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Transition of the Number of Schools and Pupils of Elementary School in Chugoku Region

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Abstract

The aim of this study is to clarify the regional characteristics of closed public elementary schools by closed period in the Chugoku region. In the Chugoku region that formed wide-area municipalities including urban and rural areas, many local governments face the problem of school restructuring due to the decrease in the number of pupils and aging. Therefore, it is necessary for future efficient facility planning to verify the relationship between the changes in the number of pupils in the elementary schools and the reorganization process of educational facilities in the Chugoku region. At first, we classify the period from Phase I to Phase V based on the increase/decrease tendency of the number of pupils and schools in the Chugoku region. Next, we analyze the municipalities by QM III, considering the differences in the number of children and the area of each municipality. Moreover, using the number of main schools in 1960 and the change rate of each school in each period, we classified the municipalities in the Chugoku region as of 1960. Finally, we grasp the characteristics of each classified types and compare them by prefecture.

Keywords: Public elementary school, Pupils number, Chugoku Region, Integration, Local characteristics

1. Background/ Objectives and Goals

In Japan, since the high economic growth period of the 1960s, depopulation of rural areas has progressed remarkably. Especially in the Chugoku region where population has been decreased

remarkably, many local governments face the problem of school restructuring due to the decrease in the number of pupils and aging. The purpose of this paper, we aim to clarify the regional characteristics of closed public elementary schools by closed period in the Chugoku region.

2. Methods

In this study, at we first classify the period from Phase I to Phase V based on the increase/decrease tendency of the number of pupils and schools in the Chugoku region. Figure 1 indicates the transitions of the number of schools and pupils in the Chugoku region.

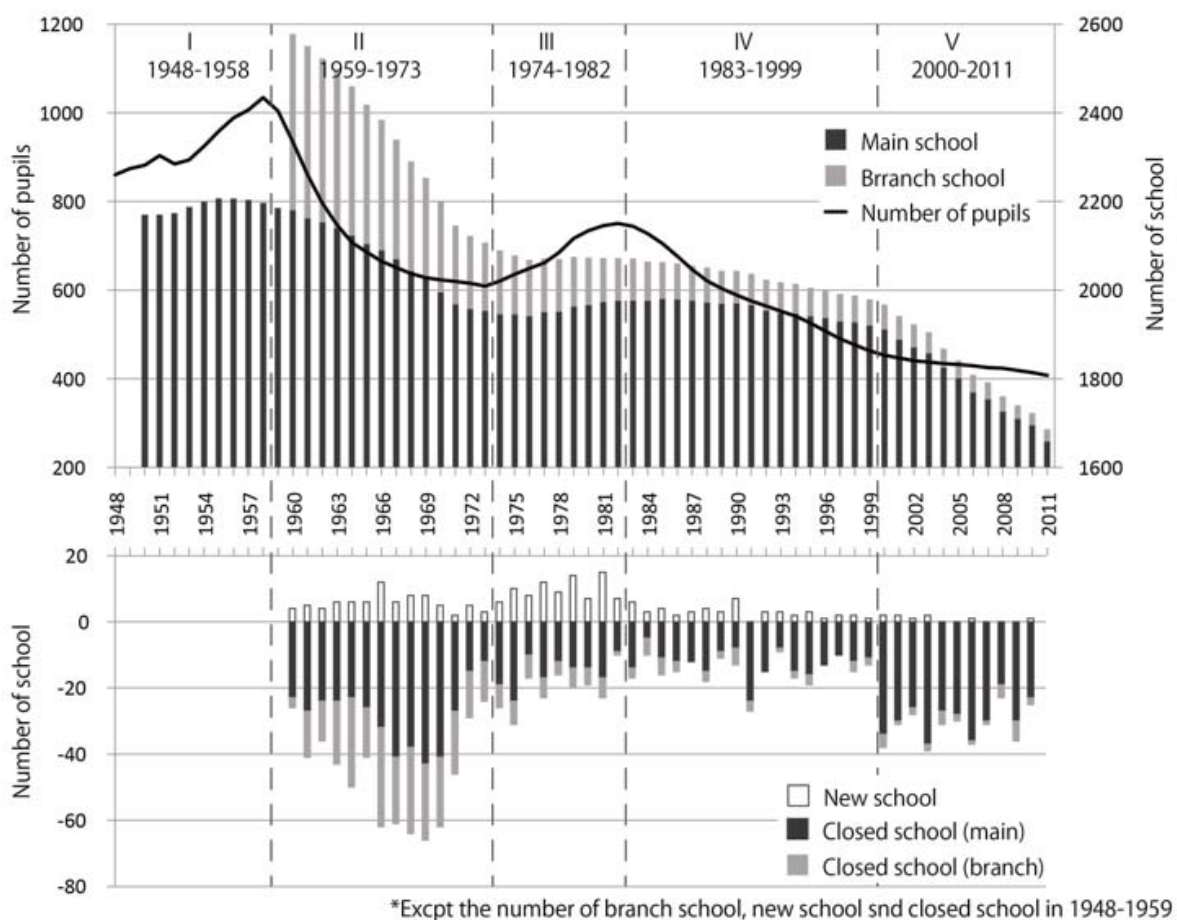


Fig. 1: Transition of the number of school, pupils and closed schools

Next, in order to clarify the regional characteristics, we analyze the municipalities by agricultural area type and Hayashi's quantification method type III (QM III), considering the differences in the number of children and the area of each municipality.

Table 1 indicates the category classification table. The first axis is interpreted as the axis showing the characteristics of the city / mountainous area of the municipality. The second axis is interpreted as the axis showing the characteristics of the flatland and intermediate area of

municipality. We classify municipalities by cluster analysis using the scores of 1st and 2nd axes.

Then, using the local community type in 1960 as basic units, we calculate and compare the number of closed schools in each period, the number of schools in the first year of each period, the rate of change of each school, divided into cities and counties. Moreover, using the number of main schools in 1960 and the change rate of each school in each period, we classified the municipalities in the Chugoku region as of 1960.

Finally, we grasp the characteristics of each classified types and compare them by prefecture.

Table 1: Quantification method type III category list and score

| Regional condition variable | Category | | Number of municipalities | score | |
|--|----------|--------------------------------|--------------------------|------------|-------------|
| | Symbol | Classification | | First axis | second axis |
| Agricultural area type | 11 | Urban area | 101 | 1.20 | -0.95 |
| | 12 | Flatland agricultural area | 18 | 0.56 | 0.91 |
| | 13 | Intermediate agricultural area | 110 | -0.08 | 1.27 |
| | 14 | Mountainous agricultural area | 138 | -0.90 | -0.46 |
| Pupils density (people/km ²) | 21 | ~11.9 | 92 | -1.18 | -1.13 |
| | 22 | 12.0~29.9 | 127 | -0.49 | 0.88 |
| | 23 | 30.0~59.9 | 66 | 0.96 | 0.55 |
| | 24 | 60.0 | 82 | 1.14 | -0.76 |
| Number of pupils in 2010 (people) | 31 | ~149.9 | 91 | -1.28 | -1.39 |
| | 32 | 150~399.9 | 122 | -0.59 | 0.97 |
| | 33 | 400~899.9 | 63 | 0.60 | 1.55 |
| | 34 | 900~ | 91 | 1.65 | -0.99 |
| The increase/decrease rate of pupils(%) | 41 | ~-80.0 | 169 | -1.05 | -0.49 |
| | 42 | 79.9~-60.0 | 102 | 0.31 | 1.56 |
| | 43 | -59.9~ | 288 | 1.53 | -0.79 |

3. Results

3.1 Transition in the Number of Pupils and Schools in the Chugoku Region

In the Phase I (1948 - 1958), the number of pupils that increased by the primary baby boom was remarkable. However, the number of schools was not changed much. On the other hand, during the Phase II (1959-1973), due to the rapid decrease of pupils after the primary baby boom, the significant integration of schools was progressed. In the Phases III (1974-1982), the number of pupils was increased again due to the second baby boom. As a result, the number of schools was gradually increased. In the Phase IV (1983-1999), the number of pupils decreased again, and in 1999 it recorded the smallest number of pupils in the past. In contrast, the number of schools has not decreased much. In the Phase V (2000-2010), the decrease in the number of pupils is the same as that in the Phase IV, but the number of closed schools is very large. It is assumed that the reorganization of elementary schools was promoted by municipal merger in Heisei period.

3.2 Regional Type by Cluster Analysis

According to geographical conditions, a total of 367 municipalities in the Chugoku region are divided into four types: (1) Urban type; (2) Flatland type; (3) Intermediate type and (4) Mountainous type. In order to compare the characteristics of each type, Table 2 indicates regional condition indicator and basic data, and Figure 2 indicates distribution of regional type.

Table 2: Reagional conditions of each type

| Type | Number of municipalities | Average of regional condition indicator | | | Average of basic data | | | Average sample score | |
|-------------------|--------------------------|---|-----------------------------------|--|-------------------------|-----------------------------------|-------------------|----------------------|-------------|
| | | The increase/decrease rate of pupils(%) | Number of pupils in 2010 (people) | Pupils density in 1960 (people/km ²) | Area (km ²) | Number of pupils in 1960 (people) | Number of schools | First axis | second axis |
| Urban type | 66 | -0.12 | 4235.4 | 149.1 | 72.5 | 6900.2 | 11.8 | 1.5 | -0.90 |
| Flatland type | 50 | -0.21 | 1409.6 | 67.3 | 63.7 | 2626.7 | 7.2 | 0.92 | 0.28 |
| Intermediate type | 155 | -0.78 | 337.1 | 32.1 | 81.8 | 1640.5 | 5.9 | -0.30 | 0.88 |
| Mountainous type | 96 | -0.87 | 126.6 | 18.7 | 111.2 | 1069.7 | 5.5 | -1.02 | -0.94 |

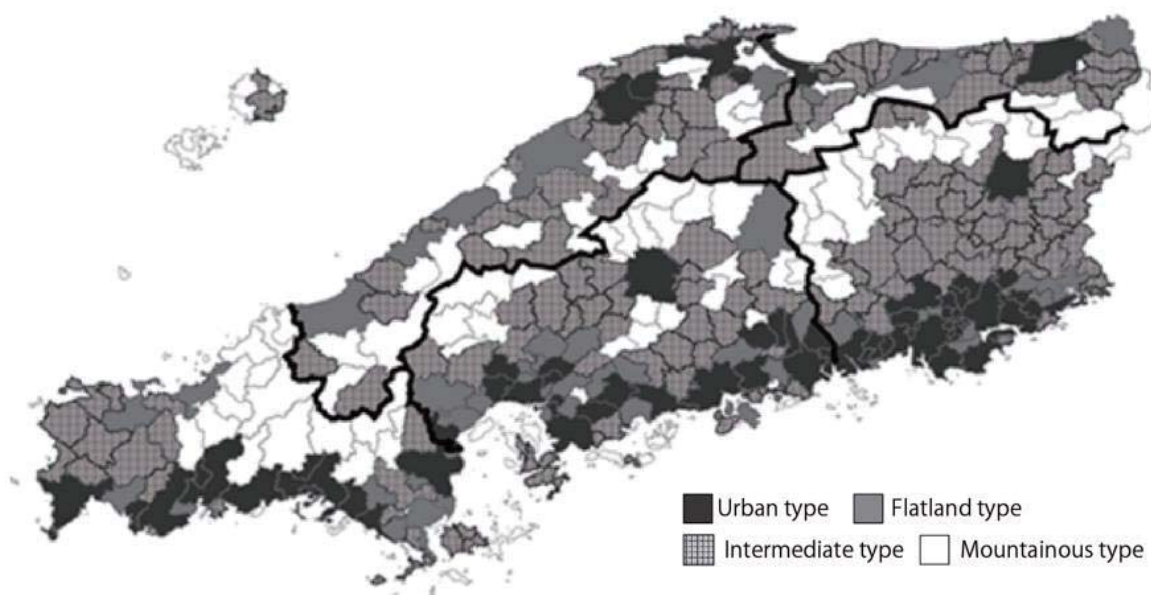


Fig. 2: Distribution map of region type

The “Urban type” municipalities have the highest pupil density in 1960 and the largest number of pupils in 2010. Moreover, the number of pupils has scarcely decreased in the last 50 years. Therefore, the average number of schools owned by municipalities is the largest. Most of major cities belong to this type. The many “Flatland type” municipalities are located around the “Urban type”. The “Flatland type” has the smallest area, but pupil density is lower than the “Urban type”. However, the rate of change of pupils in the “Flatland type” is about twice the “Urban type”. The “Intermediate type” municipalities are located between the “Flatland type” and the

“Mountainous type”. The greatest number of municipalities are classified in this type. The “Intermediate type” is larger than that of the “Urban type” and the “Flatland type”, but the pupil density is much lower. In particular, the rate of change of pupils in 50 years has been rapidly decreasing. Many municipalities located in Chugoku Mountains belong to “Mountain type”, and pupil density is extremely low. About 90% of "mountain type" pupils are decreasing, significant depopulation has been proceeding.

Next, Figure 3 indicates the proportion of region type by prefecture.

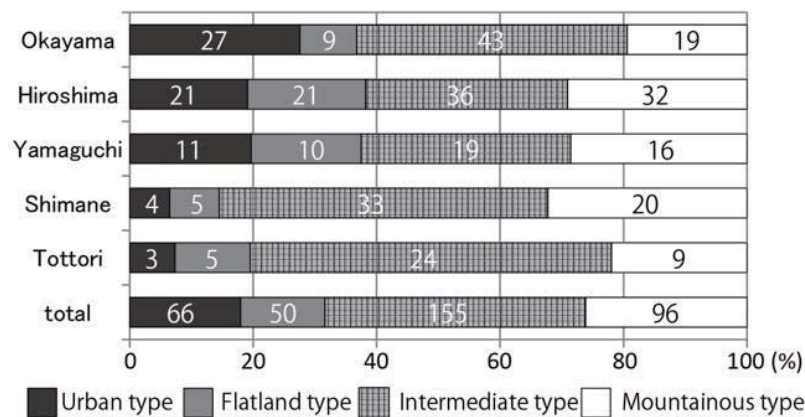


Fig. 3: Region type by prefecture

Okayama prefecture has the highest proportion of the “Urban type” among the Chugoku region. In addition, about 20% of Hiroshima and Yamaguchi prefectures are the “Urban type”. However, the "Urban type" of Shimane and Tottori prefectures is less than 10%. In Hiroshima, Okayama and Yamaguchi prefectures, the "Urban type" and the "Flatland type" account for about 40%. On the other hand, in Shimane and Tottori prefectures, the "Intermediate type" and the "Mountainous type" account for over 80%.

3.3 Classification Based on School Integration Process

Next, according to the number of schools and the rate of change of schools, the municipalities in the Chugoku region are divided into three types: (1) Maintained type; (2) Increased type; (3) Decreased type. In order to compare the characteristics of each type, Table 3 indicates result of classification of school integration, and Figure 4 indicates distribution of classified municipalities.

Table 3: Classification Based on School Integration Process

| Type [Number of municipalities] | Average number of schools (1963) | The increase/decrease rate of schools (%) | | | | The increase/decrease rate of pupils (%) | | | |
|---|----------------------------------|---|------|------|------|--|------|-----|-------|
| | | II | III | IV | V | II | III | IV | V |
| Maintained type(cities) [46] | 16.6 | -4.5 | 4.1 | 0.5 | -5.5 | -32 | 15.2 | -39 | -12 |
| Maintained type(towns and villages) [158] | 3.9 | -3.6 | 0.5 | 0.3 | -2.9 | -44 | 20.8 | -35 | -20 |
| Increased type [13] | 4.3 | 16.9 | 87.5 | 7.0 | 1.5 | 47.3 | 76.7 | -34 | -1.4 |
| Decreased type(II) [44] | 5.0 | -52 | 2.8 | 1.5 | -0.2 | -52 | 21.3 | -36 | -17.0 |
| Decreased type(III) [33] | 5.3 | -5.7 | -47 | -8.8 | 0.0 | -58.0 | -10 | -31 | -28 |
| Decreased type(IV) [16] | 5.1 | -7.5 | 0.0 | -60 | 0.0 | -74 | -5.7 | -57 | -33 |
| Decreased type(V) [57] | 5.4 | -6.9 | -2.6 | -6.0 | -57 | -57 | -9.3 | -40 | -32 |

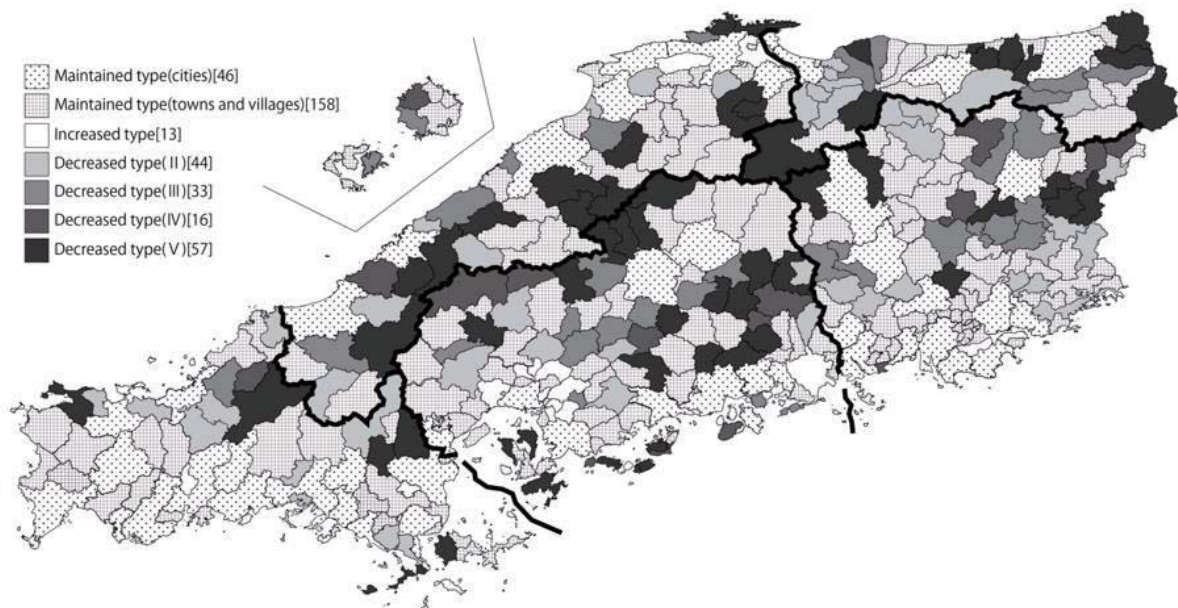


Fig. 4: Distribution map of classified municipalities

Because the "Maintained type" has gradually increased and decreased in the number of schools and pupils, integration was not done much. The "Maintained type" is divided into cities or towns and villages, furthermore, compare them. In cities and towns and villages, the average number of schools in 1960 has a big difference. More than 40% of the municipalities belong to the "Maintained type (towns and villages)".

The "Increased type" is a type in which the number of pupils increased during Phases II and III. Thereby the number of schools also has increased during the Phases II and III. The second baby boom has greatly influenced the increase of pupils remarkably in the Phase III.

The "Decrease type" is divided into four per phase. In all types the number of pupils continues to decrease. In the "Decreased type in the second period", due to the significant decrease in the

population, more than half of the schools have closed. Thereby, many municipalities have become one school form in one town and village. As a result, the number of schools after that mostly have not decreased. In the “Decreased type in the third period”, the number of pupils have decreased despite the second baby boom. In the “Decreased type in the fourth period”, despite the significant decrease in the number of pupils in the Phase II, had not integrated schools in the Phase II and III. Although it had managed to maintain the number of schools in the Phase II and III, it is assumed that the integration was promoted in the phase IV, in anticipation of future school management etc. In the "Decreased type in the fifth period", nearly 60% of schools have been integrated during Phase V. It is assumed that the municipal merger in Heisei period have affected this.

3.4 Composition Ratio of Classification by Prefecture

Figure 5 indicates composition ratio of regional type by prefecture, and Figure 6 indicates composition Ratio of regional type and classified municipalities.

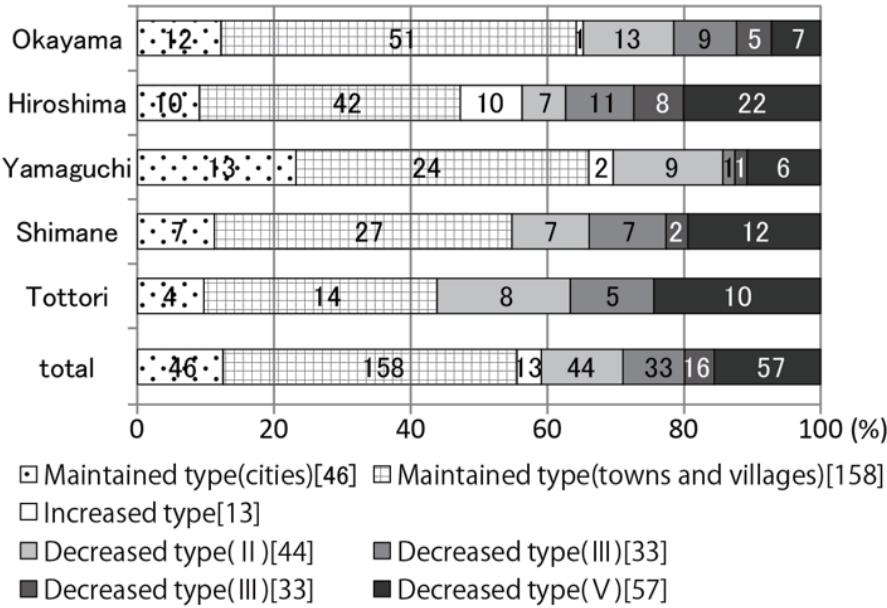


Fig. 5: Composition ratio of regional type by prefecture

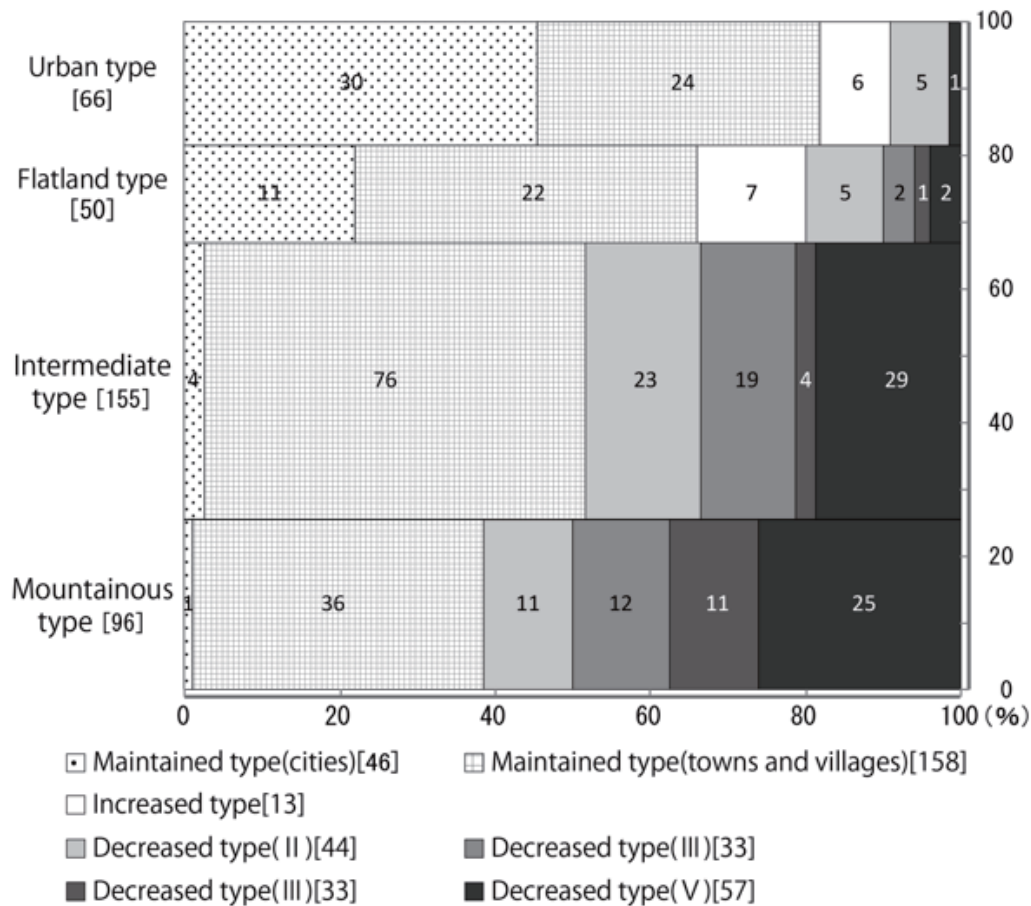


Fig. 6: Composition Ratio of regional type and classified municipalities

Compare by prefecture, the proportion of the "Maintained type" in Okayama prefecture and Yamaguchi prefecture is very high with more than 60%. In addition, the proportion of the "Decreased type" is low, among which the largest number of municipalities with the "Decreased type in the second period". This indicates that appropriate integration was done at an earlier stage than other prefectures in the Chugoku region. Moreover, it is assumed that it was hardly affected by municipal merger in Heisei period. In addition, most of the "Increased type" is municipality in Hiroshima Prefecture. About half of the municipalities in Shimane prefecture and nearly 60% of the municipalities in Tottori prefecture are the "Decreased type". In particular, there are many "Decreased type in the fourth and fifth periods". It is assumed that this was not integrated at the earliest stage and much integration was done due to the municipal merger of Heisei period.

Next, compare by region characteristics. Municipalities belonging to the "Urban type" and the "Decreased type" are very few with less than 10%. Most municipalities of the "Flatland type" maintain the number of schools. Compared to the "Urban type" and the "Flatland type", the ratio of the "Decreased type" is significantly increased in the "Intermediate type", accounting for nearly half of the total. Therefore, it is assumed that large scale integration was done. The

"Mountainous type" accounts for more than 60% of the "Decreased type", and the largest scale integration was taken place.

3.5 Conclusion

In this study, we analyzed and organized the actual conditions each municipalities in the Chugoku region after 1960. The following is the knowledge gained from this study.

We analyzed the data in the Chugoku region according to the time by the old municipal unit as of 1960 by time. According to geographical conditions, a total of 367 municipalities in the Chugoku region are divided into four types: (1) Urban type; (2) Flatland type; (3) Intermediate type and (4) Mountainous type. The "Urban type" municipalities have the highest with 149.1 pupil density in 1960 and the largest with 4235.4 numbers of pupils in 2010. Moreover, the number of pupils has scarcely decreased in the last 50 years. Therefore, the average number of schools owned by municipalities is the largest with 11.8. Most of major cities belong to this type. The many "Flatland type" municipalities are located around the "Urban type". The "Flatland type" has the smallest with 63.7 km² area. However pupil density is lower than the "Urban type" with. Moreover, the rate of change of pupils in the "Flatland type" is about twice the "Urban type" with -0.21. Municipalities classified as the "Intermediate type" are located between the "Flatland type" and the "Mountainous type". The "Intermediate type" has the most municipalities classified. The area of "intermediate type" is larger with 81.8 km² than that of "urban type" and "flat type", however the pupil density is much lower. In particular, rate of change of pupils in 50 years has been rapidly decreasing. Many municipalities located in the Chugoku Mountains belong to "Mountain type", and pupil density is extremely low. It can be seen that the decrease of pupils of nearly 90% from the rate of change of pupils can be read, which shows that the significant depopulation has been considerably proceeding.

Comparing the classification by geographical conditions by prefecture, the number of municipalities belonging to "Intermediate type" and "Mountain type" in Chugoku region are very large, accounting for over 60% of the total. In particular, in Shimane and Tottori prefectures, the "Intermediate type" and the "Mountainous type" account for over 80%. Okayama prefecture has the highest proportion of the "Urban type". In addition, about 20% of Hiroshima and Yamaguchi prefectures are the "Urban type", the "Urban type" of Shimane and Tottori prefectures is less than 10%. It is assumed that the proportion of the "Urban type" of Yamaguchi prefecture is relatively high because Yamaguchi prefecture has major cities dispersed. Furthermore in Hiroshima, Okayama and Yamaguchi prefectures, the "Urban type" and the "Flatland type" account for about 40%. On the other hand, in Shimane and Tottori prefectures, the "Intermediate type" and the "Mountainous type" account for over 80%. Therefore, In particular, it is assumed that progress of depopulation of municipalities located in the Sanin region is fast.

According to the number of schools and the rate of change of schools, the municipalities in the Chugoku region are divided into three types: (1) Maintained type; (2) Increased type; (3) Decreased type. The “Maintained type” in which more than 40% of municipalities belong is divided into cities or towns and villages, the average number of schools in 1960 has a big difference. It is assumed that "Increasing type" has greatly influenced by the second baby boom. The "Decrease type" is divided into four per phase. In all types the number of pupils continues to decrease. In the “Decreased type in the second period”, due to the significant decrease in the population, more than half of the schools have closed. Thereby, many municipalities have become one school form in one town and village. As a result, the number of schools after that mostly have not decreased. In the “Decreased type in the third period”, the number of pupils have decreased despite the second baby boom. In the “Decreased type in the fourth period”, despite the significant decrease in the number of pupils in the Phase II, had not integrated schools in the Phase II and III. Although it had managed to maintain the number of schools in the Phase II and III, it is assumed that the integration was promoted in the phase IV, in anticipation of future school management etc. In the "Decreased type in the fifth period", nearly 60% of schools have been integrated during Phase V. It is assumed that the municipal merger in Heisei period have affected this.

Compare by prefecture, the proportion of the "Decreased type" in Okayama and Yamaguchi prefectures is low, among which the largest number of municipalities with the “Decreased type in the second period”. This indicates that appropriate integration was done at an earlier stage than other prefectures in the Chugoku region. Moreover because "Decreased type in the fifth period" is small, it is assumed that it was hardly affected by municipal merger in Heisei period. In Shimane Prefecture and Tottori Prefecture, there are many "Decreased type" municipalities, especially the "Decreased type in the fourth and fifth periods" are many. It is assumed that this was not integrated at the earliest stage and much integration was done due to the municipal merger of Heisei period.

Compare by region characteristics, municipalities belonging to the "Urban type" and the "Decreased type" are very few with less than 10%. In urban areas, integration has been scarcely done. The "Decreased type" belonging to the "Flatland type" is also relatively few, most municipalities of the "Flatland type" maintain the number of schools. The "Decreased type" accounts for nearly half of the "Intermediate type". Therefore, it is assumed that large scale integration was done. The "Mountainous type" accounts for more than 60% of the "Decreased type", and the largest scale integration was taken place.

In the Chugoku region where typical integration of schools has been progressing, temporal characteristics were conspicuously shown in the integration of schools, and many differences

were also seen in the characteristics of integration for each municipality. Moreover, compared by geographical conditions, the number of closed schools gradually increased from urban area to mountainous area. However, even though decrease in the number of school children, some municipalities located in mountainous areas has been maintaining more than one school without reorganization.

From the above it is assumed that when integration of schools is performed, considerations of regional issues, the number of schools and pupils are necessary. Furthermore school reorganization needs to be carefully planned after thoroughly consideration with local residents. It is assumed that when it is possible to solve each issue of municipalities, retention of schools will be possible at mountainous area. Each municipalities in the Chugoku region has various geographical characteristic, development trend and declining tendency, and the number of pupils and schools have fluctuated, being influenced by the national policy. The statistical data obtained in this study is considered to be an important material as effective model to compose many problems about closed school. In the future it is assumed that necessary to conduct a case study of the municipality that was characteristic.

4. References

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