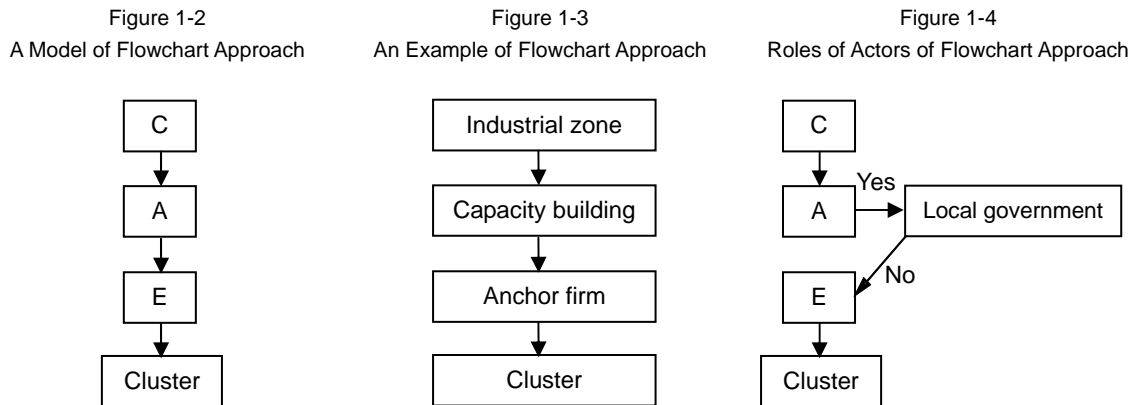
It is noted that we can illustrate cases for which our hypothesis of a flowchart approach hold true, that we can increase the number of cases, but that we cannot prove our hypothesis as a sufficient condition. Our flowchart does not deny the validity of other flowcharts whose prioritization of factors or ingredients are different from ours. We can show, by increasing the number of samples, that our flowchart may be generally applied to industrial cluster policy in other regions.

Our flowchart approach is not an empty theory but a practical hypothesis applicable to industrial cluster policy in reality since we can form a cluster if we follow the following four steps:

Find ingredients or factors such as industrial zones, capacity building, and an anchor firm. Figure 1-2 shows A, B, C, D, and E.

- (i) Select the minimum number of ingredients from the ingredients found above for a flowchart. Figure 1-3 shows C, A and E.

- (ii) Order them along a flowchart. Figure 1-4 prioritizes the ingredients. The number of ways we prioritize them is a mathematical ‘permutation’ and $3! = 3*2*1$. In general, $n! = n*(n-1)*(n-2)*...*3*2*1$. But we can implement only one policy. So we must prioritize policy measures.
- (iii) Specify actors such as central government, local government, non-governmental organization, or private firms and move forward one step on the flowchart if the answer is ‘No’.



Source: Author.

(2) The automobile industry cluster

In the manufacturing industry, an anchor firm is a firm that assembles products composed of many parts and components. An anchor firm in the automobile industry requires more than twenty thousand parts to assemble one car, and an anchor firm in the printer industry uses about eight hundred parts per printer. The related firms who supply these parts and components to the anchor firm will move into an industrial zone where their anchor firm is a tenant. An industrial cluster will thus be formed around the industrial zone by agglomeration of the firms related to the anchor firm, if sufficient conditions are met. This agglomeration will bring regional growth to the industrial cluster. We can observe many examples of this type of industrial clustering, such as the automobile industry clusters in Tianjin and Guangzhou in China. In sum, agglomeration with an anchor firm setting up the conditions for the arrival of related firms will bring regional growth.

As shown in Figure 1-1, this section proposes a general model of the flowchart approach to industrial cluster policy, considering industrial cluster policy as a regional growth strategy rather than as a national industrial policy. A sufficient condition for the success of industrial cluster policy is to satisfy the following conditions in the proper order: (1) industrial zones, (2) capacity building, and (3) anchor firms.

Many industrial clusters in East Asia have satisfied the conditions above. A local government first constructs an industrial zone as a saucer to invite foreign investors. Next, the government builds capacity to improve business and living conditions for foreign investors. The elements of capacity building include (i)

constructing physical infrastructure, (ii) building institutions, (iii) developing human resources, and (iv) creating living conditions amenable to foreign investors. Physical infrastructure refers to roads, ports, communications, and so on. Institutional building, also crucial to success in inviting foreign investors, includes streamlining investment procedures through one-stop services, deregulation of laws, and introduction of preferential tax systems. Human resources, which are usually an initial condition for foreign investors, including unskilled labor, skilled labor, managers, researchers, and professionals. Living environment, for example, includes the provision of hospitals and international schools in order to invite foreign firms. An anchor firm will be ready to invest after all of this capacity building has been carried out.

Let us illustrate how the flowchart approach can be used to examine a region's policies and determine if these are conducive to the formation of a cluster. Note that this model is typical of manufacturing industry clusters in Asia. We do not believe that the model can be applied to the biotechnology industry and the information technology industry in this form, partly because those industries do not use many kinds of parts and components.

We explain our flowchart approach with Figures 2-1 to 2-5. First, we identify whether industrial zones have been established. If these have not, we must decide which actors should establish such zones. In Asian countries, it is typical for central governments to establish industrial zones in the early stages of industrialization. In an early stage of development of Thailand and Malaysia in the 1980s, actors in the semi-public sector were responsible for establishing export processing zones and the free trade zones of industrial zones. Japanese trading corporations also established many industrial zones in the ASEAN countries. Once we identify these actors, we return to the main stream of the flowchart.

We next apply the flowchart's second step, capacity building, which takes place after the establishment of industrial zones. We examine whether water supply is sufficient for the industrial zones (Figure 2-3). We proceed down along the flowchart to examine power supplies, communication, and transportation. As an example of why this is important, note the serious shortage of power in 2004 and 2005 in Guangdong Province, China. The central government of China and the local government of Guangdong Province acted to increase the power supplied. The central government planned the generation of atomic power, the construction of dams, and the distribution of electricity by estimating the total demand and supply of electricity throughout China. The local government of Guangdong Province planned the generation and distribution of electricity. The local government tried in 2005 to alleviate the shortage of railways, subways and highways.

After physical infrastructure, we examine whether institutions are in place. The central government must institutionalize national tax systems and the local government must institutionalize local tax systems. It is well known that one-stop services for investment procedures are crucial to success in inviting foreign investors.

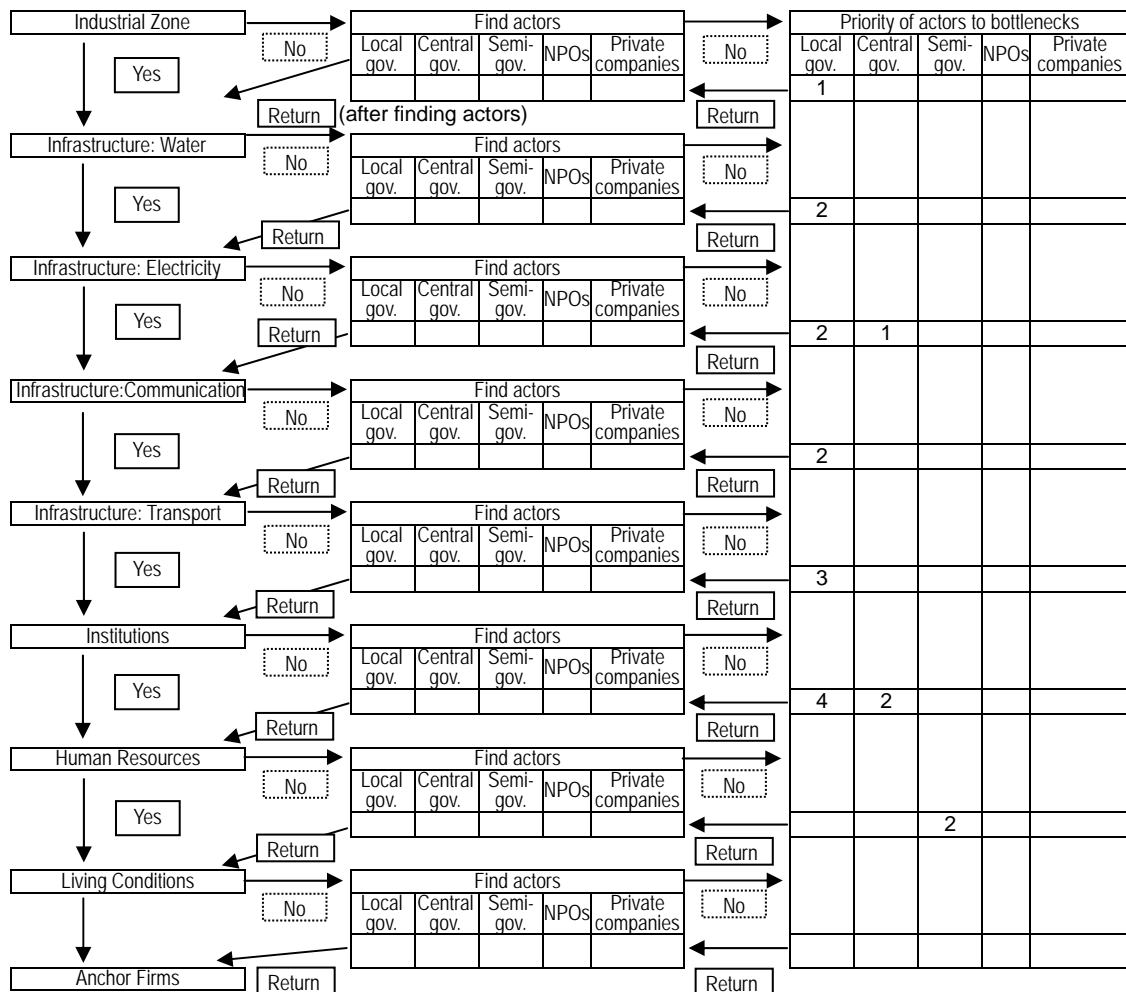
Concerning human resource development, an abundance of unskilled labor with a high literacy rate is the necessary condition to invite foreign investors whose

purpose is to employ cheap labor. On the other hand, it sometimes happens that an industrial cluster faces a shortage of skilled labor after industrialization has progressed; universities and on-the-job training centers for innovation are then needed for further development.

Living conditions are crucial to inviting foreign investors. Staff members of investor companies will have incentives to work hard if they are enjoying their lives. It is necessary to create satisfactory conditions with regards to housing, schools, hospitals, and so on. This is the last condition that must be satisfied before anchor firms can be invited.

We explain the priorities of each actor in Figure 2-5. Local governments play the main role in constructing industrial zones, supplying electricity, facilitating transport, and forming institutions. The first priority of local government in Figure 2-5 is to construct industrial zones to accept foreign investors. The second priority during the same stage is to supply electricity, facilitate transport and form institutions. The central government supplies electricity and builds institutions, with these at an equal level of priority.

Figure 2-1. Flowchart Approach



Source: A. Kuchiki and J. Kabir

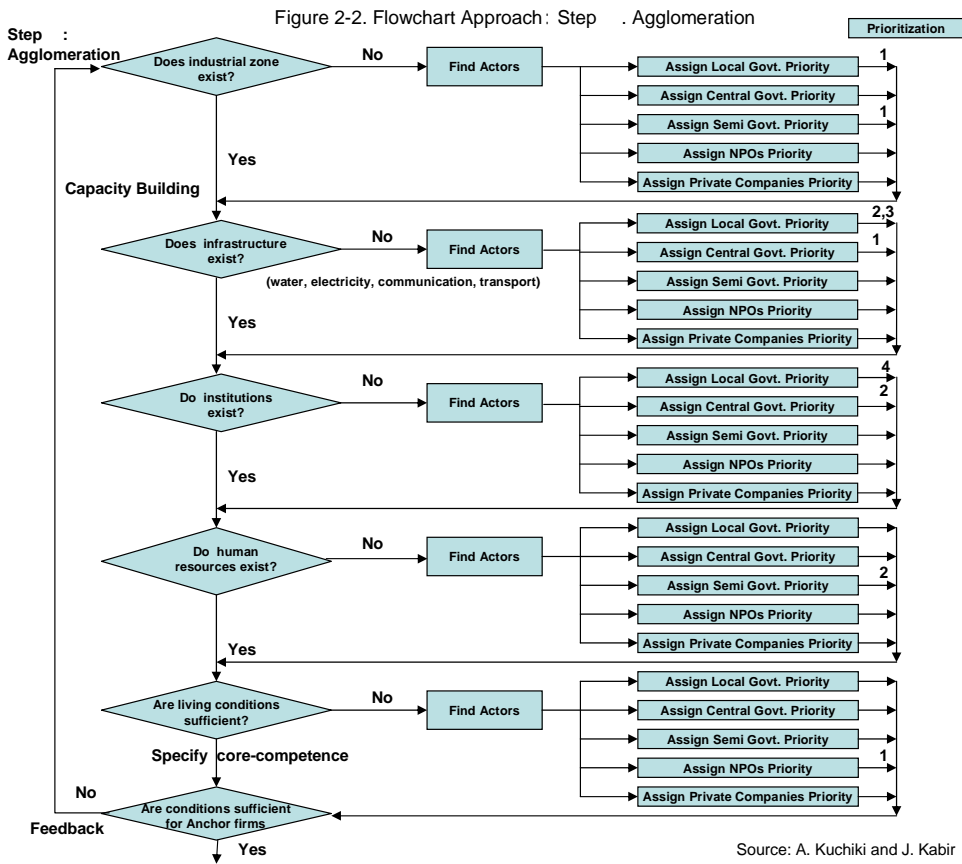
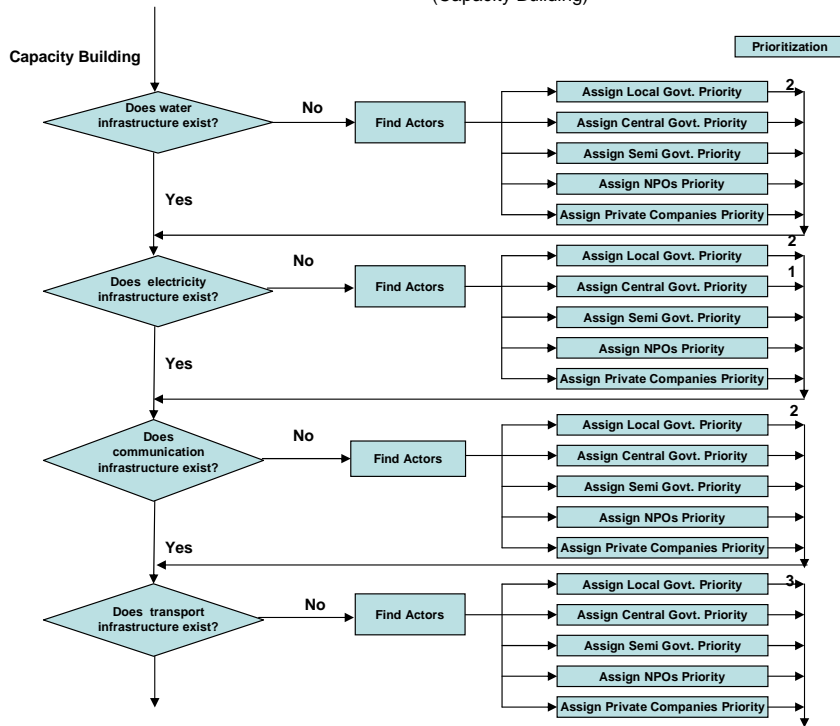


Figure 2-3. Flowchart Approach: Step . Infrastructure (Capacity Building)



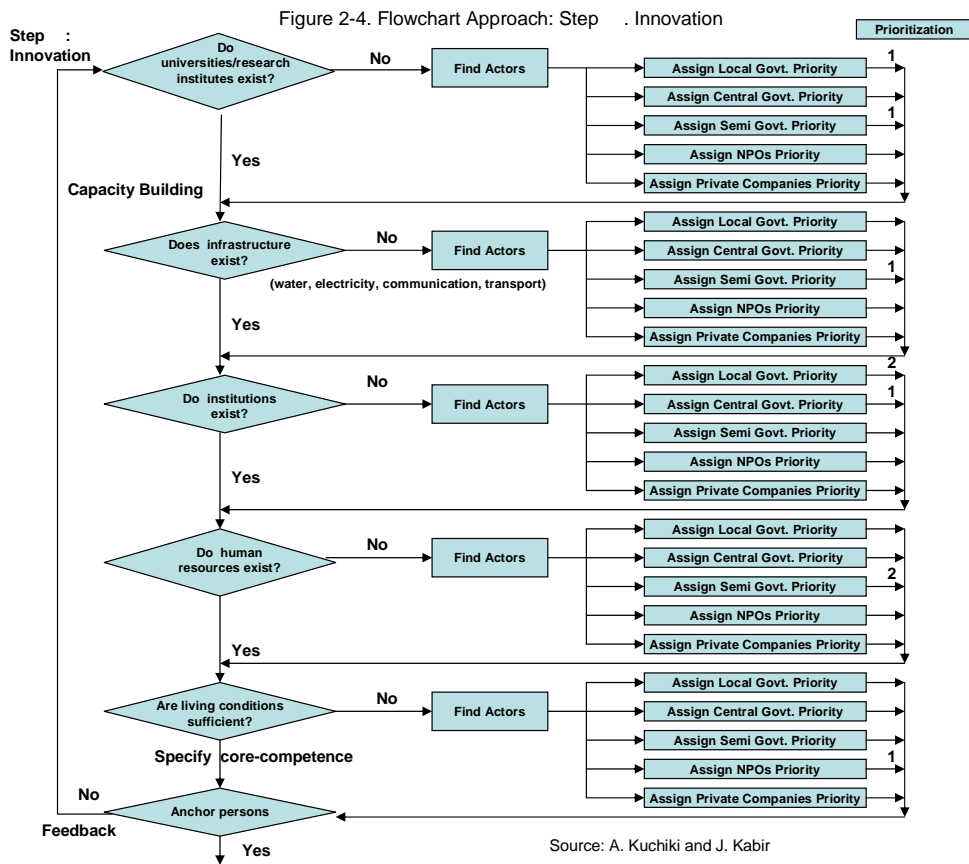
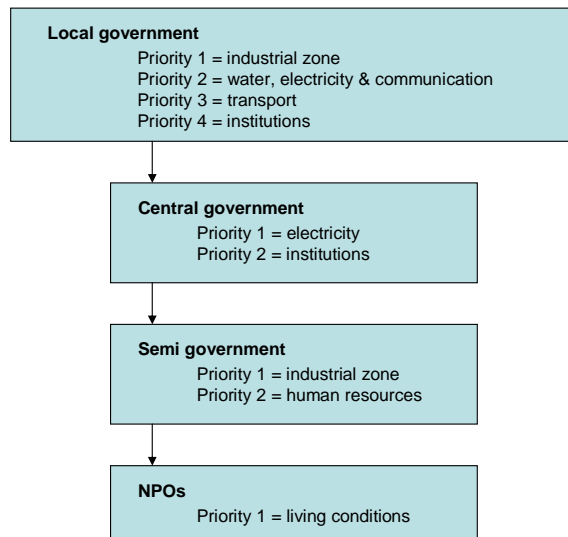


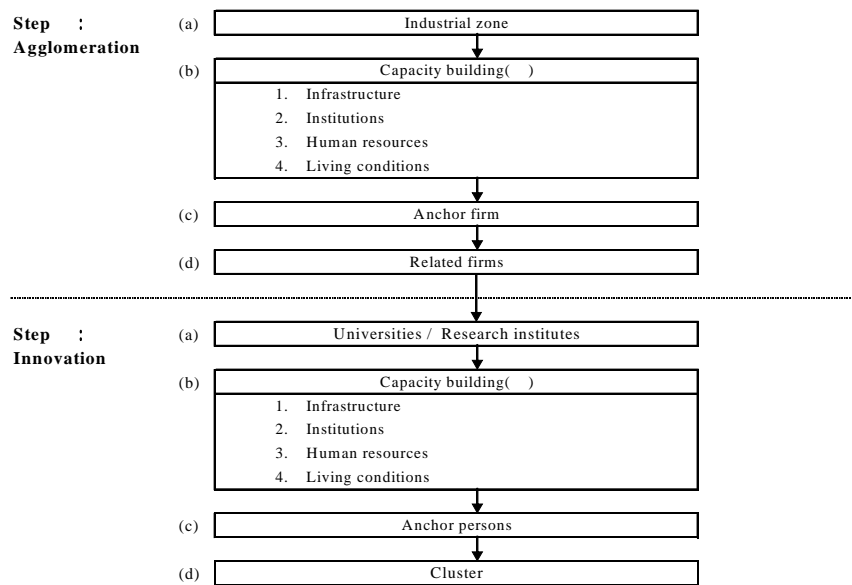
Figure 2-5. Priorities of actors



Source: A. Kuchiki and J. Kabir

Next, Figure 3 explains the overall progression of industrial clustering, dividing Step I (the process of industrial agglomeration) from Step II (innovative processes carried out by the agglomerated firms). Here we define industrial clusters as consisting of both “industrial agglomeration” (Step I) and “innovative processes” (Step II). Industrial agglomeration means that related firms locate in the same region. Innovative processes refer to active innovation by the agglomerated firms. Figure 3 also shows the process of industrial agglomeration in Step I. Step I consists of (a) industrial zones, (b) capacity building (I), (c) anchor firms, and (d) related firms. Step II is a process of innovation, and consists of (a) universities and research institutes, (b) capacity building (II), and (c) anchor individuals. Capacity building (II) involves the same factors of physical infrastructure, institutions, human resources and living conditions as capacity building (I) in Step I, but is different from the factors of capacity building (I). The conditions for innovation hold if capacity is built and anchor individuals come to the industrial agglomeration.

Figure 3. Flowchart Approach to Industrial Cluster Policy



Source: A. Kuchiki and K. Yoshida

We now explain the analysis manuals of the flowchart approach in Appendix Tables 1, 2 and 3. The first row of Appendix Table 1 specifies that a city is the core of a cluster. The second row lists specific industries such as the automobile industry, the electronics industry, the information industry, and the biotechnology industry. The third row records whether there are industrial zones as saucers to invite investors, whether the markets for the targeted industry are domestic or local, when the industrial zones were established, and which economic agents established the zones. The possible economic agents include the central government, local governments, semi-governments such as authorities, and private firms.

Appendix Table 2 examines whether (b) capacity building, consisting of 1.

infrastructure, 2. institutions, 3. human resources, and 4. living conditions is sufficient or not to implement industrial cluster policy. Items in 1. infrastructure include (1) water, (2) electricity, (3) communication, (4) transport, and so on. Items in 2. institutions are (1) one-stop services, (2) deregulation, (3) preferential treatment such as tax incentives, (4) laws and regulations, and so on. Items in 3. human resources are (1) unskilled labor, (2) skilled labor, (3) professionals, and so on. Items in 4. living conditions are (1) housing, (2) schools, (3) hospitals, (4) shopping, (5) entertainment, and so on.

If we encounter shortages, we must identify the actors responsible for these. These actors will enable success in the industrial cluster policy if they can remedy the shortages of capacity.

The key event for cluster policy is when an anchor firm decides to invest in the industrial zone. It follows that the anchor firm's related firms will decide to move to the industrial zone as well. Their decisions depend on the production size of the anchor firm – in other words, on economies of scale. The related firms estimate costs and benefits of investment in the industrial zone. See Appendix Table 3 for a list of related firms.

(3) Demand side as a pre-condition

It is noted that our flowchart approach does not explicitly discuss the demand side of the manufacturing industry since the conditions for the demand side are satisfied as follows:

Case 1:

- (i) An anchor firm locates in an export processing zone and exports its products. Then there is little constraint on demand since its factory can attain its minimal optimal level of production by exporting its products to the world. In this case the logistics of the anchor firm are crucial to attaining the minimal optimal level.
- (ii) Suppliers to the anchor firm can attain their minimal optimal level of production. The demand for the suppliers is “demand derived from their anchor firm.”

Case 2:

- (i) An anchor firm sells its products locally. The market size in the place where the anchor firm locates should be large enough for the anchor firm to attain the minimal optimal level of production. An anchor firm decides to invest in a place once it judges that local demand satisfies its condition.
- (ii) Suppliers' condition is the same as in Case 1.

Kuchiki (2007) discussed conditions to foster a new industrial cluster, applied the flowchart approach from “Step I : Agglomeration” in Figure 3 and explained the mechanism of industrial agglomeration in northern Vietnam from the viewpoint of capacity building.

We will explain Figure 3. First, specify a leader and make clear his or her

incentives for agglomeration in Step I. Second, enforce intellectual property rights for innovation. Preconditions for innovation of Step II are as follows: First, related services such as finance and insurance, logistics, marketing companies, repair shops, and used car shops. Second, professional and other services such as lawyers, restaurants, retail shops, and tourism.

(4) Three patterns of flowchart models

This section explains three patterns of flowchart models for the information technology industry, the biotechnology industry and the automobile industry. The flowchart model for the IT (information technology) industry is almost as the same as the one for the biotechnology industry. Knowledge-intensive industries include the IT industry, the biotechnology industry and the nanotechnology industry. The flowchart model of the knowledge industry is different from that of the automobile industry. The knowledge industry preconditions the existence of universities. Then local governments play important roles in implementing cluster policy. The success in the cluster policy of Austin, Texas in the United States depends on the leadership of the state governor of Texas. The partnership between the state government and municipal government is effective in the success of the cluster policy.

A large difference in the flowcharts between the automobile industry and the knowledge industry is that anchor firms play an important role in implementing cluster policy in the automobile industry while superstars play an important role in implementing cluster policy in the knowledge industry. The reason is that, while the knowledge industry needs partnerships between intellectuals, a car assembler as an anchor firm is unavoidable in the automobile industry cluster policy since a car is composed of more than twenty thousand components. Superstars are needed for cluster policy in the knowledge industry since knowledge is embodied in human resources.

Kuchiki (2005b) delineated this flowchart approach by proposing sufficient conditions for the formation of the kind of industrial clusters typical of the manufacturing industry in Asia to enhance regional growth. The typical Asian model of industrial cluster policy included the definition of an industrial zone as a “quasi-public good.” It was shown that cluster policy enhances economic growth under a production function that includes the “increasing returns to scale” of an anchor firm, and that the decision-making of firms related to the anchor firm to invest in the clustered region depends on this anchor firm creating a critical mass of “scale economies.” Kuchiki (2007) and (2005a) illustrated the successful cases of Canon in Hanoi, Vietnam, and Toyota in Tianjin, China. Canon and Toyota, both Japanese firms, functioned well as anchor firms in the flowchart model.

Tsuji and Ueki (2006) established a method of econometric analysis on the flowchart models and found that the flowchart model of the automobile industry is the case in Thailand except for the step of facilitation of infrastructure.

3. Application of the Flowchart Model to the Automobile Industry in Guangzhou

(1) Conditions in Guangzhou

(i) Industrial Zones

This section outlines the automobile industry cluster in Guangzhou City, using Figure 1-1 and Table 1. The basic model of the flowchart approach begins with the construction of industrial zones. Both the public sector and the private sector can efficiently provide industrial zones as quasi-public goods (see Kuchiki, 2005b). It is typical that the public sector provides these in advance of the private sector, since constructing such zones is often not a profitable activity. Guangzhou Municipality constructed six industrial zones for the automobile industry in southern China, as is shown in Table 2.

Table 1. Automobile Industry Cluster in Guangzhou

	Toyota	Honda	Nissan
Joint Venture Company	Guangzhou Toyota Motor Co., Ltd.	Guangzhou Honda Automobile Co., Ltd.	Dongfeng Nissan Motor Company
Establishment	2004 September 2006 May	1998	2004 May
Joint Venture Partner	Guangzhou Automobile (JVs with First Automotive Works in Tianjin)	Guangzhou Automobile, Dongfeng Automotile (Engines)	Dongfeng Automotile
Main Products	Camry	Accord, Fit	Sunny, Teana
Annual Production Volume	100,000 (2006) Production capacity: 300,000	240,000 (2004). Second plant is under construction (Scheduled to complete in 2006)	150,000
Location of Headquarters	Southern coast of Guangzhou city (Nansha district: 797km ²)	Center of Guangzhou city (Guangzhou Economic Development Zone)	North of Guangzhou city (Huadu district: 50 km ²)
Agglomeration of Components Makers	Hahsha district (12 keiretsu companies), Shunde district, Foshan city (6 keiretsu companies)	Guangzhou Economic Development Zone	Huadu district
Main Components Makers	Japanese makers	Japanese makers	Taiwanese makers Japanese makers

Source: Based on Tsukada (2005), Kuchiki arranged partly.

Notes: Korea Hyundai Motor and Guangzhou Automobile product commercial vehicles in Huadu. (Total investment: 135 billion yen) Hyundai Motor and Beijing Automobile Investment Co. produce passenger vehicles.

Table 2. Industrial Zones and Capacity Building

Zone	East Auto-Industry Belt			South of Guangzhou		Northwest of Guangzhou
Name of Districts	Guangzhou Economic & Technological Development District	Xingtang Industrial Processing Zone of Zengcheng City	Huangpu District	Nansha International Automobile Industry Park	Panyu Automobile High-tech Industry Base	Huadu Auto City
Infrastructure: () Electricity Supply	A 110 thousand KVA (kilovolt amperes) transformer substation and completed underground electrical network with two-circuit electricity supply.	A 500 thousand KVA transformer substation and 4 transformer substations of 110 thousand KVA.	Electricity Network with 6 of 110 KVA transformer substations, a 220 KVA transformer substation and Huangpu Power Plant of 1.1 million KW (kilowatt).	Several 110 thousand VA transformer substations. Zhujiang Powerplant, with capacity of 1.2 million KW and many thermal power stations with 50-100 thousand KW.	Supplied by Shilou 110 KV Transformer Substation, and a new 110 KV transformer substation is under construction.	15 transformer substations with 110 KV and a 220 thousand KV transformer substation. Power supply rate to enterprises reaches 100 % with daily supply of 4,760,000 KW/h.
() Water Supply	Xinhe Waterworks with daily capacity of 300,000 tons	Four large waterworks, Dadun, Xizhou, Xinhe and Shapu, providing daily water capacity of 1.2 million tons.	Supplied by Guangzhou Municipal Waterworks	3 main water pipes from Shawan Waterworks are serving the whole Park with daily supply of 250,000 tons.	Supplied by Shawan Waterworks with daily capacity of 560,000 tons.	3 waterworks with daily supply capacity of 200,000 tons and the water quality reaches State's sanitary standards.
() Sewage Treatment	A modern wastewater disposal station enabling separate treatment for underground water and sewage water	First stage of 300,000-ton waste water disposal station is under construction	Water and waste drainage system is under construction, which is available with first stage of Da Shadi Wastewater Disposal Station of daily capacity of 200,000 tons	Guangzhou Nansha City Wastewater Disposal Station, with daily handling capacity of the first stage of 100,000 tons	The project of drainage system which adapt the rain water type drainage, capable of 160,000 ton/day wastewater disposal is under way	150,000-ton/day waste water piping system
Human Resource: Education	Close to Gunagzhou Zone of High Learning and Guangzhou University City. Various of middle schools, primary schools, kindergartens and Japanese schools are located within the area	Within 30-minute drive to South China University of Technology, Sun Yet-Tsen University, Guangdong University of Foreign Studies, Guangdong Commercial College	Close to Guangzhou University City where many high educational and research institutes are located, capable of supplying rich human resources to enterprises	Yingdong Middle School and Nansha Central Primary School, etc	Located in the southeast of the University City, only 20-minute drive with rich human resource available	Gungzhou Institute of Automobile of South China University of Technology, Gunagdong Transportation Technology College, Guangdong Peizheng Business School
Living Conditions : () Environment	A sound environment of green hills and clean water, with villa gardens, noble residences and tourist resorts	Ecological residential areas, such as Country Garden Phonix City, Jinxiu Heung Kong Xinjiang and Xinsjijie Residential Area	Residential areas including Wanke City, Huangpu, Jinbi Millenium are within the area with average estate price at 3,500 yuan /m ²	The area is composed of river and lake with nice natural environment and well-preserved natural ecological zone	Modern residential areas with nice environment, excellent facilities, and convenient transportation network are available	The Sunshine Residential Area is surrounded by favorable environment
() Food & Entertainment	A four-star hotel (Foreign Business Center), and a golf court	Two five-star hotels and three four-star hotels and four golf courts	The District is well-known for Nangang Seafood and Bicun Lichi, a delicious fruit exclusively from Guangdong Province	Tourist attraction with Nansha Puzhou Park, Waterside Street, Nansha Golf Court, Sunflower Park, Wetland Park, Nansha Hotel, Clifford Hotel, etc	Lotus Hill, one of the Eight New Scenes of Guangzhou, and golf club, an ideal place for recreation	8 starred hotels, 2 golf courts and shopping and entertainment facilities in the Sunshine Residential area, Automobile city
() Medical Services	GETDD Hospital (322 beds) and more than 10 medical institutes	General hospitals with advanced technology and equipments, several medical institutes	More than 10 hospitals are available including Sun Yet-Tsen Huangpu Affiliated Hospital	Nansha Hospital	Two A-class hospitals, one international medical institute and the medical institutes at every town	18 hospitals and the world-level Clifford Hospital is under construction

Source: The Bureau of Foreign Trade and Economic Cooperation of Guangzhou Municipality. *A Foreign Investment Guide to Guangzhou Auto Industr.* 2005.

(ii) Capacity Building

Rows 1 to 7 in Table 2 summarize the industrial zones and capacity building of the automobile industry cluster in Guangzhou City. Table 2 shows that capacity building is defined as (a) improving the physical infrastructure of the electricity supply, water supply and sewage treatment, (b) reforming institutions, (c) developing human resources by education, and (d) improving living conditions of environment, food and entertainment, and medical services. We will clarify the issues of capacity building in Guangzhou in the future and identify the economic agents responsible for solving them.

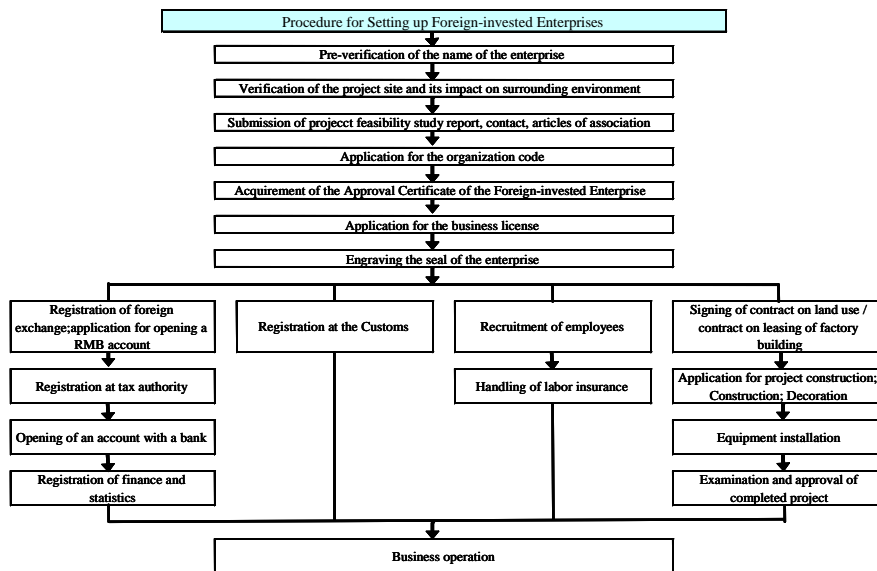
The following capacity building is needed to invite an anchor firm and its related firms, which include banks and logistics firms. The role of the central government in implementing cluster policy is not as large as its role in implementing industrial policy; institutional reform is the central government's most important job in creating clusters. In contrast, local governments play a central role in implementing industrial cluster policy, as we explain in Section 4. The leadership of local government heads – mayors in particular – is one key to cluster policy's success.

Guangzhou Municipality plays important roles in forming its automobile industry cluster. Its challenges for 2005 included the following:

- Infrastructure: addressing the shortage of electricity and construction of highways
- Institutions: creating a preferential tax system, preferential treatments for commission fees, and one-stop services
- Human resource development: dealing with a rise in labor costs and the shortage of the Chinese interpreters of the Japanese language,
- Residential conditions: construction of subways

One-stop services are crucial to a successful industrial cluster policy. Figure 4 shows the process of one-stop services in Guangzhou City.

Figure 4. One-stop Services



Source: The same as that of Table 2

(2) The Automobile Industry in Guangzhou

Honda, Nissan and Toyota, Guangzhou's anchor firms, are automobile assemblers. Their first-tier related firms had moved into Guangzhou by 2005. Anchor firms have difficulty producing new types of cars without the cooperation of their first-tier related firms.

The automobile cluster in Guangzhou City is expanding not only to the nearby cities of Foshan and Shunde, but also to Dongguan, and now covers almost the entire Guangdong Province in southern China. Sumitomo Corporation is planning to link its industrial zone in Hanoi in Vietnam to the automobile cluster in Guangzhou City through logistics. Dongguan formed its own cluster in the electronics and textile industries in the past, but has started to form an automobile industry cluster.

(i) Honda's effect

Honda began to produce motorcycles in Guangzhou in 1992. The suppliers of parts and components for Honda's motorcycles in Guangzhou are listed in Table 3. It is said that Honda's production of motorcycles in Guangzhou is part of the reason that Honda bought a Peugeot factory (France) located in the city.

Guangzhou Honda Automobile was founded on July 1, 1998; Honda Automobile of China was founded on September 8, 2003. Honda constructed its first and second factories in the center of Guangzhou City. Firms related to Honda are located in the Guangzhou Economic and Technological Development Zone (GETDZ), the Zhongshan Torch Hi-Tech Industrial Development Zone, Huadu District in Guangzhou City, and in Dongguan City.

Suppliers of Honda are mainly located in the GETDZ in Zengcheng City, whose area is 1741 square kilometers. These firms have agglomerated in Zengcheng, Zhongshan, and Foshan. As Table 1 summarizes, Guangzhou Automobile and Honda are under joint management to produce Accord-type and Fit-type cars. It is noted that Dongfeng Automobile and Honda are under joint management to produce engines. Honda's second factory in Guangzhou started to produce Honda Accord cars in 2005.

Guangzhou Municipality played a crucial role in inviting Honda to the city in 1998. This reinforces our assertion that leading roles of local governments are crucial to success in implementing industrial cluster policy.

Most of the first tier, the second tier and the third tier of Honda's suppliers moved into Guangzhou from 2001 to 2005, as shown in Table 3. There are six firms of Honda's group in Guangzhou: Guangzhou Honda Automobile, Honda Engineering China (engineering), Dongfeng Honda Engine (engines for passenger cars), Wuyang-Honda Motors (motorcycles), Honda Automobile (passenger cars for export), and Honda Motor. Honda's Japanese suppliers have moved into the Zengcheng and Yonghe Economic Zone.

Firms related to Honda (its Japanese suppliers) include Sanoh Industrial (brake tubes), Stanley Electric (lamps), and Mitsuba Corporation (motors). Furthermore, eleven related firms constructed their factories in Guangzhou from 2001 to 2004: Imasen Electric Industrial (seat adjusters), Keihin Corporation (engine peripheral devices), Yachiyo Industry (fuel tanks), F-Tech (break pedals), Hirata Technical-Hongo (car body frame components), Kikuchi-Takao (car body frame components), Toyo Radiator (radiators), Ogura Clutch (clutches), Nissin Kogyo (breaking systems), Marujun (press parts), and Honda Engineering (engineering). In sum, Honda can procure most of the main components of its cars in the Guangzhou area.

Now we will explain Honda's effect on industrial cluster policy and industrial agglomeration, using Figure 5. The flow of Honda's effect started from its construction of the first factory in the Guangzhou Economic and Technological Development Zone in 1998 and the second factory in the Zhengcheng Industrial Zone in 2005.

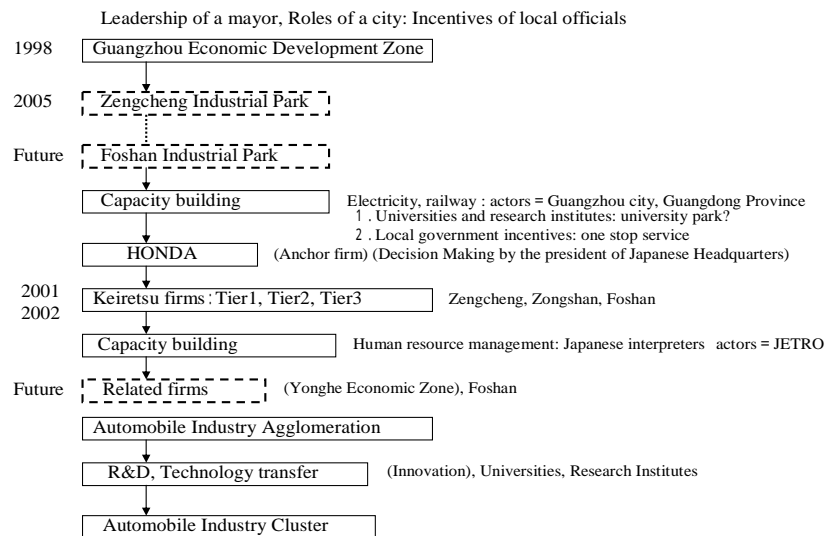
Honda considers Guangzhou City's capacity building, such as facilitation of infrastructure, to be extremely helpful. Problems with capacity often occur. These include shortages of roads, railways, electricity, and other infrastructure, as well as issues with tax reforms of institutions, wage rises, and a shortage of Chinese interpreters of the Japanese language. Guangzhou Municipality has solved problems in good time in the past, and that is one reason why Honda is increasing the number of its factories in the area¹.

Table 3. Honda's Related Companies in Guangzhou

	Company Name	Investor	Products	Foundation
1	Guangzhou Showa Autoparts	Showa, Kanematsu	Shock absorbers	1994
2	Guangzhou Stanley Electric	Stanley Electric, Honda Motor (China) Investment	Automotive lightning products	1999
3	Guangzhou Mitsuba Electric	Mitsuba, Mitsuba China (Hong Kong)	Auto electrical systems, two-wheeled vehicle engine support	1999
4	Guangzhou Sanoh Seikan	Sanoh Industrial	Automotive parts (brake tubes, fuel tubes, other tubular parts)	1999
5	Nippon Leakless	GZ Leakless	Automotive gaskets	1999
6	Auto Parts Alliance (China)	Kikuchi, Takao Kinzoku Kogyo	Aluminum structural assemblies	2001
7	Guangzhou Daiyu Seat	Daiyu	Sewn automotive seat components	2001
8	Guangzhou Marujun	Marujun	Automotive stamping parts	2001
9	NHK-Uni Spring (Guangzhou)	NHK Spring	Coil springs, stabilizers	2002
10	Guangzhou NTN-Yulon Drivetrain	NTN, Yulon Group (Taiwan)	Constant-velocity joints (CVJs)	2002
11	Guangzhou Vigo Stanley Electric	Stanley Electric	Automotive lightning products	2002
12	Guangzhou Nanbu Plastics	Nanbu Plastics	Plastic products	2002
13	Guangzhou GKI Car Interior Parts	Itochu, Kotobukiya Fronte	Automotive upholstery	2003
14	NHK Spring Precision (Guangzhou)	NHK Spring	Suspension springs	2003
15	Honda Automobile (China)	Honda Motor	Motorcycles, automobiles	2003
16	Guangzhou Dempu Automotive Parts	N.A. (*1)	Plastic products	2003
17	Guangzhou Shiroki	Shiroki	Doorframes, moldings	2003
18	Guangzhou Ahresty Automobile Parts	Ahresty	Die casting products	2003
19	Guangzhou You-Ri Automotive Parts	Sumitomo Pie & Tube, Sumitomo, Nippon Steel	Electric-resistance welded pipes	2003
20	Tokai Rubber (Guangzhou)	Tokai Rubber Industries	Anti-vibration rubber parts, Automotive hoses	2003
21	Honda Engineering China	Honda Engineering, Honda Motor (China) Investment	Mold parts	2004
22	Guangzhou Neive	Neive	Automobile parts	2004
23	Decker System	Decker, Chinese United Faith	Automobile parts	2004
24	Guangzhou Tech Interior Trim Manufacturing	TS Tech	Sewn automotive seat components	2004
25	Teikuro Guangzhou	Teikuro	Surface treatment for mold parts	2004
26	Guangzhou Bridgestone Chemical Products	Bridgestone, Guangzhou Automobile Group	Urethane foam	2004
27	Guangzhou Fuji Tool	Fujiseiko	Carbide tools	2004
28	Toyo Automotive Parts (Guangzhou)	Toyo Tire & Rubber	Anti-vibration rubber parts	2004
29	Ring Techs Automobile Products	Ring Techs, Metal One	Steel wheels for passenger cars	2004
30	Tsuchiya (Guangzhou) Automotive Components	Tsuchiya	Plastic products	2004
31	Akebono Co. (Guangzhou)	Akebono Brake Industry	Brakes	2004
32	Ohashi Technica (Guangzhou)	Ohashi Technica	Automobile parts	2004
33	Guangzhou Uchiyama Manufacturing	Uchiyama Manufacturing	Gaskets, seals	2004
34	Tocalo & Han Tai	Tocalo, Han Tai	Surface modification	2005
35	Guangzhou Hori Automobile Glass	Hori Glass	Plastic parts for windshields	2005
36	Guangzhou Linjun Automobile Internal Decoration	Hayashi Telempu, Guangzhou Automobile Group	Automotive upholstery	2005
37	Guangzhou Ninomiya Cold Forging Automotive Parts	Ninomiya	Cold forged products	2006
38	Tigerpoly Manufacturing	Tigers Polymer	Rubber seats, plastic hoses	2006

Source: Inagaki (2004), Shunde District, Foshan City (2005)

Figure 5. Flowchart Approach to Industrial Cluster Policy in Guangzhou
Honda Effect



Source: A. Kuchiki and H. Tsukada

The capacity building necessary for Honda's operation involves increasing electricity production and constructing a railway. Honda was forced to operate its factory on Saturdays and Sundays and to substitute holidays on weekdays due to a shortage of electricity in 2004. Honda uses railways to distribute its products, and asked Guangzhou Municipality to extend a railway to a location near the factory. Guangzhou City is thus an agent in facilitating infrastructure building.

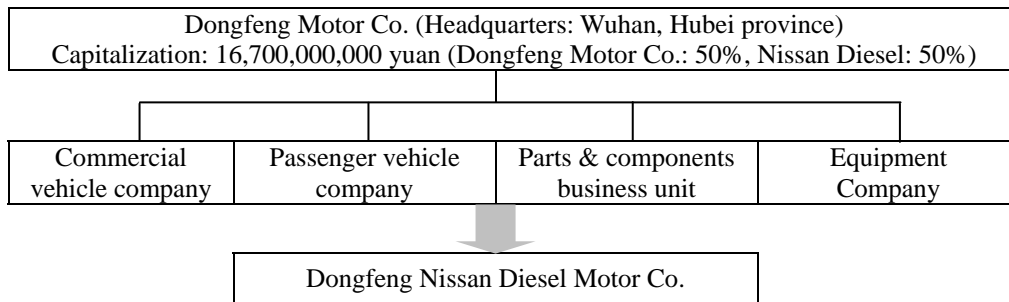
Honda moved into Guangzhou by buying a factory from Guangzhou Peugeot, even though Honda realized that the factory did not fit Honda's own factory designs. That is one reason why Guangzhou Municipality reacts favorably to Honda's requests. Honda, for its part, is satisfied with the capacity building of Guangzhou Municipality. The city is a key player in implementing industrial cluster policy. The last column of Table 3 shows Honda's effect on industrial agglomeration in Guangzhou from 1999 to 2005.

(ii) Nissan's effect

Nissan's facilities are located in the Huadu District of Guangzhou City. Nissan started to produce cars there in 2004. The area is 50 square kilometers and the second factory was under construction in 2005. Several firms that provide parts and components to Nissan are located in the Huadu District.

Dongfeng Automobile and Nissan are under joint management to produce Sunny-type and Tiida-type cars. Nissan established a joint venture with Dongfeng Automobile in Wuhan, Hubei Province, providing half of the joint venture's 16.7 billion yuan in capital, in June, 2003. Figure 6 shows the agglomeration structure of firms related to Dongfeng Nissan Motor Corporation.

Figure 6. Dongfeng Nissan Diesel Motor Co.



Source: The People's Government of Guangzhou Municipality, *Guangzhou Automotive Development Forum in Tokyo (2005)*

The firm was previously named Dongfeng Automobile, and its four products are commercial cars, passenger cars, components and equipment. The firm started operation in May, 2004 and changed its name to Dongfeng Nissan Automobile in April, 2005. Dongfeng Nissan Automobile operates factories producing vehicles and engines, and an R&D center. Thirty-two parts suppliers for Dongfeng Nissan are located in southern China, twenty-eight of them in eastern China and twelve of them in other cities. Dongfeng Nissan Automobile purchased 67% of its parts from southern China and 20% from eastern China in money terms in 2005 (Guangzhou Automotive Development Forum, 2005). That is to say, Dongfeng Nissan Automobile purchased large quantities of high value-added parts from suppliers in southern China, including Guangzhou City.

According to Inagaki (2005), the following seven firms in Nissan's keiretsu,² or group firms, moved to Guangzhou City from 2003 to 2005: Hitachi Unisia Automotive (drive train equipment), Kinugawa Rubber Industrial (body seals), Yorozu (suspension parts and modules), Unipress (press forming materials), and Calsonic Kansei (air conditioning systems) in the Huadu District.

According to the Guangzhou Automotive Development Forum (2005), the reasons for Dongfeng Nissan Motor Co., Ltd. investing in Guangzhou's Huadu district are as follows: first, it was effective to set up the firm's new automobile plant by making use of the assets of Aeolus Automobile Co., a former joint venture between Dongfeng Nissan; second, an engine plant and an R&D center, which help develop domestic production capability, should be efficiently located near the main automobile plant; third, both the Guangzhou Municipality and the district government of Huadu were extraordinarily supportive. This third reason was crucial to Nissan's decision to invest in Huadu. The reasons why suppliers to Dongfeng Nissan invested in southern China are as follows: first, the location is close to their customer, Dongfeng Nissan; second, they feel a sense of security due to the presence of so many other Japanese firms; third, the local government supports them by facilitating infrastructure development and offering preferential tax treatment.

In sum, Dongfeng Nissan Motor Co., Ltd. and its related firms invested in the Huadu District mainly because the local government strongly supported them (Guangzhou City (2005)). The last column of Table 4 shows Nissan's foundation of suppliers, which demonstrates Nissan's effect on industrial agglomeration in Guangzhou from 2003 to 2005.

Table 4. Nissan's Related Companies in Guangzhou

	Company Name	Investor	Products	Foundation
1	Dongfeng Motor	Nissan Motor, Dongeng Motor	Passenger cars, commercial vehicles	2003
2	Unipress Guangzhou	Unipress	Car body components	2003
3	Yorozu Bao Mit Automotive	Yorozu Co., Shanghai Bao Steel Int. Economics & Trading, Mitsui & Co.	Suspensions	2003
4	Guangzhou Mitsuike Autoparts	Mitsuike Co.	Metallic dies	2003
5	Dongfeng Passenger Vehicle Research & Development Center	Dongfeng Nissan	Research and development center	2004
6	Guangzhou Hitachi Unisia Automotive Parts	Hitachi Automotive Systems	Power steering system	2004
7	Fuzhou Fukwang Rubber & Plastic	Kinugawa Rubber Industrial	Body sealing products	2004
8	Guangzhou Hua Jing Automotive Steelparts	Mitsui & Co.	Steel plates	2004
9	Kiriu-Lioho	Kiriu Co., Lioho Machine Works (Taiwan)	Brake parts	2004
10	Guangzhou Nishikawa Sealing Systems	Nishikawa Rubber	Sealing parts	2004
11	Alpha (Guangzhou) Automotive Parts	Alpha Co., Marubeni Vehicle	Key sets	2004
12	Xingguang (Guangzhou) Autoparts**	Hoshi Diecast Kogyosho	Die-castings	2004
13	Tacle Guangzhou Automotive Seat	Tachi-S Co., Ltd.	Automobile seats	2004
14	Guangzhou Kasai Automotive Interior Trim Parts	Kasai Kogyo	Interior parts	2004
15	Calsonic Kansei (Shanghai) (Huadu Branch)	Calsonic Kansei	Module products	2005
16	MI Steel Processing Guangzhou	Marubeni Itochu Steel	Steel plates	2005
17	Cast Autoparts**	Daiichi Kinzoku	Automobile parts	2005
18	Fuji Autotech Guangzhou	Shanghai Min Fang Auto Parts, Fuji Kiko, Tachi-S Co., Ltd.	Automobile seats	2005
19	Calsonic Kansei (Guangzhou) Components	Calsonic Kansei	Instrument panels, exhaust products	2005
20	Guangzhou Mahle Filter System	Mahle Filter Systems Japan	Air filters, motor heat insulation boards	2005
21	Tachi-S Trim Guangzhou	Tachi-S	Automobile seats	2005
22	Engine Factory of Dongfeng Nissan	Dongfeng Nissan	Engines	2006
23	Toyo Quality One Guangzhou**	Toyo Quality One, Nagase & Co.	Automobile devices	2006
24	Guangzhou Nanjo QuanXing Autoparts**	Taiwan QuanXing, Nanjo Kogyo	Automotive seats	2006
25	Guangzhou Kanto Autoparts**	Kanto Auto Works	Auto bodies and parts	2006

Source: Inagaki (2004), Huadu District, Ghangzhou (2005)

**= Author's translation

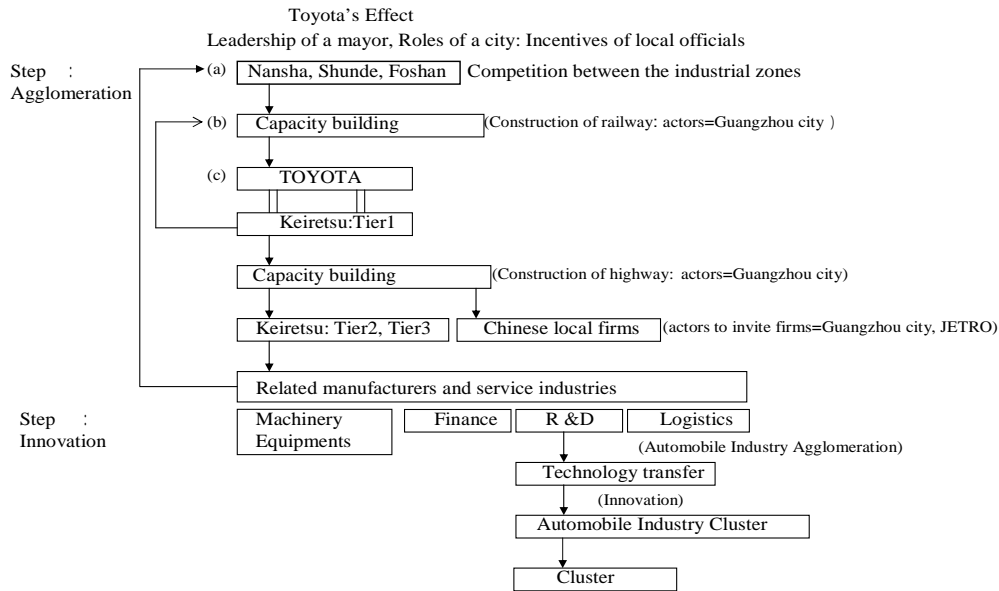
(iii) Toyota's effect

The Toyota group in Japan consists of fourteen firms, including Denso, Aichi Steel, Aisin, and Toyota Tsusho. Kyohokai is Toyota's supplier group, consisting of 208 firms in 2004 including Aisan, Koito, Tokai Rubber and Bridgestone. Toyota and Guangzhou Automobile have a joint venture in Guangzhou. As is shown in Table 1, Toyota is scheduled to produce Camry-type cars in 2006 in Guangzhou. Toyota has a factory in a 797 square kilometers industrial zone in Nansha in southern Guangzhou City. The area of Foshan Shunde is 806 square kilometers. Thirteen of Toyota's first-tier

keiretsu firms are located in the same district as Toyota in Nansha. Many of Toyota's related firms are located in Shunde and Foshan near Nansha. The keiretsu firms in the second tier and the third tier provide their products to the first tier firms of not only Toyota but also Honda and Nissan. This represents the partial collapse of keiretsu relationships among Japanese firms.

Figure 7 shows Toyota's effect. A highway from Nansha to the center of Guangzhou was constructed as part of capacity building in 2005, since it was needed for the construction of Toyota's factory. A subway for Toyota's workers to commute is scheduled to be constructed in 2006. Toyota's first-tier keiretsu firms are scheduled to construct their factories in Nansha, Shunde, and so on. The second tier and third tier firms, together with Chinese firms, are also expected to agglomerate in Guangzhou.

Figure 7. Automobile Industry Cluster



Source: A. Kuchiki and H. Tsukada

A staff member from Toyota said that Toyota indirectly asked its keiretsu firms to construct their factories in Guangzhou and to satisfy Toyota's criteria for both good quality and reasonable prices. The suppliers are forced to buy parts made by Chinese firms in order to meet Toyota's criteria. Chinese firms can satisfy Toyota's quality and price requirements, and are thus able to supply their products to Toyota jointly with Toyota's first tier suppliers. The last column of Table 5 shows Toyota's supplier foundation and shows Toyota's effect on industrial agglomeration in Guangzhou from 2002 to 2005. Tables 3, 4 and 5 summarize the effects of Honda, Nissan and Toyota on industrial agglomeration in Guangzhou.

Table 5. Toyota's Related Companies in Guangzhou

	Company Name	Investor	Products	Foundation
1	Foshan Melx Leather	Melx	Leather products for automobile seats	2002
2	Foshan Nichiwa	Nichiwa	Bolts, nuts, pressed parts	2003
3	Toyota Gosei (Foshan) Rubber Parts	Toyota Gosei, Toyota Tsusho	Body-sealing products for automobiles	2004
4	Aisin Seiki (Foshan) Automotive Parts	Aisin Seiki	Engine parts	2004
5	Aisan (Foshan) Auto Parts	Aisan Industry, Toyota Tsusho	Throttle bodies, engine valves	2004
6	Foshan Japan Brake	Japan Brake Industrial	Brake assemblies	2004
7	Foshan Shunde Yinhe Motorcycle	Axle	Motorcycles	2004
8	Foshan Tokairika Automotive Parts	Tokai Rika, Toyota Tsusho	Switches, steering locks	2004
9	Koyo Lioho (Foshan) Automotive Parts	Koyo Seiko, Koyo Metaltec, Toyota Tsusho	Bearings	2004
10	Foshan Yutaka Auto Parts	Yutaka Giken	Torque converters	2004
11	Foshan Summit Nikka Mold & Metal Products	Sumitomo	Mold and metal products	2004
12	Toyota Gosei (Foshan) Auto Parts	Toyota Gosei, Toyota Tsusho	Interior and exterior parts	2004
13	Toyoda-Koki Automotive (Foshan)	Toyoda Machine Works	Power steering parts	2004
14	Takagi Auto Parts (Foshan)	Takagi Seiko, Pla-Net	Plastic components, molds	2004
15	Kobe Wire Products (Foshan)	Kobe Steel, Metal One, Kyodo Shaft, Sugita Wire	Steel bars and steel wires	2005
16	Elastomix (Foshan)	Elastomix	Carbon master batch	2005
17	Guangzhou Parkerizing	Nihon Parkerizing, Asahi Chiyoda Kogyo, Hamamatsu Netsuhori Kogyo, Parker Netsuyori Kogyo	Surface treatment for automobile parts	2005
18	Toyota Boshoku Foshan	Toyota Boshoku	Oil filters	2005
19	Fujikura Kasei (Foshan) Paint	Fujikura Kasei, Kyokuto Boeki Gaisha	Coating for plastics	2005
20	Foshan Unytite	Unytite	Bolts, nuts	2005
21	Tokai Spring Mfg. (Foshan)	Tokai Spring Mfg., Nagase & Co., Ltd.	Precision leaf springs, press products	2005
22	Yamasei Automotive (Foshan)	Toyoda Machine Works, Yamasei Kogyo, The Yokohama Rubber	Power steering parts	2005
23	Sanyo Seiko (Foshan)	San-Esu	Mold parts	2006
24	Foshan Dongrong Xuri Electrics	Toei Kagaku Kogyo, Xuri	Automobile parts	2006
25	Foshan Nitigura	Nihon Glassfiber Industrial	Exhaust manifold covers	2006
26	Foshan Shunde Yazaki Auto Parts	Yazaki	Automotive instruments	2006
27	Hegu (Foshan) Automotive Fuel System	Nichiwa Sangyo	Automobile parts	2006
28	Daiichi Bussan (Foshan)	Daiichi-Bussan	Insulators	2006
29	Usui Automotive Parts	Usui Kokusai Sangyo Gaisha	Brake tubes, power steering tubes	2006
30	Enkei Aluminum Products (Guangdong)	Enkei	Aluminum wheels	2006
31	Foshan Shune Lefu Hardware Precise Mold	Osamu Fukui, Tsuneo Imai, Yosuke Fukui, Masaru Nikamura	Mold parts	2006
32	Azimit Auto Parts (Foshan)	Azimit	Mold parts	2006
33	Sugiyama Kogyo (Foshan) Mold	Sugiyama Kogyo, Toyota Tsusho	Mold parts	2006

Source: Inagaki (2004), Nansha Development District (2005).

(*)=Author's translation

(3) Technological innovation by transfer through foreign direct investment

The latter parts of Figures 5 and 7 show how the firms in Guangzhou City innovate new technologies. Industrial clusters will expand if the agglomerated firms continuously create innovations. Technology, embodied in human resources, is needed for innovation. We will explain how technology transfer works in Guangzhou.

Technology transfers from the Japanese firms of Honda, Nissan and Toyota to Chinese firms by the following three routes. First, some Japanese firms foster Chinese technical experts by sending them to factories in Japan for several months to learn the relevant production processes. Second, Chinese firms employ Japanese skilled workers at high salaries after their retirement. Japanese firms send their Japanese skilled workers to factories in Guangzhou City. They are

forced to retire at the age of 60, and are subsequently employed by Chinese firms. Third, technology transfers by way of joint ventures between Japanese firms and Chinese firms. The joint venture between Dongfeng Automobile and Honda produces engines. The joint venture between Guangzhou Automobile and Honda produces the Accord, Odyssey and Fit models. The joint venture between Dongfeng Automobile and Nissan produces the Tiida. The joint venture between Guangzhou Automobile and Toyota produces the Camry. There are also combinations of joint ventures between Dongfeng Automobile, Honda, Guangzhou Automobile, Nissan, and Toyota. The combinations of these joint enterprises serve to standardize technology.

(4) Constraints on the cluster's further development

Figure 7 shows how we apply our flowchart approach to industrial cluster policy in Guangzhou. Innovation is the next step in industrial agglomeration. Japanese firms in the R&D industry, the logistics industry, and the finance industry moved in to drive Step II by initiating innovative processes. It is notable that the innovation process of Step II did not start in the automobile industry in Guangdong.

Capacity building in the human resource development part of the flowchart requires that Guangzhou increase its numbers of Chinese interpreters of the Japanese language. These interpreters are crucial for Japanese firms to move into Guangzhou, and are also necessary in order to develop local researchers for joint R&D projects. Innovations in industrial clusters depend on R&D activities.

As is shown in Figure 5, the industrial automobile cluster in Guangzhou is at a stage where innovation is needed for the further development of the cluster. Japanese firms in the automobile industry moved into China to seek cheap labor in the 1990s. Nissan produced Sunny vehicles, but the sales were not favorable in 2004 since Sunny was not popular and was not the newest model. Nissan started to produce its newest model, named the Tiida, and sales of these were favorable in 2005. Japanese firms must change their way of thinking, away from producing old fashioned types of vehicles in China by using cheap labor, and toward constructing centers of research and development in China, innovating the newest types of technology to fit Chinese tastes, and strengthening the competitiveness of their local subsidiaries in China.

Industries related to the automobile industry are agglomerating in Guangzhou, as shown Figure 7. These are the electronic parts industry, the machine equipment industry, and automobile-related service industries including finance, logistics, R&D and so on.

4. Industrial Cluster Policy by the Local Government of Guangzhou City

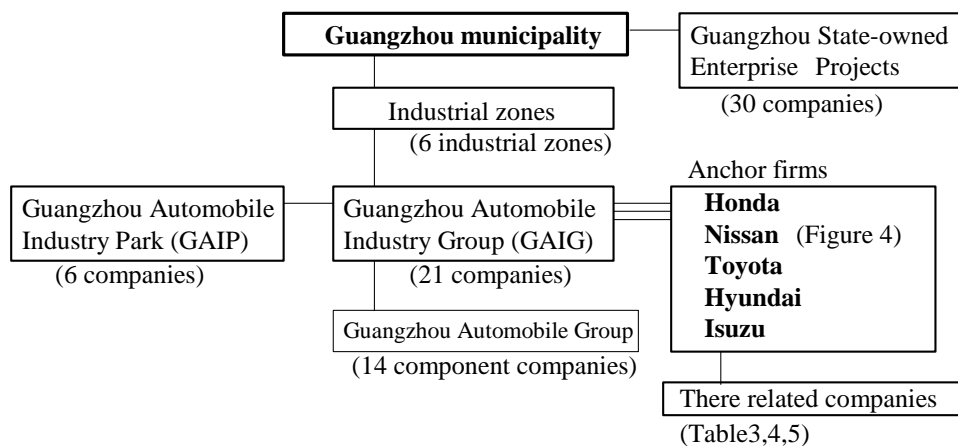
This section summarized in Figure 8 shows that Guangzhou's role as a leader of industrial cluster policy is crucial to the success of the city's automobile cluster development. The Guangzhou Municipality has positioned the Guangzhou Automobile Industry Group (GAIG) at the center of the industrial cluster. The municipality facilitated a joint venture between GAIG and Honda in 1998, a joint venture between Honda and Dongfeng Automobile, and two joint ventures in engines and vehicles

between GAIG and Toyota in 2004. Guangzhou Guangqi Toyota Motor was founded on September 6, 2004. Guangzhou Automobile Industry Group and Hyundai Motor Company signed a joint venture agreement on June 21, 2005. In addition, Guangzhou Automobile Industry Group and Isuzu established a joint venture in 2000. The municipality also facilitated the establishment of sixteen joint ventures between GAIG's affiliated firms and the following sixteen firms: Denso, Toyota Bosyoku, Hayashi Telempu, T-ST, Stanley Electric, Honda Engineering, Bridgestone, Toyota Tsusyo Corporation, Daiki Aluminium Industry, Chuo Precision Industrial, Parker Corporation, Showa Corporation, Mitsuba, Kanematsu Corporation, Nippon Konpo Unyu Soko, and Honda Express.

As is shown in Figure 9, Guangzhou Municipality has an automobile industry cluster, including procurement firms and marketing firms. The number of procurement firms was more than three hundred in 2005, in the steel, components, rubber, electric and electronic products, and upholstery areas, etc. The tenants of Guangzhou Automobile Industrial Park (GAIP) are joint ventures between GAIG and the firms shown in Table 6.

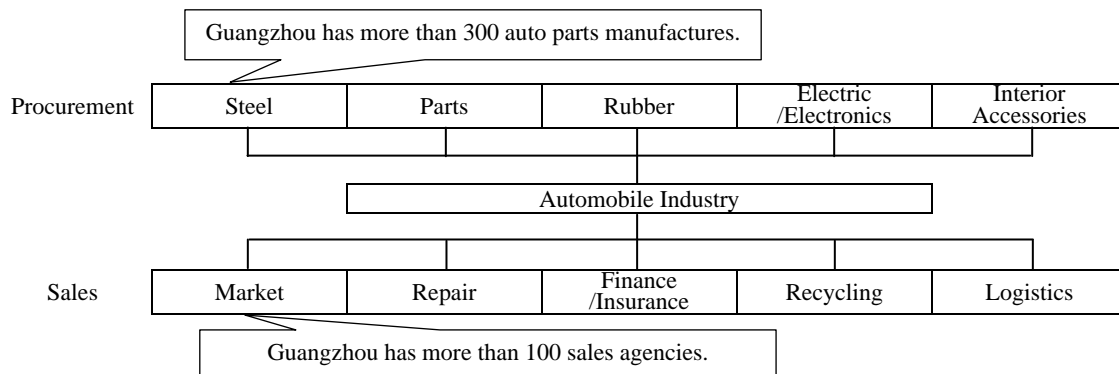
Using Figure 8, we will show below that Guangzhou Municipality has led the industrial cluster policy in Guangzhou to success. Guangzhou Municipality's industrial cluster policy measures are as follows: (1) Establishment and management of industrial zones as quasi-public goods (see Kuchiki, 2005b), (2) Support for Guangzhou Automobile Industry Group and Guangzhou Automobile Group Components, (3) Promotion of joint ventures between state-owned enterprises and foreign firms. Guangzhou's mayor and local officials of Guangzhou Municipality may have personal incentives to promote these ventures, as this may win them promotion. These incentives are effective, as they have led to the success of the industrial cluster policy.

Figure 8. Roles of Guangzhou City



Source: Author's

Figure 9. Guangzhou Automobile



Source: The People's Government of Guangzhou Municipality, Guangzhou Automotive Development Forum in Tokyo (2005)

Table 6. Guangzhou Automobile Industrial Park Co. (GAIP)

1	Guangzhou Guangqi Toyotsu Logistics Equipments Co., Ltd.	Deals mainly with design, production, process, sales and after-sales service of industrious jig and fix systems, logistics turnover box and simple transportation equipment.
2	Guangzhou Guangqi Toyotsu Service Co., Ltd.	Provides high quality services to related enterprises, including meal, bus service sanitation, real estate management, etc.
3	Guangzhou Guangqi Toyotsu Resource Management Co., Ltd.	Deals mainly with the recovery, process and sales of auto wastes and ordinary wastes in order to keep the promise of environmental protection.
4	Guangzhou Guangqi Toyotsu Automobile Equipment Co., Ltd.	Deals mainly with the development, design, production sales, installation, maintenance of automobile parts and components and also provides technical service, consultation, after-sales service and lease.
5	Multi-function business Training Center Project	Provides business training to Guangzhou Toyota project enterprises.
6	Terrestrial Digital Mobile TV Project	Deal mainly with the development, production, sales and after-sales of terrestrial digital mobile TV terminal.

Source: Guangzhou Automobile Industrial Park Co., Ltd.

(1) Establishment and Management of Industrial Zones for Industrial Clustering

Guangzhou Municipality manages industrial zones in both Guangzhou and the surrounding cities, as shown in Table 2. Guangzhou City has industrial zones in the following six districts: (1) Huadu Auto City in Northwest Guangzhou, (2) Nansha International Automobile Industry Park and (3) Panyu Automobile High-tech Industry Base in South Guangzhou, (4) Guangzhou Economic and Technological Development District, (5) Xiangtang Industrial Processing Zone of Zengcheng City, and (6) Huangpu District in the East Auto Industry Belt.

First, Nissan, its related firms, and Hyundai of South Korea are tenants of (1) Huadu Auto City in Northwest Guangzhou, and (3) Panyu Automobile High-tech Industry Base in South Guangzhou and Automobile High-tech Industry Base in South Guangzhou.

Second, Toyota and its related firms are tenants of (2) Nansha Development Zone. Third, the tenants of (4), (5) and (6) in the East Auto-Industry Belt are the first factory of Guangzhou Honda, the engine factory of Dongfeng Honda, the Honda

factory for export, the second factory of Honda, New Wuyang Honda Motorcycle plant, Baolong Motors, factories for parts manufacture, and marketing firms.

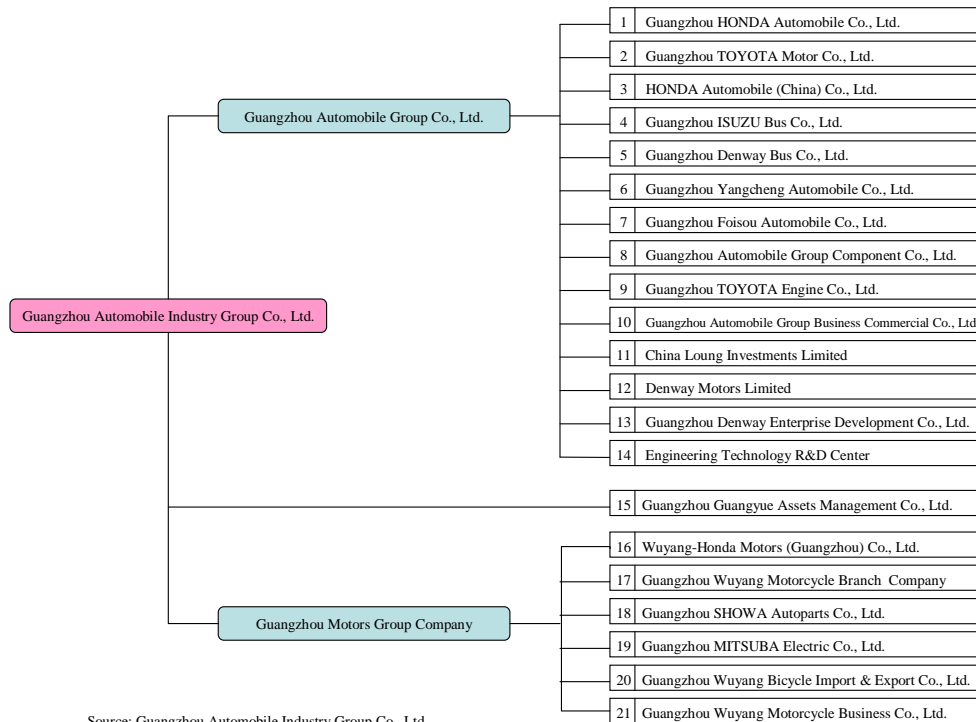
It should be noted that the authorities of the industrial zones in Guangzhou City compete with each other in inviting foreign firms to their zones.

(2) Support for the GAIG and Guangzhou Automobile Group Component (GAGC)

The Bureau of Foreign Trade and Economic Cooperation of Guangzhou Municipality issued *A Foreign Investment Guide to Guangzhou Auto Industry* in 2005. This brochure advertised the city's one-stop services (shown in Figure 4). These services helped foreign investors invest in firms related to GAIG.

As is shown in Figure 10, GAIG consists of the following three subgroups: Guangzhou Guangyue Assets Management, Guangzhou Automobile Group, and Guangzhou Motors Group Company. GAIG consists of fourteen joint ventures, including those of Guangzhou Automobile with Honda, Showa, and Mitsuba. GAIG consists of twenty one enterprises in total. Guangzhou Guangqi Industrial Development Company has six enterprises in design, food services, recycling, aftercare business, business training, and digital mobile televisions.

Figure 10. Group Structure of Guangzhou Automobile Industry Group



Source: Guangzhou Automobile Industry Group Co., Ltd.

GAIG has joint ventures with the four anchor firms of Honda, Toyota, Isuzu and Hyundai. Guangzhou Automobile Group Component (GAGC) consists of fourteen firms including Denso, Stanley, and Bridgestone, as is shown in Table 7. Their products are seats, air-conditioners, lamps, floor carpets, interior components, springs, precision springs, small lamps, urethane, aluminum alloy, interior systems, tire-and-wheel assemblies, and insulators.

Table 7. Guangzhou Automobile Group Component Co., Ltd.

1	Guangzhou TS Automobile Interior System Co., Ltd.	Car seats, seat angle modulators
2	Guangzhou Denso Co., Ltd.	Car air conditioners
3	Guangzhou Stanley Electric Co., Ltd.	Lamps
4	Guangzhou Linjun Automobile Internal Decoration Co., Ltd.	Floor carpets
5	Guangzhou Junxing Automobile Components Co., Ltd.	Seat frameworks, car door interior trim panels
6	Guangzhou Jun'an Interior Components Co., Ltd.	Carpets, sound insulation products
7	Guangzhou Huade Automobile Spring Co., Ltd.	Springs
8	Guangzhou Sanda Fine Spring Manufacture Co., Ltd.	Precise springs
9	Guangzhou Sccep Lamps Co., Ltd.	Small lamps
10	Guangzhou Bridgestone Chemical Products Co., Ltd.	Polyurethane
11	Guangzhou Aluminum Smelting Technology (GAST)	Secondary aluminum ingots
12	Guangzhou Intex Auto Parts Co., Ltd.	Seats, door trims and molded headliners
13	Guangzhou Zhongjing Automobile Parts Co., Ltd.	Aluminum wheels
14	Guangzhou Parker Auto Parts Co., Ltd.	Insulators

Source: Guangzhou Automobile Group Component Co., Ltd.

(3) Promoting the establishment of joint ventures between state-owned enterprises and foreign firms

Guangzhou Municipality actively promotes the establishment of joint ventures between state-owned enterprises and foreign investors. The municipality gives foreign investors preferential tax treatment and efficient one-stop services. The municipality has established thirty joint ventures between state-owned enterprises and foreign investors, as is shown in Table 8.

Table 8 Guangzhou State-Owned Enterprise Project

1	Guangzhou Zhujiang Steel Co., Ltd.	Steel
2	Guangzhou Pearl River Copper Co., Ltd.	Copper
3	Guangzhou Aluminum Materials Plant Co., Ltd.	Aluminum
4	Guangzhou Copper Materials Co., Ltd.	Copper
5	Guangzhou Machine Tools Factory Co., Ltd.	Machine tools
6	Guangzhou Diesel Engine Factory	Diesel engines
7	Guangzhou Cable Factory	Cables, wires
8	Guangzhou Electric Machine Works	Electric machines
9	Guangzhou Jiateli Micro-motor Co., Ltd.	Micro motors
10	Guangzhou Wanbao Refrigerator Co., Ltd.	Refrigerators
11	Guangzhou Wanbao Enameled Wire Co., Ltd.	Enameled wire
12	Guangzhou Tiger Head Battery Group Co., Ltd.	Batteries
13	Guangzhou Eagle Coin Enterprises Group Corp.	Canned foods
14	Guangzhou Baijua Flavours and Fragrances Company Ltd. (G.B F.F.)	Fragrances
15	Guangzhou Watch Factory	Watches
16	Guangzhou Flashlight Industrial Co.	Flashlights
17	Guangzhou South Alkali Manufacturing Co., Ltd.	Sodium carbonate
18	Guangzhou Pearl River Chemical Industry Co., Ltd.	Paint, ink
19	Guangzhou Huangpu Chemical Factory	Chemicals
20	Guangzhou South China Rubber Tire Co., Ltd.	Rubber, tires
21	Guangzhou Building Materials Enterprise Group Co., Ltd.	Building materials
22	Guangzhou Guangxiang Tire Enterprises Group Co., Ltd.	Tires, rubber
23	Guangzhou Baiyunshan Pharmaceutical Co., Ltd. /Guangzhou Baiyunshan Chemistry Pharmaceutical Factory	Medical devices
24	Guangzhou South China Medical Instrument Co., Ltd.	Pharmaceutical
25	Guangzhou Hanfang Modern Natural Medicine Research and Development Co., Ltd.	Pharmaceutical
26	Guangzhou Baidi Biotechnology Co., Ltd.	Bio-pharmaceutical
27	Guangzhou Pearl River Piano Group Co., Ltd.	Pianos
28	Guangzhou Subsidiary Foodstuff Co., Ltd.	Seasonings
29	Guangzhou Foodstuff Group	Edible oil
30	Guangzhou Mr. Sausage Food Co., Ltd.	Meat packers

Source: The People's Government of Guangzhou Municipality, Guangzhou State-Owned Enterprise Project Introduction, 2005.

Many mayors in China are keen to invite foreign investors to their cities. Guangzhou Municipality held an investment seminar in Tokyo, Japan in October 2005.

The mayor of Guangzhou Municipality, Zhang Guangning, was its mission leader, and many Japanese investors signed contracts at the seminar to invest in Guangzhou. It is said that Guangzhou City is trying to become equal in status to Beijing, Tianjin, and Shanghai (Weekly Toyo Keizai, Jan. 6, 2006, p. 35), and that Mayor Zhang Guangning is called an “automobile mayor,” making efforts to invite foreign investors to Guangzhou by complementing the system by which firms are invited to the province.

The position of mayor in China is often a stepping stone to the position of provincial head in China; Mayor Zhang has the opportunity to be head of Guangdong Province. His desire for promotion could be one factor in the success of his city’s industrial cluster policy. Mayor Zhang targets his policies effectively and exercises strong leadership, in part to realize his personal goals. Leadership and the incentives for leadership are keys to success in industrial cluster policy.

5. Conclusions

The flowchart approach to industrial cluster policy is an action plan for prioritizing policy measures in a time-ordered series. This paper proposed a general model of the flowchart approach to industrial cluster policy and applied this model to Guangzhou’s automobile industry cluster. Japanese firms Honda, Nissan, and Toyota have agglomerated in Guangzhou, in addition to Chinese firm Guangzhou Automobile, Japanese firm Isuzu, and Korean firm Hyundai. The last column of Tables 3, 4 and 5 display the effects of Honda, Nissan, and Toyota on industrial agglomeration in Guangzhou from 2002 to 2005. Guangzhou Municipality implements industrial cluster policy by promoting joint ventures between Guangzhou Automobile and foreign firms.

We confirmed that our model of the flowchart approach to industrial cluster policy is valid in the case of the Guangzhou’s automobile industry cluster. We reached the following two conclusions. First, we clarified the effects of Honda, Nissan, and Toyota on agglomeration in Guangzhou’s automobile industry cluster. Second, we established (as shown in Figure 9) that local governments play a crucial role in successful industrial cluster policy, and that the mayor of the local government should be offered incentives, such as his or her promotion, in order to target industrial clustering and implement cluster policy. One of the reasons why Guangzhou’s automobile industry cluster policy is successful is that the mayor targets his or her policies and exercises effective leadership. The leadership of the mayor of Guangzhou Municipality is crucial to the success of the city’s industrial cluster policy.

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Notes

¹ We interviewed a staff member of Guangzhou Honda, on 23 August, 2005.

² A Japanese term describing a loose conglomeration of firms sharing one or more common characteristics. The firms do not necessarily need to own equity in each other. (Investpedia.com)
Keiretsu (the kanji literally means “series” or “related sequence”) is a Japanese term for a set of firms with interlocking business relationships and shareholdings. In Japanese the term also refers to a firm that has many branches. (en.wikipedia.org)

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- Weekly Toyo Keizai, Jan. 6, 2006, p. 35.

Appendix Table 1
 Format of the Analysis
 (check list)

(1) City: Hanoi, Tianjin, Penang, Guangzhou, etc...				
(2) Industry: automobile, electronics, information technology, software, biology, etc... : number of firms related to an anchor firm				
(3) (a) Industrial zones	Market	Established year	Economic agents	
	Domestic or export		Public, semipublic or private	
(c) Anchor firm				
(4) Case: success or failure: core competence				

Source: Author's

Appendix Table 2
 Format of the Analysis : Capacity Building

		IZ or EPZ	Actors				
			Sufficient or not	Local gov.	Central gov.	Semi-gov.	NPOs
Capacity	1. Infrastructure	(1) Water					
		(2) Electricity					
		(3) Communication					
		(4) Transport					
	2. Institutions	(1) One-stop services					
		(2) Deregulation					
		(3) Preferential treatments (tax incentives, etc.)					
		(4) Laws and regulations (bankruptcy laws and intellectual property right)					
	3. Human resource	(1) Unskilled labor					
		(2) Skilled labor					
		(3) Professionals					
	4. Living conditions	(1) Housing					
		(2) International schools					
		(3) Hospitals					
		(4) Entertainment					

Source: Author's

Appendix Table 3
 Format of the Analysis : Related Firms

Related firms	Established year	Products

Source: Author's