

# Economic disparities among regions in Japan and the problem of the spread of information and communication equipment in the countryside

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**Abstract**—Japan’s government believed that the development of ICT networks and penetration of information and communications equipment in the countryside reduce the economic and population disparities among regions. Since the latter half of the 90s, some local governments built “intelligent facilities” equipped with ICT network so as to foster the information and communications industry in their area as part of regional “informatization policy”. However, “intelligent buildings” failed to attract information and communication companies, economic disparities among regions are in fact widening, while the macro economy is recovering and expanding. Main points are the contents of the regional informatization policy and the effect on the development of ICT networks and the information and communication industry. As “economy of concentration” works more in the information and communications economy, the development of ICT networks and related industries would concentrate economic power in urban areas. At present, it is essential for the regional informatization policy to develop information and telecommunications infrastructure that addresses the needs of residents who lack access to information, and to implement careful information literacy education for residents.

**Keywords**—*economic disparities among regions, regional informatization policy, digital divide, economy of concentration.*

## 1. The relation of economic disparities among regions and the spread of information and communication equipment

### 1.1. “The lost decade” and regional income disparities

During the 90s, the Japanese economy fell into a recession of unprecedented length. Therefore, the 90s have been dubbed “the lost decade”. The development of information and communication networks came to be seen as a necessary stimulus for improving efficiency of the macro economy, and the government adopted the belief that its development was particularly important in the countryside, where

social infrastructure lagged behind that of large cities. In fact, in terms of macro economy, government investment in the IT field and corporate information investment had a good effect on economic growth. Japan’s information and communications industry has been expanding and is a leading industry today (Table 1).

The information and communications industry consists of eight sectors:

- communications;
- broadcasting;
- information services;
- video picture, sound information, character information production and distribution;
- manufacture of information and communication electronics equipment and related products;
- information and communications related services;
- information and communications related construction work;
- research.

Types of business that comprise four sectors with largest number of employees, based on 2004 data [1] are:

- information services (employees, 1,004,204) consist of two businesses: computer programming and other software services and data processing and information services;
- research (771,715), which cannot be further subdivided;
- information and communications related services (662,383) consist of four businesses: rental services of information and communications equipment, advertising, printing and bookbinding businesses, cinemas, and legitimate theatres;
- communications (634,118) consists of four businesses: postal service, fixed telecommunications, mobile telecommunications and services incidental to telecommunications.

Table 1  
Growth of Japanese information and communications industry [1]

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Gross domestic product (GDP) generated by information and communications industry [billion yen]	32 905	37 519	40 596	42 415	43 939	46 355	50 807	52 927	56 686	61 909
Growth rate [%]		14.0	8.2	4.5	3.6	5.5	9.6	4.2	7.1	9.2
Information and communications industry share of total GDP [%]	6.8	7.6	8.1	8.6	9.0	9.3	10.2	10.5	11.0	11.7

Consequently, since the latter half of the 90s the ownership of information communication equipment and use of Internet among households have dramatically increased in Japan (Fig. 1).

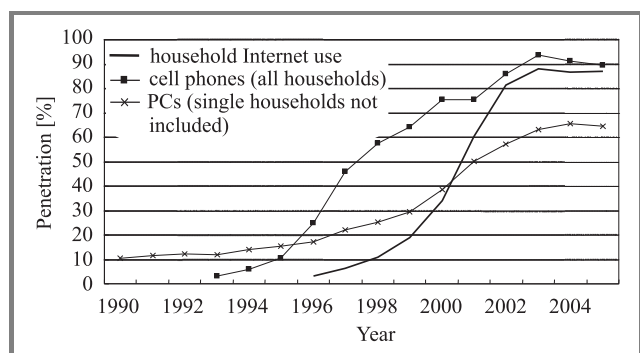


Fig. 1. Changes of penetration of information and communications equipment and Internet access [2].

Figure 2 shows trends in regional economic disparities in terms of the coefficient of variation for per capita prefectural income and per capita compensation of employees in the 47 prefectures of Japan. Between 1990 and 2001, the coefficients of variation for the two indicators declined, while in subsequent years they have risen. In other words, throughout “the lost decade”, regional disparities narrowed, and they have been widening in subsequent years due to the business recovery since 2001.

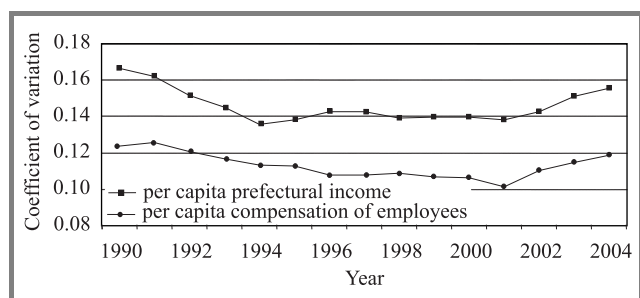


Fig. 2. Changes of coefficient of variation on per capita regional income [3].

That is to say, nowadays, information and communication network investment in the countryside has not boosted economic activity. Why has this happened? Tables 2 and 3 show the top and bottom five prefectures in terms of per

capita prefectural income in 1990 and 2003. As you can see on the map (Fig. 3), all the top five are located in the center of Honshu island. On the other hand, the bottom five are mostly thinly populated prefectures located in the areas far from central Japan, or in isolated or mountainous areas.

Table 2  
Top five and bottom five prefectures – fiscal year 1990 [3]

Top prefecture	Per capita prefectural income [thousand yen]	Bottom prefecture	Per capita prefectural income [thousand yen]
Tokyo	4139	Okinawa	1892
Osaka	3596	Nagasaki	2001
Aichi	3318	Kagoshima	2066
Kanagawa	3219	Miyazaki	2068
Saitama	3135	Kouchi	2116

Table 3  
Top five and bottom five prefectures – fiscal year 2003 [3]

Top prefecture	Per capita prefectural income [thousand yen]	Bottom prefecture	Per capita prefectural income [thousand yen]
Tokyo	4267	Okinawa	2042
Aichi	3403	Aomori	2160
Shizuoka	3226	Nagasaki	2187
Siga	3205	Kouchi	2238
Kanagawa	3184	Kagoshima	2239

As for the information and communications industry, they can easily get profit in urban areas due to economy of concentration. Conversely, in isolated or mountainous areas, information and communications companies, especially telephone operators, are not willing to invest because of comparatively high investment costs.

After 2000, most successful and expanding businesses in Japan have been related to the information and communications industry; almost all these companies have been concentrated in big cities.

Therefore, the development of information and communication networks in the countryside by the government during

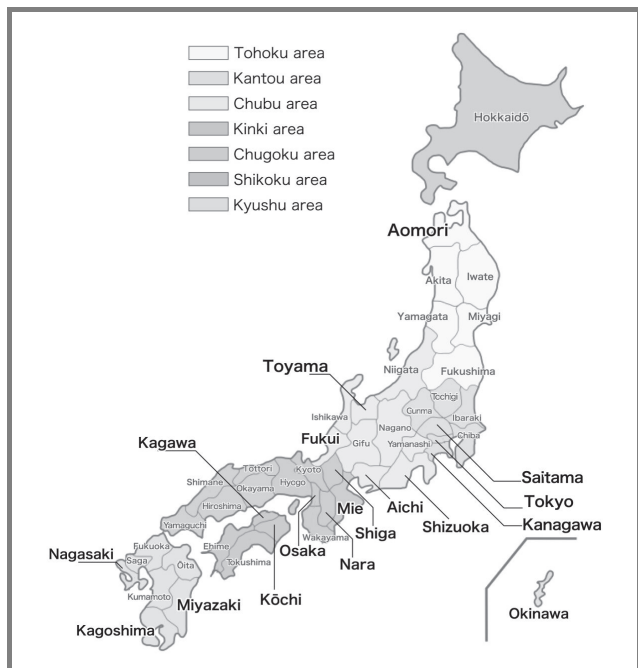


Fig. 3. Regions and prefectures of Japan.

“the lost decade” has not caused enough effective demand in those areas. That explains why the economies of rural prefectures have been stagnant in recent years.

**1.2. Correlation between penetration of information and communications equipment and regional economy**

Standard (fixed-line) telephones and TV sets are classified as information and communications equipment, but they are owned by almost every household, and therefore cannot be used as indicators for regional informatization disparities. Accordingly, we should use ownership of mobile phones, PCs and satellite receivers (satellite TV subscription) as indicators for regional informatization disparities, and examine their correlations with the regional economy. In fact, looking at the top five and bottom five prefectures by ownership of mobile phones and PCs (Tables 4 and 5) we find a resemblance in terms of per capita prefectural income.

Table 4  
Top five and bottom five prefectures by penetration of mobile phones (1999) [2]

Top prefecture	Penetration among households [%]	Bottom prefecture	Penetration among households [%]
Fukui	73.1	Hokkaido	53.2
Ishikawa	71.7	Yamaguchi	54.4
Shiga	71.2	Miyazaki	54.5
Tokushima	71.0	Kagoshima	55.8
Saitama	70.8	Aomori/Akita	57.3

Table 5  
Top five and bottom five prefectures by PC penetration (2004) [2]

Top prefecture	Penetration among households [%]	Bottom prefecture	Penetration among households [%]
Kanagawa	77.4	Okinawa	43.4
Aichi	76.1	Nagasaki	53.8
Siga	76.0	Aomori	56.2
Fukui	76.0	Kouchi	56.4
Nara	75.6	Kagoshima	57.7

Considering this fact, we will look at the relationship between ownership of information and communications equipment and per capita prefectural income using regression analysis.

Correlation between per capita prefectural income and ownership of information and communications equipment is shown in Fig. 4. Since Tokyo prefecture is an exceptional case, analysis excludes the Tokyo data, and the total num-

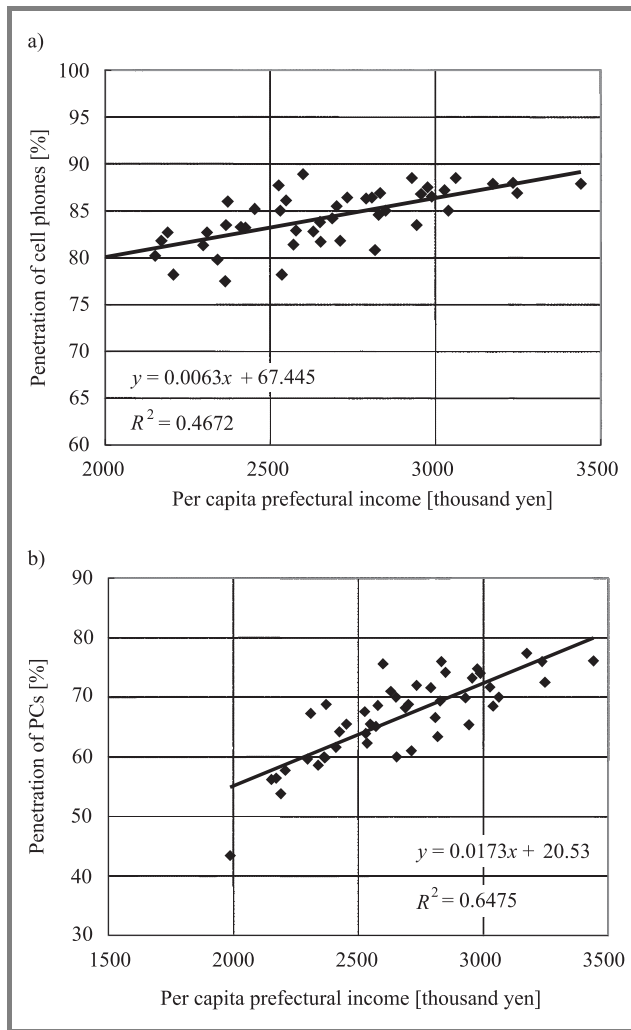


Fig. 4. Correlation between per capita income and penetration of information equipment: mobile phones (a) and PCs (b).

ber of data points is 46. Correlations are strong: the more developed regional economy is, the greater the availability of information equipment.

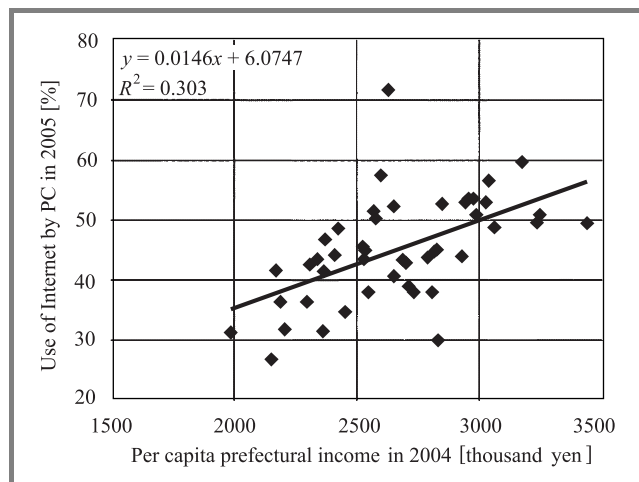


Fig. 5. Correlation between per capita income and use of information technology (2004).

However, the correlation between per capita income and use of information technology, meaning connecting the PCs to Internet, is not strong (Fig. 5). This is an astonishing fact and the problem is thought to lie in the use of PCs.

## 2. Features of Japan’s regional informatization policy

### 2.1. Definition of regional informatization and regional informatization policy

Presently, there is no unified definition in Japan of regional informatization or any consensus on what the term means. In practice, it is interpreted differently by different researchers [4]. By the same token, regional informatization (informatization) policy and regional information system are used with a variety of different meanings by researchers. In this paper, I will consider regional informatization in the following broad framework (Table 6).

Table 6  
Classification of regional informatization

A	Informatization for regional residents	1	Development of regional telecommunication infrastructure
		2	Penetration of information and telecommunications equipment among regional residents
		3	Use of information and telecommunication equipment by regional residents
B	Informatization of local governments (municipalities)	e-public administration (e-municipality)	

Based on the above, regional informatization policy is defined in this paper as a policy to promote regional informatization by governments, at both the national and local levels [5].

### 2.2. Japan’s 90’s regional informatization policy

During late 90s, Japan’s regional informatization was focused on items A-1, A-2 in Table 6, which meant development of information and communications networks around Japan. The government thought this would stop the concentration of population and economic power in big cities and consequently to narrow economic disparity between urban and rural areas [6]. Some local governments built “intelligent facilities” to foster development of information and communications industry in their area. Those policies had succeeded in recovering macroeconomy, but the information and communications companies have rather centered in big cities. “Intelligent buildings” failed to attract the information and communication companies.

### 2.3. Japan’s recent regional informatization policy

Now Japan’s government is eager to carry out IT policy including regional informatization policy. The strategic objective of the e-Japan Strategy II, announced in July 2003, emphasized the usage and application of IT, and based on that strategic objective, the government announced New IT Reform Strategy in January 2006. The strategic objective of the e-Japan Strategy II was to emphasize the usage and application of IT, and based on that strategic objective. New IT Reform Strategy aims to create a society where everyone can enjoy the benefits of IT at any time and any place. Under the new strategy [1] both national and local governments and municipalities are called upon to implement measures to reach the following targets of the strategy by 2010, and:

- resolve problems faced by Japanese society by means of IT (structural reform of medical care, environmental-friendly society, the world’s most effective e-public administration, and realization of an affluent society throughout people’s life cycles by means of telework and e-learning);
- develop IT infrastructure (development of an IT infrastructure that eliminates the digital divide, and nurturing of world-class human resources specializing in sophisticated and advanced IT);
- send a message to the rest of the world showing Japan’s determination to seek structural reform and make international contributions.

Japan’s government has been focusing on expanding broadband service and e-public administration – see items A-1 and B in Table 6. Japan’s broadband usage fees are, as has

been frequently mentioned in recent years by the government, among the lowest in the world (Fig. 6). The white paper [1] emphasizes that this is a result of government policy which prompted price competition.

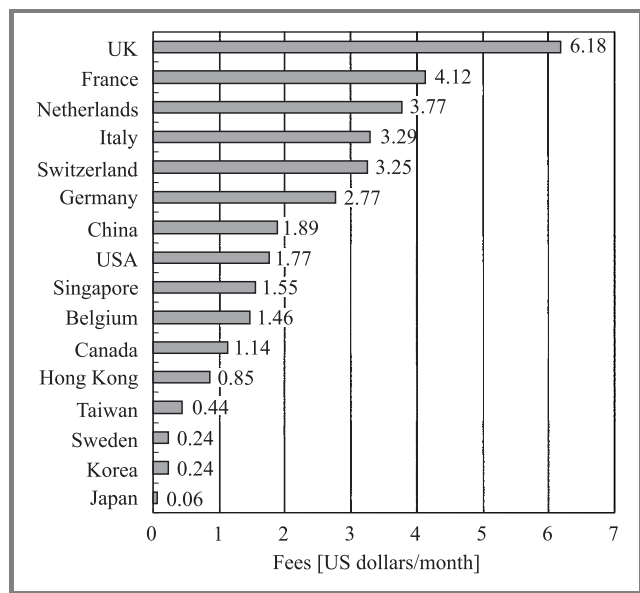


Fig. 6. Broadband access fees in selected countries (in descending order) [1]. (Note: Based on the offered speed and usage fees of DSL and cable Internet access in each country (*The Portable Internet*, ITU, Sept. 2004), the usage fee for 100 kbps access is calculated.)

Japan's broadband penetration is low by international standards, and broadband service is not yet universally available. Penetration is much higher in South Korea, Belgium, Hong Kong and Canada, where usage fees are far higher than in Japan (Fig. 7). Looking at the broadband pene-

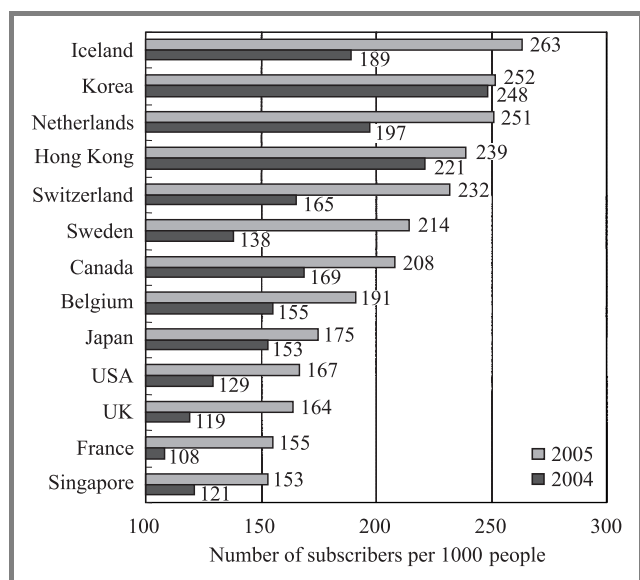


Fig. 7. Countries with high broadband penetration [1].

tration by prefecture, the top three prefectures are Tokyo, Kanagawa and Shizuoka, with 37.7%, 36.7% and 33.5%,

respectively. The lowest two are Kagoshima and Kouchi with 10.4% and 14.3%, respectively – much lower than the top three, or even the national average of 27.6% (Table 7).

Table 7  
Top five and bottom five prefectures by broadband penetration in 2006 [1]

Top prefecture	Penetration among households [%]	Bottom prefecture	Penetration among households [%]
Tokyo	37.7	Kagoshima	10.4
Kanagawa	36.7	Kouchi	14.3
Shizuoka	33.5	Kumamoto	15.5
Fukui	33.3	Aomori	16.8
Mie	33.3	Miyazaki	16.9

This regional digital divide still prevails, and because of the lagging prefectures, Japan's broadband dissemination rate is lower than that of other countries. In Japan, there were estimated to be 87.54 million Internet users at the end of 2006, making up 68.5% of the total population. The number of users has continued to decline from 2003, the peak year, though the usage rate is rising, albeit at a decreasing rate.

Table 8 indicates that nearly 90% of people from their late teens through their 40s use the Internet, while among those in their late 60s the proportion falls to 48.0% and for those in their 70s and over to around 30%. Comparing by size of municipality, the usage rate was 81.3% for the central Tokyo wards, ordinance-designated large cities and prefectural seats, but was significantly lower in other cities and in towns and villages, where the rate was 74.1% and 63.4%, respectively. Mr. Honkawa, an information science analyst, pointed out that the digital divide reduces use of the Internet and broadband access in Japan [7].

Table 8  
Popularity of Internet usage by age groups [%] [1]

Age group	2004	2005	2006
6–12	62.8	65.9	67.9
13–19	90.7	93.9	93.0
20s	92.3	95.0	94.4
30s	90.5	92.8	92.5
40s	84.8	90.6	89.3
50s	65.8	75.3	75.2
60–64	49.0	55.2	59.7
65–69	27.3	42.0	48.0
70s	15.4	19.3	32.3
80s	6.9	7.2	16.0
Area	2004	2005	2006
Central Tokyo wards, ordinance-designated big cities and prefectural seats	78.2	79.3	81.3
Other cities	68.0	73.5	74.1
Towns and villages	56.9	68.4	63.4

### 3. Problems with regional informatization policy and example of successful case by local government

#### 3.1. Problems of regional informatization policy by local governments

Municipality expenditures on informatization have increased in line with the central government's call for a regional informatization policy, as stated earlier. Municipalities have focused, in particular, on their own informatization, with the aim to become e-municipalities [8]. However, there are a number of regional informatization policies that were induced by a "demonstration effect", based on the view, for example, that as the neighboring prefecture (or neighboring city) has deployed a CATV network or constructed facilities related to informatization, one's own prefecture (or our city) should follow suit [4].

Most of these regional informatization projects induced by a "demonstration effect" are not created to fulfill the needs of residents of rural areas, in particular in sparsely populated areas with many elderly people, and thus it seems unlikely that they will help improve the productivity of the affected region as a whole in the long run.

#### 3.2. Successful case of regional informatization: Yamada village

The term IT literacy is sometimes used in a way that includes the ability of people to make full use of information and telecommunications equipment, and we use the term in that sense in this report. Even if the regional telecommunication infrastructure is well developed, information and telecommunications equipment has widely penetrated among regional residents, the Internet is accessible from anywhere in the region, a lack of IT literacy among residents can lead to a digital divide, for example, between those who can operate PCs and those who cannot. The successful case of regional informatization can be found in Yamada village in the Toyama prefecture [9]. Yamada is a mountain village with a population of approximately 2100, located in a isolated rural area. The majority of residents in Yamada were not familiar with "keyboards" and had never used PCs before. The village succeeded in solving a lack of IT literacy among residents in the end of the 90s, by using the following policies: since 1996, PCs have been lent to all villagers who wanted them, and simple information network facilities were constructed. In particular, a university located in Takaoka (the second largest city in Toyama prefecture) has sent students to the village every year as a part of their collage (Takaoka National Collage) education course, to teach villagers how to operate PCs. Most villagers have been trained basic IT skills regularly at simple building called Information Center in one to one classes. As a result, in 1998 the Internet usage rate of the whole village rose above that of the central Tokyo wards.

This successful project cost about 350 million yen a year. The village did not build expensive "intelligent facilities" but majority of villagers have been satisfied with this informatization policy.

It could be said that the main priority of regional informatization policy should not be the computerization of various operations run by municipalities including e-public administration (e-municipality) or the construction of informatization-related facilities. There is a clear digital divide between the metropolitan region and rural areas. However, though there is no detailed data available to support this supposition, it appears that the disparities between cities and towns and villages within the same rural areas are even more significant [10].

### 4. Concluding remarks: desirable direction for regional informatization

#### 4.1. Risk of "government failures"

More developed information and telecommunications infrastructure in rural areas and increased ownership and usage of information and telecommunications equipment could enhance the economy of rural areas, but is unlikely to help narrow regional economic disparities.

The correlation between average prefectural land prices (expected earnings for broadband supplier) and the penetration of broadband (investment in broadband facilities) is strong (Fig. 8).

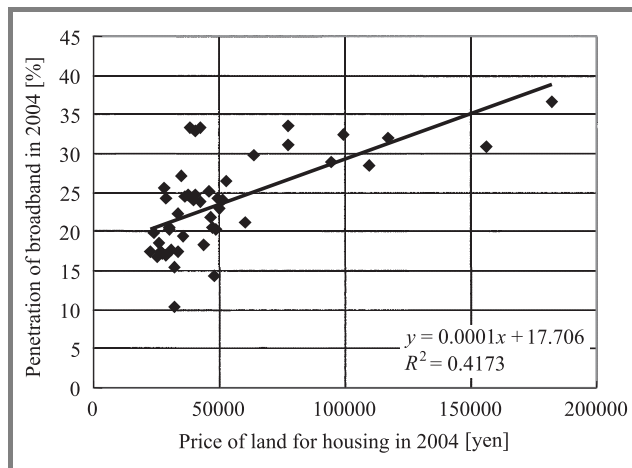


Fig. 8. Correlation between land price and broadband penetration.

It is interpreted that the information and telecommunication business has little that prospect of breaking into rural areas, so it is difficult for businesses in those areas to attract private sector investment. Leaving everything to market principles can lead to adverse effects of excessive concentration of economic power and population, or what is known as "market failure" [11].

On the other hand, it is difficult to say that it was effective for rural municipalities to invest independently into

Table 9  
Share of home employed persons in large areas [%] [3]

Year	Hokkaido-Tohoku	Kantou	Chubu	Kinki	Chugoku	Shikoku	Kyushu	Total
1990	14.5	34.3	15.0	15.7	6.3	3.4	10.8	100
1993	14.3	34.6	15.0	15.8	6.2	3.3	10.8	100
1994	14.3	34.5	15.1	15.7	6.2	3.3	10.8	100
1995	14.3	34.5	15.1	15.7	6.2	3.3	10.9	100
1996	14.4	34.4	15.2	15.7	6.2	3.3	10.8	100
1997	14.4	34.5	15.2	15.6	6.2	3.3	10.9	100
1998	14.3	34.7	15.2	15.5	6.1	3.3	10.9	100
1999	14.3	34.8	15.1	15.5	6.1	3.2	10.9	100
2000	14.3	34.8	15.1	15.5	6.1	3.2	10.9	100
2001	14.2	35.0	15.1	15.4	6.1	3.2	10.9	100
2002	14.2	35.1	15.2	15.3	6.1	3.2	10.9	100
2003	14.1	35.2	15.3	15.2	6.1	3.2	10.9	100
2004	13.8	35.4	15.3	15.3	6.1	3.2	10.9	100

informatization and the construction of informatization-related facilities in an attempt to close the regional economic disparities. Rather, it appears that such endeavors by rural municipalities caused “government failures”, which refers to public spending that does not meet true needs of residents.

Regional informatization often does not go beyond mere computerization of public administration, meaning the promotion of the efficiency of civil services provided by municipalities [12].

#### 4.2. Growth of information and communications industry and “economy of concentration”

Following the end of World War II, the Japanese government formulated the Comprehensive National Development Plan, a long-term plan that served as essential guidance for national land development at the time. Five such national development plans have been formulated up to the present, each aiming primarily to achieve balanced development in the whole of Japan [13].

The latest national development plan, the *Grand Design for the 21st Century*, was adopted by the cabinet in March 1998. It aims to promote the development of information and telecommunications networks in rural areas, and in particular fiber-optic networks, which are expected to attract businesses that have a relatively large degree of freedom to locate their operations in rural areas. However, the latest development plan does not clarify which type of business has significant flexibility regarding the location of operations.

Looking at per capita home employed person’s productivity in 7 areas, the highest has been in the Kantou area where Tokyo is located. Considering the share of home employed persons, the number in the Kantou area has been

the highest, too (Fig. 9). Furthermore, this share has been expanding somewhat since 2000 (Table 9). New information and communications companies have been established in urban areas recently.

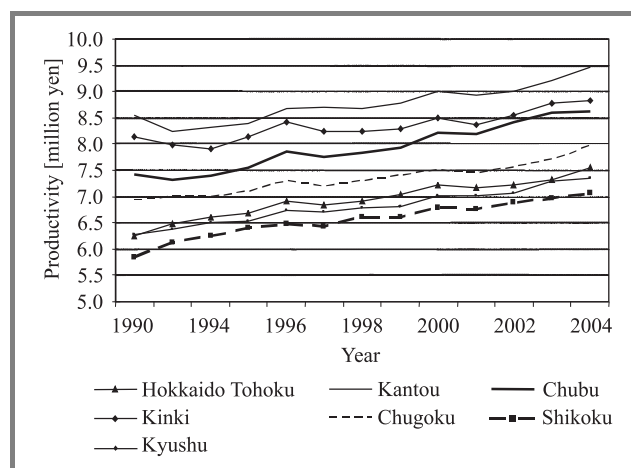


Fig. 9. Changes of per capita productivity of home working persons in large areas [3].

Businesses operating in the information service sector, the largest source of employment in the information and communications industry, are largely engaged in services for other businesses rather than to individuals and they tend to prefer to locate their operations in areas where business establishments are concentrated (Table 10).

Therefore, it would be incorrect to conclude that if the telecommunication infrastructure becomes better developed in rural areas, information service businesses will be encouraged to locate their operations there. So it is interpreted that “economy of concentration” has been working more in the information economy.

Table 10  
Annual revenues of IT industry in Japan [million yen]  
and Tokyo's share [14]

Year	Japan	Tokyo prefecture	Growth rate [%]	Tokyo's share [%]
1991	6 825 247	3 637 919		52.9
1992	7 127 618	3 803 327	4.5	53.4
1993	6 514 358	3 371 034	-11.4	51.7
1994	6 177 007	3 152 205	-6.5	51.0
1995	6 362 183	3 169 921	0.6	49.8
1996	7 143 543	3 655 082	15.3	51.2
1997	7 587 959	3 982 493	9.0	52.5
1998	9 800 606	5 098 666	28.0	52.0
1999	10 151 890	5 383 935	5.6	53.0
2000	10 722 864	5 783 936	7.4	53.9
2001	13 703 868	5 837 592	35.5	57.2
2002	13 973 141	8 002 468	2.1	57.3
2003	14 170 633	8 145 871	1.8	57.5
2004	14 527 056	8 858 191	8.7	61.0

**4.3. Priority should be on providing information literacy education to those who lack access to information**

A more developed ICT in rural areas and increased ownership and usage of information and telecommunication equipment could enhance the economic power of rural areas, but would be unlikely to help narrow regional economic disparities. It is difficult to say that it was effective for rural municipalities to construct informatization-related facilities in an attempt to attract information and communications companies and to close the regional economic disparities. If local governments supply their services using IT (e-municipality), majority of their residents separated by the digital divide will not benefit from these public goods.

At present, it is essential for the regional informatization policy to develop information and telecommunications infrastructure that addresses needs of residents who lack access to information, and to implement careful information literacy education for residents, listed as item A-3 in Table 6.

The majority of people in isolated or mountainous areas in Japan are aged. In the future, they will have to operate information and communications equipment to get critical information or services such as medical, financial and legal [15]. Reducing the digital divide would foster the information and communications industry in the end.

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