The Function and Limitation of Government in Developing Industrial Cluster : Case Study of Semiconductor Industry in North-Kyushu Japan

Tung, Ching-Ying
Faculty of Economics, Kyushu University

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The Function and Limitation of Government in Developing Industrial Cluster: Case Study of Semiconductor Industry in North-Kyushu Japan[1)]

Ching-Ying Tung[2)]

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Abstract

This paper is a qualitative research that takes semiconductor industrial cluster of North Kyushu[3)] Japan as an example to describe how local government plays an important coordinator role as well as faces the limitations in developing industrial clusters. We firstly survey the government's function and limitation under global recession era; secondly, rethink Porter's complete system constructed in 1990 and point out the key parts which complete system could not provide a good description; and finally, offer a reference for developing countries and any region that have relatively weak industrial nature to deal with challenges from economy recession or hollowing-out problems.

To make the discussion more clear, this paper is composite of three parts. In first section, the complete system is briefly noted, so that the theoretical structure can be clearer. Secondly, the chance factor and diamond model of present North Kyushu are described further to make the main research question in focus. And finally, bring out the function of government in developing

1) The most content of this paper has been presented in 7th Asialics Conference on 2010/4/17 in the topic named "Government as A Key Coordinator in Developing Industrial Cluster: Case Study of Semiconductor Industry of North-Kyushu" with two cooperate authors, Tsung-Che Wei and Yasumasa Motowaki, and this paper is the first revised version. Tsung-Che Wei, Assistant Research Fellow of Chung- Hua Institution for Economic Research (Taiwan), holds a research project called "The Strategy of Japan in Developing Industrial Cluster" and provides the outline instruction for this paper. Yasumasa Motowaki, Director of Emergency Employment and Economic Policy Department, Industry and Economy Bureau, City of Kitakyushu, offers survey assistance and comment for this research.

2) Ph. D. Program 3rd Year, Graduate School of Economics, Kyushu University, E-mail: tung1228@hotmail.com.

3) Here the area of North Kyushu includes five prefectures in Kyushu, which are Prefectures of Fukuoka (including Kitakyushu city), Kumamoto, Saga, Oita, and Nagasaki.

and promoting the semiconductor industry to help realize the whole mechanism of Kyushu case, so that the limitation of government's role could also be well observed.

Through studying the case of Kitakyushu city of North Kyushu region, it would not only provide useful ideas for nations to invigorate the industries through constructing an industry-academy collaboration learning platforms, but also help to rethink Porter's complete system under the impact of global recession.

Key words: Government, development of industrial cluster, construction of innovative platform,

1．Introduction

Global economy and recession have weakened the advantage and productivity of Japanese industries, including semiconductor industry, under turbulent times, how to upgrade and transform the industrial technology and core competence to achieve sustainable development or search new opportunities are becoming the important issues. As this research believes that, in policy view-point, applying the concept of developing industrial cluster is able to comprehend the process and the performance of the upgrading or transformation of industrial technology, we explores the strategies in developing Japanese industrial cluster by observing Kyushu semiconductor industry, so as to provide a considerable reference to face the global recession and hollowing-out problems.

In this paper, there are five organizations related to developing Kyushu's semiconductor industry introduced, including Kitakyushu Foundation for the Advancement of Industry, Science and Technology (FAIS), Fukuoka Industry, Science & Technology Foundation (Fukuoka IST), Kyushu semiconductor Industries & Technology Innovation Association (SIIQ), Kyushu Innovation Creative Collaboration (KICC), and Asia Semiconductor Trading Support Association (ASTSA). We adapt comparison methods to assess the roles and performance of these organizations, and screens FAIS that operates Kitakyushu Science and Research Park (KSRP) as the main case study object.

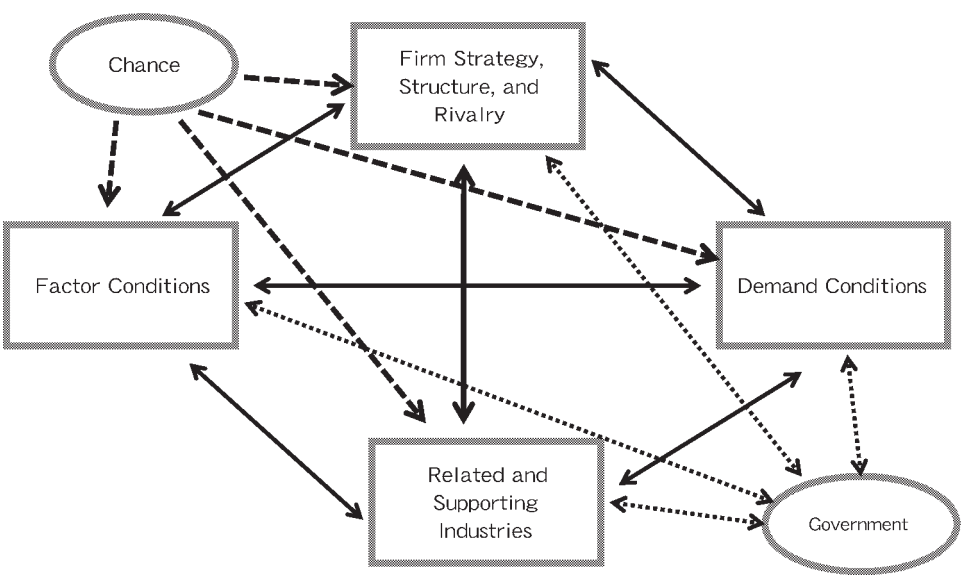
The research results provide two implications for the strategies in developing semiconductor industries. First, Japanese government plays a coordinator role to construct learning platforms for industries and universities to trigger and accelerate the diffusion and link of knowledge, so that the goal of advancing industrial technology to a high value-added direction could be achieved. However, under global recession, regional economy keeps deep influenced by outside economic or politic factors, therefore, apart from the contribution of local government, the comprehensive planning by the central government and the continually advance of the competitive advantages of the local companies are also critical. The other is under global era, companies act not only within home country but also in global wide area, therefore government's role in advancing

industrial cluster has it regional limitation, and instead the competitive advantage of company emerges to be vital.

2 . Porter's complete system: the roles of chance and government

Porter (1990) considers the four determinants of diamond model decide the nature of national competition advantage, in addition to, the other two critical factors outside of the industry are necessary to be added to build up a complete system, so that the formation and mechanism of national competitive advantage could be well views. These two factors are "chance" and "government"; both can bring positive and negative influence upon diamond model. And the system with diamond model and factors of chance and government is called "complete system".

Figure 1: Complete System (Porter 1990, p.127)



-Chance

According to Porter, Chance events, such as acts of pure invention or major technological discontinuities or oil shocks, are important because they create discontinuities that allow shifts in competitive position. Sometimes, chance events play the roles partly by altering conditions in the diamond model, therefore it can bring opportunities as well as crises and then change a static situation into a dynamic one. In addition to, chance events can also allow shifts in competitive advantage in an industry, while national attributes play an important role in *what nation exploits them*.

To deal with chance and change the threats into opportunities, “invention” and “entrepreneurship” play the irreplaceable status in reconstructing national advantages. Invention and entrepreneurship can be emerging from companies or industries itself; besides after the appropriate arrangement, they can also be nurtured in universities or government policies. (Porter 1990, pp. 124-126)

In this paper, the main chance events are two, which are the impacts to Kyushu semiconductor companies that caused from global supply system and global recession. Two impacts decrease B2B demands dramatically, so that the local companies are forced to face the global competition independently as well as adjust the original strategies or find ways out through invention and entrepreneurship.

-Government

On the other hand, government can be seen as the fifth determinant that not only influences (or be influenced by) each of the four determinants in positive or negative ways but also shapes the circumstances (chance) through policies or regulations. In Porter’s opinion, a successful government policy is to play a role to provide a competitive environment through help industries remove pressures on firms to let them improve and upgrade. (Porter 1990, pp. 126-128)

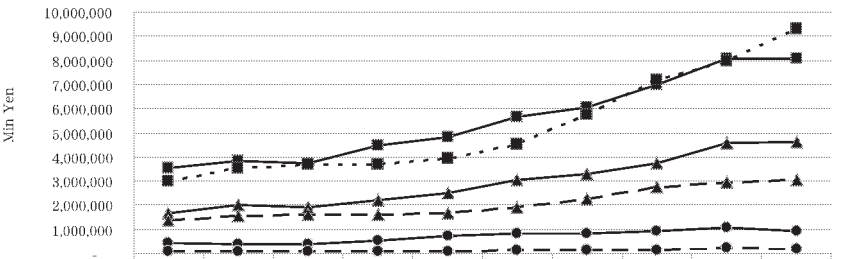
In short, when industries face a critical chance, the static diamond model become unstable and dynamic, to overcome the crisis and change the situation into up-grade opportunity, invention and entrepreneurship are necessary. If the determinants are strong enough, the firms might develop and grow through the chance; however, if not, the involvement of government is unavoidable. How government set up an appropriate policy to help firms extricate from difficult situation is the main question of this paper. Here we would like to take Kitakyushu city government as an example to discuss the importance, function and limitation of government’s role in developing semiconductor industry.

3 . Brief history of semiconductor industry in Kyushu Japan

-Basic information

Kyushu is a big island located at the south tip of Japan, there are over 13 million people living in this 42,000 square kilometers area. Kyushu is close to China and Korea, and takes less than 2 hours to fly to Taiwan and Shanghai; therefore, it is an important gate for Japan to do business with Asian countries. For this decade, the import and export amounts between Kyushu and China and Korea continues keep rising (figure 2 and 3), it is obvious that the economic activities of Kyushu is mainly within East Asia area, besides, its economy is influenced by China.

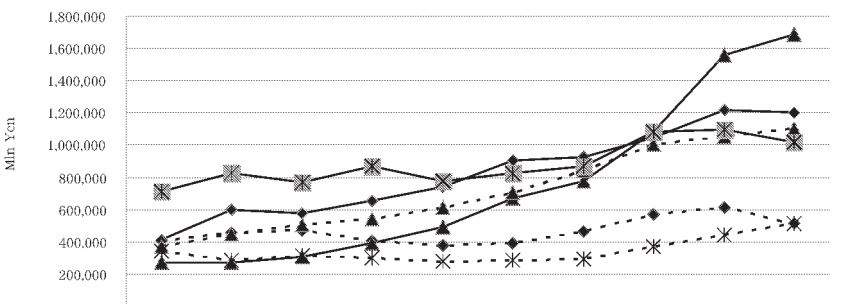
Figure 2: Trading Amount of Kyushu (in Area)



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
EX-World	3,548,29	3,839,08	3,722,91	4,486,30	4,803,79	5,674,94	6,080,69	7,009,02	8,075,15	8,096,20
Im-World	2,986,91	3,527,27	3,708,40	3,691,09	3,919,02	4,543,83	5,762,61	7,176,18	7,973,85	9,297,33
EX-Asia	1,678,61	2,001,24	1,905,64	2,235,49	2,496,24	3,035,31	3,320,03	3,747,57	4,562,61	4,615,27
Im-Asia	1,357,02	1,564,04	1,625,02	1,638,01	1,698,76	1,901,31	2,261,89	2,766,60	2,931,75	3,030,97
Ex-EU	462,766	401,524	408,859	565,678	721,010	831,828	844,780	934,640	1,096,75	943,660
Im-EU	93,493	103,875	103,428	116,606	117,865	137,095	145,134	167,856	257,998	201,783

Source: http://www.customs.go.jp/moji/moji_toukei/data.html (Re-edited)

Figure 3: Trading Amount of Kyushu (in Nation)

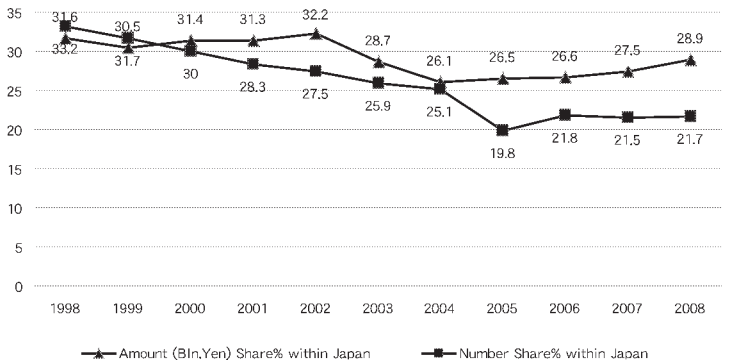


	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Ex-Korea	415,363	597,418	579,132	654,762	740,053	905,488	923,333	1,047,050	1,215,364	1,202,284
Im-Korea	405,074	455,625	467,869	407,058	379,153	389,139	462,241	569,400	614,384	514,344
Ex-China	269,956	273,584	304,172	390,928	493,870	670,151	776,804	1,081,856	1,560,783	1,684,177
Im-China	370,869	449,193	506,029	543,097	609,642	706,478	838,648	1,003,120	1,053,236	1,104,461
Ex-USA	709,804	822,478	771,108	865,443	772,557	826,834	867,819	1,080,125	1,097,584	1,016,788
Im-USA	343,235	281,853	312,079	297,921	280,383	286,438	291,265	369,333	437,835	515,192

Source: http://www.customs.go.jp/moji/moji_toukei/data.html(Re-edited)

Kyushu contributes 8-9% GDP of Japan. In the aspect of industrial structure, agriculture and manufacturing industries occupy main parts of Kyushu's GDP, and some manufacturing business especially have excellent performance in Japan, such as steel ship manufacturing and IC manufacturing. The former owns 29.7% market shares and the latter occupies 28.9% market shares in Japan in 2008. (SIIQ, 2009) Therefore, we can say that semiconductor industry is one of the most important industries in Kyushu.

Figure 4: Kyushu's IC Production



Source: Kyushu METI web data and SIIQ (2009)

-Kyushu's brief Semiconductor industry development history

The growth of IC manufacturing business started in 1967 when Mitsubishi Electric set up IC factory in Kumamoto; after that other Japanese big electronics companies such as NEC, Toshiba or SONY also started to set up their IC factories in North Kyushu area, especially in Fukuoka. With the support from big companies, during 1970s and 1980s, local supply companies had being set up continently, until late 1980s the semiconductor KEIRETSU vertical supply chain was completed in Kyushu, most of the local companies did IC production, others focused on the business of production of discrete devices and manufacturing equipments. (Yamazaki 2008, SIIQ 2009)

Since 1985, the global operation and the construction of global supplier chain had been becoming vital, however with the strong industrial foundation, Kyushu's local companies built up outstanding base for the production of semiconductor manufacturing equipments, and using these to do ICs producing business. Semiconductor companies of Kyushu did enjoy the golden times until 1995.

After 1996, to establish a more efficient global supply chain, most of Japanese big companies shifted their DRAM manufacturing factories to Korea, Taiwan and China, that forced Kyushu semiconductor industry face the crisis of recession. Therefore, local companies learned that they have to forsake the present business style and be independent from the order of big companies. The change of environment forced local companies to shift themselves from the mass manufacture suppliers to ones with capabilities of design and development; moreover, they also tried to upgrade technologies of equipment and ICs manufacturing. To this end, local companies try to develop new customers as well as strengthen the function of design and development by achieving the diversification of business and entrancing the high-added value System LSI business through construct learning platforms and networks. (KIAC, 2004; Yamazaki, 2008)

Under the impacts from market shrinking and the international competition since 1997, most local companies did not have or prepare the capabilities to develop not only their own strategies but also the appropriate function to develop new technologies, thus Japanese government started to involve in developing and invigorating semiconductor industry. Japan government adopted "Act on Temporary Measures for Activation of Specific Regional Industrial Agglomerations (特定産業集積の活性化に関する臨時措置法)" in1997, and then passed "Promotion Activity in Creating New Business (新事業創出促進法)" in 1998 to improve employment and revitalize local economy.

Although Japan government tried to save the industrial and economic problem in late 1990s, but when IT bubble collapsing happened in 2000, the recession had been extending, therefore the more strategic policies were anticipated. In 21 century, some projects raised, and after 10 years efforts, the results had being emerging.

Table 1: Semiconductor related companies in Kyushu

Semiconductor	North Kyushu					South Kyushu	
	Fukuoka	Saga	Nagasaki	Kumamoto	Oita	Miyazaki	Kagoshima
Manufacture	82	4	10	34	28	14	19
FPD	2	0	2	3	0	0	2
Solar Battery	1	0	1	2	0	2	0
Equipment	91	10	11	67	33	13	18
Material	105	22	11	45	22	22	19
Electric equipment & parts	40	3	8	15	16	12	11
Facility	11	2	3	4	2	2	0
Total	304	36	44	149	85	52	65

Source: SIIQ 2009

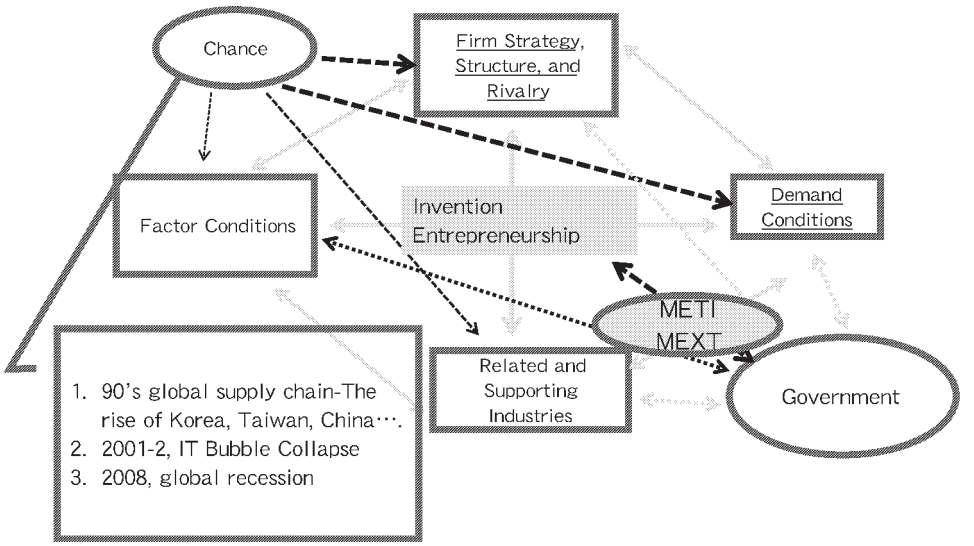
4 . Five organizations in developing semiconductor cluster at north Kyushu

-Central government's projects

Since 2000, to resolve the impact from IT bubble collapsing, two critical economic projects/acts are adopted, one is conducted by Ministry of Economy, Trade and Industry (METI) called "Industrial Cluster Project (ICP)" (since 2001) ; the other is leaded by Ministry of Education, Culture, Sports, Science and Technology Japan (MEXT) called "Knowledge Cluster Initiative (KCI)" (since 2002).

Both projects are held by central government to provide budgets for R&D, human resource education, and new business creations. For example, KCI is a project that government plans to

Figure 5: The Impacts of "Chance" and the Responses of "Government"



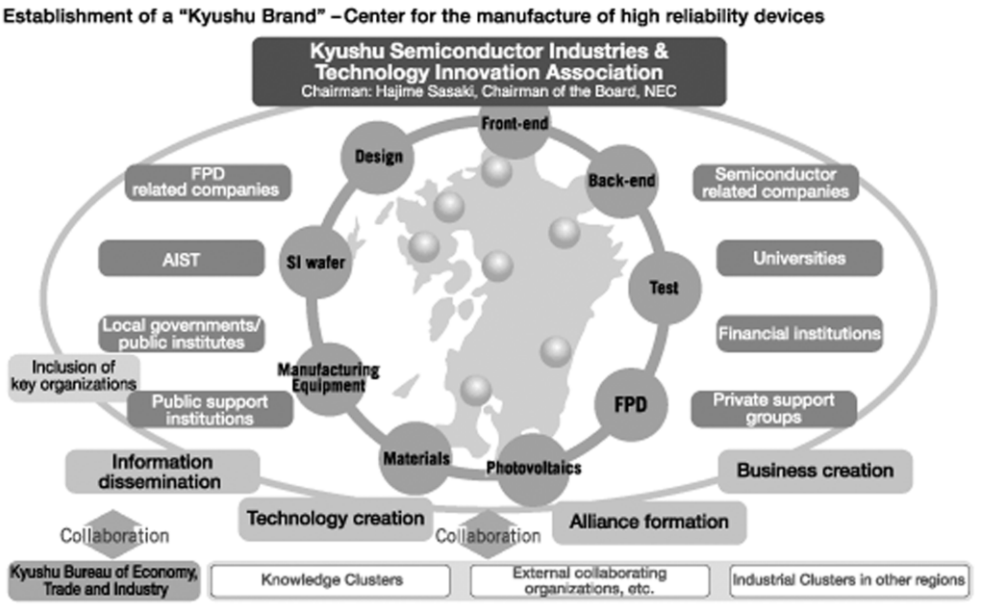
support new inventions, besides, the learning platforms construction between companies and research institutions and the investment to nurture talents are encouraged, by doing so, the local companies and industries could have more chance to up-grade their capabilities indirectly. And ICP is operated through local branches of METI that focuses on constructing cooperation networks among industry, government and universities to strengthen the support and function of local research and development and venture incubation. In addition to, providing funds to research matching function between researchers and businessmen to expand channels and sales is also a key mission.

To transfer the central government budget into local resource, local government establishes organizations which out of formal administration systems to operate related works. Take ICP for example, this project distributes budgets to all regions in Japan, where have some matured excluding industries which need to be invigorated. In Kyushu area, three sub- projects are adopted, including Kyushu Recycle and Environmental Industry plaza (K-RIP), Kyushu Bio Cluster Project, and Kyushu Silicon Cluster Project. Therefore, semiconductor industry is one of the supported disciplines. And in Kyushu, most budgets and resource goes to north part of Kyushu, especially Fukuoka area.

-Five organizations

The promoting resource of Kyushu's semiconductor industry can be divided into three types, the first is from central government's project budget, second is from local government's budget, and finally from private funds. And most of the organizations absorb mixed resource.

Figure 6: Central Government's Plan Composition



Source: http://www.cluster.gr.jp/en/Action/kyushu2.html

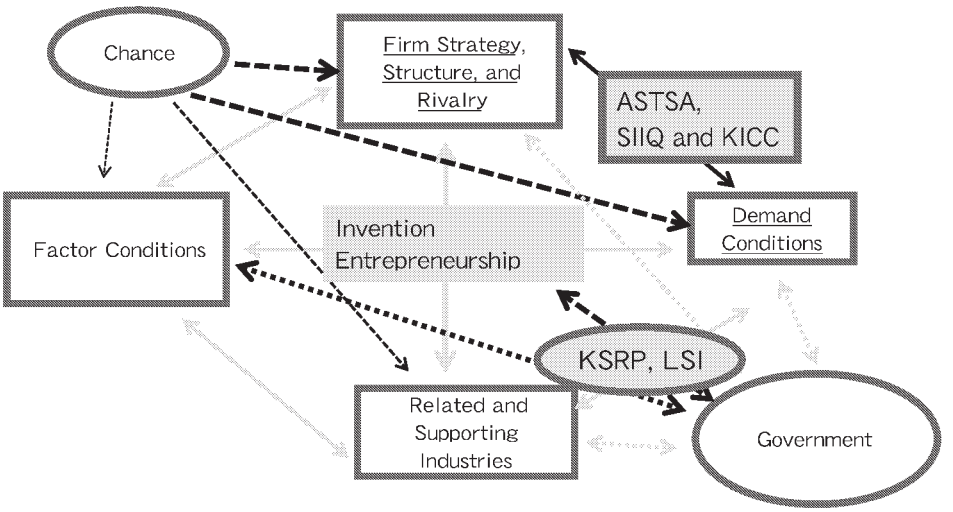
In operation level, they also can be classified to three levels, including (1) prefecture and city developing focus, (2) whole Kyushu area focus, and (3) international network construction.

For the prefectures and city operation level, there are "Kitakyushu Science and Research Park (KSRP)" which is operated by FAIS with total support from Cith of Kitakyushu; and the other is "Fukuoka Institute of System LSI Design Industry (LSI)" which is operated by Fukuoka IST funded by Fukuoka Prefecture. Both are established by local government and get the project funds mainly from government systems.

For the whole Kyushu operation level, there are two organizations qualified, including "Kyushu Innovation Creative Collaboration (KICC)" and "Kyushu Semiconductor Industries & Technology Innovation Association (SIIQ)". Both are set up in Fukuoka city by semiconductor related companies and with the support and cooperation from METI Kyushu Bureau or other administration and industrial networks in initial stage or at present.

Finally, for the international operation level, there is "Asia Semiconductor Trading Support Association -Japan Fukuoka (ASTSA)", which is voluntarily supported by Prof. Tomokage Hajime of Fukuoka University and the research institution called Kyushu Economy Research Center (KERC). The purpose of ASTSA is to help Kyushu semiconductor companies connect with international companies by means of technology exchange and build up international alliances.

Figure 7: The Positioning of Five Organizations



The following table is the brief introductions of the five organizations, which set up around Fukuoka and Kitakyushu city. Four of them get the project fund from ICP and KCI resources that offered by the central government. It is obvious that most of organizations located at Fukuoka city operate resource and networks in multiple and mixed levels, therefore it is very difficult to measure the importance and the role of government of Fukuoka Prefecture and city independently. Thus, here we choose FAIS as the case study example to explore the function, role, and results of the government in industry invigoration and development by introducing KSRP.

5 . Case study: FAIS/ KSRP

Basing on establishment purpose, the roles of Kitakyushu Foundation for the Advancement of Industry, Science and Technology (FAIS) are a coordinator among regional universities, research institutes and business circles, as well as a comprehensive supporter of small and medium enterprises and venture companies. FAIS was founded in 800 million Yen by Kitakyushu city government, and in 2008 it was proved 3.1 billion to operate research and development works.

FAIS conducts several missions, including managing Kitakyushu Science and Research Park (KSRP), forming SoC Designing Bases, operating TLO (Technology Licensing Organization), promoting cooperation between business and academic circles, advancing the Knowledge Clusters Projects (KCP[4]) and so on. Most of the missions are conducted and accomplished in KSRP, so the following will focus on how FAIS operate KSRP.

Table 2. The Institutes promoting the development of the Kyushu Semi-conductor Industry

Name/Location	Set-Up Year	Involved Government	Main Operator	Goals
KSRP/ Kitakyushu City	2001	Kitakyushu City	FAIS	Promote the Industry-University exchange and cooperation based on the research in the university.
LSI/ Fukuoka City	2004	Fukuoka Prefecture,	Fukuoka IST	Focus on professionals training, research and development, and incubation of innovative business.
KICC/ Fukuoka City	2002	Institutes of National, Regional and Local Administrational, Educational and Industrial Unites	KICC Networks	Cross-technology exchange and business promotion in Kyushu.
SIIQ/ Fukuoka City	2008	Indirectly Supported by METI- ICP	CEOs of Enterprises	To support the technology research exchange of University and research institution in Kyushu.
ASTSA/ Fukuoka City	2006	n.a.	Kyushu Economic Research Center (KERC)	To hold the international seminars and international negotiations to assist the international development of Kyushu Business.

-FAIS and KSRP

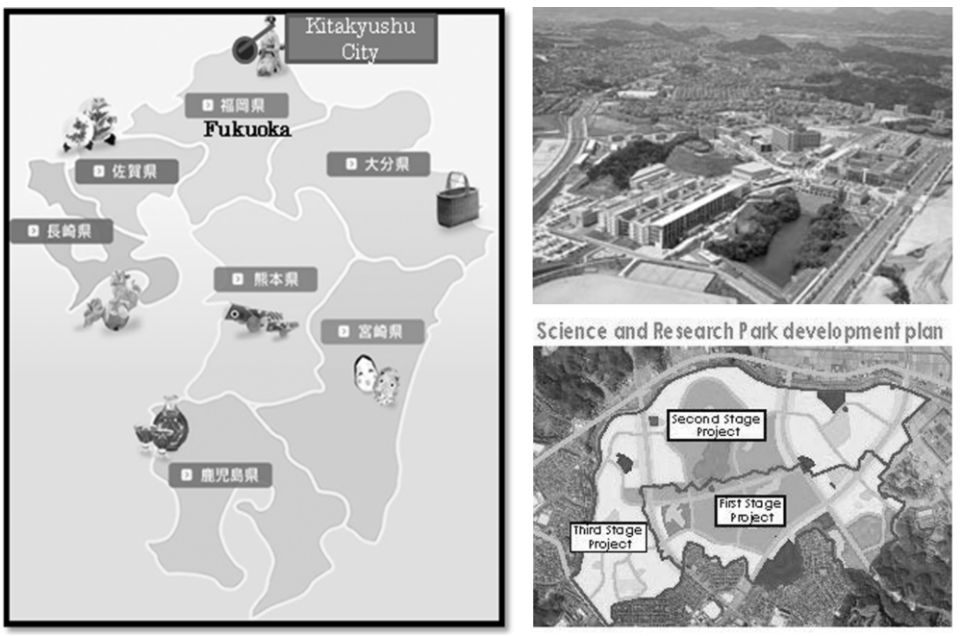
The idea of KSRP was planned in 1989 by Kitakyushu City[5], and was launched formally in 2001. FAIS plays the roles of the main organizer, manager, and instructor; and the main goal of KSRP is to assemble the science and mechanics departments of National and private university/ research institutes, in order to provide information exchange and knowledge learning chances for companies, student and various kinds of education and research institutions. KSRP is anticipated to cultivate high-technology professionals, promote the upgrade of industrial technology, and to create the development of the new-style industry.

The total development area of the KSRP is 335 hectare, which is mainly occupied by The University of Kitakyushu, Kyushu Institute of Technology, Waseda University, and Industry-

4) KCP is another name for KCI (Knowledge Cluster Initiative).

5) Kitakyushu City is one of the metropolis in Japan which called an ordinance-designated city (政令指定都市, seirei shitei toshi), which has more 500,000 populations and similar status with prefecture. In Japan, there are 18 cities designated by government ordinance, all of them are able to apply for subsidy from central government directly

Figure 8-10: Map of Kitakyushu City and KSRP



Source: http://www.welcomekyushu.jp/(Re-edited)　Source: KSRP HP

University cooperation subsidiaries. In addition, there are also many other universities and research institutes set up their branches and office within campus to commerce each other. In the beginning of the establishment, there were only 300 people in KSRP, however, seven years after, the number of students was over 2000 and the number of researcher and staff were also over 3000 in 2007.

-The Function and Performance of KSRP

To provide an environment for innovation, KSRP attracts universities and research institutes to set up graduate schools and labs, and then builds up collaboration network for industries and universities. It not only provides the environment for competitive potential new-style industries and professional cultivation, but also promotes the technology upgrade by Industry-University information exchange and cooperation. Moreover it also assists the commercialization of academic research.

The function of KSRP organization can be classified into two types, the first is the platform for Industry-University cooperation, and the other is the platform for research and development. The learning channels of the platforms and Industry-University collaboration include the Salon for Industry-University cooperation, and cooperative activities of Industry-University collaboration, which consists of conference speeches, seminars and academic symposiums and exhibitions.

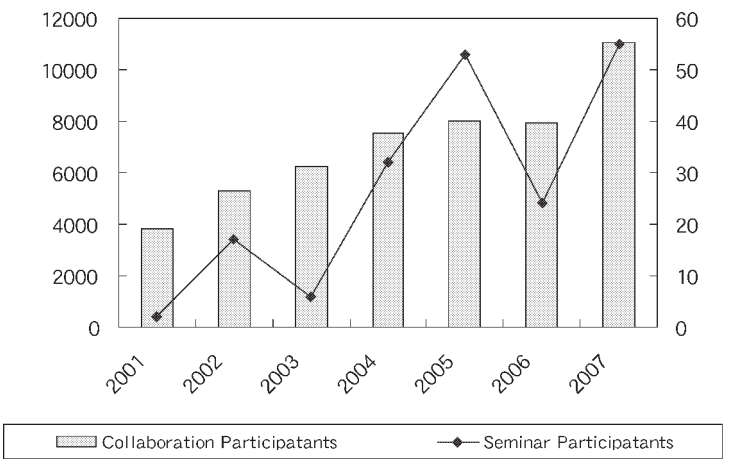
Table 3. The brief description of the composition of research institutes/ facilities in KSRP

Category	Institutes	Main Department or Functions
University	Waseda University	Includes a graduate school and a research of Information, Production and Systems departments. Especially focus on information architecture, production systems, and system LSI education and research.
	Kyushu Institute of Technology	Graduate school of Life Science and Systems Engineering with departments of biological function and engineering and brain science and engineering.
	The University of Kitakyushu	A faculty and graduate school with international and environmental engineering departments.
	Fukuoka University	Set up eco-technology, environment and energy related institutes in KSRP campus.
Industry-University common-use Facilities	Collaboration Center	It is the main institute for Industry-University joint research using. Also a facility for research institutes such as the Fukuoka Research Center for Recycling Systems and businesses conducting cutting-edge research in the fields of information and environment. Here, businesses can carry out research and development in collaboration with academia.
	Semiconductor Center	Has facilities in which joint research and development is conducted through collaboration between universities and the electronics industry, particularly those possessing fundamental technology related to the semiconductor manufacturing process and high-precision processing. It opens up the use of high-precision machinery for the trial manufacturing of IC and MEMS and provides facilities for research and development for companies aiming at a new field of applications.
	IT Advancement Center	The institute engages in research and development and the professionals' cultivation of the net and semi-conductor design, and it provides the machines and spaces for the technology of highly-advanced information transmits, semiconductor design, and software design.
	Business Venture Support Center	To provide the university the relevant facilities for the research and development of the innovative business and career-building
	Technology Development and Exchange Center	To provide the facility and environment for the cooperation of cogeneration technology and the research and development for other latest technologies.
	Media Center	To serve as the information collecting (library) of the city and the multi-media information center

Source: FAIS (2008) and Internet Information. (Re-edited)

Moreover, there are visiting trips to KSRP and final result presentations that are planned by Kyushu cluster projects. According to the growing number of the audience and the business attended, the operation condition has the tendency to keep developing and receive attention continuously.

Figure 11: The Network Growth of KSRP



Source:FAIS (2007)

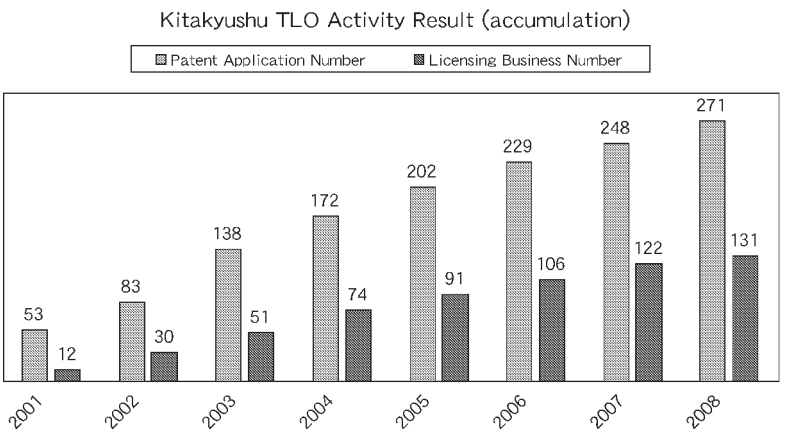
Besides the normal network and platform for technology exchange, FAIS also takes advantages of its TLO (Technology Licensing Organization) institute in Kitakyushu to transfer the results of received patents of the university and research institutes to the private enterprises in way of licensing agreement. Afterwards, it takes the benefits from the patent as feedbacks to the researcher or universities for new researches. Through the Industry-University cooperation, businesses and research institutes can be familiar with the technology trends and also have chance to exchange the market knowledge to each other, which is beneficial to the affirmation of research direction and minimization of the market risk after commercialization. The result can be seen from the growing trend of the patent application and the commercialization.

The functions of research and development mainly rely on the financial support and planning of central and local governments. KSRP is designated by Kitakyushu city government, however in addition to funds from the local government; it also owns financial support from KCPs provided by MEXT to develop the researches on semiconductor (System LSI), information technology and environmental technology.

In addition, the governmental cluster development funds, FAIS and KSRP also receives subsidy for the research expenditures from METI, Ministry of Agriculture, Forestry and Fisheries (MAFF) and Organization for Small & Medium Enterprises and Regional Innovation, JAPAN

(SMRJ) and so on.

Figure 12: Patent Application and TLO Business Results Of Kitakyushu



Source:FAIS (2007)

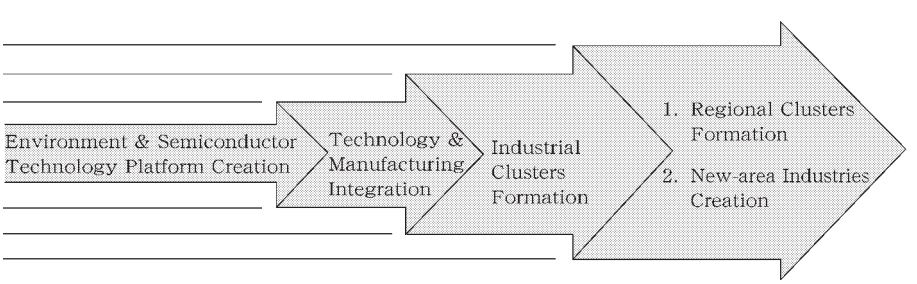
Table 4: External Funds to KSRP and Universities

	2001	2002	2003	2004	2005	2006	2007	2008
External Funds (mln ¥)	423	1,606	1,439	1,665	1,782	2,003	2,029	2,271
Number of Joint Researches	93	157	243	302	323	291	273	267

Source: FAIS (2008)

When conducting these research projects, nurturing new generation and providing knowledge diffusion environment for generations within campus are essential; meanwhile, through Industry-University cooperation, horizontal information exchange can be accomplished. By doing these, the development industrial technology can be realized.

Figure 13: The Functions of the development and learning platform basing on KCP in KSRP



6 . Analysis: government's function and limitation

It should be highly noted that the role of the backstage coordinator played by FAIS is very important in developing industries, which can provide the capital and the supplement of the urban spatial planning, and build the field for and Industry-University cooperation. From the funding purpose of FAIS, we can see Kitakyushu city government trying to promote industrial reformation and seek for new business opportunities for local companies and industries; however, in fact, what government can do is limited in R&D and education support for the operations of firms and markets are out of government's authority. Here we apply this case to Porter's complete system, and got the following analyses.

Factor Conditions: The government plays an important role to import funds for developing industrial cluster. Japanese central and local governments provide funds, budgets and subsidy to empower the industrial factor conditions. Moreover, for one of the purposes for funding is to nurture next generation, therefore, human resource is strengthened by education and research support. Finally, the funds for research and development projects could assist to upgrade manufacturing technology for industrial reformation.

Firm Strategy, Structure, and Rivalry: The goal of industry-government-academic cooperation is to develop new and venture businesses to meet the demand from changing environment. Government provides an opportunity for companies to develop competitive advantages through platforms, however, in fact, the efforts and input of companies are vital, and that is needed to be further observed in the future.

Demand Condition: The reason for government provides support to semiconductor industry is due to the original business styles have been unable to assist local companies being compete with overseas rivals. Local companies lose the orders, thus the fundamental solution for them is expansion of markets. However, in Kyushu's case, it is can difficult for government to intervene markets for the semiconductor market is fully involved by global competition. Even though local governments are willing to offer funds, at present the result is still very limited. Currently, what FAIS can do is to support the innovation and research activities in universities go commercialization gradually.

Related and Supporting Industries: This factor is the weakest part in FAIS's operation. The reason is that most research projects are proposed by professors or laboratories in universities,

governments only play the role to review the proposals and offer funds for potential researches. Therefore, most projects are not direct link to the demand to support industrial development. This also shows the coordinator function of government is limited, and how to build up a strong cooperation among industries and companies is critical, after all, as Porter mentioned the key role for competitive advantage development is industry itself.

Invention and Entrepreneurship: The two solutions for industry reformation and innovation are invention and entrepreneurship, so Kitakyushu plans to speed up invention by contracting academic cluster- KSRP. However, the result in nurturing entrepreneurship is not obvious in KSRP. Entrepreneurship could bring the benefits of market expansion, research commercialization and profit creation. In the whole planning of KSRP, it looks that there is no strategic positioning of entrepreneurship, and this may be the reason for why FAIS returns low outputs over a high input.

FAIS provides a good case for how a government constructs an open and transparent learning platform for industries to exchange technologies and markets information and knowledge. In particular, KSRP is established as an academic cluster to support industrial development, it is a reference for connect universities with industries to provide a holistic environment for learning and a competitive campus for research and development.

However, we can also see the limitation of government's role in developing industrial cluster, when the cluster itself is too weak to be advanced. In Kyushu, the main problem of developing semiconductor industry is the continuous impacts from global economic competition and recession, so also find that in this kind of situation, the function of local government is limited. Therefore, under the global competition, the degree of integration of industries and companies is quite limited if only relying on the effort of local governments. To achieve efficient result in developing industrial clusters, more efficient planning, coordinating, and execution conducted by central government is also important. In brief, if the chance brings too many damages to the four elements of Diamond model, the government's role becomes critical, so not only local government but also central government need to involve in conducting efficient development planning and execution.

Afterword

In 7th Asialics Conference, Prof. Patarapong Intarakumnerd suggested us to adopt more industrial data to deeply access the cluster developing results; and Dr. Pun-arj Chairatana offered some ideas related to「Dual Double Diamond, DDD」model for future research. In addition, Dr.

Chen Lee-in generously provided empirical research paper for reference. I appreciate all the opinions, comments and support.

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2010 March 01: ASTSA

2010 March 02: FAIS

2010 March 03: Fukuoka IST, and METI Kyushu Bureau

2010 March 04: SIIQ

Acronym List

ASTSA: Asia Semiconductor Trading Support Association

FAIS: Kitakyushu Foundation for the Advancement of Industry, Science and Technology

Fukuoka IST: Fukuoka Industry Science Technology Foundation

ICP: Industrial Cluster Project
KCI: Knowledge Cluster Initiative/ KCP: Knowledge Cluster Project
KERC: Kyushu Economic Research Center
KIAC: Kyushu Industrial Advancement Center
KICC: Kyushu Innovation Creative Collaboration
KITEC: Kyushu Industrial Technology Center
KSRP: Kitakyushu Science and Research Park
LSI: Fukuoka Institute of System LSI Design Industry
METI: Ministry of Economy, Trade and Industry
MEXT: Ministry of Education, Culture, Sports, Science and Technology Japan
SIIQ: Kyushu Semiconductor Industries & Technology Innovation Association