

Chapter 3 Analysis of Current Status of Regional Industrial Innovation & Observed Success Factors

– Survey Responses from Academic and Governmental Organizations –

3-1. Survey Overview

3-1-1. The Meaning of Regional Industrial Innovation

The term “regional industrial innovation” as addressed in this study refers not only to regional efforts to create new industries, but also to efforts designed to transform and revitalize existing regional industries. As mentioned earlier, this sur-

vey was conducted as part of the Economic Research Institute’s 2004 research project entitled “Conditions for the Formation of Innovation Systems in Machine Industries in Japan.”

3-1-2. Objectives

The purpose of this survey is to acquire an understanding of activities performed by academic (universities and national colleges of technology) and governmental organizations. These organizations form an external environment that influences regional machine-related industries, which in turn contribute greatly to regional economies. The survey is also designed to clarify the success factors (basic conditions) necessary for regional industrial innovation.

attempt to determine 1) the weight that these organizations place on regional resources, 2) what areas they believe are critical to the promotion of industrial agglomeration, 3) what factors they believe prevent the adequate promotion of regional industrial agglomeration and industry-academia-government cooperation, 4) how they are contributing to regional industries, and 5) how they evaluate their own measures for promoting regional industries. Respondents were divided up into eight separate regions.

Specifically, we conducted this survey in an

3-1-3. Survey Details

Survey Title:	Survey on the Current Status of Regional Industrial Innovation & Success Factors
Research Organization:	Japan Society for the Promotion of Machine Industry, Economic Research Institute
Survey Period:	Late November 2004 – Mid-January 2005
Survey Targets:	Total 1,834 Japanese academic and governmental organizations Universities and national colleges of technology: 738 Prefectural government and associated organizations: 226 Municipal government and associated organizations: 870
Survey Method:	Surveys sent and collected via postal mail
Responses:	Total valid responses: 460 (25.1% response rate) Universities and national colleges of technology: 173 (23.4%) Prefectural government and associated organizations: 65 (28.8%) Municipal government and associated organizations: 222 (25.5%)

3-2. Compilation of Results

The compilation of survey results is as follows.

3-2-1. Recognition of Regional Resources

- Overall, the regional resources that carried most weight with respondents were natural environment, transportation access, and regional business climate, culture, and history.
- Natural environment was most popular in

the Tohoku and Hokkaido regions, transportation access was most popular in the Kanto and Kinki regions, and regional business climate, culture, and history was most popular in the Kyushu, Kinki, and Shikoku regions.

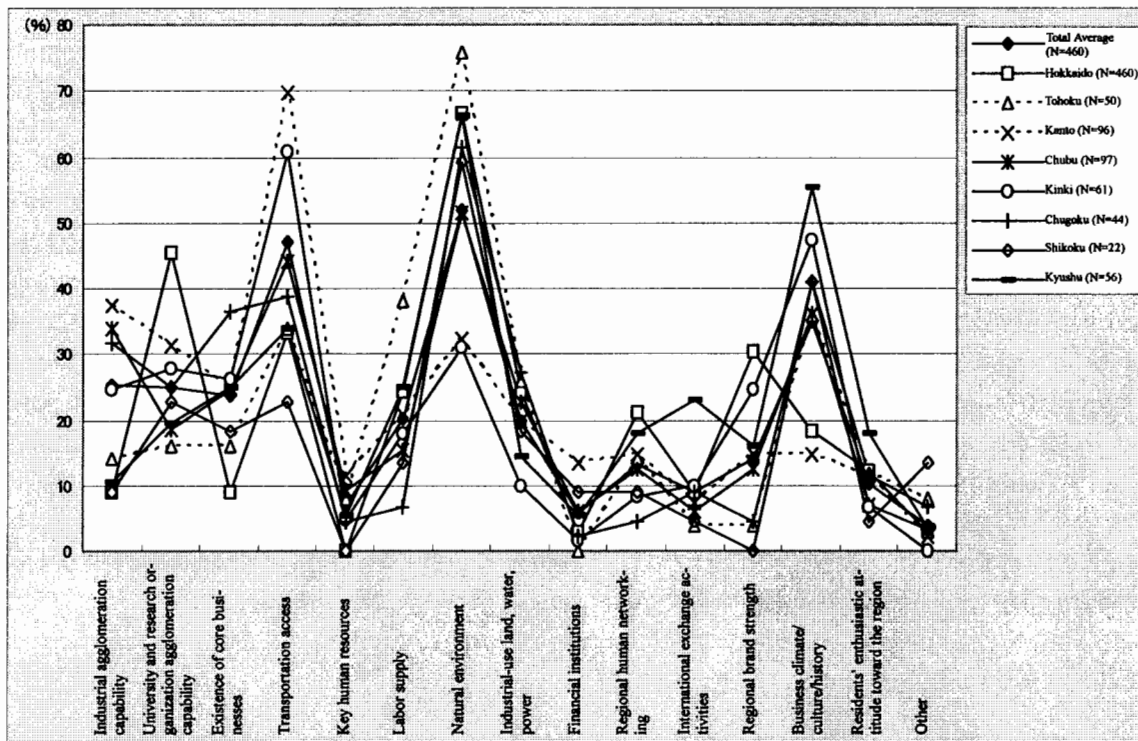


Diagram 3-1 Recognition of Regional Resources by Region (multiple answers allowed; N=460)

<Trend Analysis>

It appears that regions that responded with natural environment and regions that responded with transportation access are inversely correlated with each other. In particular, the Kanto and Kinki regions placed the greatest priority on transportation access, while the remaining regions indicated that natural environment was a top concern. In other words, these results seem to illustrate the contrast between metropolitan (Tokyo and Osaka are represented by the Kanto and Kinki regions) and rural areas of Japan.

Likewise, western Japan (Kyushu, Kinki, and Shikoku regions) placed a relatively greater emphasis on regional business climate, culture, and history than eastern Japan (Tohoku region).

3-2-2. Priorities for the Promotion of Industrial Agglomeration

- Overall, most respondents indicated that a main priority for promoting industrial agglomeration was the fortification of existing SMEs. This response was particularly common in the Shikoku region.
- New business attraction was also a relatively common response, particularly in the Tohoku and Chubu regions.
- Respondents from the Hokkaido region strongly emphasized the development of research parks by universities and research organizations.
- Respondents from the Chubu, Tohoku, and Shikoku regions indicated that the revitalization of traditional local industries was a priority.
- Respondents from the Kinki, Kanto, and Kyushu regions placed a relatively high priority on the nurturing and support of venture businesses.

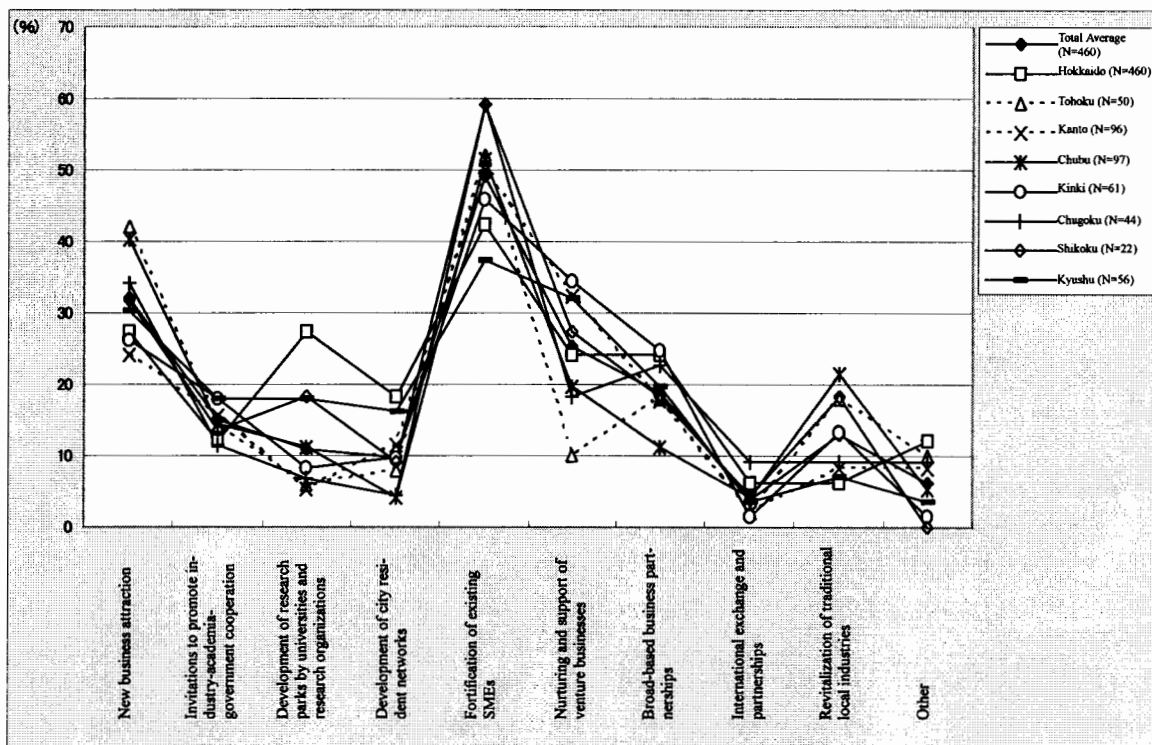


Diagram 3-2 Priorities for the Promotion of Industrial Agglomeration by Region (maximum two answers allowed; N=460)

<Trend Analysis>

Regardless of the differences that exist between regions, most respondents indicated that a main priority for promoting industrial agglomeration was the fortification of existing SMEs; this result seems to indicate just how much the condition of regional industries relies on the vitality of SMEs. Furthermore, the attraction of new businesses seems to be a common theme as well, which points to the fact that the inviting businesses is still considered a key element in the promotion of regional industrial agglomeration.

In the Chubu, Shikoku, and Tohoku regions, the revitalization of traditional local industries also appears to be a priority and indicates the importance of industrial agglomeration that is suited to the characteristics of the region's resources.

3-2-3. Factors that Prevent Adequate Contribution to and Promotion of Regional Industries by Academic and Governmental Organizations

- Overall, a large percentage of respondents indicated that inadequate key human resources is a factor that prevents adequate contribution to and promotion of regional industries, particularly respondents from the Chugoku and Kinki regions.
- Regardless of the differences that exist between regions, roughly 40% of respondents indicated that inadequate ability to forge partnerships is a factor.
- Respondents from the Hokkaido and Tohoku regions strongly indicated that a poor sense of participation among local businesses is a factor.
- A relatively high percentage of respondents from the Kyushu, Kinki, and Shikoku regions indicated that inadequate financial aid is a factor.

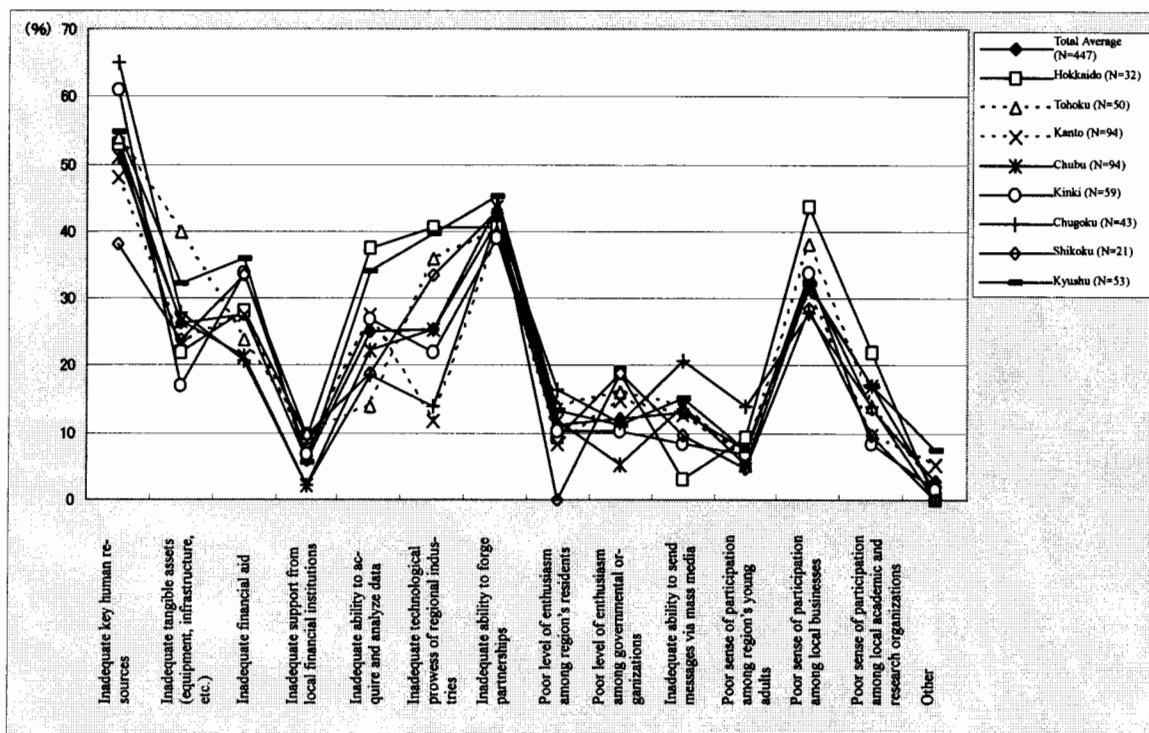


Diagram 3-3 Factors that Prevent Adequate Contribution to and Promotion of Regional Industries by Academic and Governmental Organizations (multiple answers allowed; N=447)

<Trend Analysis>

Since inadequate key human resources and inadequate ability to forge partnerships were common responses, it is possible to draw the conclusion that adequate regional human resources are vital conditions for regional industrial contributions by universities and national colleges of technology and effective implementation of industrial promotion policies by governmental organizations. One may conclude that shortage of experts in creative and networking fields is the largest obstacle.

As for poor sense of participation among local businesses, this result illustrates the importance of providing more opportunities for businesses to participate in promotional activities.

3-2-4. Factors that Prevent Adequate Promotion of Industry-Academia-Government Partnerships by Academic and Governmental Organizations

- There are five “peaks” that appear in the Diagram below; they represent “key human resources,” “networking ability,” “local business’ sense of participation,” “technological prowess of local industries,” and “financial aid.”
- A comparatively high percentage of respondents from the Chugoku, Kinki, and Kyushu regions answered that inadequate key human resources is a factor that prevents adequate promotion of industry-academia-government partnerships.
- Respondents from the Kyushu and Chugoku regions strongly indicated that an inadequate ability to forge partnerships is a factor.
- A relatively high percentage of respondents from the Tohoku and Kanto regions indicated that a poor sense of participation among local businesses is a factor.
- A very high percentage of respondents from the Shikoku region answered that inadequate technological prowess of regional industries is a factor.
- A relatively high percentage of respondents from the Kinki and Kyushu regions indicated that inadequate financial aid is a factor.

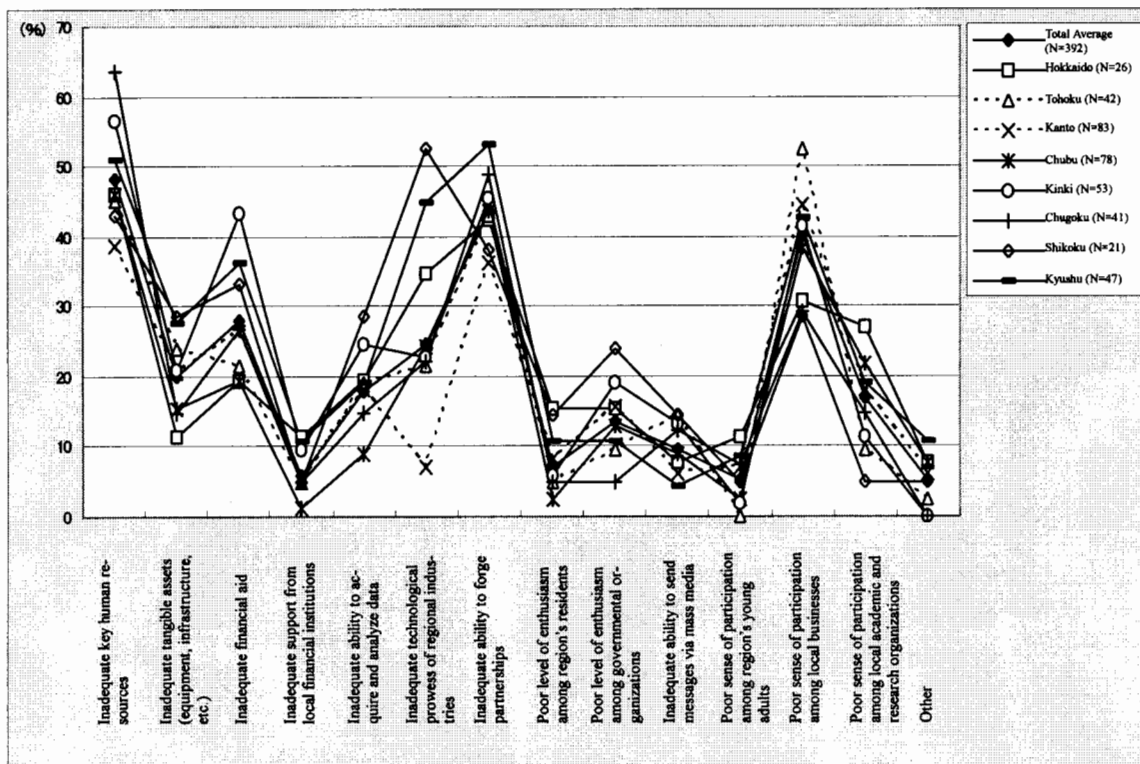


Diagram 3-4 Factors that Prevent Adequate Promotion of Industry-Academia-Government Partnerships by Academic and Governmental Organizations (multiple answers allowed; N=392)

<Trend Analysis>

The most common responses concerning areas of inadequacy were inadequate key human resources, inadequate ability to forge partnerships, poor sense of participation among local businesses, inadequate technological prowess of regional industries, and inadequate financial aid.

A particularly large number of respondents from the Shikoku region answered that inadequate technological prowess is a factor, which seems to indicate that technological improvements among regional industries are critical to promoting industry-academia-government partnerships. Many respondents from the Shikoku region also answered that a poor level of enthusiasm among governmental organizations is also a factor; it is therefore possible to say that stepping up promotional efforts is an urgent issue.

3-2-5. Regional Industrial Innovation: Degree of University and National Colleges of Technology Contribution & Degree of Prefectural and Municipal Government Policy Effectiveness

※ In this section, academic and governmental organizations evaluate their own degrees of contribution and policy effectiveness, respectively, concerning regional industrial innova-

tion.

※ Evaluations were based on the rating system shown below.

<Rating System>

- Higher than expected degree of contribution, policy effectiveness: +2
- Expected degree of contribution, policy effectiveness: +1
- A certain degree of contribution, policy effectiveness: ±0
- Low degree of contribution, policy effectiveness: -1
- Virtually no contribution, policy effectiveness: -1

- The overall average rating was -0.28.
- Respondents from the Kinki region in particular gave themselves the poorest ratings, fol-

lowed by respondents from the Shikoku and Kanto regions, respectively.

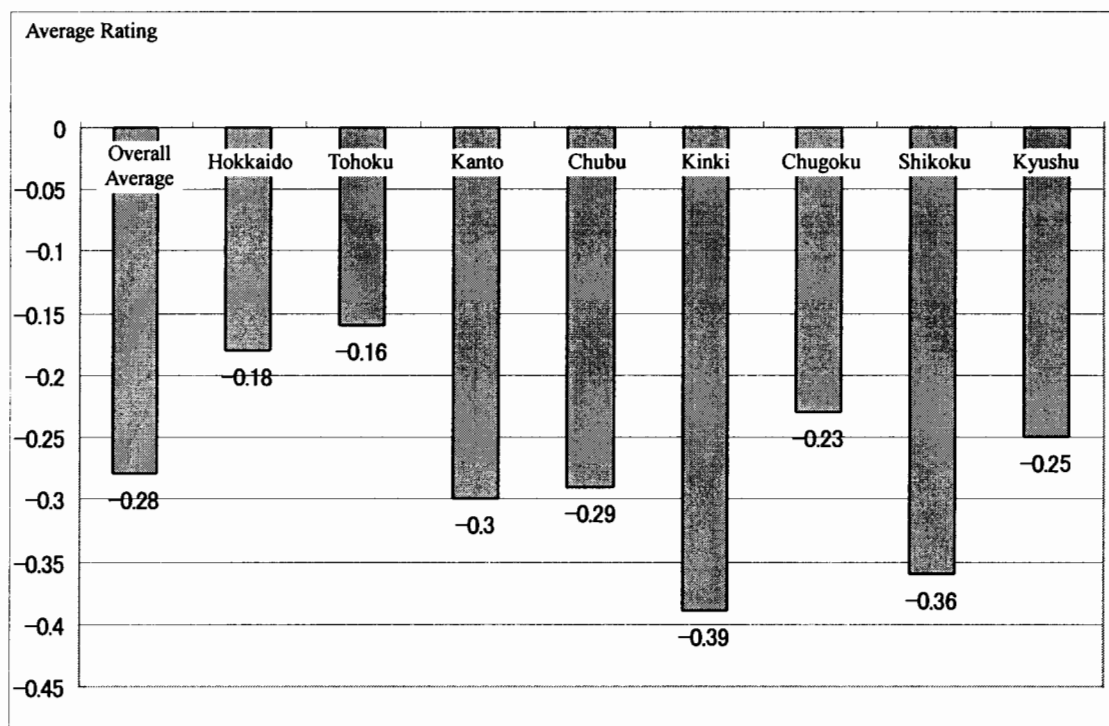


Diagram 3-5 Degree of Contribution & Effectiveness by Region (N=459)

<Trend Analysis>

The average rating of contributions by universities and national colleges of technologies and the effectiveness of prefectural and municipal government policies was a -0.28 (virtually a rating of 0), which suggests that the majority of respondents believe that a certain degree of contribution and policy effectiveness exists. None of the participating regions had an above-zero score, however, which indicates a need for stronger efforts on the part of academic and governmental organizations.

3-2-6. Regional Industrial Innovation: Degree of Contribution and Policy Effectiveness by Three Types of Organizations (Academic, Prefectural & Municipal)

<Rating System>

- Higher than expected degree of contribution, policy effectiveness: +2
- Expected degree of contribution, policy effectiveness: +1
- A certain degree of contribution, policy effectiveness: ±0
- Low degree of contribution, policy effectiveness: -1
- Virtually no contribution, policy effectiveness: -1

- When we examine self-evaluation scores by type of organization (as opposed to region), we see that the average rating of prefectural government organizations is a positive number, albeit a low rating.
- The ratings for universities, national colleges of technology, and municipal government organizations, however, are all minus numbers; the score for municipal organizations is particularly low.

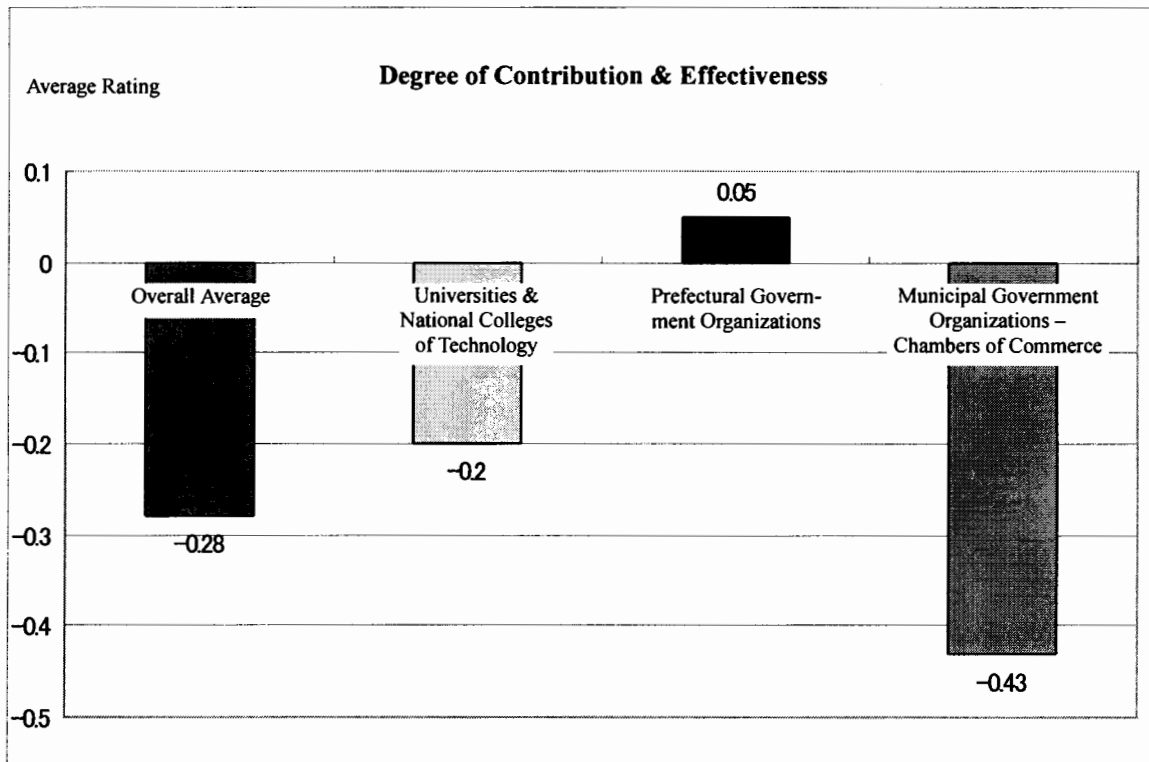


Diagram 3-6 Degree of Contribution and Policy Effectiveness by Three Types of Organizations (N=459)

<Trend Analysis>

It is important to point out that, when considering these results, one must take into account that the scope has been limited to innovation in regional machine industries. Therefore, regions with fewer machine industries will naturally have lower ratings; the same is particularly true for cities, which have much more limited territories, and that is likely why the rating is so low for municipal government organizations.

We believe that the minus rating for universities and national colleges of technology is due to the fact that university education and research is aimed at a large number of diverse fields, not just machine industries.

3-2-7. Regional Industrial Innovation: Degree of Contribution and Policy Effectiveness by Two Types of Organizations (Academic & Governmental)

- When we examine self-evaluation scores by type of organization (academic vs. governmental), we see that the average rating is a minus number, although the average rating of governmental organizations is comparatively low.

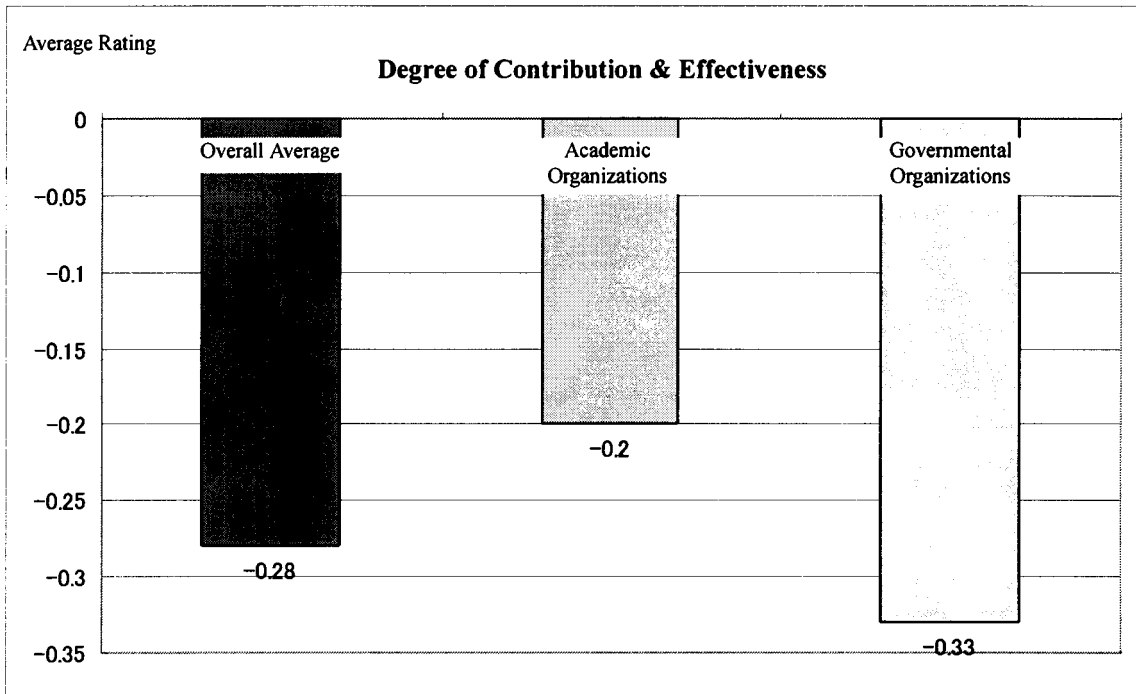


Diagram 3-7 Degree of Contribution and Policy Effectiveness by Two Types of Organizations (N=459)

<Trend Analysis>

It is important to point out that, when considering these results, one must take into account the scope covered by the region in question. Consequently cities, which have limited territories (and comparatively fewer machine industries), are more likely to have lower ratings, and this contributes to an overall rating for governmental organizations that is lower than that of academic organizations.

Based on these results, we can draw the conclusion that an issue concerning “regional scope” exists. In other words, even when referring to the theories of industrial agglomeration and clusters, it is difficult to determine the “scope” of regions in Japan that are to be targeted by governmental policies designed to promote industrial development.

※ According to Michael Porter’s cluster theory, geographical expansion of clusters may occur on various different scales; the scope may be limited to a single city, it may cover an entire nation, or it may include several neighboring nations. (Taken from “Competitive Strategy Theories II;” Diamond, Inc.; 1999; p. 70)

3-2-8. Regions Recognized as Regional Industrial Innovation Models

- Based on total responses from representatives of both academic and government (prefectural and municipal) organizations, Tokyo appears to be the region that is most commonly recognized as a model of innovation in regional machine industries.
- The fact that Iwate Prefecture (No. 2) ranked higher than Osaka (No. 3) deserves a closer look.
- Aichi Prefecture ranked No. 4 and Nagano and Yamaguchi Prefectures are tied at No. 5.

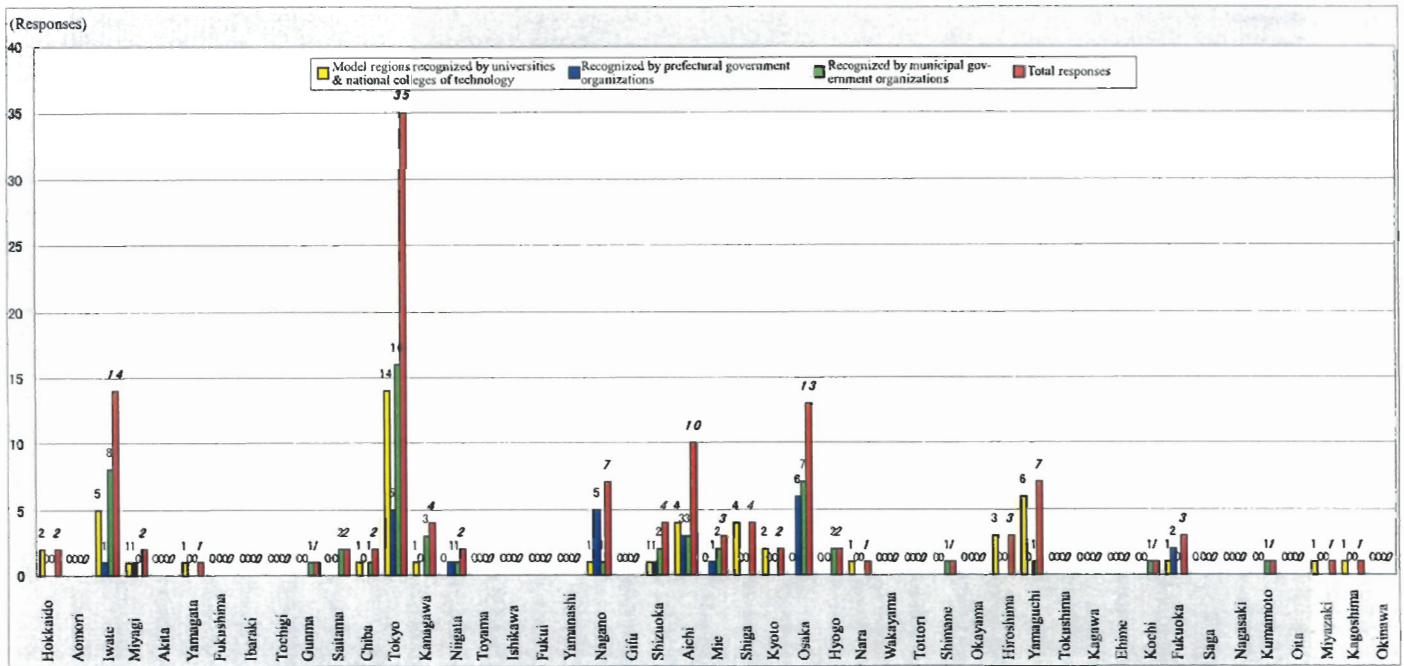


Diagram 3-8 Regions Recognized as Regional Industrial Innovation Models
(Participants were asked to respond freely with multiple answers; N=110)

<Trend Analysis>

Since there were few responses to this question, the results should not be considered to hold much statistical significance. Still, it cannot be denied that Tokyo is recognized by respondents from most regions as being a model of regional industrial innovation.

Some of the likely reasons for Iwate Prefecture's No. 2 ranking are 1) the existence of the Iwate Network System (INS), which can be considered as a "loose" network, 2) Iwate University's aggressive efforts with INS to forge partnerships with corporations, and 3) the existence of governmental organizations – beginning with the Governor's Office – that pay visits to and stay in close contact with the region's businesses. These same trends have also been observed in the Eastern Osaka area.

Aichi Prefecture's high ranking is most likely due to the fact that it is home to Toyota Motor Corporation, a core business that is able to attract other businesses to the region.

Nagano Prefecture's relatively high ranking may be attributed to its ability to create widely-recognized brands as evidenced by Suwa Area Industrial Messe, a world-class industrial conference established through a partnership between the Nagano Prefecture cities of Suwa, Okaya, and Chino.

Finally, Yamaguchi Prefecture's relatively high ranking may be attributed to the acclaimed TLO (Technology Licensing Organization) activities of Yamaguchi University.

3-2-9. Universities and National Colleges of Technology Recognized as Regional Industrial Innovation Models

- Based on total responses from representatives of Japanese universities and national colleges of technology, Iwate University is most commonly recognized as an innovation model, followed by Waseda University and Ritsumeikan University, which tied at No. 2.
- Tokyo University of Agriculture and Technology and Tokuyama College of Technology also ranked relatively high in the results.

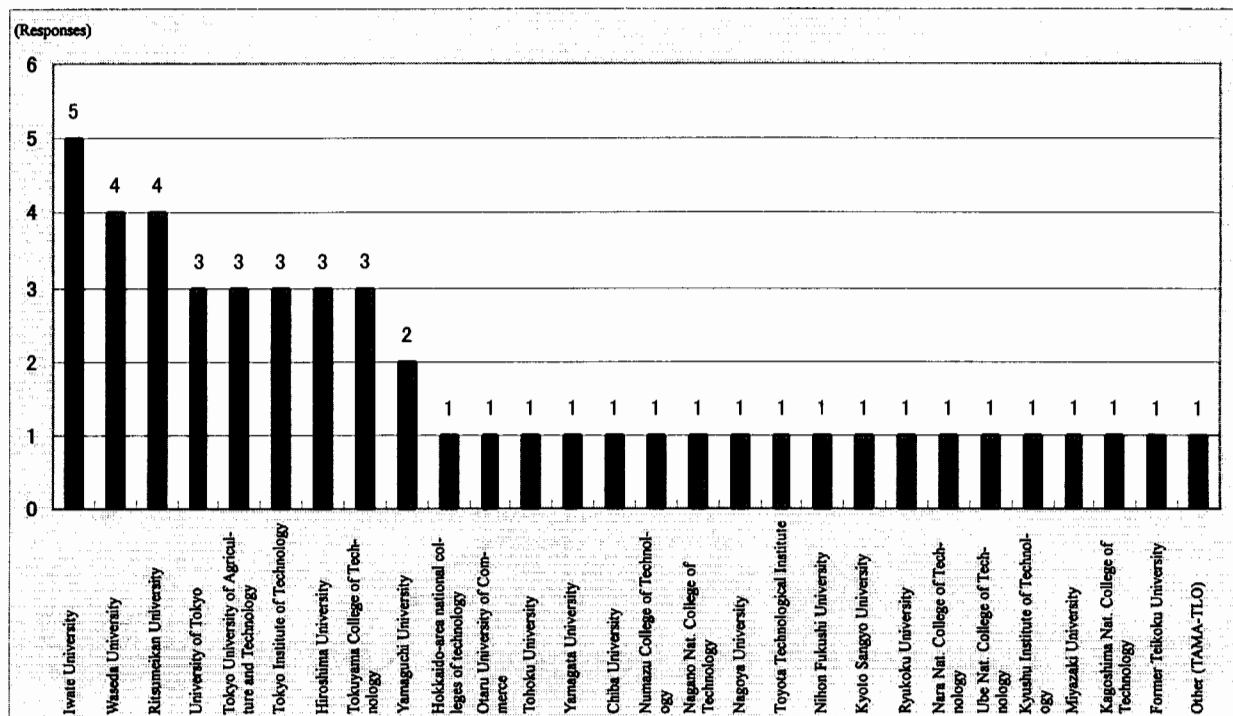


Diagram 3-9 Universities and National Colleges of Technology Recognized as Regional Industrial Innovation Models (Participants were asked to respond freely with multiple answers; N=46)

<Trend Analysis>

Since there were few responses to this question, the results should not be considered to hold much statistical significance. Still, Iwate University was clearly the most popular response, most likely because of the reasons specified in the previous section: prefecture-wide efforts to establish industry-academia-government partnerships. Furthermore, a sense of crisis among people associated with Iwate University appears to drive these activities.

The high rankings of Waseda and Ritsumeikan, leading private universities from Eastern and Western Japan, may be attributed to their widely-known efforts to nurture venture businesses, forge business partnerships, and establish presences in Kyushu and other regions. Tokyo University of Agriculture and Technology's high ranking, too, may be attributed to its acclaimed venture-nurturing efforts.

Tokuyama College of Technology has been attracting attention for its aggressive efforts to develop industry-academia-government partnerships and to contribute to regional industries through its Techno-Refresh Education Center. Other national colleges of technology such as Hokkaido-area colleges, Numazu College of Technology, Nagano National College of Technology, Nara National College of Technology, Ube National College of Technology, and Kagoshima National College of Technology also appear in the rankings. This seems to indicate the importance of the role played by national colleges of technology in regional industrial innovation.

3-2-10. Regions Recognized as Regional Industrial Innovation Models by Prefectural Government Organizations

- Tokyo's Ota Ward and Higashi-Osaka City both ranked No. 1.
- The Niigata Prefecture cities of Sanjo and Tsubame were also mentioned.
- The Nagano Prefecture cities of Suwa, Ueda, Nagano, and Saku seem to be receiving a relatively high level of attention.

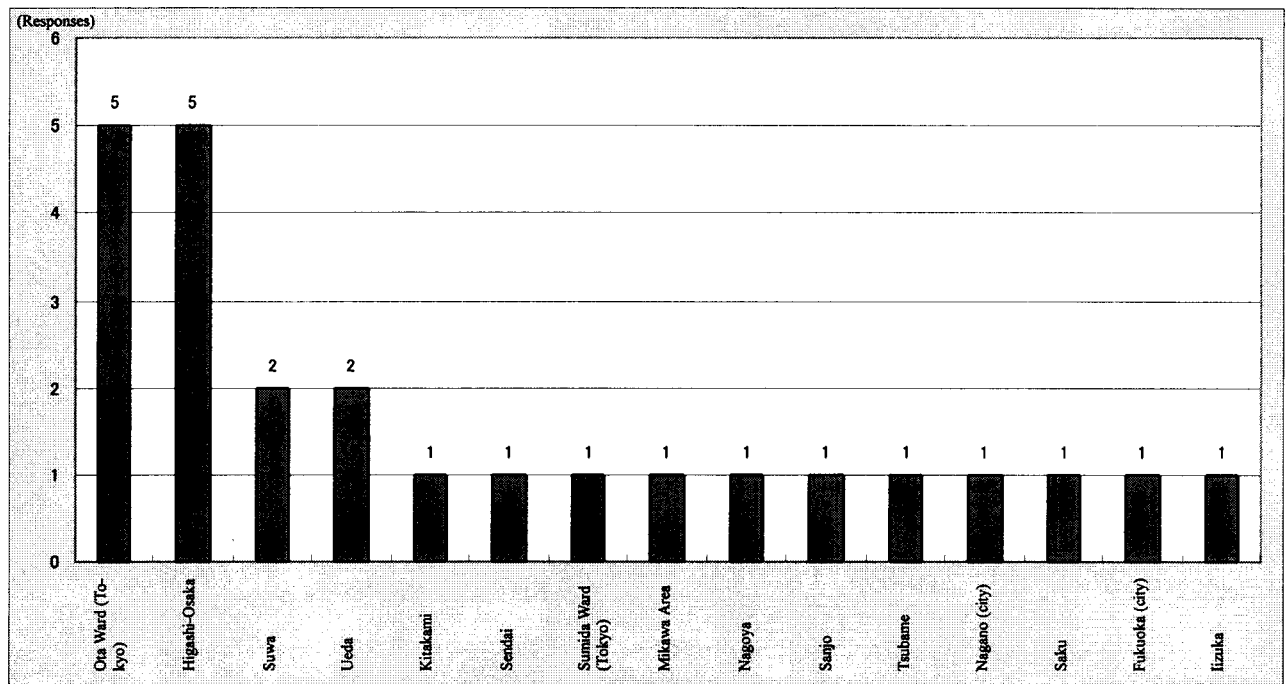


Diagram 3-10 Regions Recognized as Regional Industrial Innovation Models by Prefectural Government Organizations
(Participants were asked to respond freely with multiple answers; N=20)

<Trend Analysis>

Again, since there were few responses to this question, the results should not be considered to hold much statistical significance. Still, Tokyo's Ota Ward and Higashi-Osaka City are clearly popular models. Both regions fall into the "urban industrial agglomeration" category and are well-known around the nation as locations where small and medium-scale factories have concentrated. At the same time, these regions are also facing a number of issues, including 1) a reduced number of offices/plants, 2) the aging of business owners, 3) problems regarding the transfer of businesses and technologies to new leadership, and 4) problems concerning the survival of manufacturing operations that rely on a network of businesses. In spite of these challenges, however, industries in these regions have refused to give in, and this forward-looking attitude is likely one of the main reasons why these two regions ranked so highly.

The appearance of multiple cities from Nagano Prefecture in this ranking may be attributed to the region's ability to create widely-recognized brands as evidenced by Suwa Area Industrial Messe. Additionally, Ueda City is known for its Multimedia Information Center and ability to lure high-tech businesses to the area.

The appearance of Iizuka City (Fukuoka Prefecture) may be attributed to its efforts to develop an "information industry city" through partnerships with Stanford University and others.

3-2-11. Regions Recognized as Regional Industrial Innovation Models by Municipal Government Organizations

- Tokyo's Ota Ward and Higashi-Osaka City ranked No. 1 and 2, respectively.
- Iwate Prefecture's Hanamaki City ranked No. 3.
- Hikawa (Shimane Prefecture) and Haruno (Kochi Prefecture) were also mentioned.

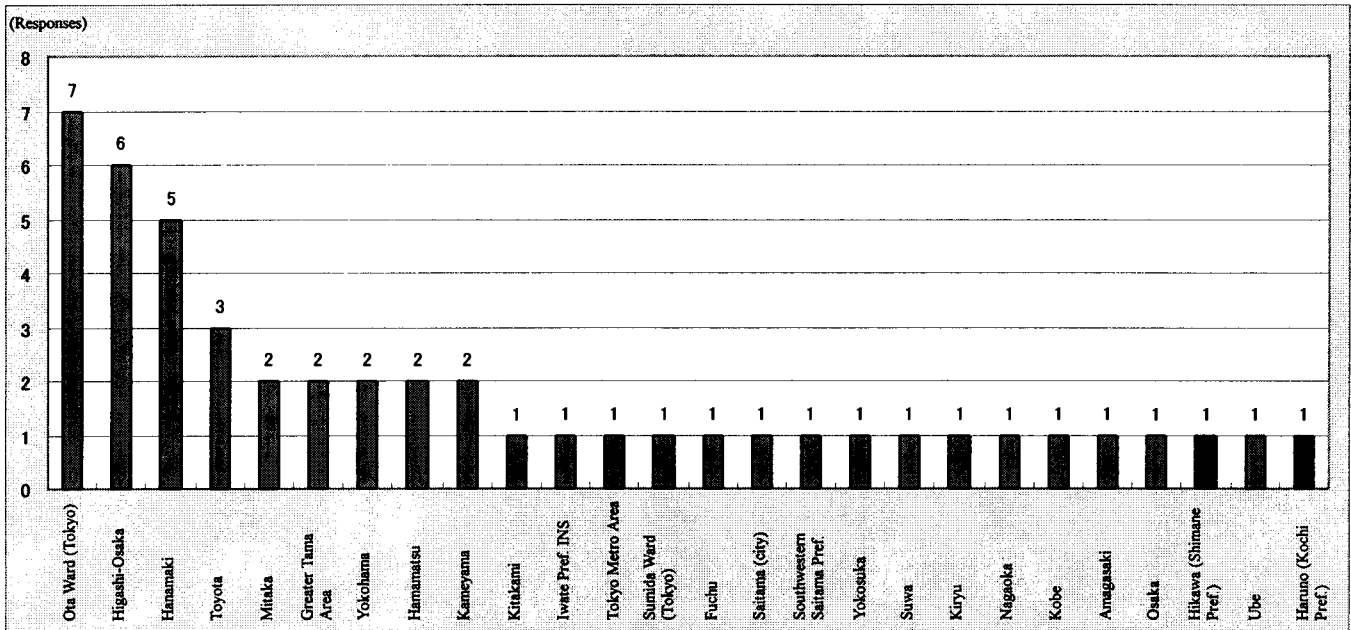


Diagram 3-11. Regions Recognized as Regional Industrial Innovation Models by Municipal Government Organizations
 (Participants were asked to respond freely with multiple answers; N=44)

<Trend Analysis>

Since there were few responses to this question, the results should not be considered to hold much statistical significance. Still, Tokyo's Ota Ward and Higashi-Osaka City are, again, clearly the most commonly recognized models; the reasons mentioned in the previous section likely apply here as well.

The appearance of Hanamaki (Iwate Prefecture) may be attributed to efforts on the part of the city and prefecture to lure businesses to the region, and also to the city's acclaimed broad-based transportation infrastructure. Iwate Prefecture's Kitakami City and INS (not a city, but a network system) also made the list. Based on these results, we may conclude that Iwate Prefecture has a relatively high level of recognition as a regional industrial innovation model compared to other regions in Japan.

The appearance of Shimane Prefecture's Hikawa may be attributed to its success in convincing Fujitsu and Murata Manufacturing to set up shop in the area and its recent factory lease program designed to support entrepreneurial activity.

The appearance of Kochi Prefecture's Haruno City may be attributed in part to the fact that it is home to Nippon Kodoshi Corporation's paper manufacturing plant.

3-2-12. Overseas Universities Recognized as Regional Industrial Innovation Models by Japanese Universities and National Colleges of Technology

- Stanford University (U.S.) was the most commonly mentioned overseas university. By country as well, U.S. universities were the most commonly mentioned.
- Shanghai Jiao Tong University (China) ranked No. 2, and the University of Oulu (Finland) ranked No. 3.

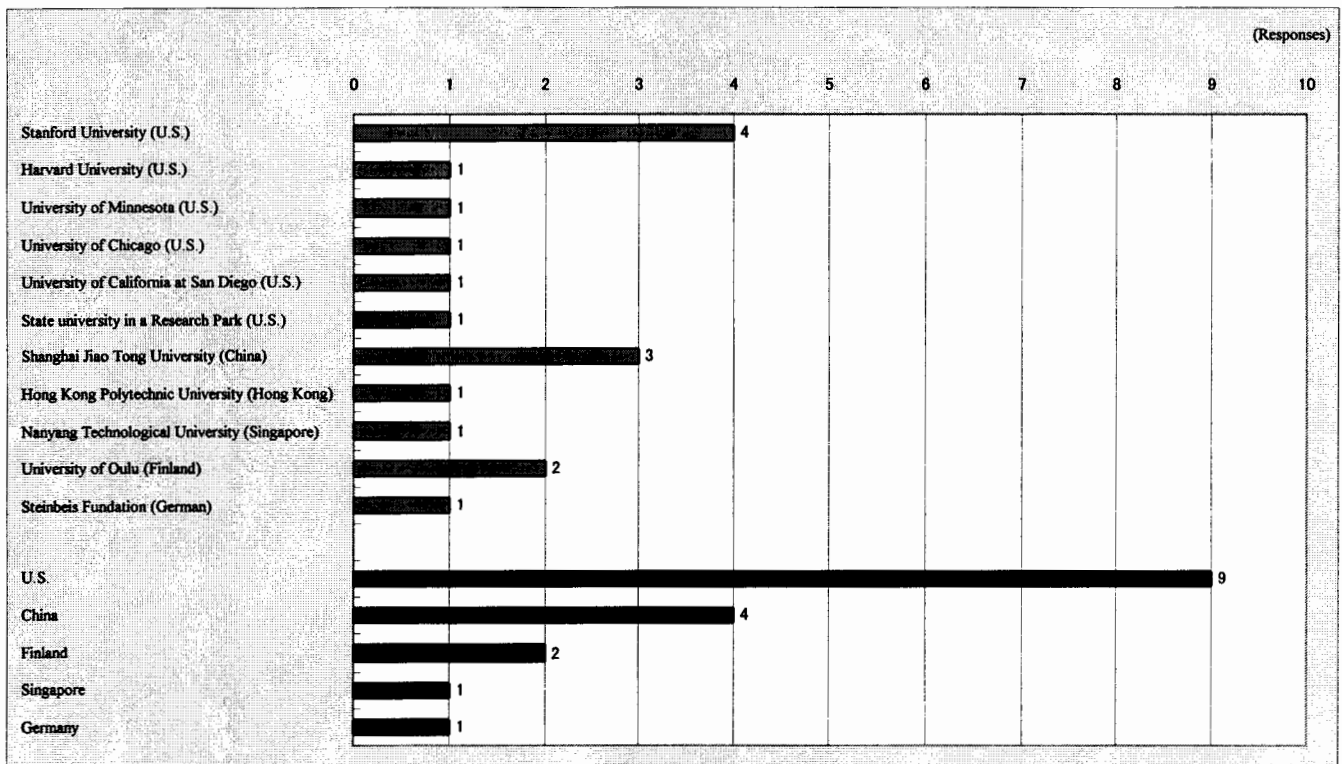


Diagram 3-12 Overseas Universities Recognized as Regional Industrial Innovation Models by Japanese Universities and National Colleges of Technology
 (Participants were asked to respond freely with multiple answers; N=15)

<Trend Analysis>

Since there were few responses to this question, the results should not be considered to hold much statistical significance. Still, U.S. universities, lead by Stanford University, were clearly the most commonly recognized models. These results seem to suggest that the Silicon Valley model is still recognized as a valid one.

The appearance of Shanghai Jiao Tong University in the list may indicate that Chinese universities are rapidly emerging as industrial innovation models.

Finland's University of Oulu is attracting attention as a government policy-induced cluster model, and has also launched the "Finnish Well-being Center Project," a health and welfare equipment R&D program, in cooperation with the Sendai (Miyagi Prefecture) municipal government.

3-2-13. Foreign Cities Recognized as Regional Industrial Innovation Models by Prefectural Government Organizations

- In addition to several U.S. cities, which were the most commonly mentioned regional industrial innovation models, two Chinese cities, the Finnish city of Oulu, and the Swedish city of Malmo also appeared in the list.

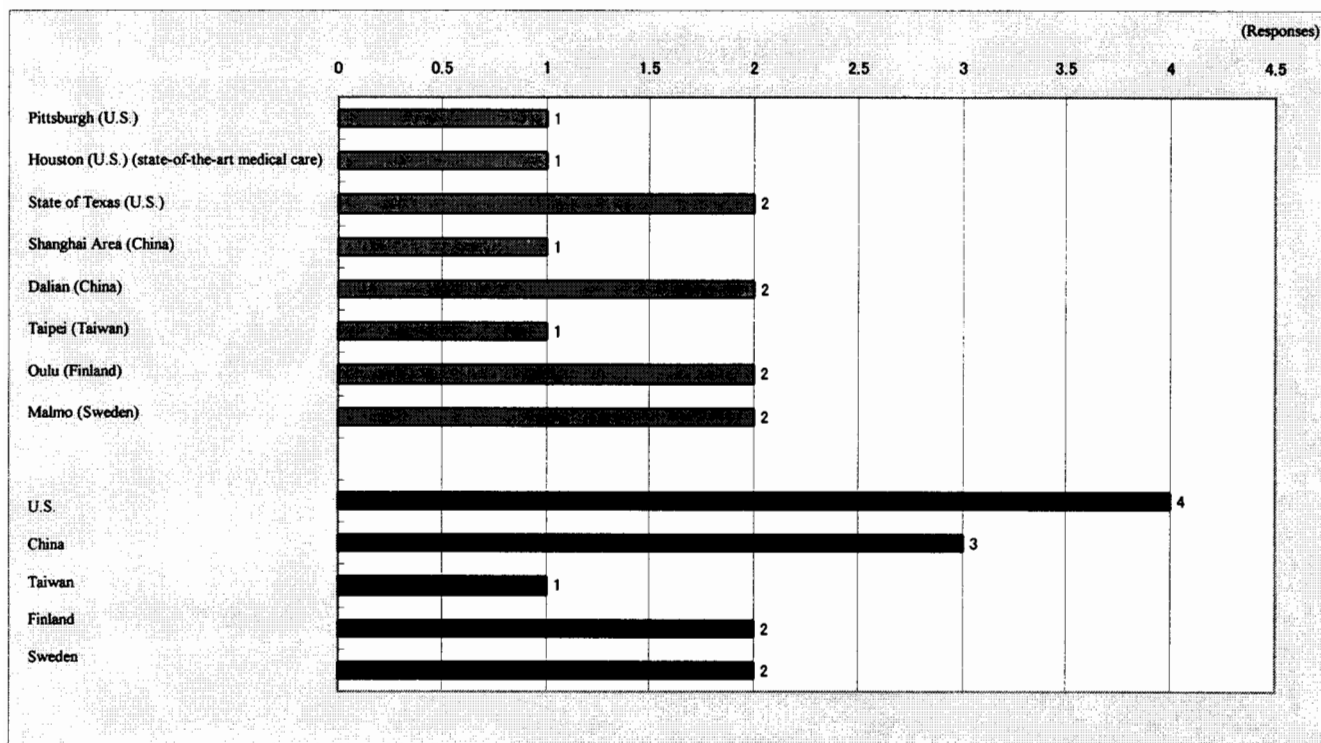


Diagram 3-13 Foreign Cities Recognized as Regional Industrial Innovation Models by Prefectural Government Organizations
 (Participants were asked to respond freely with multiple answers; N=10)

<Trend Analysis>

Since there were few responses to this question, the results should not be considered to hold much statistical significance. Still, U.S. and Chinese cities were clearly the most commonly recognized models. The mention of Houston may be attributed to the city's large concentration of medical industries.

It is also notable that two Northern European cities were mentioned. The mention of Finland's Oulu is likely attributable to the reasons discussed in the previous section. Sweden's Molmo is drawing attention as a model of innovation in the medical, welfare, and housing industries and, in recent years, has attracted a number of delegations of industry observers from Japan.

These results seem to indicate that not only U.S. models but Chinese and Northern European models as well are emerging as viable industrial innovation models, and that models are becoming more diverse.

3-2-14. Foreign Cities Recognized as Regional Industrial Innovation Models by Municipal Government Organizations

○ No city stands out as a commonly recognized regional industrial innovation model. Comparing responses by nation, however, shows that German cities are more commonly recognized than cities in other nations. Further-

more, Northern Europe (Switzerland, Finland, and Sweden) stands out again as a commonly recognized region that contributes to industrial innovation.

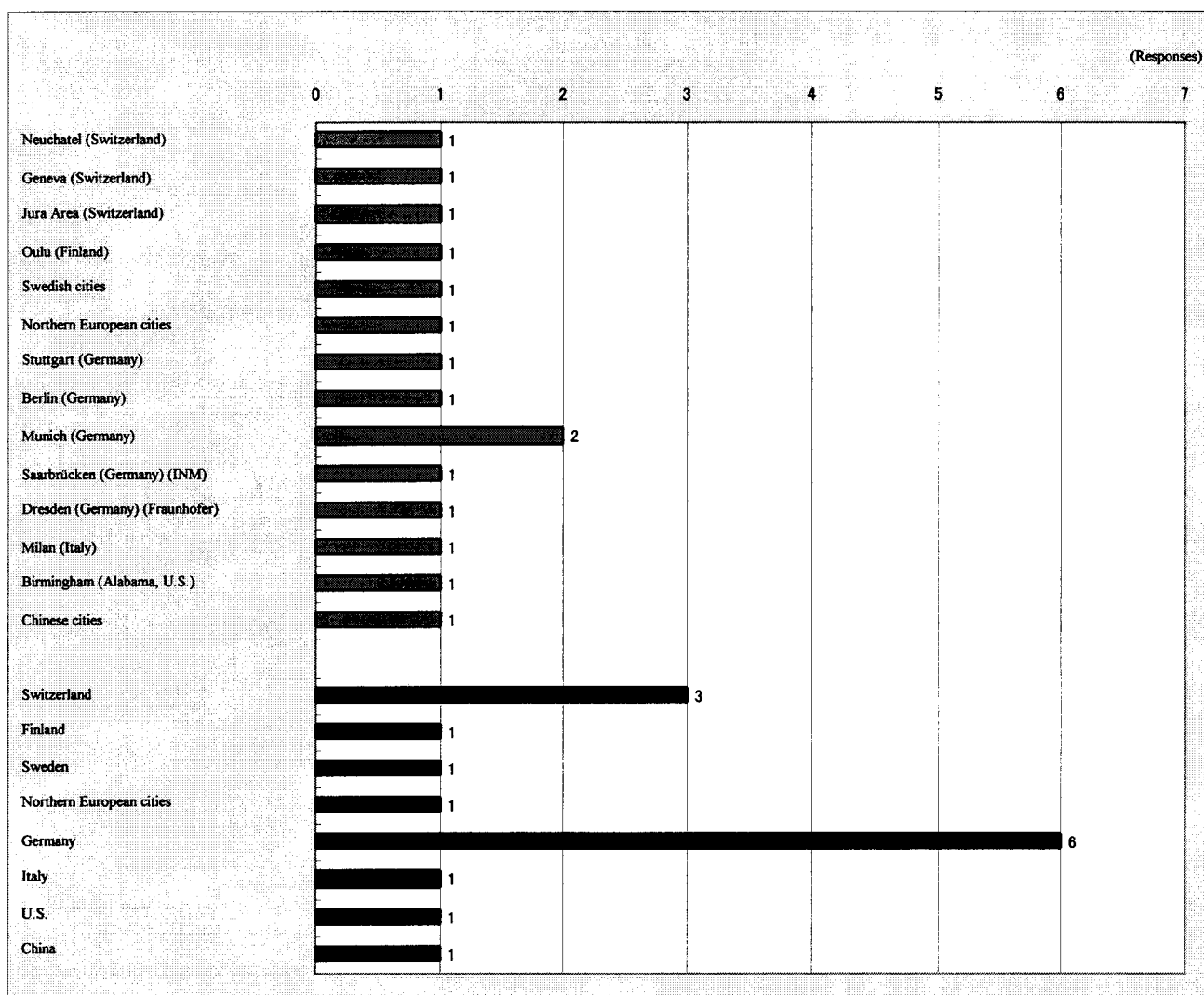


Diagram 3-14 Foreign Cities Recognized as Regional Industrial Innovation Models by Municipal Government Organizations
 (Participants were asked to respond freely with multiple answers; N=9)

<Trend Analysis>

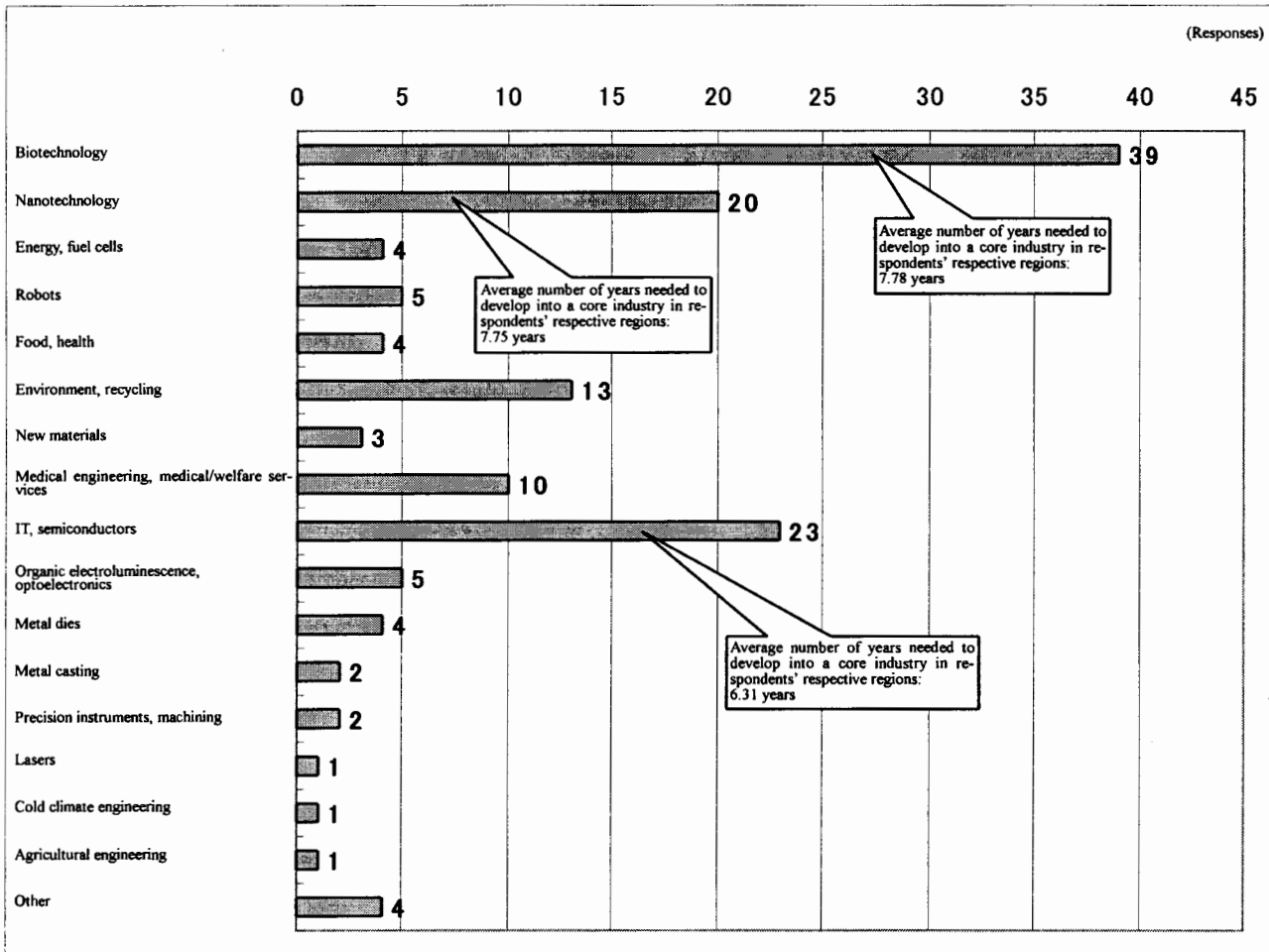
Since there were few responses to this question, the results should not be considered to hold much statistical significance. Still, German cities were clearly the most commonly recognized models; this result differs somewhat from the results in the previous section. Germany's high ranking may be attributed to the existence of the Polytechnic.

University of Munich, the Institute for New Materials (INM) in Saarbrücken, and the Fraunhofer Society in Dresden.

3-2-15. University and National College of Technology Involvement in New Fields of Industry

- This question, too, solicited free-choice answers from respondents. The most common response was the biotechnology field, followed by the IT and semiconductor field and the nanotechnology field, respectively.
- Respondents believed that it would take an average 7.82 years for the biotechnology industry to become a core industry in their respective regions, while the IT and semiconductor industry would require an average of 6.31 years and the nanotechnology industry would require an average of 7.75 years.

Chinese cities



Note: The average numbers of years needed for the biotechnology, IT and semiconductor, and nanotechnology industries to develop into core industries are based on 22, 13, and 16 responses, respectively.

Diagram 3-15. University and National College of Technology Involvement in New Fields of Industry (Participants were asked to respond freely with multiple answers; N=94)

<Trend Analysis>

Universities and national colleges of technology are most commonly involved in the biotechnology, IT, and nanotechnology fields, partly because of the fact that the national government has placed a high priority on them. Still, based on the responses, it seems that it will take more or less than seven years before these develop into regional core industries.

3-3. Regional Industrial Innovation: Keys to Achieving Success

Based on the results of our survey entitled “Innovation in Regional Industries: Current Conditions & Success Factors,” which focused on regional machine industries, we were able to deduce the following keys to achieving successful innovation.

Keys to Achieving Success in Innovation in Regional Industries Focusing on Regional Machine Industries

Key Human Resources

There is a need for human resources and organizations that are closely tied to and tenaciously represent and promote their respective regions without being influenced by their background of industrial, academic, or governmental sectors.

Strong Partnership-forming Ability

There is a need for human resources and organizations that are able to effectively link together and leverage the region’s various leading resources while at the same time helping to enhance and supplement resources that are currently considered to be inadequate.

Mechanisms for Raising Local Business’ Sense of Participation

It is important for governmental and academic organizations to work aggressively to create opportunities for local businesses (particularly SMEs) to participate in activities designed to establish industry-academia-government partnerships and promote regional development. It is also important for representatives from these organizations to pay actual visits to a region’s businesses in order to network more effectively.

Effective Use of Financial Aid

Once a governmental or academic organization has been granted financial aid, these organizations must work hard to raise business awareness and improve the strength of their organizations so that grant money is used effectively.

Determine What the Strengths of Model Cities and Universities Are

We believe that a close observation of the domestic and overseas model cities and universities discussed in this report will reveal some important keys that regions in Japan can use to successfully promote industrial innovation.

Leverage the Advantages of Regional Resources

The advantages of regional resources differ from region to region. This indicates a necessity to develop industrial policies that leverage regional resources and take into account the opinions of the region’s residents.

Some survey questions and tabulation results have been omitted from the English report but are included in the Japanese-language version, particularly detailed prefectural/municipal-government-specific responses concerning regional industrial innovation success factors. Please see the Japanese version for more complete information.