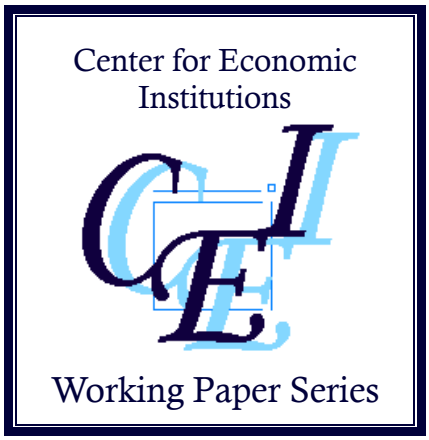
Center for Economic Institutions

Working Paper Series

No. 2011-7

"Management of Cluster Policies: Case Studies of Japanese, German, and French Bio-clusters"

Hiroyuki Okamuro
Junichi Nishimura



Institute of Economic Research
Hitotsubashi University
2-1 Naka, Kunitachi, Tokyo, 186-8603 JAPAN
http://cei.ier.hit-u.ac.jp/English/index.html
Tel:+81-42-580-8405/Fax:+81-42-580-8333

Management of cluster policies:

Case studies of Japanese, German, and French bio-clusters

October 2011

Hiroyuki Okamuro (Hitotsubashi University)
okamuro@econ.hit-u.ac.jp
Junichi Nishimura (Hitotsubashi University)
b111086k@r.hit-u.ac.jp

Abstract
This paper provides a detailed comparison of the following five cases of Japanese and European clusters in biotechnology: (1) Kobe Biomedical Innovation Cluster (KBIC) in Kobe (Japan), (2) Fuji Pharma Valley Cluster in Shizuoka Prefecture (Japan), (3) BioM Biotech Cluster in Munich (Germany), (4) BioRegion Rhine-Neckar in Heidelberg (Germany), and (5) Alsace BioValley Cluster in Strasbourg (France). We pay special attention to the cluster policy and its management by each region's core cluster management organization. Information on the focal clusters and the management of cluster policies has been obtained through interviews with the cluster directors and core staff in 2010 and 2011. We find several similarities and differences among the five cases of Japanese and European clusters. We also discuss how the management of cluster policies by the core management organizations may be related with the performance of regional clusters.

Keywords: management, cluster policy, regional cluster, R&D, biotechnology, international comparison
JEL classification codes: O32, O38, R58

1. Introduction

Industrial and intellectual clusters have been attracting much attention from practitioners, policymakers, and academia. Such high-tech clusters are expected to contribute to regional innovation and development, especially by promoting collaboration and knowledge spillover among research organizations and local firms[1].

To date, most studies on clusters comprise detailed case studies on specific cluster areas such as Silicon Valley (Saxenian 1994; Porter et al. 2001). Several studies have also been made on cluster policies in different countries (Borras and Tsagdis [2008] for several European countries; Dohse [2000, 2007] for Germany), but only a few of them empirically investigate the effects of cluster policies on participant firms using micro data (Falck et al. [2010] for Germany; Nishimura and Okamuro [2011a, 2011b] for Japan)[2]. The management of cluster policies by cluster management organizations is also an important issue and one that is expected to affect the performance of each cluster (Council on Competitiveness 2007; Jungwirth et al. 2011). However, to the best of our knowledge, few in-depth studies have been conducted on the management of clusters by management organizations on the basis of comparisons between clusters in various national contexts.

Thus, this paper provides a detailed comparison of the following five cases of Japanese and European clusters in biotechnology: (1) Kobe Biomedical Innovation Cluster (KBIC) in Kobe (Japan), (2) Fuji Pharma Valley Cluster in Shizuoka Prefecture (Japan), (3) BioM Biotech Cluster in Munich (Germany), (4) BioRegion Rhine-Neckar in Heidelberg (Germany), and (5) Alsace BioValley Cluster in Strasbourg (France). We selected these cluster regions for three reasons. First, these are the representative intellectual clusters of biotechnology and life science in their respective countries. Second, they have all received (and are still receiving) public subsidy from their national (federal) governments. Third, they all have distinct core organizations for the management of cluster policies.

In this research, we focus on biotechnology clusters for the following reasons.

---

[1] Many previous studies have suggested that geography matters in determining the innovative capability (e.g., Jaffe et al. 1993; Anselin et al. 1997; Acs et al. 2002; Fritsch and Franke 2003; Dahl and Pedersen 2004; Owen-Smith and Powell 2004; Audretsch et al. 2005; Rondé and Hussler 2005; Furman et al. 2006; Squicciarini 2008; Aldieri and Cincera 2009; Abramo et al. 2011).

[2] According to Okubo and Tomiura (2010), Duranton (2011), and Martin et al. (2011), there is a huge amount of literature on the economies of agglomeration (Rosenthal and Strange 2004; Martin et al. 2008) and the clustering process/mechanism in an established cluster (Pyke et al. 1990; Saxenian 1994; Markusen 1996; Gordon and McCann 2000; Maskell 2001; Martin and Sunley 2003; Hospers et al. 2009). Unfortunately, as Yang et al. (2009) and Martin et al. (2011) indicate, there are few empirical studies that examine the condition of the effective organization of cluster policies.

First, the field of biotechnology is regarded as representative of high-tech industries in Japan, Germany, and France, countries with a rapidly aging population. Further, biotechnology is characterized as one of the science-based industries in which formation of networking between industries and universities is especially important for innovation (Mayer-Krahmer and Schmoch 1998). National cluster policies toward biotechnology are therefore emphasized in these countries. Moreover, it is desirable to focus on a specific technological field so that we may exclude differences in cluster management policies due to technological differences.

We pay special attention to the cluster policy and its management by the core cluster management organization in each region[3]. More concretely, we address the research questions of how cluster management organizations prepared for the application for cluster competition, selected research consortia members, and allocated R&D subsidy. Further, we are interested to find out how project monitoring and project evaluation are done in each region. We also provide information on the types of support measures offered by the cluster management organizations and their motivation for coordination with other cluster projects. We also discuss how the management of cluster policies by the core management organizations may be related with the performance of regional clusters.

We obtained information on the focal clusters and the management of cluster policies by conducting interviews with the focal cluster directors and core staff at Kobe in December 2010, at Munich, Heidelberg, and Strasbourg in February 2011, and at Shizuoka in July 2011, and from the websites of the related ministries and focal cluster management organizations, listed after the references.

The remainder of this paper is organized as follows. Section 2 reviews the national cluster policies of Japan, Germany, and France. Section 3 presents an overview of the regional characteristics of each cluster, including historical review and regional potential. Section 4 compares in detail the management of cluster policies by the core management organizations in each cluster region (focusing on the application process for cluster competition, management and evaluation of R&D projects, and support programs). In Section 5, we discuss how the management of cluster policies may be related to the performance of regional clusters. We summarize and conclude our paper in Section 6.

[3] As indicated in McDonald et al. (2006), no general consensus has been achieved yet on the spatial, technological, and industrial structure as well as the institutional characteristics of industrial clusters. In this paper, we do not go into further details of cluster typology, but examine the cluster policies as defined by each country. Cluster policies are regarded as regional, industrial, or technological policies and implemented as targeted subsidization or networking support under any of these aspects.

2. National Cluster Policies in Japan, Germany, and France

This section presents an overview of the cluster policies in Japan, Germany, and France. Specifically, we compare the selection procedure in cluster competition and the degree of competition.

2.1. Cluster policy in Japan

Japan has two focal national cluster programs (see Table 1 for more details): the Industrial Cluster Project (ICP) by the Ministry of Economy, Trade and Industry (METI) since 2001[4] and the Knowledge Cluster Initiative (KCI) and the City Area Program by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) since 2002. The MEXT programs were reorganized and integrated into the Regional Innovation Cluster Program in 2010.

A knowledge cluster, as defined by MEXT, is a system for technological innovation. Organized by local initiatives including universities and other public research institutes with original R&D plans, the system also stimulates the participation of private companies. The selection procedure of KCI is characterized as a top-down process with limited competition. MEXT selected 30 potential regions in which core research institutes and industrial infrastructure for specific technological fields exist, and invited local organizations to submit proposals for a business plan of the industrial cluster including cooperative R&D projects. Based on the proposals, MEXT finally selected 12 regions (including KBIC) to be supported by the first-round KCI from 2002 to 2006. The total KCI budget for the period 2002–2009 was around 68.5 billion yen. MEXT changed their rules since 2007 (the beginning of the second round) to enable the government induce local authorities to partially finance R&D projects.

The City Area Program is a minor version of KCI, with a smaller cluster area and smaller budget. Unlike KCI, the selection procedure of the City Area Program, at least in the first round, was characterized as a competitive bottom-up process[5]. Each target area obtains financial support from MEXT for three years. Fifty-nine areas were

[4] See Nishimura and Okamuro (2011a, 2011b) for more details of this program. The program completed the second period in 2010. In the third and current period since 2011, in principle, the government no longer provides direct financial support to the individual industrial clusters; each cluster organization has to finance its support measures by itself. However, the government will continue its financial support to specific technology areas (e.g., biotechnology) that are especially important from the viewpoint of national strategy.

[5] For the moment, no public information is available on the selection process of this program. We obtained related information in a telephone interview with a MEXT bureaucrat. He told us that at the beginning, it was not easy to collect many proposals so that in fact the competition for selection may not have been hard.

supported in the first round (2002–2006), of which 22 obtained support twice: relatively well-performing areas have a good chance of being selected later to the higher category "development stage" with a doubled budget. Fuji Pharma Valley is one of the nine cluster areas supported by the City Area Program from 2004 to 2006 (general stage), and one of the ten areas supported from 2007 in the development stage. The total budget of the City Area Program for the period 2002–2006 is estimated to be around 20 billion yen. MEXT changed their rules since 2006 to enable the government subsidize up to 50% of the total budget. The other half should be financed by local authorities and others.

KBIC, one of the most popular bio-clusters in Japan, has received public support from both ICP and KCI (but mainly from KCI). The core cluster management organizations in KBIC are the City of Kobe and the Foundation for Biomedical Research and Innovation (FBRI). Fuji Pharma Valley is an interesting case of biomedical cluster initiatives that has been supported from its beginning by the City Area Program of MEXT. Its core cluster management organization is the Pharma Valley Center (PVC), which belongs to a public foundation for industrial development.

2.2. Cluster policy in Germany

In Germany, BioRegio, enacted in 1996, was the first national program with competition of proposals for developing innovation networks[6]. Both the Munich Biotech Cluster and BioRegion Rhine-Neckar were selected as the regional cluster projects and supported by BioRegio for five years. Following BioRegio, there were several cluster policies, mainly passed by the German Federal Ministry of Education and Research (BMBF), such as BioProfile, BioFuture, EXIST, and InnoRegio[7]. This paper focuses on the most recent national cluster policy, "Spitzencluster-Wettbewerb" (Leading-Edge Cluster Competition), operational since 2008.

The purpose of Spitzencluster-Wettbewerb is to lead Germany to the top of the league of technologically advanced nations. The selection procedure of this national cluster competition is characterized as a bottom-up process with strong competition. For example, only five regions were selected from among 38 applicants in the first-round cluster competition by an independent jury (one bio-cluster in five regions). The total budget of Spitzencluster-Wettbewerb for the 2008–2014 period is around 400 million euro.

BioRegion Rhine-Neckar was selected in the first round of the

[6] See Dohse (2000, 2003) for more details of the BioRegio project.
[7] See Eickelpasch and Fritsch (2005) for more details of these projects.

Spitzencluster-Wettbewerb program in 2008. The core cluster management organization in BioRegion Rhine-Neckar is BioRN Cluster Management GmbH (hereafter BioRN). The Munich Biotech Cluster won the second-round competition, and has received public support since 2010 for the M4 project for personalized medicine and targeted therapeutics. The core management organization of this cluster project is BioM Biotech Cluster Development GmbH (hereafter BioM).

2.3. Cluster policy in France

In France, the Local Productive Systems (LPS) issued in 1998 can be seen as the first national cluster policy[8]. In 2005, the national cluster program "Pole de Competitivite" (Competitive Cluster) came into operation. This is a more ambitious and costly cluster policy than the LPS, and a quarter of LPS projects have been transformed into the Pole de Competitivite.

The selection procedure of the Pole de Competitivite program can be described as a bottom-up process with limited competition. In the first-round cluster competition, the French government selected not only regional clusters as "competitive clusters" (67 out of 105, including Alsace BioValley as one of the eight selected bio-clusters), but also research projects in each regional cluster. Some members in a cluster collaborate with members of other clusters, and such collaboration is often supported by the cooperation of cluster organizations in both regions. In this sense, competition among clusters in France may be regarded as less intensive than in Germany. The total budget of the Pole de Competitivite program for the period2006–2011 is around 3 billion euro.

Alsace BioValley Cluster is one of the eight regional life science clusters that received R&D subsidy under the Pole de Competitivite program. The core cluster management organization in Alsace BioValley Cluster is Alsace BioValley.

3. Overview of Regional Characteristics

This section presents, generally, a brief history (especially, the origin of the clustering process) of each cluster region. Then, we discuss the regional potential with regard to the number of firms and variety of public organizations.

3.1. Kobe Biomedical Innovation Cluster

The concept of KBIC was developed in the middle of the 1990s after a major earthquake occurred in Kobe, to induce a shift toward a high-tech cluster of medical and

[8] See Martin et al. (2011) for more details of the LPS projects.

pharmaceutical industries. In 1998, the City of Kobe set up a committee to forge the plan of KBIC, in which Prof. Imura, a member of the National Council for Science and Technology Policy, played an influential role. He also became the president of FBRI, a core cluster management organization established in 1998.

KBIC is located on a small artificial island close to the city center of Kobe and also very close to the new Kobe Airport. Today, there are approximately 200 cluster firms in KBIC. Also, some large firms are active in the cluster. For example, a subsidiary of a big pharma company plays the role of coordinator. Further, thirteen public research institutes and incubators[9] and five universities[10] are located there. The new Central Municipal Hospital and a next-generation supercomputer will also be set up in the near future.

3.2. Fuji Pharma Valley Cluster

The concept of the Fuji Pharma Valley cluster was developed in 2001 in preparation for opening a new public hospital, the Shizuoka Cancer Center. Shizuoka Prefecture intended to establish a high-tech cluster of medical and pharmaceutical industries around this top-level hospital, involving local small businesses. In 2002, the Fuji Pharma Valley Initiatives was started with the First Strategic Plan and the opening of the Cancer Center. Indeed, a unique feature of this cluster is that it is centered at a public hospital and based on its clinical needs. In 2003, the Pharma Valley Center (PVC) was established as the local cluster management organization. PVC belongs to the Shizuoka Industry Creation Organization, a public foundation that supports start-up activities as well as business innovation and R&D by small firms in this prefecture. The Fuji Pharma Valley Initiatives is headed by Ken Yamaguchi, the president of the Shizuoka Cancer Center.

The Fuji Pharma Valley Cluster, one of three high-tech clusters promoted by the prefecture government, is located at the foot of Mount Fuji in the eastern part of Shizuoka Prefecture. The cluster area comprises several municipalities, including Mishima, Numazu, and Nagaizumi. There are no universities located in the cluster area, except the Numazu National College of Technology[11]. The main research institutes in

[9] FBRI, RIKEN Center for Developmental Biology, Translational Research Informatics Center, Business Support Center for Biomedical Research Activities, Kobe Biotechnology Research and Human Resource Development Center, Kobe Medical Device Development Center, Kobe Healthcare Industry Development Center, RIKEN Center for Molecular Imaging Science, Kobe International Business Center, Kobe KIMEC Center Building, Kobe Incubation Office, Kobe Hybrid Business Center, and International Medical Device Alliance.

[10] Konan University, Kobe Gakuin University, Kobe Shukugawa Gakuin University, Kobe Women's University, and Kobe University of Health Sciences.

[11] This is one of the Koutou Senmon Gakkou (Kou-Sen), national or public technical colleges, that

this cluster area are the research wing of the Shizuoka Cancer Center in Nagaizumi and the National Institute of Genetics in Mishima, which cooperate with some universities located outside, such as the Tokyo University of Agriculture and Technology, the Tokyo Institute of Technology, Waseda University, and Shizuoka University. Approximately 200 cluster firms, mostly small manufacturers, are located in the Fuji Pharma Valley Cluster.

3.3. BioM Biotech Cluster

The BioM Biotech Cluster is located in Martinsried, near Munich, where several research institutes in life sciences have concentrated since the 1970s. Spin-offs of researchers from a public organization of gene research have formed a biotechnology cluster since the late 1980s. In the middle of the 1990s, an incubation facility (The Innovation and Startup Center for Biotechnology: IZB) started with 30 firms; this accommodates 60 firms today. In 1996, this cluster was selected by the BioRegio project for 5 years. BioM was established in 2006 as the core management organization of this cluster to promote marketing, networking, and coordination. Prof. Domdey, its current managing director, has played the leading role in the cluster management since the 1990s.

Since 1997, the number of bio-related start-ups in the BioM Biotech Cluster has increased from 31 to 120. More than 400 university-industry alliances have been achieved so far. Today, approximately 350 cluster firms (including 120 biotechnology start-ups) are located in this cluster. Although large firms are on the whole not active in clusters, several large firms such as Roche Diagnostics participate in the M4 Project as consortium members. Famous universities (Ludwig-Maximilians-Universität and Technische Universität München) and two university hospitals are located in the area. Further, three Max Planck Institutes and another national research institute (Helmholtz Center) play an important role in activating the cluster. A large incubator (IZB) supports start-ups. The Court of Justice for intellectual property right and the German and EU patent offices are also located in the proximity.

3.4. BioRegion Rhine-Neckar

The BioRegion Rhine-Neckar ranges over the three federal states of Baden-Wuerttemberg (Heidelberg, Mannheim), Rheinland-Pfalz (Ludwigshafen), and Hessen (Darmstadt). Despite having such a cross-state range, the association defines

---

integrate the courses of high schools (three years) and junior colleges (two years). Thus, Kou-Sens are comparable to junior colleges rather than universities.

itself as a biotechnology cluster with biotech companies located within a radius of 30 km. Traditionally, this cluster area has been a core of the chemical industry and life science research in Germany, centered at the University of Heidelberg.

The BioRegion Rhine-Neckar cluster was supported by BioRegio subsidy from 1996 to 2000. To execute this project, the BioRegionRhein-Neckar-Dreiecke.V. (BioRN association: today, BioRN Network) was founded in 1996. Further, The BioRN association set up the BioRN Cluster Management GmbH (BioRN) in 2008 to prepare for the application for the Spitzencluster-Wettbewerb. Dr. Tidona, the current managing director of BioRN Cluster Management GmbH, was scouted for the preparation on account of his expertise in bio-start-ups, venture capital, and consulting business.

Approximately 200 firms (including 77 biotechnology start-ups) and three big pharma companies (Roche in Mannheim, Merck in Darmstadt, and Abbott in Ludwigshafen) are located in the BioRN cluster. Famous universities and public research institutes are also located: the University of Heidelberg (with the university hospital), the University of Mannheim for Applied Sciences, Deutsches Krebsforschungszentrum (German Cancer Research Center) (DKFZ), the European Molecular Biology Laboratory (EMBL), Max-Planck-Institute of Medical Research, Heidelberg Institute for Theoretical Studies (HITS), Heidelberg Institute for Stem Cell Technology and Experimental Medicine (HI-STEM), and the National Centre for Tumor Diseases, Heidelberg (NCT).

3.5. Alsace BioValley Cluster

The Alsace BioValley Cluster is a member of the Trinational Biovally, which includes besides Alsace the southern part of Baden in Germany around Freiburg and the northwestern part of Switzerland around Basel. The concept of the BioValley cluster took shape in 1996 with the support of the INTERREG II project of the EU Commission. The INTERREG project, which was started in 1991, aimed to promote its network beyond the boundaries of the EU countries. By receiving public support from the INTERREG, the Alsace BioValley was founded in 1998 as a central office for managing the Trinational BioValley. It cooperates with the BioValley Deutschland e.V and the BioValley Basel as members of the Trinational BioValley.

There are approximately 390 firms in life sciences, including big pharma companies (1/3 in drug and 2/3 in medical engineering), in the Alsace BioValley cluster. In general, large firms are not interested in the support programs of Alsace BioValley. Some big pharma companies are interested only in scouting and the education that is provided especially in close cooperation with Strasbourg University. However, some

large firms in Alsace actively participate in the cluster management from the viewpoint of regional contribution. Strasbourg University and approximately 20 public research institutes are located there.

In the Trinational Biovally area, there are approximately 600 cluster firms (350 biotechnology- and 250 medical devices-related firms) and famous research institutions such as the University of Freiburg in Breisgau and the University of Basel. Forty percent of big multinational pharma companies are located in the Trinational BioValley area, especially around Basel.

4. Comparison of the Management of Cluster Policies

In this section, we compare the management of cluster policies by the core organizations in five biotechnology clusters with regard to the application process for the national cluster competition, management, and evaluation of R&D projects; support programs for cluster members; and coordination with other cluster projects.

4.1. Application for cluster competition

4.1.1. Kobe Biomedical Innovation Cluster for the Knowledge Cluster Initiative

The City of Kobe and FBRI (especially the Office of Pro-Cluster Kobe) jointly developed formal plans of the cluster project and selected cooperative research projects without calling for proposals from cluster firms and universities except for the projects of regenerative medicine.

At first, research subjects were determined considering the outcomes of the first-round KCI. (Since 2007, KCI has been in the second round. KBIC was also included in the targets of the first round.) Then, for each subject, some research projects were selected from among several candidates by the core organizers of KBIC including the representatives of the City of Kobe and the general manager and research director of FBRI. Regarding regenerative medicine for which they called for proposals, the City of Kobe and FBRI set up an evaluation committee including outside experts to select the projects. Finally, KBIC won the race and was selected by MEXT as a supported region of KCI. Sixteen R&D projects were supported by KCI.

4.1.2. Fuji Pharma Valley for the City Area Program

The Fuji Pharma Valley cluster has been supported by MEXT with the City Area Program (2004–2009) and the Regional Innovation Cluster Program since 2010. In

applying for the first stage, and also in later applications, the prefecture government (the Office of New Industry Agglomeration) developed formal plans of the cluster project by determining research subjects and cooperative research projects without calling for proposals from cluster participants[12]. In the following (development) stage of this program, Yamaguchi, the head of the Fuji Pharma Valley Initiatives and president of the Shizuoka Cancer Center, played an important role. Ten cooperative research projects in four groups were supported in the development stage of the City Area Program (2007–2009). For the current Regional Innovation Cluster Program (2010–2012), four out of these ten were selected, considering the probability of commercialization of research outcomes.

4.1.3. BioM for the Spitzencluster-Wettbewerb

In case of the M4 project, BioM called for proposals of university-industry research consortia and selected 32 R&D projects (currently 31) from among the proposals that fit well with each other. Then, BioM drew up the cluster project plan on the basis of research and budget plans of each consortia presented by the firms and universities. The BioM Biotech Cluster is one of the five winners among 23 candidates out of different technological fields in the second-round competition.

4.1.4. BioRN for the Spitzencluster-Wettbewerb

In preparing for cluster competition, BioRN called for university-industry research projects. The scientific advisory board of BioRN selected the best 36 R&D projects from among 78 proposals and integrated the project plans into the cluster project plan. Five regions, including the BioRegion Rhine-Neckar as the only bio-cluster, were selected from among 38 applicants as the winners of the first-round cluster competition by an independent jury.

4.1.5. Alsace BioValley for the Pole de Competitivite

Alsace BioValley prepared a proposal for the Pole de Competitivite, collaborating from the beginning with cluster firms and universities (in other French bio-clusters, cluster management organizations usually do not intervene or support the development of research plans by cluster firms). Finally, the board of directors of the Alsace BioValley Cluster selected research projects (consortia) to be included in the cluster project.

[12] Calling for proposals of research subjects and research projects was originally intended but not realized.

4. 2. Management and evaluation of R&D projects

4.2.1. Selection of members of research consortia

There are no explicit conditions for consortium members in KBIC. Practically, however, consortium members should be the organizations that participate in and cooperate with KBIC.

In case of the Fuji Pharma Valley cluster, selection of consortia members is left to the project leaders who are top researchers of the Cancer Center, the National Institute of Genetics, and the Tokyo University of Agriculture and Technology. There are no conditions for cluster firms, but in fact, the research consortia supported by MEXT programs include only a few local firms; in this sense, most cluster firms are not directly integrated into METI programs.

Members were determined before they applied for cluster competition in BioM and BioRN. Regarding BioM, the associate partners, who joined the M4 project later, do not have the right to receive financial supports. However, M4 is a very dynamic program: existing and new R&D projects are repeatedly evaluated for continuation and acceptance. Some R&D projects are not directly funded by the M4 program, but are still a part of the personalized medicine initiative.

As for the Alsace BioValley Cluster, members of the R&D projects to be included in the Pole de Competitivite were determined before they applied for membership. In the Pole de Competitivite, every research consortium has to include at least two private firms and a university (or a public research institute).

In the Alsace BioValley Cluster, a firm must be a cluster member to obtain public R&D subsidy (a firm has to pay a small amount of membership fee to be registered as a member). Before submitting a research proposal to the French government, a cluster firm has to get the approval of the Alsace BioValley Cluster. By this procedure, Alsace BioValley reduces duplications and waste of research funds.

4.2.2. Allocation of R&D subsidy

There is no rule on the ratio of R&D subsidy to total budgets of R&D projects with regard to MEXT programs. The City of Kobe and FBRI allocate the amount of R&D subsidy considering the needs of each project in KBIC. Similarly, PVC allocates the amount of R&D subsidy based on project plans. Because all research projects to be subsidized are initiated from the clinical needs and scientific seeds of the core research institutes, these institutes play the central role in project budgeting.

In case of Spitzencluster-Wettbewerb, the federal government takes the rule of

the matched funding scheme on the subsidy ratio of R&D projects. That is, the ratio of R&D subsidy in each R&D project is fixed as 50%. Furthermore, only private firms can be subsidized in BioRN, while universities as their research partners obtain research budgets through commissioned R&D of subsidized firms.

In the Pole de Competitivite, R&D consortia can obtain public subsidy up to 60% of their research budgets: consortia of private firms can be covered up to 50%, and those of universities can be funded up to 100%. In this way, the cluster policies in Germany and France urge subsidized firms to put in reasonable efforts.

4.2.3. Monitoring of research projects

MEXT programs require project monitoring. More concretely, in KBIC the coordinators of FBRI regularly monitor the progress of R&D projects and hold formal research meetings once a year. In the case of Fuji Pharma Valley, PVC monitors the progress of subsidized R&D projects every year, with internal evaluation by the heads of the Pharma Valley Initiatives and outside experts. Moreover, PVC organizes annual meetings in Tokyo with presentations of research outcomes that are not limited to the research projects supported by MEXT programs.

BioM performs an accounting audit every six months for each research project. Within the M4 program, they conduct several rounds of evaluations of existing and new projects.

BioRN strictly monitors the progress of R&D projects. BioRN has developed an original management tool by which cluster firms have to input information on implementation of research budgets. Otherwise, they cannot expend public R&D subsidy (“no report, no fund”). BioRN monitors the expenditure of research funds with this special software (on the whole, cluster management organizations do not monitor how cluster firms expend research budgets).

Alsace BioValley regularly monitors the progress of R&D projects by sharing information with the corporate treasurers of the subsidized firms.

4.2.4. Project evaluation

KCI publishes interim evaluations three years after the commencement of the projects. The government checks the self-evaluations provided by each cluster region, and on the basis of this, decides which cluster projects should be continued and what the budget should be. In the case of KBIC, the first self-evaluation by FBRI was regarded as upper-biased by MEXT and subjected to strict re-evaluation. Based on the interim evaluation, the allocation of research budgets was often revised and, in some cases,

discontinued. KCI actually allows the research consortia to commercialize research outcomes. The final evaluation of the first-round KCI was completed in a similar way to the interim evaluation. KCI published the final evaluation reports in 2006.

The City Area Program publishes final evaluations of completed projects, while interim evaluations are not conducted for short programs for three years. The results of final evaluations of the first (basic) stage may affect acceptance to the next, the development stage, with doubled budget. Moreover, PVC has outside experts evaluate its performance at the end of each strategic plan, independent of the evaluations for the MEXT programs.

In case of BioM, the federal government will conduct an interim evaluation of the M4 project at the end of the second year. BioM is obliged to provide the government with information on project outcomes for project evaluation. Based on the interim evaluation, the federal government can take a decision on which projects to continue and with how much budget. The project evaluations will not be made public, although BioM can ascertain the results.

The scientific advisory board of BioRN conducts strict evaluation of each R&D project. If a project turns out to be without promise, BioRN recommends the federal government to cease the support of the project and to reallocate its budgets to other projects. The government usually follows the suggestion of BioRN. Further, any technologically successful project is requested to generate positive cash flows from licenses or new products.

In the Pole de Competitivite, Alsace BioValley does not conduct self-evaluation. The central government entrusted the interim evaluation to Boston Consulting Group (BCG). Alsace BioValley provided them with their future action plan and scientific roadmap based on the project outcomes in the first period (2006–2008). Based on BCG's evaluation, the government could finally decide on which cluster projects should be continued and with how much budget.

4.3. Support programs

KCI basically provides financial supports for university-industry R&D cooperation in selected regions. Further, the City of Kobe provides several types of hard and soft support measures for cluster members in KBIC. As examples of hard supports, the City of Kobe provides tax reduction, R&D subsidy, and investment funding (Kobe Biomedical Fund and Kobe Life Science IP Fund). For soft support measures, the City of Kobe and FBRI set up the Office of Pro-Cluster Kobe, which coordinates the activities among cluster members in KBIC through matching of research partners,

organizing events and meetings, and providing consulting services. Moreover, a major task of KBIC is to attract external firms and institutes to invest in the cluster area.

Like KCI, the City Area Program and the Regional Innovation Cluster Program provide financial supports for university-industry R&D cooperation in selected regions. In the case of Fuji Pharma Valley, around 70% of MEXT subsidy goes directly to the research projects, while the rest is used for overhead costs and coordination. Further, Shizuoka Prefecture (the Shizuoka Industry Creation Organization) provides several types of hard and soft support measures to cluster firms. This is because the Regional Innovation Cluster Program requests matched funding at the cluster level. (Cluster management organizations should provide as much funds as the MEXT subsidy.) Hard support measures comprise subsidies and loans for start-ups and innovative small firms as well as for R&D projects including industry-university consortia. Soft measures comprise the organization of seminars and events (business and research matching) as well as consulting services. On the contrary, PVC provides no hard support and very little soft support to local small firms: business and research matching is organized once a year and social meetings, twice a year.

BioM provides various supports to firms not only in the BioM Biotech Cluster but also to firms in the State of Bavaria. As hard supports, BioM allocates federal R&D subsidy and provides incubation service. Further, its soft supports include networking in and beyond the cluster region, organizing meetings and events, providing information on websites, consulting services, and lobbying.

BioRN allocates federal R&D subsidy to consortia firms and provides infrastructures such as office spaces. BioRN also provides various soft supports: matching of research partners and venture capitalists, organizing events and meetings, and providing consulting services.

Alsace BioValley allocates public R&D subsidy to research projects. It is noteworthy that, in order to apply for a public R&D subsidy, the proposal should be approved by the Alsace BioVally Cluster. It also provides various soft supports for member firms: matching of research partners, organizing events and meetings, supporting applications for public subsidies, providing database service, and supporting international marketing (business representation). The contents and scope of support programs differ according to the ranks of membership (normal and premium): database and business representation services are provided only to premium members. Recently, Alsace BioValley has started supporting start-ups.

4.4. Coordination with other cluster projects

Cluster projects in the Kansai area (especially Osaka-Saito and Kobe) aim at forming wide-area clusters (e.g., Kansai Super Cluster). However, up to now there have practically been no collaborative research projects between FBRI and the Senri Life Science Foundation in Osaka, although cooperation between universities is active. Further, there is practically no international cooperation with clusters outside Japan, except for that with Medicon Valley in Denmark and Sweden.

PVC recently conducted some exchange programs with other national and foreign cluster organizations. In 2008, the staff of the French bio-cluster organizations in Paris, Toulouse, and Nantes visited the Fuji Pharma Valley, and then the PVC staff visited these French clusters in 2009. Moreover, PVC organized a national conference on cancer in February 2010, where the members of seven medical cluster organizations in Japan presented their relationship with local firms. The core research centers in the Pharma Valley cluster cooperate in R&D with universities and private firms in other areas (especially in Tokyo); however, such cooperation is not based on inter-cluster coordination. Thus far, no effort has been made to establish inter-cluster R&D cooperation. According to the Third Strategic Plan starting in 2011, they intend to promote the commercialization of research outcomes through synergy effects of inter-cluster cooperation.

One of the main tasks of BioM is to coordinate interregional relationships among clusters in Germany. BioM is also involved with the Advanced Biotech Cluster Platforms for Europe (ABCEurope) project, which coordinates activities of European clusters[13]. Prof. Domdey, the founder and managing director of BioM, is active in coordination with other clusters in Europe. Although there are no formal agreements with other European clusters, BioM is a founding member of the Council of European BioRegions (CEBR), and cooperates with other European biotechnology clusters within this initiative on different levels. Moreover, two projects of European interregional cooperation are planned and submitted to the EU Commission.

One of the recent major tasks of BioRN is to promote international cooperation with other clusters concentrating on complementary technologies in relation to BioRN. For example, BioRN intends to set up a new big project with Cambridge (UK) and Leuven (Belgium) and will be applying for a large-scale EU subsidy for this project. BioRN is not interested in cooperation within Germany, because it puts higher value on worldwide cooperation.

[13] This project has been supported by the Europe Innova (EU Commission) since 2009. European clusters include PCB Barcelona, Alsace BioValley, OneNucleus Cambridge, BioWinBelgium, Technologiepark Heidelberg, INNOVA Hungary, MVA Medicon Valley, BioM Munich, Medicen Paris, Stockholm Science City, Cluster bioPMed Turin and Wallonia, and MATIMOB Israel.

In France, the Alsace BioValley cluster has been cooperating with Lyon and Toulouse regions as the Life Science Corridor since 2008. These regions have different but related scientific focus within life science, which enables them to have smooth cooperation. Alsace BioValley also participates in the ABC Europe project that coordinates European life science clusters. Further, Alsace BioValley is active in worldwide cooperation, extending beyond Europe (e.g., the US, Canada, Israel, China, and Japan).

5. Discussion

We could find several significant similarities and differences in the five cases of Japanese and European clusters by comparing the selection procedure of national cluster competition and the management of cluster policies by the core cluster management organizations. This section discusses how they may be related with the performance of the regional clusters, referring to the previous literature. Our major findings can be summarized as follows (see Table 2).

5.1. Selection procedure of national cluster competition

We found that the competitive processes and the degree of competition in the national cluster policies have significant differences. For example, in Japan, the top-down selection process by the government is relatively prevalent in the national cluster policy, except for the City Area Program. In contrast, Germany's national cluster policy takes a bottom-up process with hard competition. The French national cluster policy takes a bottom-up process with limited cluster competition, different from both Japan and Germany. In this sense, the City Area Program by MEXT is more similar to the French policy than to the other cluster policies in Japan.

Differences with regard to the competitive processes in cluster policies would potentially affect the performance of regional clusters. There are several advantages and disadvantages of the bottom-up selection procedure in R&D projects (Eickelpasch and Fritsch 2005). We list three advantages of the bottom-up selection procedures in the following[14].

First, diverse approaches (ideas) would allow one to learn through experience, using different methods of problem solving, and identify more superior solutions. Competition between alternative approaches may be regarded as an effective means of

[14] There are also potential disadvantages to the bottom-up selection procedure. For example, it takes much time for the selection procedure and needs discerning and equitable judgment of proposals. Further, it may promote "picking the winner" and cause regional gaps.

stimulating the search for better solutions and their dissemination. This is in line with the theory of federalism or, more generally, systems competition (Frey and Eichenberger 1999; Vanberg and Kerber 1994).

Second, if the concepts are developed in the bottom-up process, the solutions and ideas will be custom-tailored, and these could be innovative, not only because of the competition between the concepts but also through interaction with the public administration (Toedtling and Tripple 2005). Therefore, the competitive approach can play an important role and function as a laboratory for discovering and disseminating superior ways to organize innovative activities.

Third, a great advantage of the bottom-up approach is that applicants (in this case, the core cluster management organizations) have a considerable degree of freedom in arranging the organizational form of innovative activities that correspond to their specific regional needs. This is because there is no reason to believe that policymakers are better informed than the managers of the local management organizations or firms about the economic potential of their targets (Wolf 1993; Cowling et al. 1999; Hospers et al. 2009).

5.2. Management of cluster policies by the core management organizations

There are several significant similarities and differences in the management of cluster policies by the core management organizations.

First, the process of preparation for the applications for the national cluster policies is different across cluster regions. In Japan and France, the core management organizations start developing research plans from the beginning. On the contrary, BioM and BioRN did not intervene in the planning of R&D projects. They called for R&D proposals from cluster firms and drew up their project plans on the basis of the selected research proposals. In the five clusters, it is common that the core management organizations first reviewed R&D projects before the government's screening. This double review process of R&D projects may be stricter in Germany because cluster management organizations are not involved in the development of initial R&D plans. The discussion on the advantages of the bottom-up selection procedure is also applicable to the process of preparation for the application. We expect that German clusters would adequately benefit from these advantages by calling for proposals of R&D projects from diverse cluster members.

Second, we found several differences in the management of R&D projects. With regard to the MEXT programs, there is no rule on the ratio of R&D subsidy to

total budgets of R&D projects[15]. Thus, in KBIC and the Fuji Pharma Valley, R&D subsidy is allocated to each project according to project plans. In Germany and France, the matched funding scheme is adopted on the subsidy ratio of R&D projects, which requires substantial commitment by the subsidized firms. According to Mora-Valentin et al. (2004), commitment is among the most important success factors of research collaborations. Thus, it may be desirable to provide subsidized firms with sufficient incentives for more commitment.

Third, we also found differences in the extent of regular monitoring of R&D projects by the core cluster management organizations. Cluster management organizations in all the five regions conduct regular monitoring of subsidized R&D projects. Among them, monitoring by BioRN may be the strongest. BioRN developed an original management tool by which it monitors the research expenditures of each R&D project. BioRN further checks the profitability of project outcomes.

Fourth, there are several differences in the process of the government's (interim) project evaluation. In KBIC, the Fuji Pharma Valley, and the BioRN Cluster, the cluster management organizations are closely involved in project evaluation by conducting self-evaluation of R&D projects. BioM does not evaluate each project, but summarizes the entire project outcomes for the government. Interim evaluations are made public in Japan, but not in Germany. The French government entrusts the responsibility of conducting interim evaluations to a private consultant firm. Alsace BioValley does not conduct self-evaluations, but provides this consultant with the project outcomes.

Strict monitoring and evaluation of collaborative R&D projects may be key factors for successful R&D projects for the following reasons. The outcome of an innovation process is unknown in advance, and this may induce research partners to behave in opportunistic ways (Kranton and Minehart 2001). Without trust in cooperative R&D, participants may take opportunistic actions such as "cheating, shirking, distorting information, misleading partners, providing substandard products/services, and appropriating partners' critical resources" (Das and Teng 1998, p. 492). Control mechanisms by a third party are indispensable for reducing the losses generated by opportunistic behavior (Zucker 1986; Das and Teng 1998).

Fifth, we found that every core cluster management organization in the five regions provides both hard (R&D-related) and soft (networking and coordination) support programs to cluster members. As specific differences, KBIC makes much effort

[15] As mentioned earlier, MEXT has changed the rule since 2006 so that the government subsidizes up to 50% of the total budget. Another half should be financed from local authorities and other sources.

to bring in firms and research institutes from outside and to provide them with research funds. In the Fuji Pharma Valley cluster, various types of supports to local firms are mostly provided by some other organization within the prefecture. BioM offers support programs even to the firms that are not located in the Munich cluster but in the State of Bavaria, while supports by other cluster management organizations targeted in this paper are limited to their specific cluster regions. Further, the contents and scope of the support programs provided by Alsace BioValley differ according to the ranks of membership (normal and premium).

It is justifiable that core cluster management organizations provide both hard and soft supports. Regarding hard support, there are two types of market failure concerning R&D: incomplete appropriability of R&D outcomes (Griliches 1992; Spence 1984; Teece 1986) and high uncertainty of R&D activity (Malmberg et al. 1996). R&D support by a third party promotes collaborative R&D projects, which could internalize knowledge spillovers and reduce uncertainty through improved coordination and the pooling of risks and resources. Soft support can also be indispensable for the enhancement of regional performance. The government is considered to be able to alleviate various knowledge-specific failures in the knowledge-based economy, whereas the rationale for traditional industrial policy derives from welfare economics and market failure arguments (Dobrinsky 2009). Knowledge-specific (networking) failures involve a large number of agents/stakeholders as well as complex links and interactions among them. As Porter (2000, p.26) has indicated, cluster policies should aim at ‘‘removing obstacles, relaxing constraints, and eliminating inefficiencies that impede productivity and innovation in the cluster.’’

Finally, we observe some heterogeneity in the motivation of cluster management organizations toward coordination with other cluster projects. All five regions engaged in interregional cooperation. However, KBIC, the Fuji Pharma Valley cluster, and BioRN are not active in domestic cooperation and have just recently started international cooperation, while BioM and Alsace BioValley have been actively engaged in domestic and international cooperation.

Coordination with other cluster projects also may be an important element that contributes to the performance of regional clusters. As Desrochers (2001) insists, local firms typically regard outside collaborative partners as more important than their neighbors even in highly advanced clusters such as Silicon Valley. Further, Nishimura and Okamuro (2011a) empirically confirm that local firms collaborating with partners outside the cluster show higher R&D productivity in terms of quantity and quality. This implies that a support system is necessary through which local firms can find

appropriate partners according to their research topics, even if such partners are located outside the clusters.

6. Summary

This paper provides a detailed comparison of the following five cases of Japanese and European clusters in biotechnology: (1) Kobe Biomedical Innovation Cluster (KBIC) in Kobe (Japan), (2) Fuji Pharma Valley Cluster in Shizuoka Prefecture (Japan), (3) BioM Biotech Cluster in Munich (Germany), (4) BioRegion Rhine-Neckar in Heidelberg (Germany), and (5) Alsace BioValley Cluster in Strasbourg (France). We pay special attention to the national cluster policy and its management by the core cluster management organization in each region.

Through in-depth interviews, we found several significant similarities and differences among these five cases. We also discussed how the management of cluster policies by the core management organizations may be related with the performance of regional clusters. We intend to develop our research on comparative evaluations of national cluster policies and their management in different countries with different characteristics with the help of additional cases and further information in a future study.

Acknowledgments:
This research obtained financial support from the Japan Society for the Promotion of Science (JSPS), Grand-in-Aid for Scientific Research (A) (No. 20243018). The authors are grateful for this support. We thank our interview partners of the cluster management organizations for providing valuable information. Any remaining errors and omissions are our own.

References:

Abramo, G., D'Angelo, C. A., Costa, F. D., Solazzi, M. (2011). The role of information asymmetry in the market for university–industry research collaboration. Journal of Technology Transfer, 36, 84–100.

Acs, Z. J., Anselin, L., Varga, A. (2002). Patents and innovation counts as measures of regional production of new knowledge. Research Policy, 31, 1069–1085.

Aldieri, L., Cincera, M. (2009). Geographic and technological R&D spillovers within the triad: Micro evidence from US patents. Journal of Technology Transfer, 34, 196–211.

Anselin, L., Varga, A., Acs, Z. (1997). Local geographical spillovers between university research and high technology innovations. Journal of Urban Economics, 42, 422–448.

Audretsch, D. B., Lehmann, E. E., Warning, S. (2005). University spillovers and new firm location. Research Policy, 34, 1113–1122.

Borras, S., Tsagdis, D. (2008). Cluster policies in Europe. Firms, institutions, and governance. E. Elgar.

Broecker, J., Dohse, D., Soltwedel, R. (eds.), (2003). Innovation clusters and interregional competition. Springer.

Council on Competitiveness (COC) (2007). Governor's guide to cluster-based strategies for growing state economies. National Governors Association (Center of Best Practices).

Cowling, K., Oughton, C., Sugden, R. (1999). A reorientation of industrial policy: Horizontal policies and targeting. In: K. Cowling (ed.), Industrial policy in Europe: Theoretical perspectives and practical proposals (pp.17–31). Routledge.

Dahl, M. S., Pedersen, C. R. (2004). Knowledge flows through informal contacts in industrial clusters: Myth or reality? Research Policy, 33, 1673–1686.

Das, T. K., Teng, B. S. (1998). Between trust and control: Developing confidence in partner cooperation in alliances. Academy of Management Review, 23, 491–512.

Desrochers, P. (2001). Geographical proximity and the transmission of tacit knowledge. Review of Austrian Economics, 14, 25–46.

Dobrinsky, R. (2009). The paradigm of knowledge-oriented industrial policy. Journal of Industry, Competition and Trade, 9, 273–305.

Dohse, D. (2000). Technology policy and the regions: The case of the BioRegio contest. Research Policy, 29, 1111–1133.

Dohse, D. (2003). Taking regions seriously: Recent innovations in German technology policy. In: Broecker, J., Dohse, D., and Soltwedel, R. (eds.), Innovation clusters and interregional competition. Springer.

Dohse, D. (2007). Cluster-based technology policy—The German experience. Industry and Innovation, 14, 69–94.
Duranton, G. (2011). California dreamin': The feeble case for cluster policies. Review of Economic Analysis, forthcoming.
Eickelpasch, A., Fritsch, M. (2005). Contests for cooperation—A new approach in German innovation policy. Research Policy, 34, 1269–1282.
Falck, O., Heblich, S., Kipar, S. (2010). Industrial innovation: Direct evidence from a cluster-oriented policy. Regional Science and Urban Economics, 40, 574–582.
Frey, B., Eichenberger, R. (1999). The New Democratic Federalism for Europe: Functional, Overlapping and Competing Jurisdictions. E. Elgar.
Fritsch, M., Franke, G. (2003). Innovation, regional knowledge spillovers and R&D cooperation. Research Policy, 33, 245–255.
Furman, J. L., Kyle, M. K., Cockburn, I., Henderson, R. M. (2006). Public & private spillovers, location and the productivity of pharmaceutical research. NBER Working Paper No. 12509.
Gordon, I. R., McCann, P. (2000). Industrial clusters: Complexes, agglomeration and/or social networks? Urban Studies, 37, 513−532.
Griliches, Z. (1992). The search of R&D spillovers. Scandinavian Journal of Economics, 94, S29–47.
Hospers, G-J., Desrochers, P., Sautet, F. (2009). The next Silicon Valley? On the relationship between geographical clustering and public policy. International Entrepreneurship and Management Journal, 5, 285–299.
Kranton, R. E., Minehart, D. F. (2001). A theory of buyer–seller networks. American Economic Review, 91, 485–508.
Jaffe, A. B., Trajtenberg, M., Henderson, R. (1993). Geographical localization of knowledge spillovers as evidenced by patent citations. Quarterly Journal of Economics, 63, 577–598.
Jungwirth, C., Grundgreif, D., Müller, E. (2011). How to turn public networks into clubs? The challenge of being a cluster manager. International Journal of Entrepreneurial Venturing, 3, 262–280.
Malmberg, A., Solvell, O., Zander, I. (1996). Spatial clustering, local accumulation of knowledge and firm competitiveness. Geografiska Annaler. Series B, Human Geography, 78, 85–97.
Markusen, A. R. (1996). Sticky places in slippery space: A typology of industrial districts, Economic Geography, 72, 294–314.
Martin, P., Mayer, T., Mayneris, F. (2008). Spatial concentration and firm-level

productivity in France. CEPR Discussion Papers 6858.
Martin, P., Mayer, T., Mayneris, F. (2011). Public support to clusters: A firm-level study of French “Local Productive Systems”. Regional Science and Urban Economics, doi:10.1016/j.regsciurbeco.2010.09.001.
Martin, R., Sunley, P. (2003). Deconstructing clusters: Chaotic concept or policy panacea. Journal of Economic Geography, 3, 5–35.
Maskell, P. (2001). Towards a knowledge-based theory of the geographical cluster. Industrial and Corporate Change, 10, 921–943.
McDonald, F., Tsagdis, D., Huang, Q. (2006). The development of industrial clusters and public policy. Entrepreneurship and Regional Development, 18, 525–542.
Meyer-Krahmer, F., Schmoch, U. (1998). Science-based technologies: University–industry interactions in four fields. Research Policy, 27, 835–851.
Mora-Valentin, E. M., Montoro-Sanchez, A., Guerras-Martin, L. A. (2004). Determining factors in the success of R&D cooperative agreements between firms and research organizations. Research Policy, 33, 17–40.
Nishimura, J., Okamuro, H. (2011a). R&D productivity and the organization of cluster policy: An empirical evaluation of the Industrial Cluster Project in Japan. Journal of Technology Transfer, 36, 117–144.
Nishimura, J., Okamuro, H. (2011b). Subsidy and networking: The effects of direct and indirect support programs of the cluster policy. Research Policy, 40, 714–727.
Okubo, T., Tomiura, E. (2010). Industrial relocation policy and heterogeneous plants sorted by productivity: Evidence from Japan. RIETI Discussion Paper Series 10-E-016.
Owen-Smith, J., Powell, W. W. (2004). Knowledge networks as channels and conduits: The effects of spillovers in the Boston biotechnology community. Organization Science, 15, 5–21.
Porter, M. (2000). Location, competition, and economic development: Local clusters in a global economy. Economic Development Quarterly, 14, 15–34.
Porter, M. et al. (2001). Cluster of innovation. Regional Foundations of U.S. Competitiveness, Council on Competitiveness.
Pyke, F., Beccattini, G., Sengenberger, W. (1990). Industrial districts and interfirm cooperation in Italy. International Institute for Labour Studies.
Rondé, P., Hussler, C. (2005). Innovations in regions: What does really matter? Research Policy, 34, 1150–1172.
Rosenthal, S. S., Strange, W. C. (2004). Evidence on the nature and sources of agglomeration economies. In: Vernon H., Jacques F.T. (eds.), Handbook of Regional and Urban Economics, Vol. 4 (2119–2171), Elsevier.

Saxenian, A. (1994). Regional advantage: Culture and competition in Silicon Valley and Route 128. Harvard University Press.
Spence, M. A. (1984). Cost reduction, competition, and industry performance. Econometrica, 52, 101–121
Squicciarini, M. (2008). Science parks' tenants versus out-of-park firms: Who innovates more? A duration model. Journal of Technology Transfer, 33, 45–71.
Teece, D. (1986). Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. Research Policy, 15, 285–305.
Toedtling, F., Trippl, M. (2005). One size fits all? Towards a differentiated policy approach with respect to regional innovation systems. Research Policy, 34, 1203–1219.
Vanberg, V., Kerber, W. (1994). Institutional competition among jurisdictions. Constitutional Political Economy, 5, 193–219.
Wolf, C. (1993). Markets or governments: Choosing between imperfect alternatives. Cambridge, 2nd Ed. MIT Press.
Yang, C-H., Motohashi, K., Chen, J-R. (2009). Are new technology-based firms located on science parks really more innovative? Evidence from Taiwan. Research Policy, 38, 77–85.
Zucker, L. G. (1986). Production of trust: Institutional sources of economic structure, 1840–1920. Research in Organizational Behavior, 8, 53–111.

Internet websites:

MEXT (Knowledge Cluster Initiative):
http://www.mext.go.jp/a_menu/kagaku/chiiki/cluster/index.htm
MEXT (City Area Program):
http://www.mext.go.jp/a_menu/kagaku/chiiki/city_area/index.htm
BMBF (Leading-Edge Cluster Competition):
http://www.hightech-strategie.de/en/468.php
Ministere de l'Economie, des Finances et de l'Industrie(Pole de Competitivite):
http://competitivite.gouv.fr/
Kobe Biomedical Innovation Cluster (KBIC):
http://www.city.kobe.lg.jp/information/project/iryo/
Fuji Pharma Valley: http://www.fuji-pvc.jp/
BioM Biotech Cluster: http://www.bio-m.org/en.html
BioRegion Rhine-Neckar: http://www.biorn.org/biorn-cluster/
Alsace Biovalley: http://www.biovalley.com/content.cfm?nav=1&content=2

Table 1 Overview of recent cluster policies in Japan, Germany, and France

Policy Name	**Knowledge Cluster Initiative (Reginal Innovation Cluster Program since 2010)**	**City Area Program (Reginal Innovation Cluster Program since 2010)**	**Industrial Cluster Project**	**Spitzencluster-Wettbewerb (Cutting-edge cluster competition)**	**Pole de Competitivite (Competitive Cluster)**
Country	Japan	Japan	Japan	Germany	France
Period	2002－2006 (first) 2007－2009 (second)	the same as KCI; three-year projects starting in 2002	2001－2005 (first) 2006－2010 (second) 2011－2020 (third)	2008－2013 (first) 2010－2014 (second)	2006－2008 (first) 2009－2011 (second)
Budget	68.5 billion yen (2002－2009)	for each cluster 100-200 million yen per year; About 20 billion yen (2002-2006)	196 billion yen (2001－2007)	EUR 400 million (2008－2014)	EUR 3 billion (2006－2011)
Program Initiator	Ministry of Education, Culture, Sports, Science and Technology (MEXT)	Ministry of Education, Culture, Sports, Science and Technology (MEXT)	Ministry of Economy, Trade and Industry (METI)	Federal Ministry of Education and Research (BMBF)	DGE (General Directorate for Enterprise, Ministry for Economy, Finance and Industry)
Source of Fund	Ministry of Education, Culture, Sports, Science and Technology (MEXT)	Ministry of Education, Culture, Sports, Science and Technology (MEXT)	Ministry of Economy, Trade and Industry (METI)	Federal Ministry of Education and Research (BMBF)	Ministry for Economy, Finance and Industry; Ministry of Interior and Regional Development; The French National Research Agency; OSEO; FUI
Number of Selected Regional Clusters	12 (first round)	59 in the 1. period, starting in 2002-2006, ending in 2004-2008); 30 in the 2. period starting in 2007-2009	19	5	67
Number of submitted applications	30	?	None (Complete top-down selection)	38	105

Table 2

National cluster policy	Knowledge Cluster Initiatives	City Area Program	Spitzencluster-Wettbewerb (Cutting-Edge Cluster Competition)		Pole de Competitivite (Competitive Cluster)
Name of regional cluster	Kobe Biomedical Innovation Cluster	Fuji Pharma Valley Cluster	BioM Biotech Cluster	BioRegion Rhein-Neckar	Alsace BioValley Cluster
Location	Kobe, Japan	Eastern part of Shizuoka Prefecture, Japan	Munich (Martinsried), Germany	Heidelberg, Germany	Strasbourg, France
Core management organization	City of Kobe, Foundation for Biomedical Research and Innovation	Pharma Valley Center	BioM Biotech Cluster Development GmbH	BioRN Cluster Management GmbH	Alsace BioValley
Regional potential	200 firms, 7 universties and 12 public research institutes	200 firms, no universities (a national technical college), 2 public research institutes (one with a hospital)	350 firms (120 biotech start-ups), 2 universities, its hospitals and 3 Max-Planck-Institutes	200 firms (77 biotech start-ups and 3 big pharmas), 2 universities, a university hospital and 6 public research institutes	390 firms in life science including big pharma (1/3 in drug and 2/3 in medical engineering) and a university and 20 public research institutes
Selection of regional cluster projects by the government	Top-down process with imited competition	Bottom-up process with limited competition	Bottom-up process with hard competition	Bottom-up process with hard competition	Bottom-up process with limited competition
Selection of the cluster participants	Any firm in the cluster region focusing on biotechnology and medical engineering is a cluster firm.	Any firm in the cluster region focusing on biotechnology and medical engineering is a cluster firm.	Any firm in the cluster region focusing on biotechnology is a cluster firm.	Any firm in the cluster region focusing on biotechnology is a cluster firm.	membership fee required
Calling for research projects	no (except for a specific field)	no	yes	yes	no
Preparation for application for the national cluster project	Management organization selected research projects and prepared for application.	The prefecture government selected research projects and prepared for application.	Management organization drew up the project plan based on selected research proposals.	Management organization drew up the project plan based on selected research proposals.	Management organization drew up the project plan collaborating with members of selected consortia.
Regular monitoring of research projects	Regular monitoring by the coordinators; formal research meetings annually	Regular monitoring by the coordinators; formal research meetings annually	Accounting audit every six months for each project	Regular monitoring by the scientific advisory board; Budget reallocation according to performance; Requirement of positive cash-flow	Regular monitoring by sharing information with corporate treasurers
Project evaluation: interim	By the government; made public; discontinuance or budget reallocation possible	No interim evaluation because of short programs (3 years); Final evaluation by the government; made public	By the government; not made public; discontinuance or budget reallocation possible	By the government; not made public; discontinuance or budget reallocation possible	Entrusted to a foreign consulting group; discontinuance or budget reallocation possible
Support programs (hard)	Allocation of national R&D subsidy and providing infrastructure; Additional supports by the cluster management organization	Allocation and management of national R&D subsidies; Further supports for small local firms by the prefecture government through management organization and a public foundation	Allocation of federal R&D subsidy and incubation service	Allocation of federal R&D subsidy and providing office spaces	Allocation of public R&D subsidy
Support programs (soft)	Partner matching, events and meetings, and consulting	Few direct support for small local firms by the cluster management organization	Partner matching, events and meetings, information on the web, consulting, and lobbying	Partner matching, VC matching, events and meetings, and consulting	Partner matching, events and meetings, support of subsidy application, database service, international marketing
Utilization for support programs			3/4 of cluster firms utilize support measures.		Less than half utilize supports.
Role of large firms	Some are active in the cluster.	No local large firms active in the cluster. Core research institutes cooperate with some large firms in Tokyo.	Some are among consortium members.	Active	Inactive; interested only in scouting and education; A big pharma is the vice-president of the board of directors.
Coordination with other cluster projects	No concrete organizational cooperation. Few international cooperation.	Active exchanges with domestic and foreign clusters, but no concrete organizational cooperation.	Coordination of interregional relationship in Germany; Active but informal relationship with other European clusters	Promotion of international cooperation; No interest in cooperation within Germany	Cooperation within the Trinational BioValley and with other French clusters; Active in worldwide cooperation