

## **Possibilities and Problems for the Regional Innovation in Japan\***

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**Abstract** : Under a knowledge-based economy, regional innovation policies have been treated as important regional policies. In this paper, the author attempts to argue the possibilities and problems for regional innovation in Japan. For this purpose, the author has investigated the development of industry-academy-government collaboration in Ube City which has been designated as one of a number of knowledge cluster projects by the National Government.

Ube City is a typical company town and the regional system had been characterized by the vertical relationship between a core company and its subcontractors. Since the late 1990s, the local national university has played an important role to promote cooperation with various types of enterprises, research institutions, and local governments. As such horizontal relationships have become more influential, it is necessary to overcome the gap in interest and knowledge base between the core company and the local university.

**Keywords** : industrial district, knowledge cluster, regional innovation system, regional policy, Japan

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### **1. Introduction**

Japan is currently undergoing a significant socioeconomic transformation. Globalization and structural-reform are regarded as the central motors to this transformation. Japan is also experiencing a rapid demographic change in the form of a declining birthrate and an aging population. Under

these circumstances, Japanese national land policy and industrial location policy have experienced an important turning point (Matsubara, 2006).

The Ministry of Land, Infrastructure and Transport revised the former Comprehensive National Land Development Act in 2005 and replaced the Comprehensive National Development Plans with the New National Land

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Sustainability Plan. The National Land Sustainability Plan is comprised of the “National Plan” and the “Wide-area Regional Plan”. The latter plan is planned in each regional block by mutual collaboration and cooperation of the central and prefecture governments, under appropriate divisions for each role.

Table 1 shows some important legislation, such as the Industrial Relocation Promotion Law and the Technopolis Act, have been repealed. Instead of such local supporting policies which led to the decentralization of factories, independence of the regional economy and enhancement of international competitiveness have been thought of as important policy. The Industrial Cluster Program and the law concerning establishing regional industrial clusters, these two policies which are focusing on the development of industrial agglomeration areas are now influential industrial location policies in Japan.

Under a knowledge-based economy, regional

innovation policies, such as the Industrial Cluster Policy and the Knowledge Cluster Policy, has been treated as important regional policies. Figure 1 shows the outline of the Knowledge Cluster Initiative by Ministry of Education, Culture, Sports, Science and Technology. In this Knowledge Cluster, the role of the university has been expected and the geographical scale of each designated area is narrower than those of the Industrial Cluster Projects.

In this paper, the author attempts to argue the possibilities and problems for regional innovation in Japan. The following section will indicate the framework and theoretical focal points of the regional innovation system. In the third section, the development of industry-academy-government collaboration in Ube City, which has been designated as a knowledge cluster project by the National Government, will be analyzed. The forth section will summarize the characteristics and issues on regional innovation in Japan.

Table 1. Changes in Regional Economic and Industrial Policy

<ul style="list-style-type: none"> <li>• Retreat from promoting decentralization</li> </ul>
Industrial Relocation Promotion Law* (since 1972) → (repealed in 2006) High-tech Industrial Zone Promotion Act* (since 1983) → (repealed in 1999) Knowledge-intensive Industry Location Act* (since 1988) → (repealed in 1999)
<ul style="list-style-type: none"> <li>• Supporting development of regional competitive industries and enterprises</li> </ul>
Industrial Cluster Program* (since 2001) Small and Midium Enterprises New Business Activity Promotion Law* (since 2005) The Law Concerning Establishing Regional Industrial Clusters* (since 2007)
<ul style="list-style-type: none"> <li>• Regional innovation policy</li> </ul>
Industrial Cluster Policy* (since 2001) Knowledge Cluster Policy** (since 2002)

Note: \* enacted by Ministry of Economy, Trade and Industry

\*\* enacted by Ministry of Education, Culture, Sports, Science and Technology

Source: Ministry of Economy, Trade and Industry.

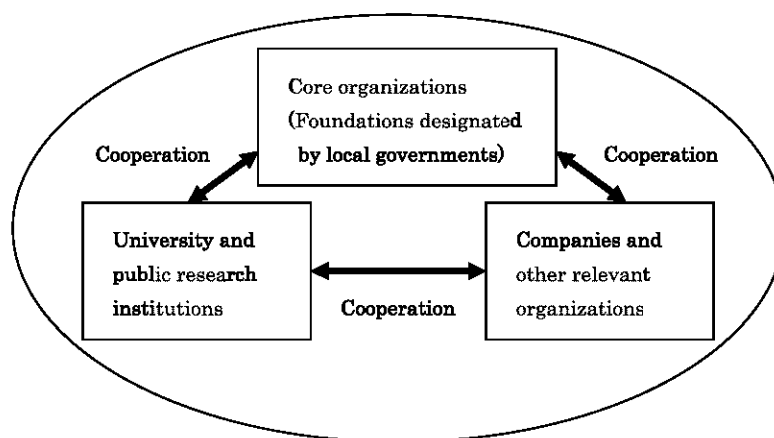


Figure 1. Structure of the Knowledge Cluster Initiative

Note: Local governments make their own project plans and MEXT (Ministry of Education, Culture, Sports, Science and Technology) selects areas and assists core organizations.

Source: Cluster Brochure 2006, Ministry of Education, Culture, Sports, Science and Technology.

## 2. Theories of the Regional Innovation Systems

In his recent paper entitled “Spatial Knowledge Flows and Regional Innovation Systems”, the author tried to clarify the meaning, characteristics and problems on regional innovation studies and point out the necessity of detail empirical studies considering knowledge flows and spaces of innovation (Matsubara, 2007).

Figure 2 shows the main structure of regional innovation system. This system is constructed by the use of knowledge, resource, human capital flows and interactions between knowledge application and an exploitation subsystem and knowledge generation and diffusion subsystem assisted by regional innovation policy.

The idea of a regional innovation system, which was advocated by Professor Phil Cooke in Wales, has been adopted as regional policy in the

European Union in the 1990s. And many empirical studies on the regional innovation system have been conducted (Cooke, P., Heidenreich, M. and Braczyk, H-J.eds., 2004). However, regional innovation strategy in Europe has faced with some criticism and has been reconsidered in recent years (Tdtling, F. and Trippl, M., 2005).

One of a number of alternative approaches is the Innovation-related knowledge flows in European industry (KNOW) project (Caloghiron, Y. et.al.eds.,2006). European researchers show the complexity of knowledge flows and are trying to compare those knowledge flows in European countries.

As for theoretical discussion, the relationship between the nature of knowledge and knowledge flow is becoming one of the focal points. Three different debates regarding to the knowledge flow are summarized as follows.

First is responded to tacit knowledge and

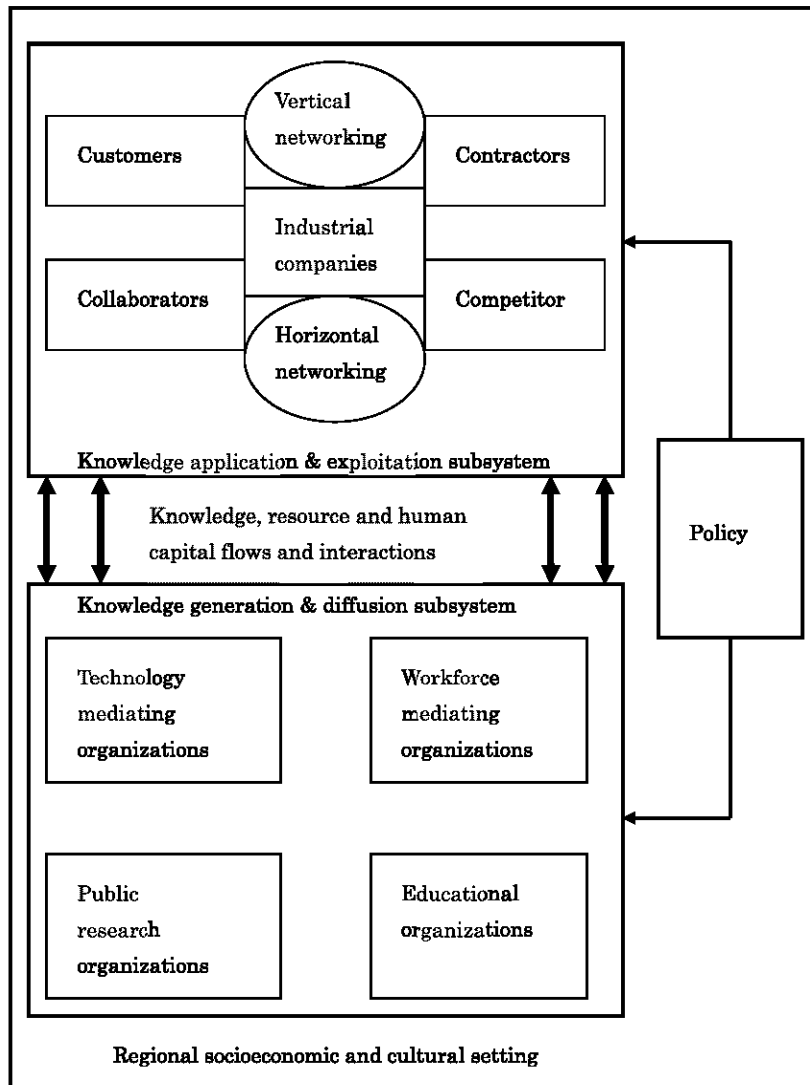


Figure 2. Main structure of regional innovation system

Source: Based on Tödting and Tripp(2005) p.1210.

geographical proximity. Maskel and Malmberg (1999) argue that proximity between firms plays an important role in interactive learning processes and that knowledge creation is supported by the institutional embodiment of tacit knowledge useful for particular classes of activity.

Second is related to local buzz and global pipeline. Bathelt et al. (2004) refer to two kinds of knowledge flows as local buzz and global pipelines following Stoper and Venables (2004). Buzz arises from face-to-face contacts and facilitates the circulation of information in a local

Table 2. Synthetic vs. analytic knowledge base

Synthetic	Analytic
Innovation by application or novel combination of existing knowledge	Innovation by creation of new knowledge
Importance of applied, problem related knowledge (engineering) often through inductive processes	Importance of scientific knowledge often based on deductive processes and formal models
Interactive learning with clients and suppliers	Research collaboration between firms (R&D department) and research organizations
Dominance of tacit knowledge due to more concrete know-how, craft and practical skill	Dominance of codified knowledge due to documentation in patents and publications
Mainly incremental innovation	More radical innovation

Source: Asheim and Gertler (2005).

community. On the other hand, pipelines refer to channels of communication used in distant interaction between various actors, such as firms and research institutions. Gertler and Wolfe (2006) pointed out that the precise mix of the global and local knowledge flows present in individual clusters must of necessity be indeterminate.

Third is based on the new division of knowledge base. Table 2 shows a comparison of synthetic and analytic knowledge bases. Regarding to the Synthetic knowledge base, the innovation takes place mainly through the application of existing knowledge. This occurs in response to the need to solve specific problems coming up in the interaction with clients and suppliers. Industry examples include plant engineering, and specialized advanced industrial machinery. R&D is less important and tacit knowledge seems to be more important. This leads to a rather incremental innovation.

On the other hand, as for the analytical knowledge base, scientific knowledge is highly important. Examples are biotechnology and information technology. Companies have their

own R&D departments and University-industry links are important. Knowledge generation is based on the application of scientific principles and methods and knowledge processes are more formally organized. Knowledge application is in the form of new products or processes and there are more radical innovations.

Using this knowledge-based distinction, Gertler and Wolfe (2006) tried to classify 13 industrial clusters in Canada. It is necessary for the development of the regional innovation theories to accumulate and compare many empirical studies in various countries.

### 3. Regional Innovation in Japan's Industrial Districts: A Case in Ube City

#### 1) The outline of Ube

Ube City is a local city with a population about

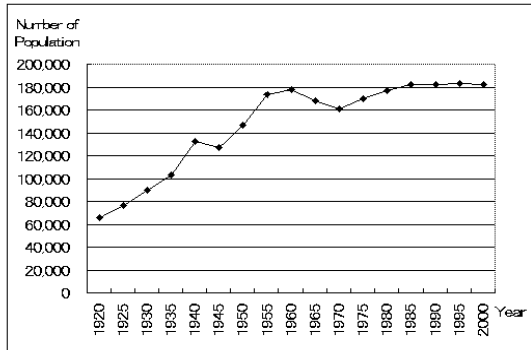


Figure 3. Population change in Ube City  
Source: Sotohebo(2006).

18 thousands in 2005 and is located in the southwest edge in Honshu Island. It is known as a company town of Ube Industries Ltd., Ube Kosan, which was established by local people as an associational organization named Ube Kyodo Gikai (Sotohebo, 2006). This point differs from other company towns, where the external large enterprise like Mitsubishi and Mitsui have dominant power in the regional economy and society.

It is effective to take into consideration the social economic history in order to understand the regional innovation system in Ube. The first stage is during the pre-war period when coal mining and related industries were rapidly emerging and major companies, such as Okinoyama Coal Mine, Ube Shinkawa Iron Works, Ube Cement Production, and Ube Nitrogen Industry, had been established.

The second stage is the period of the 1960s and 1970s. In spite of the high economic growth period in total Japan, Ube faced a severe recession because of the declining coal mining industry. This change is shown in Figure 3 and Figure 4. In Figure 3 the population steeply increased from 1920 to 1960 because of the growth of industries such as coal mining, cement, and chemical. But in the 1960s, all coal mine shafts were closed because of cheaper imported coal (Figure 4). The chemical industry also converted from coal chemicals into petrochemical or fine chemical products. The population has been maintained by the growth of service industries and the fusion of surrounding

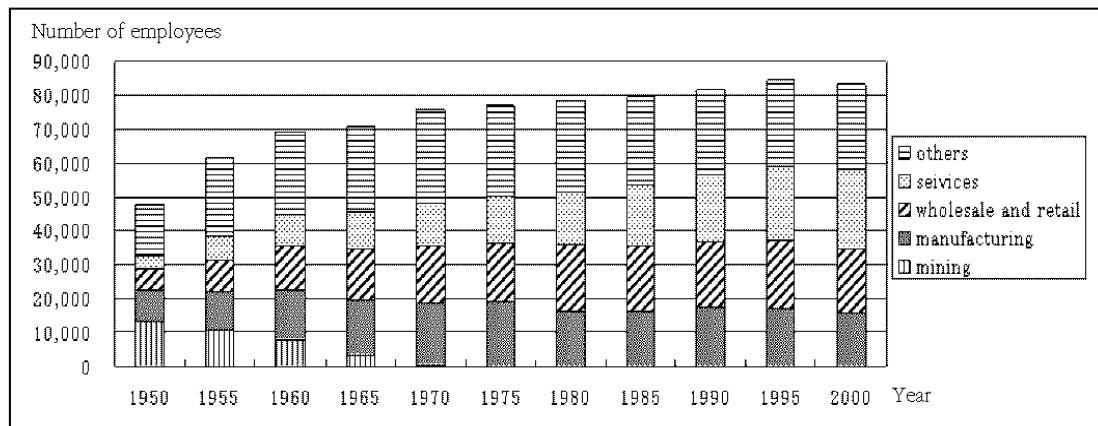


Figure 4. Changes in industrial structure in Ube City  
Source: Sotohebo(2006).

small towns.

Figure 5 shows the distribution of major factories in Ube City and its surrounding area. We can see two different kinds of industrial area. One is the coastal and older industrial area. In this area, chemical, cement and grass plants, such as the main plants of Ube Industries and subcontractor's plants, are located. The other one is inland and in a newer area. In this area, there are industrial estates which were constructed in the 1980s under the technopolis project and electronics factories like NEC Yamaguchi were established.

Ube Industries Ltd. is now a major chemical company and has many establishments in Japan. It also produces a wide range of products such as cement, building materials and aluminum. It established a second head office in Tokyo in 1963

and transferred substantial head office function from Ube to Tokyo . And new plants in Chiba and Sakai have been established in the 1970s to supply petrochemical products to consumers in the Tokyo and Osaka Metropolitan areas.

However, it would be wrong to say that “Ube Industries had abandoned Ube City”. Ube City is still important for Ube Industries and factories in Ube City still now play important roles such as research and development and new product introduction.

## 2) Regional innovation in Ube

In order to clarify the recent development of regional innovation in Ube City, it is important to keep in mind the historical background. The first

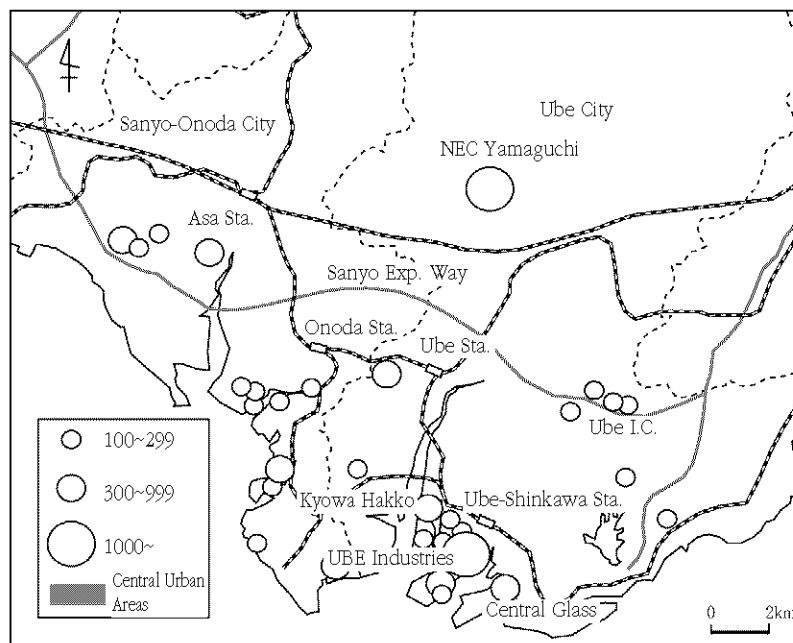


Figure 5. Distribution of major factories in Ube region  
 Source: Sotohebo(2006)

of these is the early establishments of institutions of higher education as a result of Ube City's eager search for university level institutions. Ube Higher Technical School and Yamaguchi Prefectural Medical School were established in 1938 and 1944 respectively, and they have been reorganized as the Department of Technology and Medical Department in Yamaguchi University.

Second is the 1950s anti-air pollution movement which was the first case of Industry-Academy-Government collaboration. The department of sanitation in Yamaguchi Prefectural Medical School conducted systematic enquiry in order to advance measures against air pollution under a request from the Ube city office. Based on the results of the investigation, the municipal office enacted an environmental control act and the enterprise attached a dust-collecting apparatus.

Third is Ube technopolis project from 1984 to 2000. Like other technopolis areas, the achievement ratio regarding to new industrial location was low, but in this period, some important R&D facilities, such as science university branch, mechatronics center and industrial technical center were established, and these facilities are now becoming important elements for regional innovation system in Ube(Figure 6).

However, Industry-Academy-Government Collaboration has been accelerated since 1997. In 1997 a study group of the collaborative research center was organized within Yamaguchi University. Figure 6 shows the collaborative organization of Yamaguchi University. As shown in Figure 7 (a), the component ratio of local companies has increased since 1995. But the main partner is large enterprises. The rate of small and medium seized

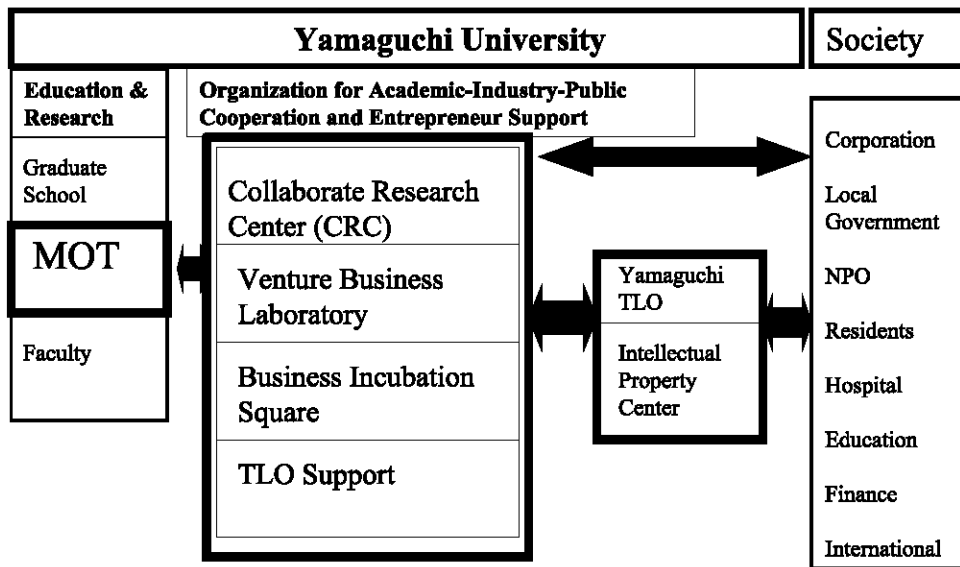


Figure 6. Collaborative organization of Yamaguchi University

Source : "Inter Lab" 08/2005, Yamaguchi University.



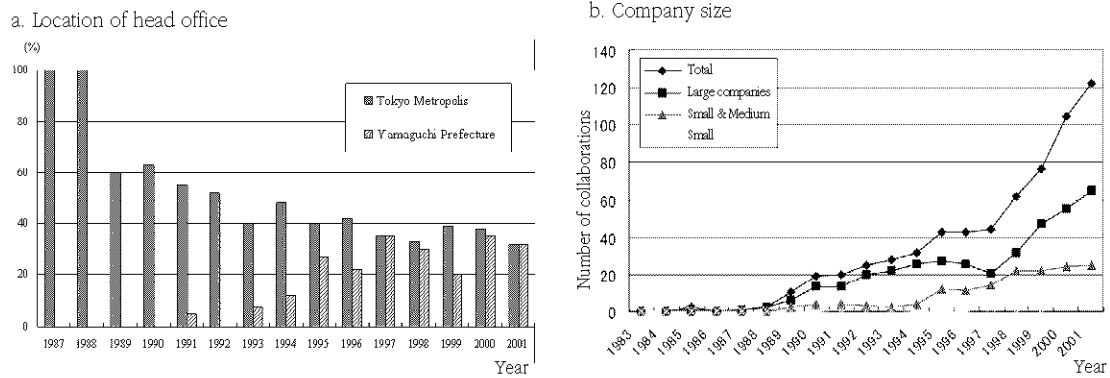


Figure 7. Characteristics of collaborative companies  
 Source : National Institute of Science and Technology Policy (2003).

companies is still small in Figure 7 (b).

Figure 8 shows the result of social network analyses using the list of participating companies and academic organizations related to the knowledge cluster initiative project in Ube by the Ministry of Education, Science and Technology. The strong tie between the Medical Department

and Department of Technology of Yamaguchi University make an important node in this figure. The third node is made by Choshu Sangyo, which is a local electronics company in Sanyo-Onoda City, Ube's neighboring city. Other influential companies, such as Mitsubishi and Matsushita Electric Works, also play important roles. It is also

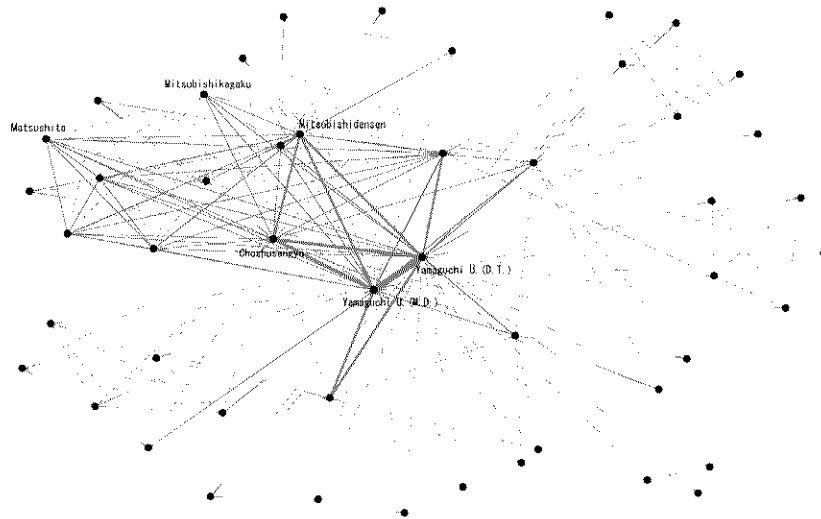


Figure 8. A result of social network analysis in Ube  
 Source: YOKURA, Y. based on data about Study Groups of Collaborative Research.

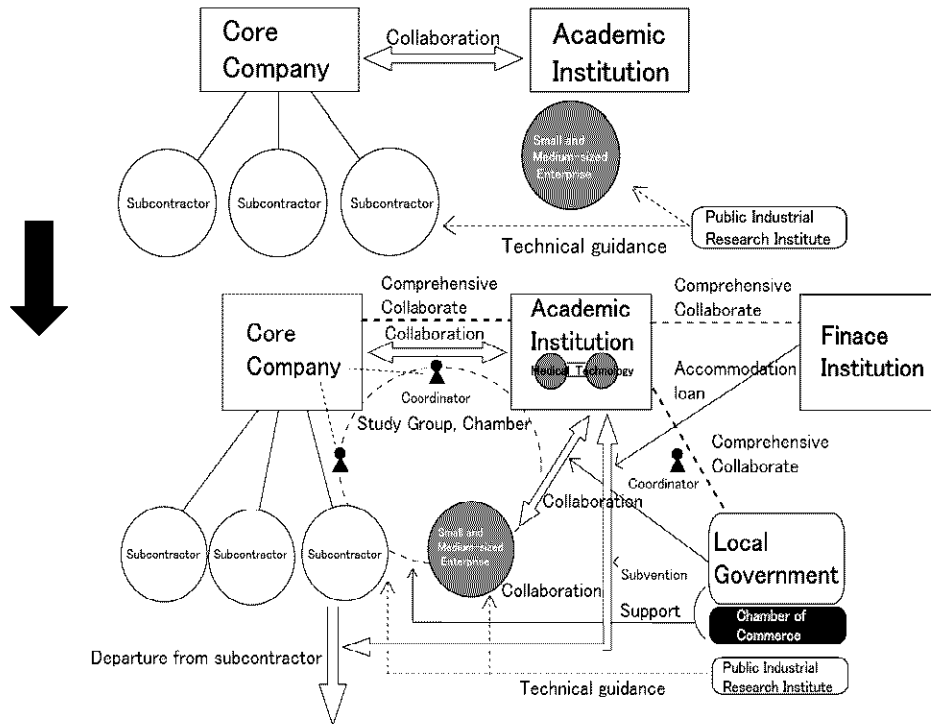


Figure 9. Changing relationships among actors in Ube

Source : Sotohebo(2006).

important to notice that Ube’s core manufacturing company, Ube Industries, is not positive in this project. The main research theme of Academia is white LEDs and its application to medical devices and equipments. On the other hand, Ube Industries has a strong interest on environmental protection. There is a gap which is hard to fill.

Figure 9 shows changing relationships among actors in Ube. Traditionally like other company towns, Ube had been characterized by vertical relationship between core company and subcontractors. Since the late 1990s, the presence of horizontal relationships among academic institutions, local small and medium sized

enterprises, local banks, and local governments has increased.

Of course, it is too early to declare that the former vertical subcontracting system has been transformed by a newly emerging regional innovation system, but it is clear that an important change has occurred in the local city Ube.

#### 4. Concluding Remarks

In this paper, the author has reviewed recent theoretical studies on the regional innovation and

investigated the development of industry-academy-government collaboration in Ube City. Three points are summarized as important implications through the case study.

First, it is a key issue how to overcome the gap of interests and knowledge base between the core company and the local university. Most large companies have developed multi-established organizations in Japan and overseas. They have various R&D facilities and construct in-house innovation system. However, in recent years it is becoming indispensable to combine various knowledge assets. And it is desirable for the development of the regional economy to use the absorptive capacity of the core company and commercialize research results in the local area.

Second, revitalizing central urban areas and urban space renovation is a very important task. Like other local cities in Japan, Ube City is suffering from a decline of central urban areas with the decrease of population and the value of commercial sales. It is desirable to improve urban functions and to construct comfortable urban space in order to foster human resources and recruit personnel for R&D.

Third, the regional innovation system consists of various components and is realized on a historical base. It is necessary to accumulate detailed empirical studies, taking into consideration the significance of regional economic history, culture and society. It is also important for economic geographers to exchange experiences from empirical studies, to develop theoretical insight on regional innovation systems, and to provide perspectives on regional policy.

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## 日本における地域イノベーションの可能性と課題

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### 日本語抄録

知識経済の下で、地域イノベーション政策は、重要な地域政策として取り上げられてきた。本研究では、日本における地域イノベーションの可能性と問題点について議論することにした。そのために、ここでは政府の知的クラスター創成事業の1つに指定された宇部市を取り上げ、産学官連携の発展を国討することにした。

宇部市は、典型的な企業城下町で、中核企業と下請企業との垂直的な関係によって、地域システムが特徴づけられてきた。1990年代後半以降、さまざまなタイプの企業や試験研究機関、地方自治体との協力関係を発展させていく上で、地方国立大学の役割が重要となってきた。こうした水平的な関係が影響力をもつようになるにつれ、中核企業と地方大学との關心や知識ベースの懸隔を埋めることが必要になってきている。

### 主要語

産業地区, 知識クテスター, 地域イノベーションシステム, 地域政策, 日本

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