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Theoretical and Policy Examinations concerning Industrial Clusters in Japan

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The purpose of the present study is to explore the conditions that must be present for the formation of effective industrial clusters, which we shall attempt by way of a theoretical and policy-centered examination of industrial cluster formation in Japan. We first present an overview of the development of different systems in Japan related to collaboration among industry, government, and academia, and then examine the development process of industrial cluster policies. Finally, we use a simple partial equilibrium model to illustrate the relationship between the mechanisms of business alliances and cluster policy.

Keywords:

Industrial Clusters, Business Alliances, Policy, Japan

1. Introduction

Policies to develop industrial clusters have been adopted since the 1990s, especially in developed countries, and there is now a substantial wealth of academic work consisting of analyses of theory, empirical analysis, and policy issues involving clusters upon which we can draw (Ishikura et al., 2003; Porter, 1998; OECD, 2007a). Even if we limit a review of the literature to Japan alone, we find excellent examples of analysis such as OECD (2007b), which describes the features of industrial cluster policies and the circumstances that led to their formation, and Industrial Cluster Study Group (2005), which is an outline of gains made and issues left by policies in the first half of the 2000s.

Furthermore, there is such a broad array of approaches that cover diverse fields—including industrial agglomeration, spatial economics, knowledge creation, business strategy, and many more—that an exhaustive survey of all research on the topic done to date would be a practical impossibility. For the purposes of this paper, we shall narrow our focus to business alliances, which forms the foundations of cluster formation, and look at how such cooperation affects innovation.

In Section 2 below, we first present an overview of the development of different systems in Japan related to collaboration among industry, government, and academia, and then examine the development process of industrial cluster policies. Next, we shall shed some light on where cluster policies stand in the larger context of industrial policy, as well as characteristics of policies that are specific to Japan. In Section 3, we use a simple partial equilibrium model to illustrate the relationship between the mechanisms of

business alliances and policy. Lastly, Section 4 is devoted to perspectives on certain issues regarding industrial cluster policies that have yet to be addressed and the future directions those policies might take.

2. The background behind industrial cluster policies in Japan and their aims and institutional features

The cornerstone of industrial clusters is innovation through collaborative efforts by industry, government, and academia¹. However, the forms that industry-government-academia collaboration takes depend on the historical paths to development the country as a whole and regions within that country have taken, and are thus defined by social and economic conditions (Odagiri, 2001). In Japan, from the early Meiji Era, through the post-war years, and up to the 1970s, Japan's development mirrored that of many developing countries today. Its goal was to catch up to the world's developed nations, and it achieved economic growth by largely relying on technological transfer. After this period, the potential demand for the development of advanced technologies transformed into real domestic demand². In terms of industrial development policy for regional economy, however, a number of the negative externalities of agglomeration, such as the overcrowding and environmental pollution stemming from the excessive concentration on Tokyo as Japan's economic center in the 1970s, came to the fore. To address these issues and to strive for a more geographically balanced form of development, the Industrial Relocation Promotion Act of 1972 was enacted. Numerous policies were implemented in the 1980s with the goal of getting factories and research laboratories to relocate from Tokyo to the less urbanized regions of Japan (*Technopolis Plan* and *Zunou Ricchi Plan*). Underlying the industrial policies and regional development policies up to this period was the common theme of central government-led relocation of factories. This practice continued through the bubble economy of the late 1980s and the bubble's collapse, ending only when the country entered the so-called "lost decade".

Nevertheless, as the tides of globalization swelled in the 1990s, interest in issues such as improving national and regional economic competitiveness and sustainable development grew, and in the mid-1990s the government began to shift the focus toward policies that would "create" innovation. A series of laws to facilitate that shift were enacted, including the Science and Technology Basic Act of 1995, the "Japanese Bayh-Dole Act" of 1999, and the Intellectual Property Basic Act of 2002. These laws laid the institutional foundations for industrial cluster policies and paved the way for the government-led cluster strategies that have been implemented during and since the 2000s (OECD 2007b; Okamuro 2009). More

¹ The meaning of the knowledge creation by the cooperation of industrial-academic complex can be brought together as follows. First, it is a creation of the innovation (accumulation of the knowledge capital) by the knowledge creation. Secondly, it is contribution (accumulation of the human capital) to the personnel training that bears creative endeavors of knowledge and use. Thirdly, it is a promotion of the entrepreneur (entrepreneurship). Fourthly, these three meanings are achieved at the same time as the most important point.

² For example please see Otsuka, Togo and Hamada (2010, p.244).

specifically, the aim is to create more innovation via reduced transaction costs as systems for business alliances become more formal through institutional reforms (Appendix Table 1).

The Ministry of Economy, Trade and Industry (METI) launched the Industrial Cluster Project in 2001. The Ministry of Education, Culture, Sports, Science and Technology (MEXT) began the Knowledge CLUSTER (Cooperative Link of Unique Science and Technology for Economy Revitalization) initiative and the City Area Program in fiscal 2002, and the Project for the Strategic Development of Industry-University-Government Collaboration in 2008, although in fiscal 2010 these three policies initiatives were incorporated into the Project of Developing Regional Innovation System (Regional Innovation Cluster Program).

In the field of agriculture and foodstuffs, in 2005 the Ministry of Agriculture, Forestry and Fisheries(MAFF) initiated the Food Industry Cluster Project, but in 2008 the Act on Promotion of Business Activities by Collaboration Between Small and Medium Sized Enterprise Operators and Operators of Agriculture, Forestry and Fishery[sic](Agriculture-Commerce-Industry Collaboration Act) was passed, which rendered the Food Industry Cluster Project obsolete, but the relevant portions were integrated into the new Aid Project for Agriculture-Commerce-Industry Collaboration (MAFF/METI).

Table 1 indicates the background, purpose, description, and ultimate goal of each of these measures. In all of these initiatives, the main policy purpose is to create business alliances among the relevant entities.

One of the more peculiar features of industrial cluster policy in Japan is that the METI, the MEXT, and the MAFF each implement policies, and as policy initiatives they have each launched one project or program after another. However, as fiscal constraints increasingly demand austerity, it has become necessary to coordinate the different programs. Accordingly, steps are underway to integrate and reorganize these programs (and a political restructuring is now proceeding concurrently).

Table 1. Major Industrial Cluster Policies in Japan

	Industrial Cluster Project ¹⁾	Agriculture-Commerce-Industry Collaboration Project	Project of Developing Regional Innovation System
Implementation Entities	METI (10 Local Branch Bureau)	MAFF SMEA(METI) SMRJ	MEXT
Period	1 st Term 2001~2005: Start-up 2 nd Term 2006~2010: Growth 3 rd Term 2011~2020: Self-sustaining Developing	2008 ~	2010 ~ (2002 ~)
Budget	1 st Term 182.1 Billion Yen (Actual: about 110.0 Billion Yen)	2009: 33.4 Billion Yen (METI: 15.5, MAFF: 17.9) 2010: 27.1 Billion Yen (METI: 13.7, MAFF: 13.4)	2010: 14.7 Billion Yen
Purpose	“to form industry-academia-government networks and industry-industry networks throughout our country for the purpose of forming industrial clusters, and to create new industries and new businesses by promoting regional innovations”	Attempt the improvement of the management of the small and medium-sized enterprise and the improvement of the agriculture and forestry fishery management by promoting the business that cooperates organically by the small and medium-sized enterprise operator and the agriculture and forestry fisherman, uses each resources on business effectively, and does, and contribute to healthy development of the nation's economy.	Promoting joint research by industry, academia and government with local core universities and other research institutions with high R&D potential, and aims to form clusters capable of producing sustainable innovations by establishing industry-academia-government networks.
Target	SMEs	SMEs Operators of Agriculture, Forestry and Fishery (Corporate/Association is also possible) ²⁾	University etc. (through Core Organizations)
Measure	Subsidy	Subsidy, Easing of Regulatory Control (Financing, Credit Guarantee), Reduction of Tax	Subsidy
Contents of Projects	1 st Term 1) Network Formation 2) Support for R&D 3) Enhancement of Incubation Function 4) Support for Market Cultivation 5) Collaboration with financial Institutions 2 nd Term: Basic Principle 1) Expansion of Networks and Obvious Success of Commercialization 2) Cluster Communication between Clusters and Widening of Clusters 3) Promotion of International Communication 4) Introduction of the PDCA Cycle	Recognition Requirement for Business Scheme (within 5 years) 1) Cooperation of SMEs and Operators of Agric. Fores. And Fish. 2) Effective Use of Business Resources 3) Development of New Products and Services 4) Improvement of Management Assistance Measures that can be used 1) Subsidy METI: Promotion of Businesses and Commercialization MAFF: Promotion for Cooperation of Food and Agric. 2) Low-interest Loan Public Banking:: Financing Facility by government-affiliated financial institution METI: Special exception ‘Act on Equipment Installation Support for Small Enterprises’ MAFF: Special exception ‘Agricultural Improvement Fund Aid Act’ ‘Act on Subsidies for Improvement of Forestry and Wood Industry’ ‘Act on Subsidies for Improvement of Coastal Fishery’ 3) Credit Guarantee METI: Special exception ‘Small and Medium-sized Enterprise Credit Insurance Act’ MAFF: Special exception ‘Act on Promotion of Food Marketing Structure Improvement’ 4) Lower Tax of Equipment Investment Supported by SMRJ 1) Consultation Service 2) Brush-up of Business Scheme 3) Follow-up	Regional Innovation Cluster Program (12.1 Billion Yen): 1) Implementation of the Projects -Setting Core Organizations (designated by local government) -Assigning science and technology coordinators to promote industrializing 2) Execution of Joint Research by Industry-Academia-Government 3) Utilization of Projects and Policies of Local Governments, Relevant Ministries, etc. 4) Other Program of Independence Promotion for Industry-university-government Cooperation (2.6 Billion Yen): 1) Functional Enhancement 2) Coordinator
Implementation Structure/Outcomes	Central Government-led Type 19 projects Main Target Field 1) Manufacturing 2) IT 3) Biotechnology 4) Environment/Energy 1 st Term: Outcomes 6,100 Companies (Support for Alliance) 250 Universities (Participation in the Clusters)	Bottom-up Type Number of Consolutions 3,579 Cases Business Scheme 318 Plans (As of Jan. 31, 2010) Field: Class. of Agric.Fores.Fishre: 1) Agric.(257), 2) Fores(18), 3) Fishe(43) Class. of Comme. And Industr. Collaboration: 1) Indust.(204), 2)Comme.(88), 3)Comme. & Indust(26)	Central Government-led Type Global Type (17 regions) City Area Type (23 regions) Field: 1) Life Sciences 2) IT 3) Environment 4) Nanotechnology/Material 5) Other

Note 1: Indicating the contents of 1st term as long as it doesn't make mention.

Note 2: 1) Commercial and Industrial Association, Shopping District Promotion Association, Consumers' Cooperative Society.

2) Corporations such as Business Cooperative, Agricultural Cooperative Association, Farming Union Corporation, Forestry Cooperatives and Fishery Cooperatives. 3) Voluntary Partnerships etc. such as Village Farming Organizations.

Source: METI(2006) *Second Term Medium-range Industrial Cluster Plan*.

Industrial Cluster Study Group (2005) *Industrial Cluster Study Group Report*.

Okamuro, H. (2009) “*San-Gaku-Kan Renkei to Kurasuta*” Okamuro (2009), pp.271-300.

Nou-Shou-Kou Renkei Kenkyu-Kai (2009) *Nou-Shou-Kou Renkei Kenkyu-Kai Houkoku-sho*.

J-Net 21 (<http://j-net21.smrj.go.jp/expand/noshoko>)

MAFF/SMEA/SMRJ (2010) *Nou-Shou-Kou Renkei Jigyuu Keikaku Ninte Jirei-Shu* (5th term) Mar. 2010.

METI (2010) *Nou-Shou-Kou Renkei no Suishin* (Apr. 2010) Regional Economic and Industrial Policy Group

MEXT(2010) *Regional Innovation Cluster Program 2010* (http://www.mext.go.jp/a_menu/kagaku/chiiki/budget/1296698.htm)

3. An analysis of business alliance policies

3.1. The mechanisms of business alliances

The economic activities of companies are restricted by the quantity and quality of available management resources, such as funds, human resources, technological capabilities, and information. For this reason, at every stage in a company's life—be it establishment, continuation or growth—it pursues economic activities while trying to utilize external management resources as effectively as possible. According to Small and Medium Enterprise Agency (SMEA, 2003), a business alliance is an arrangement in which one business pursues specific business activities in cooperation with another company for the purpose of sharing management resources that are shareable while at the same time maintaining its autonomy as a company (i.e. not resorting to capital tie-ups, mergers, etc.). To paraphrase the definition provided by Kuglin and Hook (2002), a business alliance is an agreement formed between businesses for the purpose of cost reduction and improved services to customers. According to this definition, alliances are formed with a single agreement providing for equitable risk and opportunity to be shared among all parties, and are often managed by an integrated project team. The main types of business alliances given are: sales alliances, solution-specific alliances, geographically-specific alliances, investment alliances, and joint venture alliances. Furthermore, through business alliances companies can typically benefit from economies of scale, economies of complementarity, economies of scope and economies of linkage (synergy effect)³. Table 2 illustrates the relationship between the types of business alliance with their respective benefits, but it should be noted that these benefits vary depending not just on the type of alliance but on the details of the alliance arrangement.

Table 2. Classification of Business Alliances

Classification	Contents	Effects of alliances			
		Economy of Scale	Economy of Complementarity	Economy of Scope	Economy of Linkage
Sales alliance	selling complementary products and services	✓	✓		
Solution-specific alliance	jointly developing and selling a specific marketplace solution			✓	✓
Geographic-specific alliance	jointly marketing or co-brand their products and services in a specific geographic region			✓	✓
Investment alliance	joint their funds for mutual investment	✓	✓	✓	✓
Joint venture alliance	undertaking economic activity together	✓	✓	✓	✓

Source: Kuglin and Hook (2002), Maruyama(2005) and Wakabayashi (2009).

³ Refer to Maruyama (2005, pp.45-65) and Wakabayashi (2009, pp.166-187).

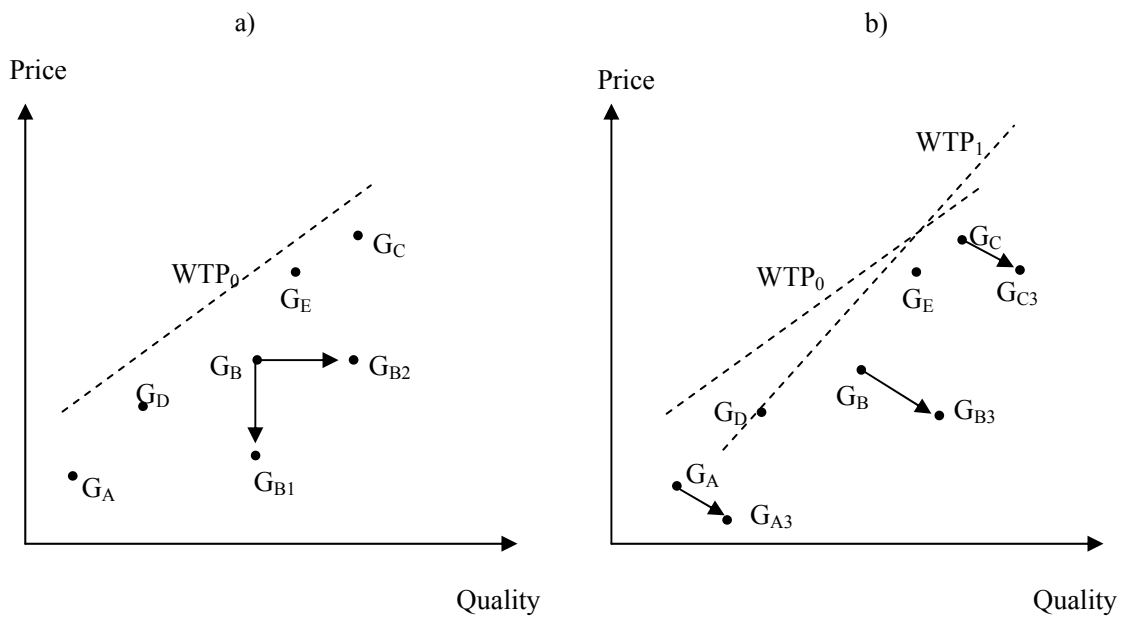
Here we shall focus on the relationships between innovations and the quality and price of goods, and in the process examine the significance of cluster formation through business alliances. First, we assume that 1) there are two types of product differentiation, namely horizontal and vertical differentiation, and that 2) the market is characterized by monopolistic competition in which there are many buyers and sellers, and price is determined by markups added to production costs. This market structure can be considered indicative of a transitional stage from growth to maturation, rather than of its nascent stage.

Figure 1-a shows the typical economic benefits associated with ordinary innovation in companies. The vertical axis shows production costs/prices, and the horizontal axis represents quality, where G_A , G_B , G_C , G_D , and G_E are goods or services produced and sold by companies A, B, C, D, and E, respectively. WTP (willingness-to-pay) is a curve that indicates the price at which consumers are willing to pay for the quality of each of the products. For example, among the five types of companies, G_B represents goods or services of quality around the middle produced at costs around the middle, and sold at middle-level prices. In addition, we assume here that the sources of differentiation are mainly the knowledge and technologies held independently by each of the companies, and that they cannot be easily imitated. However, for each of the companies A, B, C, D, and E, there are numerous other companies of the same type, which results in horizontal differentiation. Furthermore, the vertical difference between WTP_0 and G_B represents consumer surplus. In this state, because for each company price is equal to production costs plus markups, no excess profit is generated. Hence, each company adopts a strategy to maximize profits through innovation.

Here, let us imagine that company B succeeds in innovating. First, process innovation causes point G_B to shift downward in the figure to point G_{B1} . We can think of this as a cost-reduction innovation, as it shows lower price levels where quality remains constant. In contrast, product innovation results in a shift to the right from point G_B to point G_{B2} . Put differently, it is a quality-enhancing innovation, since quality goes up while production costs stay constant. As these innovations are realized, excess profits are generated. Changes such as these cause changes to each company's market share. Since each of the products can be used as replacements of each other, in either case above (i.e. where G_B shifts to G_{B1} or G_B shifts to G_{B2}), the market share for the products G_A , G_C , G_D , and G_E would shrink, while the market share of product G_B would grow. We should note, however, that in the former case, the degree to which the market share of G_C and G_E shrinks is relatively large, while in the latter case the degree to which the market share of G_A and G_D is relatively large.

However, if three companies such as A, B, and C here enter into a business alliance and form a cluster, as shown in Figure 1-b, each company simultaneously realizes both process innovation and product innovation. Furthermore, as a result of the spillover effects, the production costs of their products G_A , G_B , and G_C all go down while quality goes up (shifts to G_{A3} , G_{B3} , G_{C3}). Meanwhile, as the market becomes

saturated in terms of quantitative size and living standards rise, consumers come to demand higher quality goods and services, so the slope of the WTP curve rises, shifting from WTP_0 to WTP_1 . Through these changes, the entities that make up the cluster are able to establish win-win relationships, and as the competitiveness of the whole cluster is improved, it leads to a concurrent increase in consumer surplus. In contrast, the demand for the products of D and E, who are not companies in the cluster, will shrink; these companies are likely to decline. These companies exist in networks of competition and coordination with other companies inside their cluster, in networks of competition with companies outside that cluster, or in networks of competition with other clusters. We believe that when these types of cluster policies succeed and clusters are formed, sustained innovation occurs, and as a result the quality of life is enhanced⁴.



Source: made referring to Swann (2009, p.53) .

Figure 1. Innovation and Industrial Cluster

3.2. An analysis of business alliance policies: a partial equilibrium model

In the following sections, the profit maximization behavior of enterprise will be theoretically formulated by considering business alliance as the network formation, and the influence of policy on the network formation of enterprise will be taken into account as well.

The profit of enterprise π can be stated as equation (1). Where, P is the price of product, $F(L, K, N)$ is the production function, and A is the technical level of enterprise. L , K and N are the inputs of labor, capital and network formation (stock) respectively. We assume each price of the factors to be w , r , and b . Although w and r are decided by the market, the costs of network formation are difficult to be discovered directly. However, the cost of network formation contains the cost for searching partners, consensus

⁴ Improvement of Quality through the product innovation leads to the improvement of QOL directly.

building to form network and maintaining network. Once the network is formed, the cost will be generated and enterprises in the network will be exhausted if the effect of network cannot be produced. On the other hand, the effect of network is dependent on the amount and the quality of information about business partners, the contents of transaction and alliance of business, and the prediction of their partner's behavior⁵. It is considered that the success in development of new products through business and marketing alliance will cause the rise in the sales price per unit⁶.

$$= P(N) \cdot F(L, K, N; A) - (wL + rK + bN) \quad (1)$$

The first order condition of the profit maximization can be presented as follows.

$$MPL = F / L = w / P \quad (2)$$

$$MPK = F / K = r / P \quad (3)$$

$$MPN = F / N = b / P - (P / N) \cdot (1/P) \cdot F \quad (4)$$

The equilibrium condition of network formation can be expressed using the concept of marginal revenue as follows.

$$(F / N) \cdot P + (P / N) \cdot F = b \quad (5)$$

This is to say that, the level of network formation will be decided at the cross point of marginal revenue curve (effects of network on the increase in production + the increase in unit price) and cost of network formation. Promotion of business alliance through subsidy will decrease the cost of network formation from b to $b-s$. In other words, the effect of the policy is a part of the externality that appears only after the business alliance succeeds, and developed technology and business model spread as public knowledge, etc. (Figure 2). Moreover, the economy of agglomeration is considered to be realized through geographic concentration, etc. which reduces transaction cost of enterprises and leads to the decline in the cost of network formation, and the spill-over of knowledge leads to quality improvement (price increase).

As for the structure of networks, the formation of small-world networks, as opposed to random networks, would result in lower costs associated with network formation in addition to greater economic benefits from higher prices. The implications of this are that quantitative and qualitative differences in networks

⁵ For instance, the enactment of Commercial Code improves the incentive that business contacts keep the rules, and improves the effectiveness of dealings. And, the cost of the network formation of the enterprise is decreased from the facilitation of the forecast of the action in business contacts.

⁶ Moreover, it is necessary to consider the relation to the content of the contract including the purpose, and the distribution of profit when thinking about the reality of corporate behavior.

not only have consequences for corporate business performance, but they also have the potential to bring about differences in regional development (Kiminami et al., 2010, p.468). For these reasons, analyses of policy should also be conducted in accordance with the frameworks presented above.

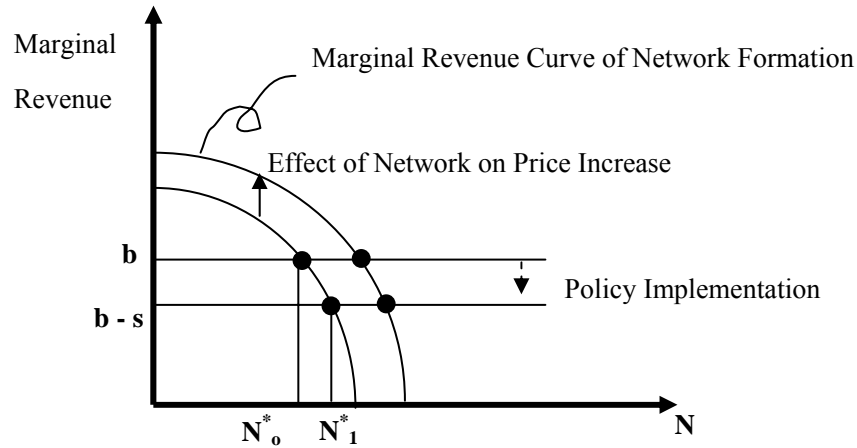


Figure 2. Optimal Point of Network Formation and Policy

4. Conclusion

Motivated by stagnant economic growth and an increasingly heated global race for innovation, Japan has gradually been implementing industrial cluster policies since the mid-1990s. Initially, multiple ministries each initiated independent initiatives to advance policies, but the many overlapping programs and projects that ensued are now being consolidated and reorganized as the government continues to push for better coordination among policy measures. The introduction of cluster policies and the reorganization process currently underway in Japan demonstrate that, while Japan's cluster policies are not dissimilar to those of other countries in terms of "creating" innovation, they have taken on a particularly new significance in Japan, as 1) cross-sector initiatives and 2) wide-area initiatives have traditionally met with resistance or indifference.

Based on model analyses, we can conclude that the success or failure of cluster policies depend upon whether there are networks in place and whether those networks lead to innovation. To ensure that those conditions are met, it is necessary to accumulate data from individual case studies focusing on the mechanisms of business alliances, and to assess policies designed to facilitate alliances. Furthermore, it is necessary to reexamine the role that industrial cluster policies have played by improving and studying the theoretical foundations of clusters at the macro (external environment), meso (internal structure), and micro (strategies of individual entities) levels (Table 3).

Table 3. Social and Economic Environment in Japan

Spatial Scale	Japan	World
Macro	1. Stagnation of Economic Growth 2. Deflation 3. Declining Birthrate and Growing Population of Elderly People (Shrinkage of Market Scale and Talent Acquisition) 4. Rapid Growth of Economy in Asian Countries 5. Unstable Political Situation	1. Knowledge Economy 2. Globalization 3. Information Society 4. Sustainable Development
Meso	1. Maturation of Industry (Mature Stage at Life Cycle) 2. Centralization to the Tokyo Metropolis and Stagnation of Local Economy 3. Tendency of Decentralization (Importance of Regional Policy)	
Micro	1. Rapid Change in Outside Environment that Surrounds Enterprise 2. Few of new opening enterprise (problem of entrepreneurship, funding, and system)	

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References

- Ishikura, Y.; Fujita, M.; Maeda, N.; Kanai, K.; Yamasaki, A. (2003). *Strategy for Cluster Initiative in Japan*. Tokyo, Yuhikaku (in Japanese).
- Kiminami, L.; Kiminami, A.; Furuzawa, S.; Nakamura, T.; Zhu, Y. (2010). An Analysis on the Business Alliance in Food-Related Industries: International Comparison between Niigata Prefecture of Japan and Heilongjiang Province of China. *Studies in Regional Science*, 40(2):449-471 (in Japanese).
- Kuglin, F.A.; Hook, J.(2002). *Building, Leading, and Managing Strategic Alliances: How to Work Effectively and Profitably With Partner Companies*. American Management Association
- Maruyama, M. (2005). *Business Economics*. Tokyo, Yuhikaku (in Japanese).
- Porter, M.(1998). Clusters and Competition: New Agendas for Companies, Governments, Institutions. *On Competition*. Harvard Business School Press, pp.155-196.
- Odagiri, H. (2001). Nihon no Gijutsu-Kakushin ni okeru Daigaku no Yakuwari: Meiji kara Jisedai made.M Aoki, A Sawa, M, Daido. (ed). *Daigaku-Kaikaku: Kadai to Souten (University Reform)*. Toyo-Keiza Shinposha, pp.117-133 (in Japanese).
- Okamuro, H. (2009). *Gijutsu Renkei no Keizai Bunseki (Economic Analysis of Technological Alliance)*. Tokyo, Doyukan(in Japanese).
- OECD. (2007a). *Competitive Regional Clusters: National Policy Approach (OECD Reviews of Regional Innovation)*. Paris: OECD Publishing.
- OECD (2007b). Japan. OECD (2007a) pp.225-239.
- Otsuka, K.; Togo, K.; Hamada, K. (ed) (2010). *The Miraculous Growth and Stagnation of an Imitation-Oriented Economy: The Case of Post-War Japan*. Kyoto, Japan (in Japanese).
- Industrial Cluster Study Group (2005). *Industrial Cluster Study Report*.
In http://www.cluster.gr.jp/relation/data/pdf/Cluster_Kenkyu_houkoku_english.pdf
- SMEA (2003). *White Paper on Small and Medium Enterprises in Japan 2003*, Japan Small Business Research Institute.
- Swann, G.M.P. (2009). *The Economics of Innovation: An Introduction*, Cheltenham: Edward Elgar.
- Tokuoka, K. (2007). Regional Policy. H Yamada, K Tokuoka (ed) *Introduction to Regional and Urban Economics (2nd edition)*. Tokyo, Yuhikaku, pp.273-304 (in Japanese).

Wakabayashi, N. (2009). *Network Organizations: New Vision from Social Network Perspective*.
Tokyo, Yuhikaku (in Japanese).

Appendix Table 1. Transition of system concerning Industry-Government-University Cooperation in Japan

Year	Policy		Industrial Policy [] Regional Policy/National Land Policy
	Act	Policy ¹⁾	
1977			[3 rd National Land Total Development Program]
1983		A joint research systems such as National Universities etc. and private companies start.	Technopolis Act ³⁾
1987		The maintenance of the joint research center in National Universities begins.	[4 th National Land Total Development Program]
1988			Act for Promotion of Concentrated Establishment of Designated Types of Businesses Contributing to More Sophisticated Local Industrial Structures (Zunou Ricchi Act) ³⁾
1992			[Multi-Polar Patterns National Land Formation Promotion Act] Act on Comprehensive Development of Regional Core Cities with Relocation of Office-Work Function
1995	Science and Technology Basic Act		
1996-2000 1997		1st Science and Technology Basic Plan	Act on Temporary Measures concerning the Activation of Specific Regional Industrial Agglomerations
1998	Act on the Promotion of Technology Transfer from Universities to Private Business Operators (TLO)		Act for Facilitating the Creation of New Business ³⁾
1999	Act on Special Measures for Industrial Revitalization (Japanese Bayh-Dole Act)		[Grand Design for the 21st Century] Act on Special Measures concerning Industrial Revitalization
2000	Industrial Technology Enhancement Act (Deregulation of side job of teacher of National Universities)		Amendment Small and Medium Enterprises Basic Act
2001-2005 2001		2nd Science and Technology Basic Plan Industrial Cluster Project(METI)1 st term start Industry-university-government Cooperation Aid Project(MEXT)	
2002	Intellectual Property Basic Act The Outline of the National Intellectual Property Strategy	Knowledge CLUSTER Initiative (MEXT)1 st term start City Area Program (MEXT) The support of the university departure business creation begins.(METI)	[Act on Special Measures concerning Urban Regeneration] [Act on Special Zones for Structural Reform]
2003	National University Corporation Act	The maintenance of the intellectual property headquarters begins. (MEXT)	[Act on Priority Plan for Social Infrastructure Development]
2004		National Universities shifts to the independent administrative agency.	
2005		Food Industry Cluster Project (MAFF; ~2009) ²⁾	Act for Facilitating New Business Activities of Small and Medium-sized Enterprises [Local Revitalization Act] [National Spatial Planning Act]
2006-2010 2010	06 Amendment Basic Act on Education (The contribution to society is added to the academe's role.)	3 rd Science and Technology Basic Plan	
2006		Industrial Cluster Project (METI) 2 nd term start	
2007			Act on Formation and Development of Regional Industrial Clusters through Promotion of Establishment of New Business Facilities, etc.
	Innovation 25	Knowledge CLUSTER Initiative(MEXT) 2 nd term start	Act on Promotion of Business Activities by Small and Medium Sized Enterprises Utilizing Resources Derived from Local Industries
2008	Agriculture-Commerce-Industry Collaboration Act	Agriculture-Commerce-Industry Collaboration Project (METI/MAFF) Strategic Development Project for Industry-university-government Cooperation (MEXT)	
2010	New Growth Strategy (Cabinet decision)	Project of Developing Regional Innovation System (MEXT)	
2011-2016 2011		4th Science and Technology Basic Plan (Drawing Up) Industrial Cluster Project (METI) 3rd term	

Note 1. METI, MEXT, MAFF indicates the projects implemented by the Ministry of Economy, Trade and Industry(METI), Ministry of Education, Culture, Sports, Science and Technology(MEXT) and Ministry of Agriculture, Forestry and Fisheries of Japan(MAFF).

Note 2. Integrates it into Agriculture-Commerce-Industry Collaboration Project in fiscal year 2010.

Note 3. "Technopolis act" and "Zunou Ricchi Act" are succeeded along with "Act for Facilitating the Creation of New Business" in 1998 and abolished. And, "Act for Facilitating the Creation of New Business" is succeeded along with the enactment of "Act for Facilitating New Business Activities of Small and Medium-sized Enterprises" in 2005 and abolished.

Source: Added with Okamuro(2009, p.61) and Tokuoka (2007)