

A Study on Patterns of Internal Migrations in Japan

From the Viewpoint of Super Long-run Changes of Industrial Structures

Ryo Fukuda*, Fumihiko Seta* and Tetsuo Kidokoro*

Abstract:

Japan is now suffering serious decrease and aging of population. Depopulation has been viewed as a problem recently, and because of it economic vitality of local areas and sustainability of communities are suffering damage. However, this problem is not necessarily arise equally in any region and there are even areas causing rapid increase of population. This is because of migration. Although the number of people who move to other regions is now smaller than that of past times in which Japanese economy was expanding rapidly, migration is still an important factor to consider problem of population in Japan, but when, how many, or to which direction people move has not been clear yet.

This paper aims to reveal the principle of migration in Japan from the view point of industry structure. Focusing on size of the supplying area of each industry and applying central place theory of Christaller, the author constructed the hypothesis which defines patterns of migration parallel to each industry structure. The growth rate of labor demand and supply of each industry explains patterns of migration in this model. To verify it, the author researched transit of migration patterns in Japan for over 200 years. The reason of long term analysis is that Japan has experienced changes from the agricultural society through the manufacturing society to the maturity in which service industries are dominant in 200 years.

As the result of the research, it can be concluded that in society which service industries are dominant, people move to larger cities following supplying area of high-level service industries and areas of migration of plural scales (national, regional and prefectural) are formed, while in society which manufacturing industries are dominant people move mainly in national scale to the center of highest level and in society which agriculture is dominant people move mainly in local scale. The knowledge presented in this paper makes a suggestion to the method to stop small cities in Japan declining. And it may contribute to prospect population in the future of other countries which is going to shift to service economies and experience depopulation.

Keywords:

patterns of migration, industrial structure, long-term transition, Christaller model

* University of Tokyo
E-Mail: 7749723748@mail.ecc.u-tokyo.ac.jp

1. Introduction

Changes of population are caused by birth, death and migration. Although we can predict the first two factors reasonably, we cannot the last. This paper aims to understand the mechanism of population transfer especially about geographical location, explaining transitions of patterns of internal migrations for over 200 years from the viewpoint of changes of industrial structures. Last 200 years the Japanese main industry experienced changes from agriculture through manufacturing to services, so it is expected to be a good example to see relations of the industry structure and migration patterns. Here a hypothesis which coordinates some theories presented separately in each period and in each scales is constructed and is verified using many data which haven't been applied until today.

This paper is composed of 9 chapters. The first chapter is the introduction. In the second chapter, some theories about migration patterns are surveyed, and based on it the hypothesis in this paper is presented in the next chapter. In the fourth, fifth and sixth chapter, the author show the knowledge of the special feature of each industries and long-term changes of industries and present the framework of analysis of the migration. Explaining the data used here in the seventh chapter, in the eighth chapter the author analyze the migration of each period. Last, the conclusion of this paper is presented in the ninth chapter.

2. Review of prior research and placement of this paper

Migration has been researched with much interests from the viewpoints of economics, geography, sociology and so on. It dates back about 130 years, Ravenstain (1885)¹⁾ advocated the law of migration. He presented principles as items, for example “the primary factor of migration is economical reason.”, analyzing birth place of census of England. Later researches are on the basis of Ravenstain (Ogasawara, 2011)²⁾. Among researches following this stream, the group which focuses on geographical location of origins and destinations of migration is research about migration patterns. Zelinsky (1970)³⁾ developed the prosperity that migration patterns would change following grades —gradually villages-cities migration would decrease and cities-cities migration would take the place of it following development of the society. This theory is the base of the perspective of this paper.

Most of previous studies on patterns of internal migrations in Japan expound dualism of “rural areas and urban areas” or “provincial areas and metropolitan areas”. However, this paper try to understand internal migrations more comprehensively considering many layers of areas such as a nation, regions or prefectures.

There are three types of researches about geographical patterns of population moving. First, migration from agricultural villages to urban areas. Namiki (1962)⁴⁾ revealed constant migration from agricultural villages not depending on business climate. Honda (1950)⁵⁾ indicated that agricultural villages have held constant population and people who move to urban areas are extra population second sons representing. This framework is very important when many people are engaged in primary industries, in Japan, before about 1970. Ito (1991)⁶⁾ supposed that there were no surplus people in agricultural villages. In 2010, only 3.99% are engaged in primary industries of people working.

Second, migration from periphery to center. Here a territory is divided into center and periphery based on industrial accumulation and central management function. In Japan centers are three metropolitan areas (Tokyo, Osaka and Nagoya). This framework is very useful to explain mutual migration of urban areas which are dominant after about 1980 in Japan and other developed

countries. Ishikawa (1994)⁷⁾ explains changes of quantity of migration to three metropolitan areas using data of various economic factors. Recently monopolar concentration to Tokyo is proceeding, so Kawai (2011)⁸⁾ and Nakagawa (2011)⁹⁾ regarded only Tokyo as center of Japan. Besides, Plane (2012)¹⁰⁾ discusses proximity, points out that cities near center record high rate of growth.

The third type, seeing from another side, specifies catchment areas of population moving. You can find how much the rate of regional scale migration and national scale migration. Ito (2004)¹¹⁾ presented change of the catchment areas of population moving using the method of principal component analysis.

3. Hypothesis

Here the author presents the framework of this paper to integrate three types of research of migration patterns and explain long term change in consistent logic. In this paper, the hypothesis “the size of area of migration parallels supply areas of industries of which ‘degrees of labor shortage’ is higher” will be built and verified. A “degree of labor shortage” means the growth rate of labor demand divided by the growth rate of labor supply. When ΔS_r , ΔD_r and LS_r stand for the growth rate of labor supply, the growth rate of labor demand and the “degree of labor shortage” in a region respectively, it can be said

$$LS_r = \frac{\Delta D_r}{\Delta S_r} - 1$$

The author utilized the central place theory by Christaller (1933)¹²⁾ to grasp supply areas of the industries. According to this theory, goods or services are supplied in centers where they can be supplied most effectively, so the sizes of supply areas depend on goods or services. Then a layer structure of centers is generated. Figure 1 shows the centers system which generated based on Christaller theory. The target of this theory is retailing, but it is also true on the other industries with some restrictions in Japan. According to Morikawa (1998)¹³⁾, Japanese city system corresponds with the Christaller model.

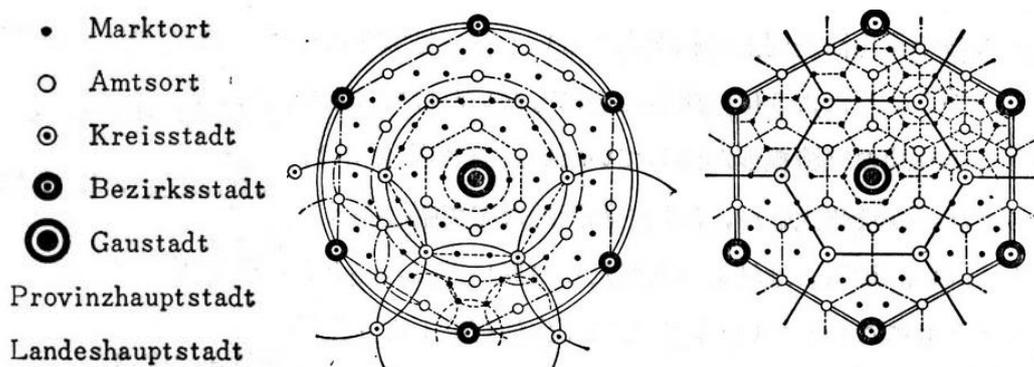


Figure 1 :the centers system (the source: Christaller, 1933)

Here the author presumes conditions below. (1) Each product or service has its original supplying areas. The extent of each areas are dependent on costs of transportation or methods of production of products and services. (2) Demands of products and services within each supplying area are in proportion to its population. In other words, people’s preferences of all supplying areas are the same. (3) You can ignore international migration because Japanese government has restricted international migration severely. (4) There are no disparities depending on regions about labor productivities. (5) People move to the nearest place if there are plural regions to which they can

move. (6) Qualities of labors are the same at all regions.

Assume that there are two level cities (one city is of higher level and six are of lower) and two industries, and an industry (industry A) is located in the higher level city and the other (industry B) is located in every city. Then industry A's supplying area covers all the land, industry B's supplying areas divide the land into 7 pieces. When growth rate of labor demand of industry A is higher than that of industry B, the city of higher level gets higher "degree of labor shortage" than cities of lower level, so people move from cities of lower level to the city of higher level. If growth rate of labor demand of industry B is higher, people move for the opposite direction. At any rate it is able to be said that "the size of area of migration parallels supply areas of industries of which 'degrees of labor shortage' is higher".

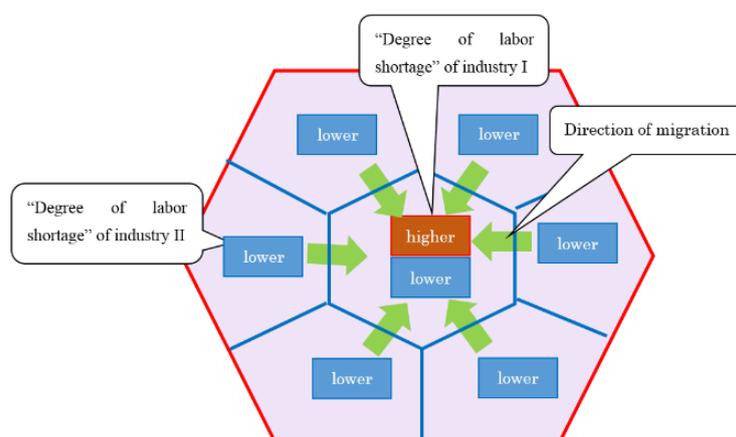


Figure 2: migration direction with two industries

4. Supplying area of each industries

Then, the author look at supplying area of each product and service. The author researched size of supplying area of each industry. Here the author judged how large the supplying area of products or services of each industry is, calculating rate of total population and working population of the industry and calculating the linear regression line. If it's the coefficient $\hat{=}$ 1, you can say the industry is located with the constant rate of population, both cities of low level and of high level, that is the industry is with small supplying area. And if the coefficient larger than 1 sufficiently, you can say the larger population of the city is, the higher rate of working populations. This means that the supplying area of the industry is larger than that of the former. In addition, you can focus on the coefficient of determination. If this is enough large it can be said that the location of the industry is based on Christaller's model, if not, the industry is located based on another logic.

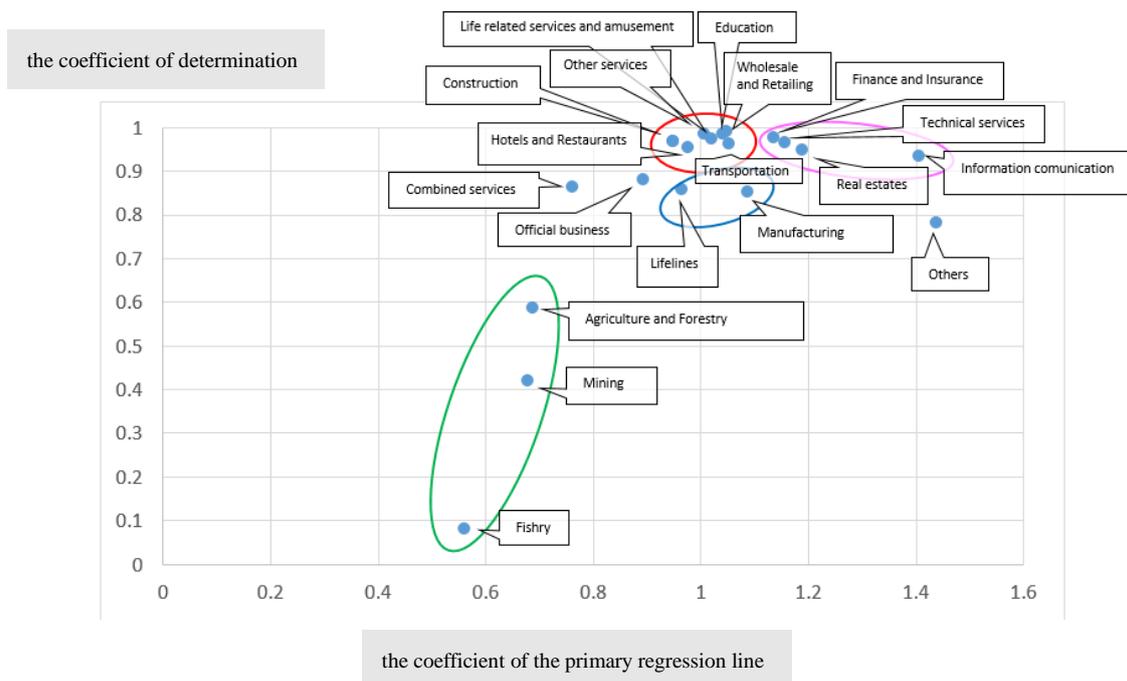


Figure 3: the coefficient of the primary regression line and the coefficient of determination (the source: the national census, 2010)

Figure 3 presents the result of the linear regression, the cross axle is the coefficient of the primary regression line, while the vertical axle is the coefficient of determination. The grouping of industry is based on Japan Standard Industry Classification, definition of cities is based on Urban Employment Area (Kanemoto and Tokuoka 2002)¹⁴⁾, regression is calculated using least squares method. The author divided industries into 4 groups based on this result.

- 1) High-level service industries. This category includes what is called FIRE (finance, insurance and real estate) industry, technical service and information communication industry. These industries have developed together with maturity of society of Japan. Central management functions (Abe, 1991) is also categorized here. The coefficients of the primary regression lines are larger than 1 and coefficients of determination are enough high. Customers of these industries are firms or other departments of its company. Therefore, these supplying areas are larger because B to B business can tolerate longer distance. And due to the networks of branches a hierarchy of cities of a few levels is formed.
- 2) Low-level service industries: wholesale, retailing, hotels, education and so on, which are primitive tertiary industries with the coefficients of the primary regression line which almost equal 1 and high coefficients of determination. In industries classified in this category, it is important to be located near consumers, so its supplying areas are small than the next category.
- 3) Secondary sector industries: manufacturing and lifelines. This category is similar to the first category in that the coefficients of the primary regression line are pretty high but these coefficients of determination are lower to some degree. This inspires part of this industry has large supplying area and agglomeration in some city. Statistics of quantity of manufacturing products circulating supports this estimation.
- 4) Primary sector: agriculture, forestry, fishry and minig. The coefficients of the primary regression line and coefficients of determination are both pretty low. Where industries

categorized in this category aren't located in cities but rural villages. You can regard this category as of lowest level and with smallest supplying area.

5. Changes of degree of labor shortage of each industries

Since modernization started, Japan underwent change of the industrial structure roughly following Petty's law. Until the end of 19th century, the primary sector was dominant and most of industries run in cities are Tertiary sector of industry for consumers. After the Industrial Revolution, the secondary sector had expanded. You can divide this expansion into two phases. First, until the end of the WW II (1945), the primary sector kept the demands of labor high level because of parasitic land owner system and low labor productivity. Second term started at around 1945. Through the agrarian reform performed during allied nations' occupation, labor productivity was heightened and farmers are enabled to move more easily to cities, and because of demobilization of soldiers who had been abroad many babies were born. Therefore labor population of cities industries increased drastically in this term. In 1970s, like other developed countries Japan was forced to stop growing its manufacturing industry for the recession caused by two oil crises and the dollar shock. Especially the impact of the first oil crisis (1973) is critical for Japan because Japan started to promote change industrial structure to save energy since this time. With this as a start, Japan has changed its center of growth to tertiary sector of industry for business, and this trend has lasted today.

In addition, it is important to look at a gap of birth rate and mortality of cities and agricultural villages. Cities "ant lion larva" theory is known about the gap of natural increase of cities and villages (Hayami, 2009¹⁵), figure 4). The rate of natural increase of agricultural villages is pretty higher than that of cities, so degrees of labor shortage of the primary sector are higher than that of the other sectors which are located in cities while demands of labor of the primary sector are not higher than that of the other.

the birth rate in cities	<	the birth rate in agricultural villages
Λ		V
the mortality in cities	>	the mortality in agricultural villages

Figure 4: Cities "ant lion larva" theory (the source: Hayami, 2009)

Judging from the mentioned above, it can be concluded that degrees of labor shortage in Japan has changed like figure 5.

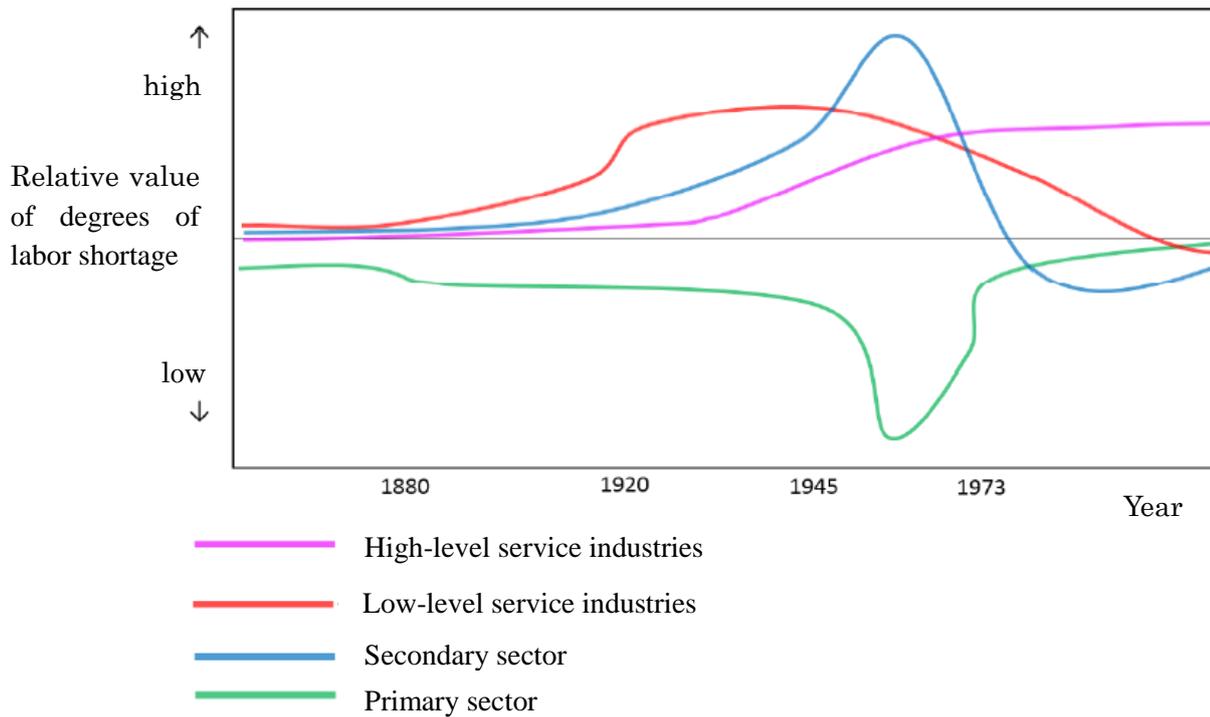


Figure 5: Transition of the degrees of labor shortage of each industry

6. Four divisions of 200 years

Based on this analysis, the author divided 200 years into 4 periods and presumed migration patterns of each period based on supply areas of each industry and transitions of “degrees of labor shortage” of each industry. The 4 periods and presumptions are as below.

a) Agriculture period: ~1890(the start of industrial revolution in Japan). The migrations of this period are regulated by the degrees of labor shortage of low-level service industries and primary sectors industries. The areas of migration on local and prefectural scales which parallel the supply areas of low-level service industries dominates.

b) Industrialization period: 1890~1945 (the end of WWII). The migrations of this period are regulated by the degrees of labor shortage of the manufacturing industries. The area of migration on a national scale which parallels a supply area of secondary sector industries dominates.

c) Advanced industrialization period: 1945~1973 (the first oil crisis). Also in this period, the area on a national scale dominates. This period is different from the former in that “degree of labor shortage” of primary sector is very low and because of it every scale area of migration is formed.

d) Shift to a service economy period: 1973~today. The areas of migration on national, regional and prefectural scales which parallels the supply areas of high-level service industries dominates. This period is different from the former in that there are plural layers (national, regional and prefectural scales) of areas of migration.

7. Data used in this paper

The data in this paper used to verify these assumptions are as table 1. This list include many data which had not been used in this context. As precious sources to see migration of agriculture period, the author used *Shumon ninbetsu aratame* (宗門人別改), which is statistics performed to confirm

people not believing in the forbidden religions and collect taxes. In many cases, there are left only about static population, but numbers of migration are also recorded in some limited cases, and here the author used prior researches about this as secondary source. After change of political system of Japan in the end of 19th century, it took long time for modernized census performed. The author utilized statistics of temporary residence mainly. This statistics is based on documents which a man submits to the city office when to live in another place which is different from his legal domicile. Statistics of temporary residence is also limited of the place which you can get, so the author discuss some regions. In addition, investigations performed by employment office, which tell us where working people has come from can be used. Since 1920, Japan has performed modernized census at intervals of five years. However, early censuses don't reveal migration of city level, so the author adopted statistics of some prefectures to inspect migration of "advanced industrialization period". Following part, the author look at migration of each period in terms.

Table.1: data referred in this paper

	Agriculture Period	Industrialization Period	Advanced industrialization period	Shift to a service economy period
Statistics	• <i>Shumon ninbetsu aratame</i>	• Statistics of temporary residence	• Migration statistics of some prefectures	• The national census
Examples	• Kyoto city • Takayama city • Koriyama city • Saijo village (Mino)	• 7 cities with advanced manufacturing industry • Kanazawa city, Okayama city • The eastern part of Tottori prefecture (Wakas town)	• Prefecture as below Miyagi, Gunma, Niigata, Ishikawa, Yamanashi, Shiga, Tottori, Hiroshima, Tokushima, Ehime, Saga	All municipalities in Japan
The date of statistics	The latter half of 18C and the first half of 19C	1920s and 1930s	1970s	1980 • 1990 • 2000 • 2010
Notes	Secondary sources	Include some secondary sources	All prefectures which have data	Seeing with urban area unit

8. Analysis of migration

To analyze data of migrations, the author assume a center system with cities of four levels and agricultural villages as following:

- Cities of the highest level, the capital city or center of the manufacturing with supplying area of national scale are included.
- Centers of regional level, cities with central management function covering plural prefectures. This category emerged in advanced industrialization period, until that they are equal to the centers of prefectural level (Kitagawa, 1962)¹⁶.
- Centers of prefectural level. Before modernization, the centers of feudal domains (*han*, 藩) correspond with this category.
- Centers of local level, cities with retailing center of surrounding areas.
- Agricultural village. This category focus on not the scenery but jobs of inhabitants.

The author decided levels of cities based on positions of administrative organization, networks of daily transportation and so on.

8-1. Agriculture Period



Figure 6: the locations of the examples of agriculture period presented here

Here the author look at four places for examples of migration of agricultural period.

- Kyoto city (the residents' birthplaces of 1846): Based on Hamano (2010)¹⁷. This city was one of the three largest city. As an example of a city of the highest level.
- Takayama city (1773~1871) : Based on Sasaki (1980)¹⁸. This city worked as the governmental and commercial center of Hida province. As an example of a center of prefecture level.
- Koriyama city (1729~1860): Based on Takahashi (2008)¹⁹. As an example of a center of local level.
- Saijo village (1773~1869): Based on Hayami and Uchida (1971)²⁰, Hayami (1972)²¹. As an example of an agricultural village.

Figure 7 presents ratio of people living in Kyoto from each province of 1846 compared with that of 1920. It can be said that the origin of residents in Kyoto of the agricultural period is limited spatially. Table 2, 3 and 4 show numbers of people who moved to/from Takayama city, Koriyama city and Saijo village. Origins and destinations are categorized to provinces or levels of cities. Kambara county in the matrix of Koriyama city is a county in Echigo province, which is next to Mutsu province Koriyama city belongs to. And from the county many people came to Koriyama to work in leisure seasons for farmers. Except migration from this county, movements within provinces are dominant both in Takayama city (only 3.40% of movement to Takayama city is outside the province) and Koriyama city (only 6.97% of movement to Koriyama city is outside the province and Kambara county). On the other hand, many of migrations from Saijo village are to “cities” and especially to Kyoto (1086 man-year out of total 6127 man-year).

It can be concluded that in this period local migration is dominant around cities of each level at least when compared with following periods. Migration towards cities of the highest level to some extent. With income differentials depended on the location there were migration to areas adjoining as workers in leisure seasons for farmers. Knowledge mentioned above agree the assumption presented in this paper that degrees of labor shortage of low-level service industries and primary sectors industries regulate migrations of this period.

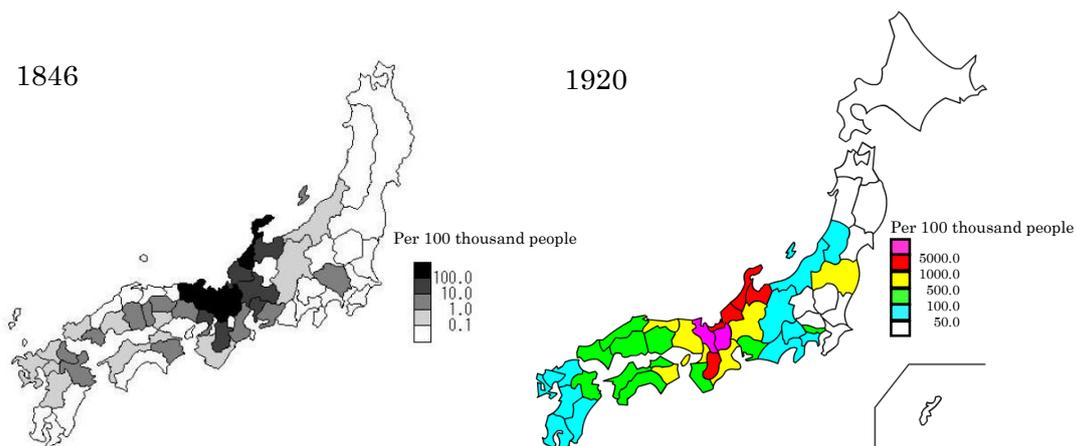


Figure 7: the ratio of people living in Kyoto city from each province to the population (the source: Hamano,2010)

Table 2: Numbers of people who moved to/from Takayama city from 1773 to 1871 (the source: Sasaki, 1980)

Category	Within the province		Outside the province	
	number	(%)	Number	(%)
Movement to Takayama	10500	96.60	370	3.40
Movement from Takayama	6288	93.98	403	6.02

Table 3: Numbers of people who moved to/from Koriyama city from 1729 to 1860 (the source: Takahashi,2008)

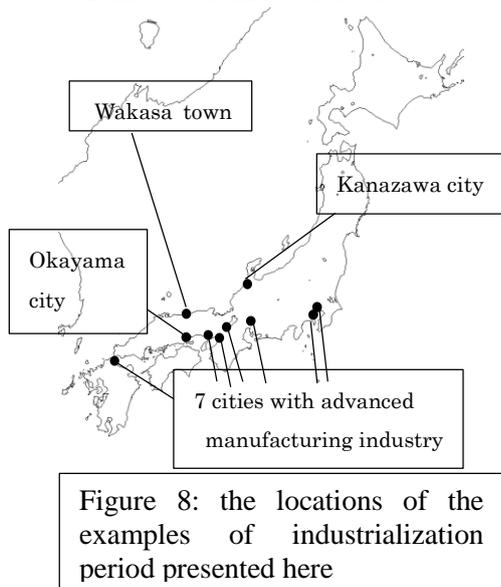
Category	Within the province		Kambara county		The others	
	number	(%)	Number	(%)	number	(%)
Movement to Koriyama	7376	63.44	3441	29.59	810	6.97
Movement from Koriyama	6494	67.51	1180	12.27	1945	20.22

Table 4: Running numbers of people who had moved from Saijo village from 1773 to 1869 (the source: Hayami and Uchida, 1971)

Category	Villages		Towns		Cities			
	man-year	(%)	man-year	(%)			Kyoto of the number	
	man-year	(%)	man-year	(%)	man-year	(%)	man-year	(%)
Movement from Saijo	2257	36.84	847	13.82	3023	49.34	1086	17.72

In this table (based on definitions of Hayami and Uchida 1971), cities correspond with cities of the highest level and centers of prefectural level and towns correspond with centers of local level largely.

8-2. Industrialization Period



In this part, the author analyze census roughly and look at three examples of migration of industrialization period.

- 7 cities with advanced manufacturing industry (1920): Tokyo, Yokohama, Nagoya, Kyoto, Osaka, Kobe and Kitakyushu. The national census. As examples of cities of the highest level.
- Kanazawa city and Okayama city (1930): Statistics of temporary residence. Both cities are administrative and commercial the center of the prefectures. As examples of the centers of prefectural level.
- The eastern part of Tottori prefecture (Wakasa town): Statistics of temporary residence (collected specially by Imori, 1943)²². As an example of cities of local level.

First, the author made a survey of the migration trends of all cities. Figure 9 presents the ratios of people from other prefectures to all residents of each city of 1930. Cities of Tokyo, Osaka, Nagoya and Kitakyushu metropolitan area (corresponding with 7 cities with advanced manufacturing industry) record high ratio and in some of these cities over 40% of residents are from other prefectures. The areas with high score besides these cities are frontier of this period, Hokkaido for example. Then, focusing on origins of movement to these central cities, figure 10 shows the ratio of people living in the 7 cities from each prefecture to the total population of each (1920). Except for Hokkaido and Okinawa, pretty apart from these areas, on one level or another, at least 10% of total population of a prefecture has come to the 7 cities. It is said that these cities absorb people from all parts of the country.

Figure 11 indicates the destinations of migration from Kanazawa city and Okayama city and Figure 12 indicates from Wakasa town (based on Imori 1943). From Kanazawa city, Tokyo and Osaka are main destinations and from Okayama city Hyogo is in addition to the mentioned above. This trend is also true for Wakasa town, a center of local level. There is a center of prefectural level (Tottori) near Wakasa, but the number of migration to Tottori is so smaller than that to Osaka.

Judging from these data, in this period, it is estimated that many people move to centers of the highest level from cities and villages of every level. This is a reflection of high degree of labor shortage of the secondary sector. Other sectors also grew, but these influences are limited.

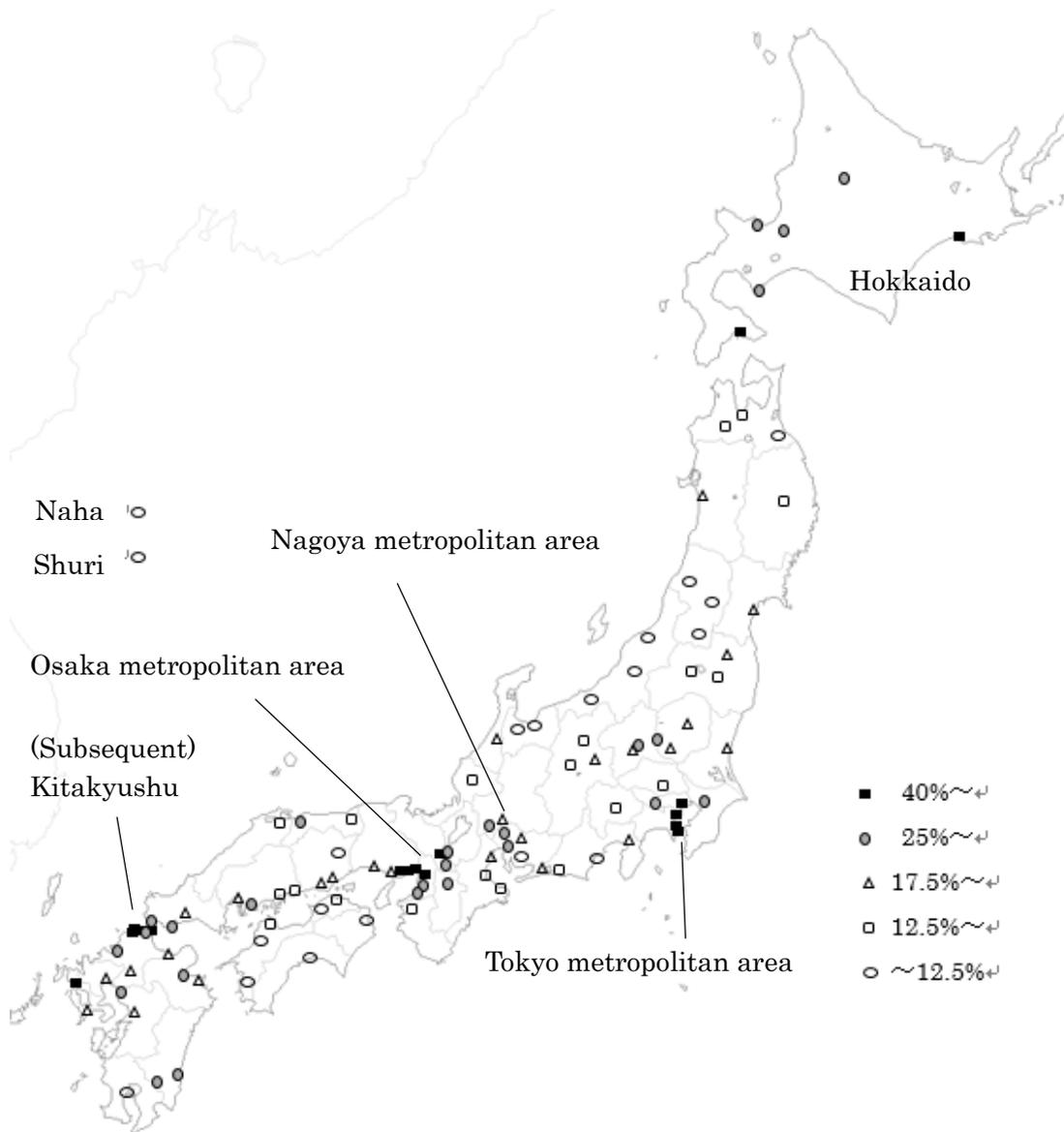


Figure 9: The ratios of people from other prefectures to all residents of each city (1930)
(the source; the national census)

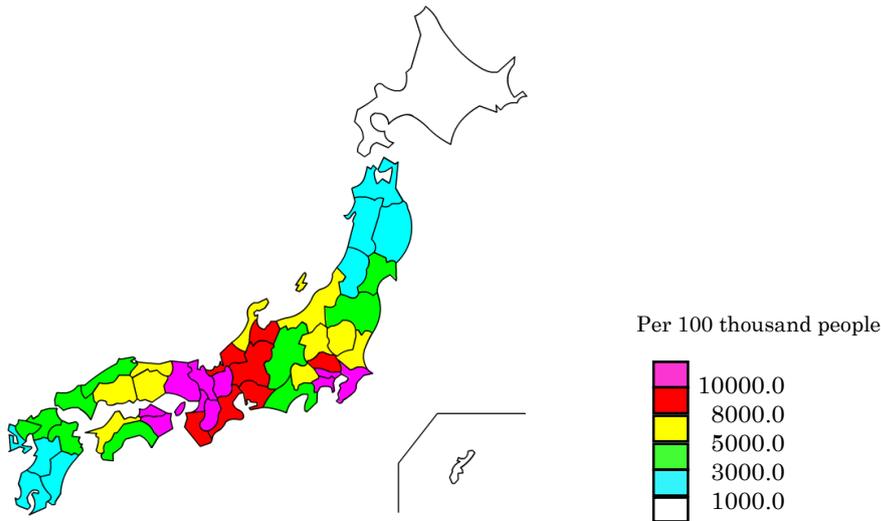


Figure 10: the ratio of people living in 7 cities with advanced manufacturing industry from each prefecture to the total population of each (1920) (the source: the national census)

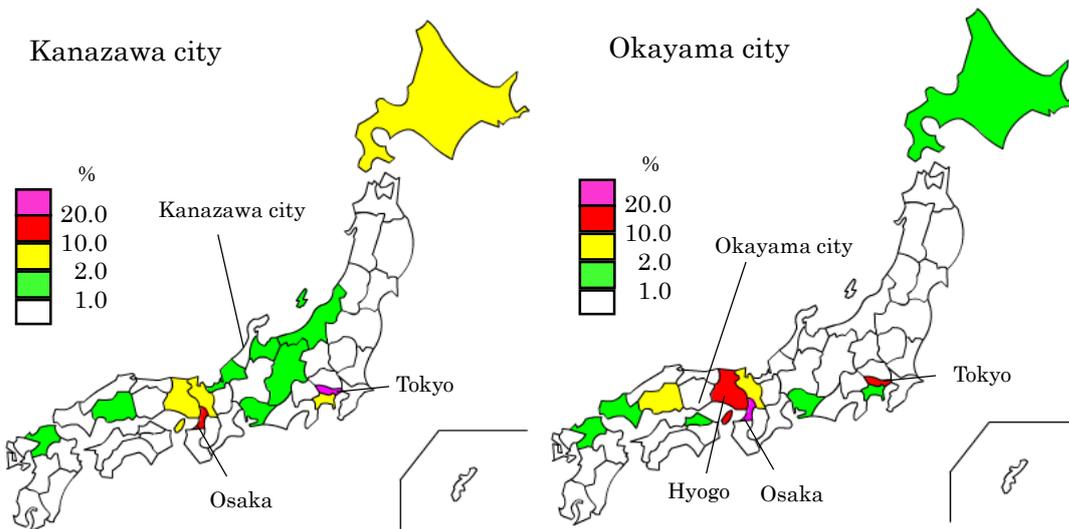


Figure 11: Ratios of the running numbers of the destinations of migrations from Kanazawa and Okayama city. (the source Kanazawa city statistics and Okayama city statistics)

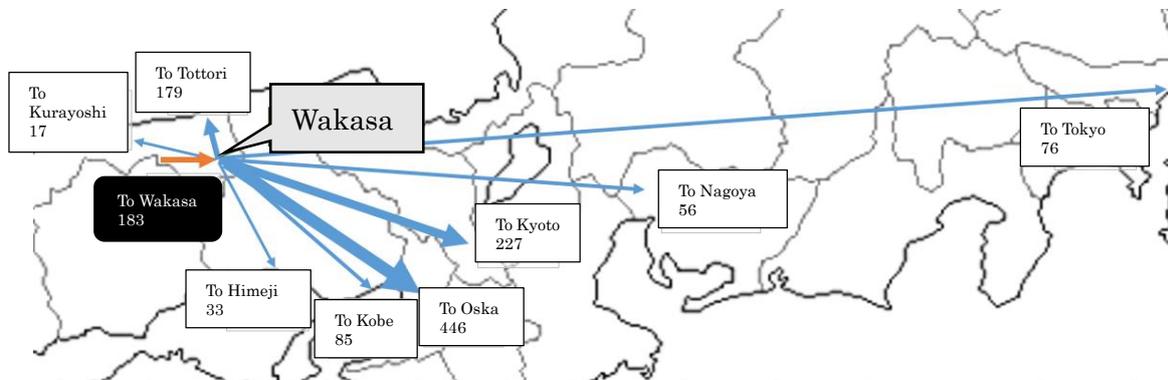


Figure 12: Summary of the running number of migrations from/to Wakasa town (1936) (the source: Imori 1943)

8-3, 4. Advanced industrialization period and shift to a service economy period

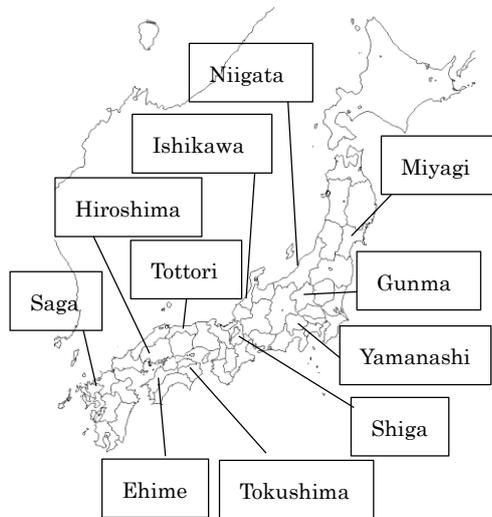


Figure 13: the locations of the examples of advanced industrialization period presented here

In this part, the author reveal the change of migration trends comparing migration patterns of some ages

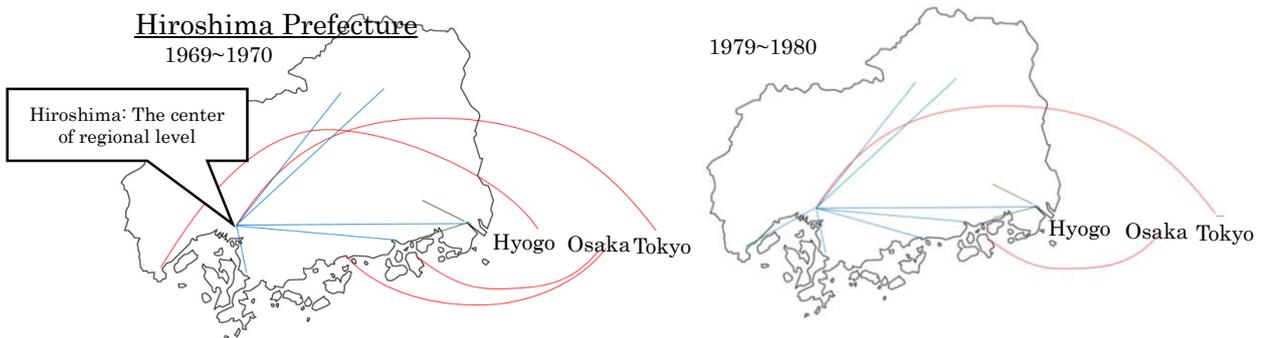
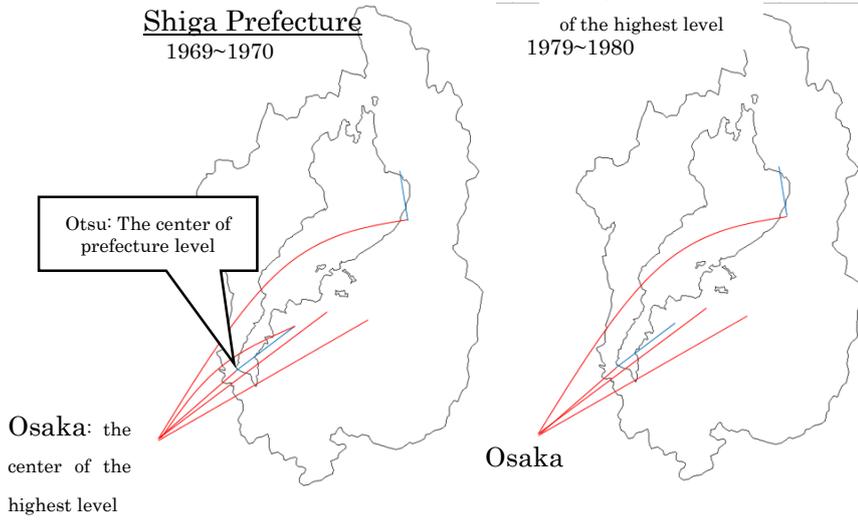
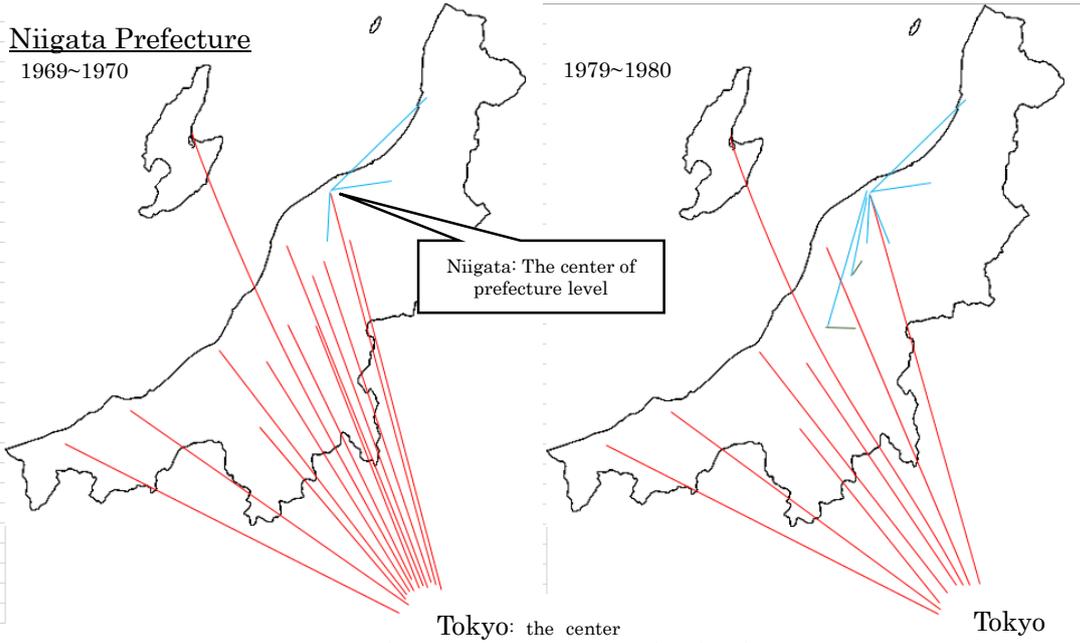
First, to compare the patterns of 1969~1970 with 1979~1980, the author used statistics of prefectures (listed at last of this paper)

Figure 14 shows changes of networks of the most popular destinations of migration of Niigata, Shiga, Hiroshima, Tokushima and Ehime prefecture. These are maps on which lines connecting a city and its most popular destination, on most cases larger than the city. First, you can see that migration to the centers of prefecture level are more than that in industrialization period. Further, it can be pointed out that sift of the main destinations from centers of the highest level to centers of prefectural level. For example, in Niigata prefecture 13cities are connected to Tokyo in 1969~1970, although only 8 cities in 1979~1980. The change of component

ratios of origins and destinations (summation of 10 prefectures, table 5) supports this fact. Movements from centers of local level out of prefecture show 3.38 point decrease, while to Centers of prefecture level show 0.02 point increase.

This trend has lasted until today. The author analyzed changes of migration patterns of all parts of Japan from 1980 to 2010, figure 15 and table 6 are result of that. It is suggested that not only migrations to the centers of prefecture level but also to the centers of region level has expanded. For example, Sendai (the center of Tohoku region) in 2005~2010 has connection to 12 cities while only 7 cities in 1979~1980. Table 6 indicates the change from 1990 to 2010 of component ratios of origins and destinations. Tendency expressed in this matrix corresponds with that of from 1970 to 1980. Movements from centers of local level to the centers of the highest level and to the centers of region level both show over 4 point decrease although to the centers of prefecture level 0.24 point increase. Totally speaking, migrations to the cities of levels next to origins' levels apt to increase and the others decrease. Only migrations from agricultural villages are decreasing to all levels.

The transitions mentioned above agree the prosperities that the migration patterns would change in parallel with the change of growing industry from the secondary sector industries to high-level service industries. In turn, in shift to a service economy period, now migration from agricultural villages has almost distinguished.



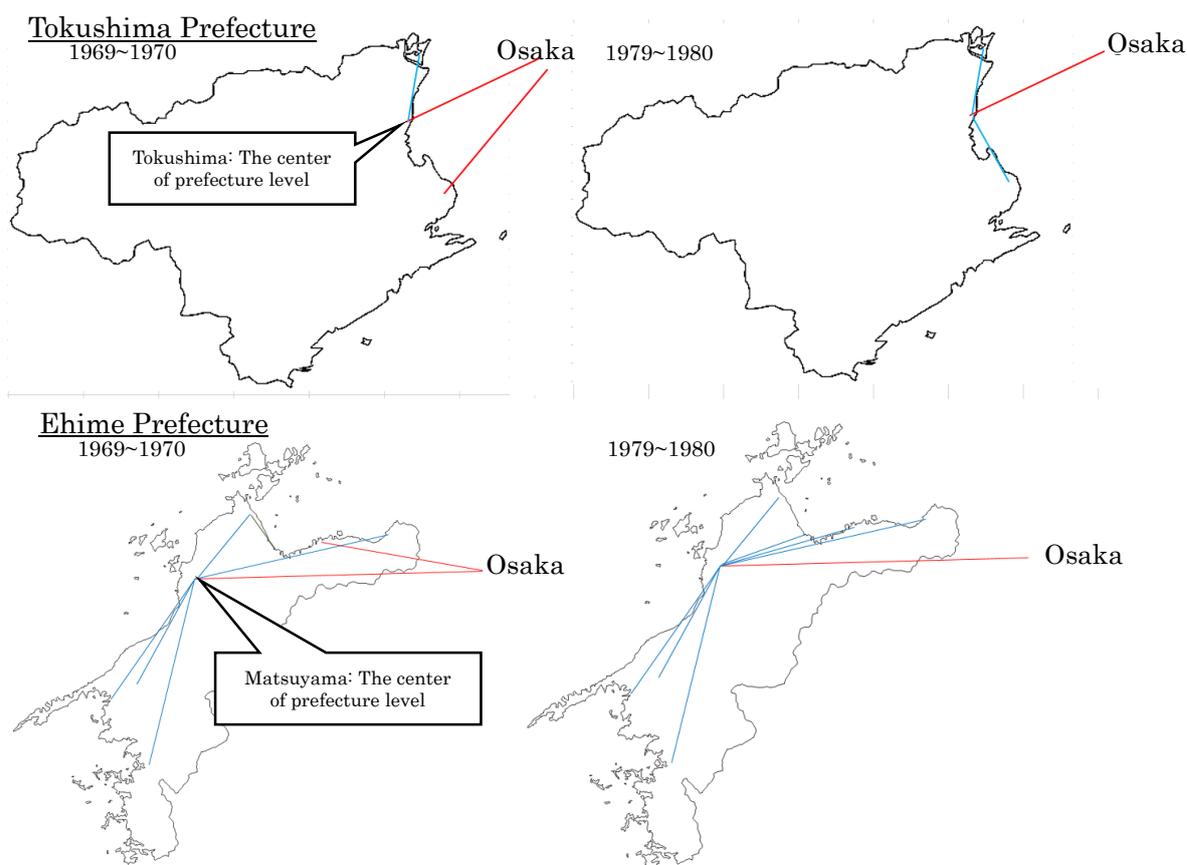
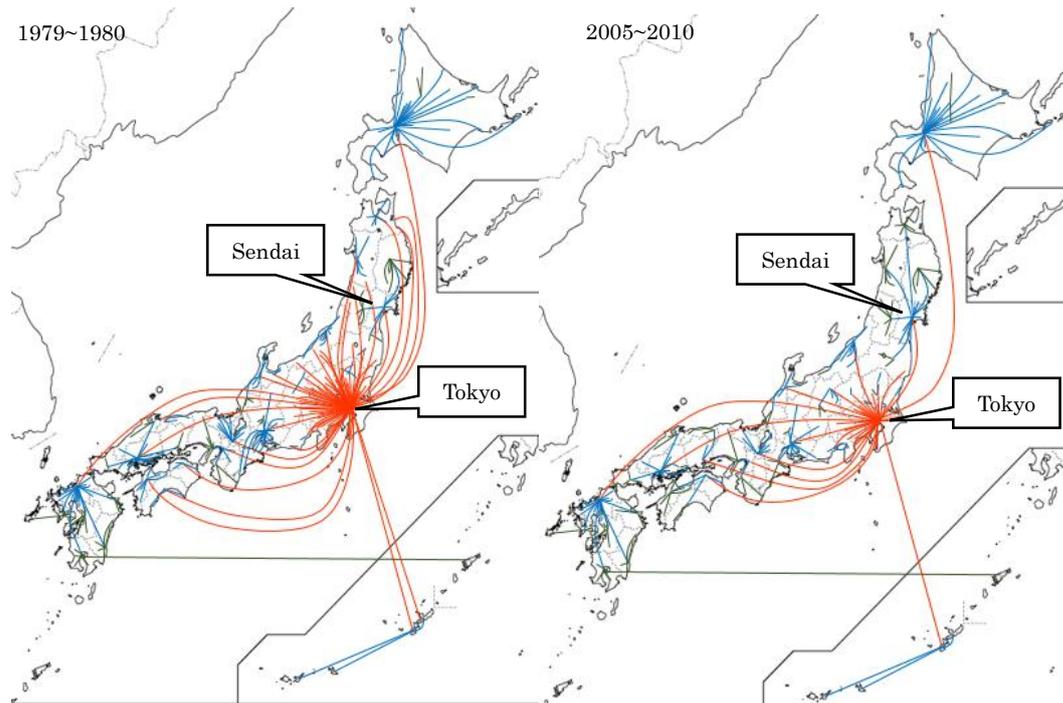


Figure 14: changes of networks of most popular destinations of migration of Niigata, Shiga, Hiroshima, Tokushima and Ehime prefecture. (the source: statistics of each prefecture)

Table 5: The change of component ratios of origins and destinations (summation of 10 prefectures, except for Ehime prefecture) (the source: statistics of each prefecture)

1970~1980		Destinations			
	Increase of points	Out of prefecture	Centers of prefecture level	Centers of local level	Agricultural villages
Origins	Out of prefecture	0.00	2.04	-4.57	-3.66
	Centers of prefecture level	4.72	0.00	2.56	3.24
	Centers of local level	-3.38	0.02	0.87	1.96
	Agricultural villages	-1.34	-2.07	1.13	-1.54
	Sum	0.00	0.00	0.00	0.00



- Colors of lines in this map represent the position of hierarchy of this network: Red lines are to the first level city (Tokyo), blue lines are to the second level, and green lines are to the centers of prefecture level.
- Urban Employment Area is used as a unit of city to emit the influences of suburbanization

Figure 15: changes of networks of most popular destinations of migration of all parts of Japan (the source: the national census)

1990~2010		Destinations				
	Increase of points	Centers of the highest level	Centers of region level	Centers of prefecture level	Centers of local level	Agricultural villages
Origins	Centers of the highest level	0.00	2.05	0.60	-0.61	-1.84
	Centers of region level	5.29	-0.72	2.93	2.03	3.86
	Centers of prefecture level	5.53	7.25	1.53	5.92	4.08
	Centers of local level	-5.54	-4.60	0.24	-2.11	-0.23
	Agricultural villages	-5.29	-3.98	-5.30	-5.25	-5.88
	Sum	0.00	0.00	0.00	0.00	0.00

Figure 16: The change of component ratios of origins and destinations (summation of all parts of Japan) (the source: the national census)

9. Conclusion

The changes of migration patterns for about 200 years can be abstracted as following (figure 17). In agriculture period, fundamentally based on supplying area of low-level service industries, cities of all levels are equally supplied of labor from agricultural villages. In industrialization period, migrations to the centers of the highest level from cities and villages of every level are dominant, and in advanced industrialization period active outflow from agriculture village and growth of all

industries located in cities join it. In shift to a service economy period, migrations to the cities of higher of one level have increased. Collecting migration data of long term, this long term changes are revealed and verified roughly.

In this paper, the author researched long-term changes of migration patterns from the view point of industry structure. As the result of this, it is shown that small cities are forced to decrease its population due to migration. Many developing countries are now undergoing industrialization and growth of the primate city following it, if it is able to apply Japanese experience to other countries, growth of high level cities will last with moderate speed after shifting to service economies. Japan is now confronting difficulty to deal with decline of the centers of local level. Plans encouraging industries in these small cities, low-level service industries for example, should be examined. On the other hand, as a description of migration patterns, this paper is not enough, mainly because of a shortage of data. Improvement of method of analysis to solve this problem is needed.

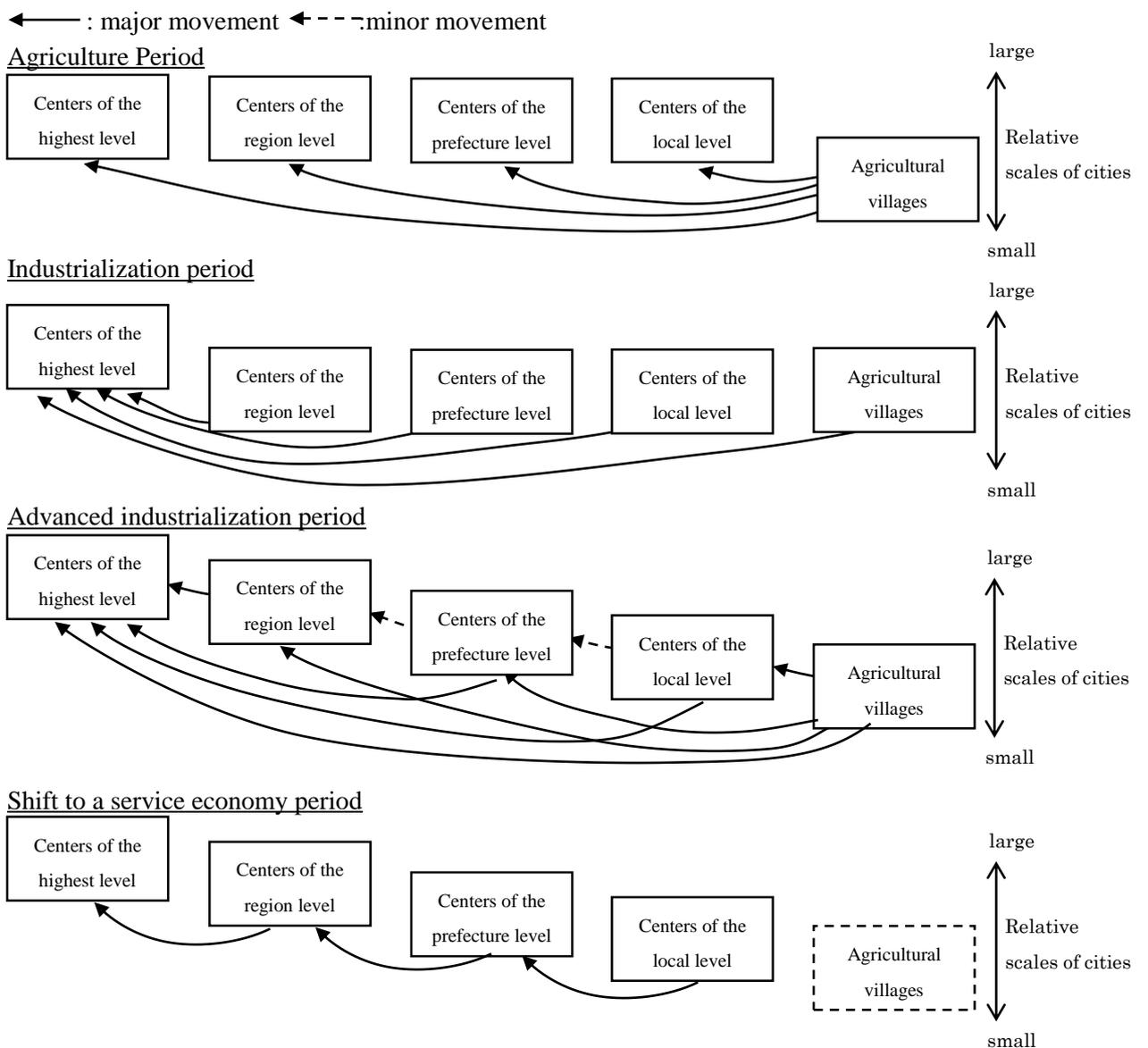


Figure 17: Conceptual diagrams of migrations of four periods

References:

- 1) Ravenstein, J. T. "The Laws of Migration" *Journal of the Statistical Society*, Vol. 48, Vol. 52, 1885 and 1889
- 2) Ogasawara, S.(2001) "the meaning of 'The Laws of Migration' of Ravenstein (In Japanese "Ravenstein no Jinko Ido Hosoku no Konnichiteki Igi") *Statistics* 2001-2, pp.6-11
- 3) Zelinsky, W. (1971) "The hypothesis of the mobility transition" *Geographical Review* 61, pp.219-249
- 4) Namiki, S. (1962) "Answer to criticism of Minami and Ono" (In Japanese "Minami , Ono Ryoshi no Hihan ni Kotaeru") *The Economic Studies Quarterly* 12-3, pp.67-69
- 5) Honda, T. (1950) "Historical analysis of problem of population in Japan" (In Japanese "Nihon Jinko Mondai no Shiteki Kaiseki") *J. of Population Problems* 6-2, pp.1-29
- 6) Ito, K.(1991) "Regional Differentials of Distributed Income and Interregional Migration" *Economic Science* 37, pp.193-318
- 7) Ishikawa, Y.(1994) "Measurement geography of migration" (In Japanese "Jinko Ido no Keiryō Chirigaku") *Kokonshoin*
- 8) Kawai, N. (2011) "A Consideration on the Factors of the Internal Migration for Three Major Metropolitan Areas" *Management Information Research* 18-2, pp.55-73
- 9) Nakagawa, S. (2006) "Depopulation and migration" (In Japanese "Jinko Gensho to Jinko Ido") *Operations Research* 51(1), pp.24-29
- 10) Plane David A. and Henrie Christopher J. (2012) *The Role of Hierarchical Proximity in Migration and Population Growth: Urban Shadow versus Urban Synergy Effects (Spatial Mobility and Dynamics Issues)*, *Studies in Regional Science* 42(1), 109-128
- 11) Ito, K.(2004) "Factors of internal migration with long distance in ages of rapid economic growth" (In Japanese "Kodo Keizai Seichōki no Kokuani Chokuyori Jinko Ido no Ketteiin") *Review of economics and information studies* 5(1・2), pp.1-56
- 12) Christaller, W. 1933. "The Central Places in Southern Germany" (Japanese version translated by Ezawa, J. "Toshi no Ricchi to Hatten" in 1966, Taimeido)
- 13) Morikawa, H. 1998. "Japanese urbanization and urban system" (In Japanese "Nihon no Toshika to Toshi Sisutemu") Taimeido
- 14) Kanemoto, Y. and Touoka, K. (2002) "Metropolitan setting standards of Japan" (In Japanese "Nihon no Toshiken Settei Kijun") *Journal of Applied Regional Science* No.7,pp.1-15
- 15) Hayami, Y. (2009) "Historical Demography of Early-modern Japan", Fujiwara Shoten
- 16) Kitagawa, K. (1962) "Development of the City as the Center of the large Region in Japan" *human geography* 14-4, pp.242-262
- 17) Hamano, K. (2010) "Patterns of migration to Kyoto in in the last days of the Tokugawa shogunate" (In Japanese "Bakumatsu Kyoto e no Chiriteki Ido Pattern) *Economics of Kansai University*, 60-2・3, pp.39-51
- 18) Sasaki, Y.(1980) "Migration of a city in Edo era" (In Japanese "Edojidai no Ichitoshi ni okeru Jinko Ido nit suite") *Research of law and economics of Chiba University* 9, pp.41-87
- 19) Takahashi, Y. (2005) "Historical demography of traditional country town" (In Japanese "Zaigocho no Rekishi Jinkogaku) *Minerva Shobo*
- 20) Hayami, Y. and Uchida, N.(1971) "Research following activity of farmers of modern times"(In Japanese "Kinsei Nomin no Kodo Tsuiseki Chosa") *The bulletin of Tokugawa forest management History Showa* 46, pp.217-256
- 21) Hayami, Y. (1972) "Documents of demography of Saijo village, Mino" (In Japanese "Noshu

Saijo Mura no Jinko Shiryo”) The bulletin of Tokugawa forest management History Showa 47, pp.171-190

22) Imori, R. (1943) “Society and life of agricultural villages” (In Japanese “Noson no Shakai to Seikatsu”) Jidaisha