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**Economic Effects of Roadside Stations on Regional Economies:  
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# Economic Effects of Roadside Stations on Regional Economies: Using Input-Output Analysis for Three Economic Zones and Municipalities in Hyogo Prefecture\*

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## 1. Introduction

Roadside Station (It is called Michi-no-Eki in Japanese) is a registration system for facilities with three basic functions: rest, information transmission, and regional cooperation. The station started as a rest stop on the road, but in recent years, its functions have diversified, including disaster prevention, welfare, medical care, and resident services (Ministry of Land, Infrastructure, Transport, and Tourism website). Furthermore, in 2014, The station was positioned as a base facility for regional revitalization policy and became a central base facility for regional revitalization. The basic policy of Roadside Stations is "regional supply," the provision of local products within the region<sup>1)</sup>. The concept of regional supply through Roadside Station is based on "theory of endogenous development" in which the region takes the initiative and local residents themselves participate in the development process to promote regional development. In particular, agricultural forest and fishery products sold at Farm Stands, direct sales depots, are basically supplied by local producers. In terms of employment, roadside stations employ local residents<sup>2)</sup>.

Because the Roadside Station system, which is based on regional supply, is attractive as a core for forming an economic cycle within the region, municipalities, which are the main bodies for locating Roadside Stations have begun to consider Roadside Stations as a trump card for the regional development. In particular, municipalities in hilly and mountainous areas have high expectations for the economic effects of Roadside Stations. For example, Roadside Station "Tobetsu" (Hokkaido Prefecture) and "Hitachi - Ohta" (Ibaraki Prefecture) are making efforts to revitalize their regions, using Roadside Station as their base, and have been effective in promoting industries within their area<sup>3)</sup>. As shown in these good examples, estimating the economic effects of Roadside Station on the region is very important not only for the local governments that set up Roadside Station but also for economic zone in the policy planning of regional revitalization. Promoting the construction of regional economic circulation in which Roadside Station plays a central role is also shown in the "To build a small base" policy by the Headquarters for *the Revitalization of Local Communities, People and Work*<sup>4)</sup>.

Therefore, in this study, in order to empirically analyze the economic effects of Roadside Station on the region, we analyze the economic ripple effects of Roadside Station in two ranges, that is, the regional economic zone unit, which is smaller than the prefecture unit and has strong economic ties, and the municipality unit, by using the input-

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\* This paper is an extension of the previous work, originally published in Japanese (Matsuo, R. and M. Yamaguchi (2018), (2019) and I have obtained permission from *Nihon Toshi Gakkai Kenkyu-Nenpo* (Annual Report of the Japan Society of Urban Studies) and *The Journal of Contemporary Social Sciences* respectively to publish the extended paper in English.

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output tables of each area. Specifically, the ripple effects of each Roadside Station on the two ranges are analyzed using the input-output tables provided for each of the seven regional economic zones in Hyogo Prefecture and the input-output tables for each city and town<sup>5)</sup>. Furthermore, the economic effects of these two ranges are compared, and the effects of regional supply derived from differences in area size are examined. In this comparative analysis, the effect of the regional supply of Roadside Station can be clarified in more detail from the range of the regional supply effect and regional characteristics. In addition, the employment effect of Roadside Station for each city and town is also analyzed, and the characteristics of each result are compared and analyzed.

## **2. Analytical methods and previous studies**

So far, Kawamura (2011), Shindo (2016) and the like have conducted research on the economic effects of Roadside Stations using input-output analysis. Among them, Kawamura (2011) analyzed case studies of major Roadside Stations in Gifu Prefecture and the economic ripple effects of all Roadside Stations in the prefecture using data of each stations. However, there were the following major problems. (1) Only the economic ripple effect of the whole prefecture is estimated. (2) Roadside Station has a characteristic of regional supply where the agricultural products are basically supplied to Farm Stands within the region, but he did not incorporate this characteristic into his analysis method. (3) He did not estimate the employment effect of Roadside Station. (4) He did not investigate basic, key, and essential variables such as sales but estimated them from the number of visitors in publications.

Therefore, in this study, a method for improving these problems is used. First, with regard to the above-mentioned problem (1), in this study, we analyzed the economic ripple effects of Roadside Stations in units of "regional economic zones" with strong economic unity and in smaller units of municipalities<sup>6)</sup>. This is because in the analysis of the economic ripple effect of Roadside Stations, the analysis in the area where economic unity is strong leads to accurately grasping the economic effect. In this study, we analyze the economic effect of Hyogo Prefecture by using regional input-output tables where the prefecture is divided into seven areas, and city and town input-output tables provided for each city and town.

With regard to the problem (2) in which Roadside Station's characteristics of regional supply was not taken into consideration", in this study, the self-sufficiency rate in conducting input-output analysis was estimated to be 100% for the provision of local products within the region. It is clearly stated that one of the basic concepts of Roadside Stations is to promote the sustainable development of the regional economy by forming the regional economic circulation through close inter-regional industrial relations to be voluntarily established. In particular, Roadside Stations, which mainly sells agricultural products, is making efforts to return profits to the local economy by selling local agricultural products and producing processed products (See National Liaison Meeting "Roadside Stations" (2017), pp. 156 -158). The 100% self-sufficiency rate used in the analysis was set based on this basic policy of Roadside Stations. The sales of agricultural products sold at Farm Stands and private services such as restaurants, hot springs, and experience-based services were analyzed based on the provision of local products within the region.

Regarding the problem (3), this study examined the effect of employment on cities and towns by estimating the number of inducers of employment and the number of inducers

of employment. Concerning Problem (4), Kawamura (2011) estimated sales data on Roadside Stations using the number of visitors' data from "Survey on tourism and recreation activities" in Gifu Prefecture. Furthermore, the data used for the survey did not cover all the Roadside Stations in Gifu Prefecture. In this study, we conducted a questionnaire survey on the sales of products and services including agricultural products, specialty products, restaurant, and the like and on the number of restaurant users (number of visitors) at all Roadside Stations in the region, and analyzed the results based on the actual survey data.

Next, an actual method of input-output analysis will be described. In this paper, the economic ripple effect refers to the effect in which the final demand generated in an industry induces the production of each industry in the region, and each induced industry induces the production of each industry one after another. In this paper, the economic ripple effect of each industry induced by the increase of final demand of the Roadside Station is shown by dividing the effect into direct effect, first indirect effect, and second indirect effect. In addition, the employment effect of Roadside Stations was estimated. The calculation method is shown in Table 1.

### **3. Areas and data used for analysis**

#### **3.1 Areas of Analysis**

Hyogo Prefecture is divided into seven regional economic zones with strong economic ties. The purpose of this study is to compare the economic ripple effect of Roadside Stations on different three areas in the prefecture. First, as "rural area" all 11 Roadside Stations in "Tajima Region", as "suburban area" all 1 (one) Roadside Station in "Hanshin area", and as "urban area" all 1 (one) Roadside Station in "Kobe City Area" were taken up, and the economic ripple effects were analyzed using the regional and city and town input-output tables. The analysis used data from all the Roadside Stations in the regions. The three regions covered in this study consist of the following municipalities.

- Kobe City Region: Kobe City
- Hanshin Region: Amagasaki City, Nishinomiya City, Ashiya City, Itami City, Takarazuka City, Kawanishi City, Sanda City and Inagawa Town
- Tajima Region: Toyooka City, Yabu City, Asago City, Kami Town, and Shinonsen Town

Hyogo Prefecture was selected as the target of the analysis because it has an input-output table for each region necessary to analyze the economic ripple effects of the regional economic zones as it is normally difficult to obtain such tables necessary for the analysis. The three regions of Kobe, Hanshin and Tajima in Hyogo Prefecture were analyzed for the following reasons. First of all, depending on the population, there are two types of areas: "urban area" which consists of Tokyo's 23 wards and cities designated by municipal ordinances with a population of more than 500,000 according to the Local Autonomy Act, and "rural area" which consists of municipalities prescribed by the Mountain Villages Development Act. Therefore, in order to cover the characteristics of the regions to be analyzed, the Kobe City Region was selected as the representative of the urban area, the Tajima Region was selected as the representative of the rural area, and the Hanshin Region was selected as the "suburban area" in the middle thereof. Using the regional input-output tables and the city and town input-output tables of each region, the

Table 1 Calculation Method for Each Index

| No.  | Index                                                                      | Calculation Method                             |
|------|----------------------------------------------------------------------------|------------------------------------------------|
| [1]  | Final Demand Increase Amount                                               |                                                |
| [2]  | Regional Self-sufficiency Matrix                                           |                                                |
| [3]  | Direct Effect (Amount of increase in Final Demand within the Region)       | $[2] \times [1]$                               |
| [4]  | Input Coefficient Matrix                                                   |                                                |
| [5]  | Amount of Input of Raw Materials (Demand Increase Amount)                  | $[4] \times [3]$                               |
| [6]  | Increase in Demand in the Region                                           | $[2] \times [5]$                               |
| [7]  | 1st Indirect Effect                                                        | $(\text{Leontief Inverse Matrix}) \times [6]$  |
| [8]  | 1st Ripple Effect (Direct Effect + 1st Indirect Effect)                    | $[3] + [7]$                                    |
| [9]  | Gross Value Added Coefficient Matrix                                       |                                                |
| [10] | Employee Income Coefficient Matrix                                         |                                                |
| [11] | Gross Value Added Induction Amount                                         | $[9] \times [8]$                               |
| [12] | Employee Income Induced Amount                                             | $[10] \times [8]$                              |
| [13] | Total Employee Income Induction                                            | $\Sigma([12])$                                 |
| [14] | Consumption Conversion Coefficient                                         |                                                |
| [15] | Total Increase in Demand from Private Consumption                          | $[13] \times [14]$                             |
| [16] | Private Consumption Expenditure Composition Ratio                          |                                                |
| [17] | Amount of Increase in Demand in Each Sector due to Private Consumption     | $[15] \times [16]$                             |
| [18] | Increase in Demand in Each Sector in the Region due to Private Consumption | $[2] \times [17]$                              |
| [19] | 2nd Indirect Effect                                                        | $(\text{Leontief Inverse Matrix}) \times [18]$ |
| [20] | Total Effect (Direct Effect + 1st Indirect Effect + 2nd Indirect Effect)   | $[3] + [7] + [19]$                             |
| [21] | Employment Coefficient Matrix                                              |                                                |
| [22] | Number of employment induced                                               | $[20] \times [21]$                             |
| [23] | Employment Coefficient Matrix                                              |                                                |
| [24] | Number of Employee Induced                                                 | $[20] \times [23]$                             |

economic ripple effect of Roadside Stations on each region was estimated<sup>7)</sup>.

### 3.2 Analysis Data

#### (1) Questionnaire Survey

The analysis data was prepared using the answers obtained from the following questionnaire survey and interview results for a total of 13 Roadside Stations in the target region. The survey was conducted on station masters in the Tajima Region (11 stations in total), the Hanshin Region (All one station), and the Kobe City Region (All one station). Survey item:

- Total sales of each Roadside Station and the ratio of sales of agricultural products, specialty products, restaurants, and hot springs to total sales (2014) (Table 2).
- Number of visitors (Number of customers passing through the register at Farm Stand). (2014).
- The current state of management of Roadside Station (Interviews conducted in May 2017).

#### (2) Composition of Input-Output Sectors in the Input-Output Table

The corresponding input-output sectors for use in input-output analysis of the data from the questionnaire are described here. For input-output analysis, we processed the regional input-output tables of Hyogo Prefecture (36 sectors) and the input-output tables of municipalities (36 divisions) into 35 sectors, respectively. In other words, in the Farm Stations of the Roadside Stations, agricultural and marine products are handled in the same store, and these amounts cannot be divided. Therefore, the input-output table was newly created by combining the two sectors of agriculture- forestry and fisheries. The

Table 2 Proportion of Sales of products and services to total sales (Units: %)

| Region              | Municipality<br>(Location)                                | No. | Roadside Station<br>(Registration Date<br>/Location)                            | Agricultural<br>and Marine<br>Products    | Specialties and Souvenirs |                               |                                      |                                       |                          |                                       | Restaurant          | Hot Spring<br>Facility |
|---------------------|-----------------------------------------------------------|-----|---------------------------------------------------------------------------------|-------------------------------------------|---------------------------|-------------------------------|--------------------------------------|---------------------------------------|--------------------------|---------------------------------------|---------------------|------------------------|
|                     |                                                           |     |                                                                                 |                                           | (100%)<br>(Total)         | (70%)<br>Dood<br>and<br>Drink | (10%)<br>Paper<br>and<br>Woodworking | (10%)<br>Pottery                      | (5%)<br>Textile<br>Goods | (5%)<br>Other                         |                     |                        |
| Tajima<br>Region    | Asago City<br>(Central Part<br>of the Prefecture)         | 1   | Asago<br>(1993.4<br>/ Middle of the Central<br>Part of the City)                | 10.00                                     | 40.00                     | 28.00                         | 4.00                                 | 4.00                                  | 2.00                     | 2.00                                  | 50.00               | —                      |
|                     |                                                           | 2   | Fresh Asago<br>(1999.8<br>/ South of the Central<br>Part of the City)           | 10.00                                     | 70.00                     | 49.00                         | 7.00                                 | 7.00                                  | 3.50                     | 3.50                                  | 20.00               | —                      |
|                     |                                                           | 3   | Tajima no Mahoroba<br>(2005.8<br>/ North of the central<br>Part of the City)    | 34.10                                     | 49.70                     | 34.79                         | 4.97                                 | 4.97                                  | 2.49                     | 2.49                                  | 16.20               | —                      |
|                     | Kami-cho<br>(Northern Part<br>of the Prefecture)          | 4   | Amarube<br>(2012.3<br>/ Northern Part<br>of the Town)                           | 10.00                                     | 85.00                     | 59.50                         | 8.50                                 | 8.50                                  | 4.25                     | 4.25                                  | 5.00                | —                      |
|                     |                                                           | 5   | Muraoka Farm Garden<br>(1993.4<br>/ South of the Central<br>Part of the Town)   | 8.00                                      | 62.00                     | 43.40                         | 6.20                                 | 6.20                                  | 3.10                     | 3.10                                  | 30.00               | —                      |
|                     |                                                           | 6   | Ayu no Sato Yataigawa<br>(1999.8<br>/ North of the Central<br>Part of the Town) | 20.00                                     | 50.00                     | 35.00                         | 5.00                                 | 5.00                                  | 2.50                     | 2.50                                  | 30.00               | —                      |
|                     |                                                           | 7   | Hachi-Kita<br>(1997.10<br>/ Southern Part<br>of the Town)                       | 10.00                                     | 85.00                     | 59.50                         | 8.50                                 | 8.50                                  | 4.25                     | 4.25                                  | 5.00                | —                      |
|                     | Yabu City<br>(North Central<br>Part<br>of the Prefecture) | 8   | Yoka Tajima no Kura<br>(2006.8<br>/ North of the Central<br>Part of the Town)   | 25.00                                     | 45.00                     | 31.50                         | 4.50                                 | 4.50                                  | 2.25                     | 2.25                                  | 30.00               | —                      |
|                     |                                                           | 9   | Yabu<br>(1994.3<br>/ East of the Eastern<br>Part of the Town)                   | 10.00                                     | 72.00                     | 50.40                         | 7.20                                 | 7.20                                  | 3.60                     | 3.60                                  | 18.00               | —                      |
|                     |                                                           | 10  | Tajima Rakuza<br>(1996.4<br>/ Center Of the<br>Eastern Part of the Town)        | 10.94                                     | 14.06                     | 9.84                          | 1.41                                 | 1.41                                  | 0.70                     | 0.70                                  | 31.25               | 43.75                  |
|                     | Toyooka City<br>(Northern Part<br>of the Prefecture)      | 11  | Kannabe Kogen<br>(1994.4<br>/ Southwestern<br>Part of the City)                 | 13.00                                     | 53.00                     | 37.10                         | 5.30                                 | 5.30                                  | 2.65                     | 2.65                                  | 17.00               | 17.00                  |
| Hanshin<br>Region   | Inagawa-cho<br>(Eastern Part<br>of the Prefecture)        | 12  | Inagawa<br>(2000.8<br>/ Central Part<br>of the Town)                            | 72.50                                     | 7.50                      | 5.25                          | 0.75                                 | 0.75                                  | 0.38                     | 0.38                                  | 20.00               | —                      |
| Kobe City<br>Region | Kobe City<br>(Southern Part<br>of the Prefecture)         | 13  | Ogo<br>(2002.8<br>/ Northern Part<br>of the City)                               | 70.00                                     | 30.00                     | 21.00                         | 3.00                                 | 3.00                                  | 1.50                     | 1.50                                  | NA <sup>*1</sup>    | —                      |
| Input-output sector |                                                           |     |                                                                                 | Agriculture,<br>Forestry and<br>Fisheries |                           | Dood<br>and<br>drink          | Pulp, Paper<br>and Wood              | Ceramic<br>s<br>Earth<br>and<br>Rocks | Textile<br>Industry      | Other<br>Manufacturin<br>g Industries | Personal<br>Service | Personal<br>Service    |

data and corresponding input-output sectors are as follows.

- Farm Stand Sales: Agriculture, Forestry and Fishery Products
- Specialty products (souvenir) Sales: 70% in food and beverage, 10% in pulp, paper and wood products, 10% in ceramics, clay and stone, 5% in textiles, and 5% in other sectors<sup>8)</sup>.
- Restaurant and Hot Spring Sales: Consumer Services

Based on the results of the questionnaire and the above assumptions, Table 2 shows the proportion of the input-output sector to total sales of each Roadside Station. Therefore,

the amount of the final demand used in the analysis was calculated by distributing the total sales of each Roadside Station obtained in the questionnaire survey to each input-output sector using the proportion in Table 2. Next, the estimation of the data of the transportation expenses which the visitors of the Roadside Station consume in the region will be described.

### **(3) Traffic cost data for visitors to Roadside Station**

Most Roadside Stations are located along national roads because they originated as rest facilities on roads. All Roadside Stations are equipped with parking lots for standard-sized cars and large-sized cars. Therefore, in this study, the transportation cost of the users of Roadside Stations is assumed to be the gasoline cost of passenger cars, assuming that all the users visit by car. The method for estimating gasoline cost is basically based on Kawamura (2011) and adds the conditions in the regional input-output table <sup>9)</sup>. First, the number of passenger cars was estimated as follows based on the number of passengers at each Roadside Stations obtained from the questionnaire survey.

#### **a. Number of passenger cars to Roadside Stations**

Data on the number of passenger cars entering the Roadside Stations were estimated using ratio of passenger cars in Kobe, Hanshin and Tajima regions calculated using "Number of entries by transportation in the last 10 years"(Kobe City, Northern Hanshin Region, Southern Hanshin Region, Tajima Region) data in "2014 Hyogo Prefecture Tourism Survey Report". The actual number of passenger cars in each region was calculated as follows; It was calculated by multiplying the ratio of passengers using private cars among tourists in each area by the number of visitors at each Roadside Station, and then dividing this figure by the average number of passengers per 1 passenger car for each type of domestic car (1.3 persons 2010 years).

#### **b. Total cost of gasoline**

It is assumed that 1/3 of the number of passenger cars will purchase 50 liters of gasoline in the region. The ratio of each type of gasoline was 70% for regular gasoline and 30% for high-octane gasoline, and the average retail price in Hyogo Prefecture (2014) announced by the Oil Information Center was used for the price. The average retail price in Hyogo Prefecture in 2014 is as follows.

High-octane gasoline: 144.7 yen/1 liter

Regular gasoline: 133.8 yen/1 liter

The sum of these amounts is the amount of gasoline consumed by the users of each Roadside Station (Table 3). The input-output sector, which corresponds to the cost of gasoline, is oil and coal products. In this study, we estimate the economic ripple effect of Roadside Stations by the input-output analysis using the following method.

## **4. Analysis Result**

### **4.1 Economic Ripple Effects on Regional Economic Zones**

Table 4 shows the estimation results of the economic ripple effect of Roadside Stations on each regional economic zone by the input-output analysis. The estimated results for each region were as follows: the direct effect, which is the amount of final demand within the region brought about by all 11 Roadside Stations in the Tajima region, was estimated

Table 3 Estimates of the total amount of gasoline consumed by visitors to each.  
Roadside Station

| No. | Roadside Station     | Number<br>of Visitors<br>(1,000 persons) | Number of<br>Passenger Cars<br>(1,000) | Gasoline<br>Cost<br>(1,000 yen) |
|-----|----------------------|------------------------------------------|----------------------------------------|---------------------------------|
| 1   | Asago                | 98                                       | 50.36                                  | 115040.39                       |
| 2   | Fresh Asago          | 500                                      | 256.92                                 | 586940.77                       |
| 3   | Tajima no Mahoroba   | 2000                                     | 1027.69                                | 2347763.08                      |
| 4   | Amarube              | 150                                      | 77.08                                  | 176082.23                       |
| 5   | Muraoka Farm Garden  | 150                                      | 77.08                                  | 176082.23                       |
| 6   | Ayu no Sato Yatagawa | 25                                       | 12.85                                  | 29347.04                        |
| 7   | Hachi Kita           | 60                                       | 30.83                                  | 70432.89                        |
| 8   | Yoka Tajima no Kura  | 360                                      | 184.98                                 | 422597.35                       |
| 9   | Yabu                 | 50                                       | 25.69                                  | 58694.08                        |
| 10  | Tajima Rakuza        | 220                                      | 113.05                                 | 258253.94                       |
| 11  | Kannabe Kogen        | 183                                      | 94.03                                  | 214820.32                       |
| 12  | Inagawa              | 688                                      | 250.33                                 | 571870.10                       |
| 13  | Ogo                  | 250                                      | 77.88                                  | 177927.40                       |

to be 1240.22 million yen; the 1st indirect effect induced by the direct effect was estimated to be 391.75 million yen; the 1st ripple effect, which is the sum of the direct effect and the 1st indirect effect was estimated to be 1631.97 million yen; and the 2nd ripple effect, which is an increase in production induced by employee income, was estimated to be 217.75 million yen. The total effect, which is the sum of the 1st and 2nd ripple effects, was 1849.72 million yen, and the ripple-effect magnification, which is the value obtained by dividing the amount of the total effect by the amount of the direct effect, was 1.49 times.

The total effect of cities and towns was as follows in order of size: Asago City (3 stations) was 1013.97 million yen, Yabu City (3 stations) was 462.02-million-yen, Kami Town (4 stations) was 231.98 million yen, and Toyooka City (1 station) was 141.74 million yen (Numbers in parentheses indicate the number of Roadside Stations in the municipalities). Among them, the total effect of Asago City is remarkable. Asago City is a rural area located in the southern mountainous area of the Tajima Region. Of the 3 Roadside Stations in the city, "Tajima no Mahoroba" is Priority Roadside Stations selected by the Ministry of Land, Infrastructure, Transport, and Tourism. The section where fresh vegetables shipped from nearby farms are abundant is popular. The average daily sales of agricultural products are 2 million yen. Among the specialties of Asago City, agricultural products such as Iwatsu green onions, black soybeans, and strawberries are famous, and they are shipped to the Roadside Stations in Asago City. The management policy focusing on agricultural product sales seems to be a factor in the large total effect of Asago City. (In Table 2, the "Tajima no Mahoroba" and Asago City's 2 other Roadside Stations appear to be different in character, but a survey and our interview conducted on these 3 Roadside Stations in Asago City shows that the 2 other stations also, like the

"Tajima no Mahoroba", use locally produced agricultural products in their processed goods and restaurant menus, which are generating large sales, and focus on selling agricultural products.).

As for the ripple effect magnification in the region, Asago City, which has a large total effect, is 1.53 times, indicating that the ripple effect magnification is also high. The analysis by Matsuo and Yamaguchi (2015) also revealed that the "Fresh Asago" located in the same city had high efficiency, which is also thought to be a factor of the high ripple effect magnification of the total of 3 stations in the city. However, the municipality with the highest ripple effect magnification in the Tajima Region was Yabu City. There are three Roadside Stations in the city, but the high ripple effect magnification means that increased final demand due to direct effects leads to significant economic effects through efficient regional economic cycles. Of the 3 stations in particular, "Yoka Tjimano-kura" is a Roadside Station established by the Private Finance Initiative (PFI). It is managed by a consortium of local companies, incorporating the know-how of the private sector in its management and operation, and is operated closely to the local community. It is characterized by its management policy in which the cooperative association for shippers of agricultural products is specified in the neighborhood, and communication between the shipper and the station is always maintained (Refer to Matsuo and Yamaguchi (2016)).

Furthermore, the ripple effect magnification for only agricultural products with a self-sufficiency rate of 100% in the whole Tajima region was 1.62 times, and the ripple effect magnification under the condition of a closed economy for agricultural products in which all intermediate products such as fertilizer and seeds were produced with a self-sufficiency rate of 100% was 2.21 times. These values were extremely large when compared with the ripple effect magnification of 1.49 times for the total product of the Roadside Station. As a result, agricultural products have a large impact on the local economy in the region, and it can be said that agricultural products produced at a self-sufficiency rate of 100% in particular are boosting the local economy<sup>10</sup>). On the other hand, the ripple effect magnification of Kami-cho and Toyooka City was 1.33 times and 1.38 times, which is lower than that of Asago City and Yabu City, respectively. Both are located in the northern part of the prefecture and in the area where ski resorts are located due to heavy snowfall in winter. These stations are often visited by visitors for sightseeing, so even in rural areas, the ratio of sales of special products such as souvenirs is higher, and therefore the ripple effect magnification is lower.

Next, we examine the economic ripple effect in the Hanshin Region. The Hanshin Region is so-called Bed Town near big cities and is located in the suburban area. There is only one Roadside Station, "Inagawa" (Inagawa -cho), in the region. The direct effect of Roadside Station on the Hanshin area was 442.12 million yen, the 1st indirect effect was 231.17 million yen, the 1st ripple effect was 673.29 million yen, the 2nd ripple effect was 12.53 million yen, the total effect was 685.82 million yen, and the ripple effect magnification was 1.55 times. Furthermore, the ripple-effect magnification of only agricultural products with the condition of 100% in the self-sufficiency rate was 1.61 times, and the analysis assuming a closed economy for agricultural products showed 2.19 times. As shown in Table 2, the ratio of agricultural product sales to total sales in the "Inagawa" in the Hanshin Region is extremely high at 72.5%. According to our interviews, the station's management policy is centered on selling agricultural products (Refer to Matsuo and Yamaguchi (2016)). It can be said that the management based on this policy has enhanced the ripple effect of the Roadside Stations in the Hanshin Region.

Table 4 Economic ripple effect of the Roadside Station on each regional economic zone  
(1,000 yen)

| Region           | Input-Output Sectors           | Region and Municipality | Analysis Condition          | Direct Effect                 | 1st Indirect Effect                    | 1st Ripple Effect |
|------------------|--------------------------------|-------------------------|-----------------------------|-------------------------------|----------------------------------------|-------------------|
| Tajima Region    | General Division               | Whole Region            | Open Economy                | 1240222.53                    | 391751.17                              | 1631973.69        |
|                  |                                | Asago City              |                             | 661974.20                     | 226233.41                              | 888207.61         |
|                  |                                | Kami-cho                |                             | 174971.11                     | 46950.06                               | 221921.17         |
|                  |                                | Yabu City               |                             | 300325.22                     | 89342.62                               | 389667.84         |
|                  |                                | Toyooka City            |                             | 102951.99                     | 29225.08                               | 132177.08         |
|                  | Agricultural Products Division |                         | Self-sufficiency rate 100%  | 468666.40                     | 260120.43                              | 728786.83         |
|                  |                                |                         | Closed Economy              | 468666.40                     | 506827.48                              | 975493.88         |
| Hanshin Region   | General Division               | Whole Region            | Open Economy                | 442118.48                     | 231174.57                              | 673293.05         |
|                  | Agricultural Products Division |                         | Self-sufficiency rate 100%  | 371146.35                     | 220283.23                              | 591429.58         |
|                  |                                |                         | Closed Economy              | 371146.35                     | 415954.36                              | 787100.71         |
| Kobe City Region | General Division               | Whole Region            | Open Economy                | 186495.15                     | 99291.54                               | 285786.68         |
|                  | Agricultural Products Division |                         | Self-sufficiency rate 100%  | 147000.00                     | 91425.42                               | 238425.42         |
|                  |                                |                         | Closed Economy              | 147000.00                     | 157879.98                              | 304879.98         |
|                  |                                |                         |                             |                               |                                        |                   |
| Region           | 2nd Ripple Effect              | Total Effect            | Ripple-effect Magnification | Regional Nominal GDP (2014FY) | Total Effect /Regional Nominal GDP (%) |                   |
| Tajima Region    | 217747.87                      | 1849721.57              | 1.49                        | 551,300,000                   | 0.3355%                                |                   |
|                  | 125764.19                      | 1013971.80              | 1.53                        |                               |                                        |                   |
|                  | 10065.74                       | 231986.91               | 1.33                        |                               |                                        |                   |
|                  | 72357.21                       | 462025.05               | 1.54                        |                               |                                        |                   |
|                  | 9560.73                        | 141737.81               | 1.38                        |                               |                                        |                   |
|                  | 30995.39                       | 759782.22               | 1.62                        |                               |                                        |                   |
|                  | 60807.17                       | 1036301.05              | 2.21                        |                               |                                        |                   |
| Hanshin Region   | 12526.46                       | 685819.51               | 1.55                        | 5,175,100,000                 | 0.0133%                                |                   |
|                  | 5484.13                        | 596913.71               | 1.61                        |                               |                                        |                   |
|                  | 26826.01                       | 813926.72               | 2.19                        |                               |                                        |                   |
| Kobe City Region | 11315.89                       | 297102.57               | 1.59                        | 6,370,100,000                 | 0.0047%                                |                   |
|                  | 6483.16                        | 244908.59               | 1.67                        |                               |                                        |                   |
|                  | 20501.99                       | 325381.96               | 2.21                        |                               |                                        |                   |

We then consider the economic ripple effect on the Kobe City Region. It is a Regional Economic Zone in an urban area. There is only 1 Roadside Station in the region, "Ogo". The direct effect of the Roadside Station on the Kobe City region was 186.5 million yen, the 1st indirect effect was 99.29 million yen, the 1st ripple effect was 285.79 million yen, the 2nd ripple effect was 11.32 million yen, the total effect was 297.1 million yen, and the ripple effect magnification was 1.59 times. Furthermore, the ripple-effect magnification for only agricultural products was 1.67 times, and the analysis assuming a closed economy for agricultural products showed 2.21 times. In the "Ogo," located in urban area, the sales of agricultural products from direct sales account for about 70% of the total sales (See Table 2). From this example, it can be said that the management policy emphasizing agricultural product sales has brought about a high ripple effect magnification to the region.

The total effects of Roadside Stations for the above 3 regions are compared with the nominal gross product (FY 2014) in each region, and the following results are obtained. As the regional nominal gross product was 551.3 billion yen in the Tajima Region, 5,175.1 billion yen in the Hanshin Region, and 6,370.1 billion yen in the Kobe Region, the total effect of Roadside Stations accounted for 0.335%, 0.013%, and 0.005% of the regional nominal gross products in each area<sup>11)</sup>. These results indicate that the economic ripple effect of the Roadside Station in the Tajima region is significantly greater than that in the other two regions. Therefore, the Roadside Station plays an important role in revitalizing the local economy in the Tajima region. This indicates that the Roadside Station policy is working effectively to revitalize the hilly and mountainous areas, such as the Tajima region, that do not have large industries within the region. In addition, it is noteworthy that the total effect is large even though there is only one station in the Hanshin region. Although the total economic effect accounts for only 0.0133% of regional nominal gross production (0.3355% in the Tajima region), it is notable that the total economic effect at 1 station stands out from other Roadside Stations. Currently, efforts are being made to establish Roadside Stations in cities to serve as bases for information and communication, and these results are valuable in supporting the promotion of this policy.

Next, we compare and consider the ripple effect magnification of the three regions. Comparing the results of ripple effect magnification of each region, among the 3 regions, the Tajima region, which is a rural area, had the lowest and the urban region (Kobe City region) had the highest. This may be due to structural differences in inter-regional industrial relations between urban and rural areas. In other words, because there are more industries in urban and suburban areas than in rural areas, more intermediate inputs can be procured within the region<sup>12)</sup>. The results of ripple effect magnification indicate that the economic ripple effect of a Roadside Station located in an urban area or suburban area contributes more efficiently to the economic cycle within the area than that of a Roadside Station located in a rural area.

However, except for the reason for the difference in the industrial structure between urban and rural areas, it can be said that the economic effect on the region is significant by locating a Roadside Station even in rural areas where the local industry is not as substantial as in urban areas. For example, the ripple-effect magnification of agricultural products in the Tajima region is 1.62, which is larger than that of the Hanshin region (1.61), so the Tajima region is not inferior to other urban areas or suburban areas in terms of agricultural products alone. From these results, it can be concluded that a greater total

economic effect can be obtained, induced by the Roadside Station, by increasing the degree of the provision of local products within the region, even if the same direct effect is obtained. Of the 13 stations surveyed in this study, the Roadside Station with the highest ratio of sales of agricultural products to total sales was "Inagawa" (72.5%), and the No. 2 station was "Ogo" (70%). Therefore, considering the above conclusion, the fact that the ripple-effect magnification in the Hanshin region and the Kobe City region is higher than that in the Tajima region can be attributed largely to the fact that these Roadside Stations (Ogo and Inagawa) are operated mainly with agricultural products.

#### **4.2 Economic Ripple effect on Cities and Towns**

First, we examine the economic ripple effect of Roadside Station on each city and town. As for the total effect, it can be seen that the total effect in Asago City within the Tajima region was large (790 million yen). The total effect of Asago City is much larger than that of Kami -cho (210 million yen), Yabu City (230 million yen), and Toyooka City (80 million yen). This was the largest among the 6 cities and towns surveyed, including Inagawa-cho in the Hanshin region (580 million yen) and Kobe City in the Kobe City Region (300 million yen).

Furthermore, when the ratio of the total effect to GDP of each city and town was compared, the ratio of Asago City was 0.61%, the highest among the Tajima region (The "Ratio of total effects of Roadside Stations to GDP of municipalities" of the other cities and towns in the Tajima region consist of 0.42% in Kami -cho, 0.27% in Yabu City and 0.03% in Toyooka City.). Asago City has a high percentage of the GDP of the city by Roadside Station, and the economic effect of Roadside Station is the most important factor for economic revitalization in the Tajima region compared with other cities and towns (Table 5).

On the other hand, the total effect of Inagawa-cho as a percentage of GDP of municipalities was 0.94%, which exceeded that of Asago City and was the largest among the 6 municipalities surveyed. In addition, the total effect of agricultural products (Self-sufficiency rate: 100%) produced in Inagawa-cho was 530 million yen, being the largest among the 6 cities and towns. This is consistent with the fact that the ratio of agricultural product sales of "Inagawa" to total sales is as high as 72.5%, and that the Roadside Station's management policy focuses on agricultural products sold at Farm Stand<sup>13)</sup>. (Other products are not produced at a local self-sufficiency rate of 100%, and not all profits are returned to the local economy because they benefit other regions. On the other hand, since agricultural products are self-supplied within the region, their contribution to the regional economy will naturally increase.). Next, we examine the "ripple effect magnification" which is the ratio of the direct effect to the total effect of each city and town. In Kobe City, it was 1.59 times, the highest among the 6 cities and towns. On the other hand, the magnification of Kami-cho was 1.32 times, the smallest among the 6 cities and towns. The result of analysis on other city and towns will be detailed in section 3.1.

#### **5.1 Difference in ripple range and ripple effect**

The ripple-effect magnification using the input-output tables by city, town and region shown in the previous section resulted in inconsistent rankings except for Kobe City, which was ranked first, and Kami-cho, which was ranked sixth. Specifically, regarding the ripple-effect magnification obtained from the analysis using the municipal input-output table, the 2nd was Asago City (1.48), the 3rd was Toyooka City (1.44), the 4th was

Table 5 Economic ripple effect of the Roadside Station on each city and town (1,000 yen)

| Region           | Municipality | Input-Output Sectors              | Analysis Condition         | Direct Effect | 1st Indirect Effect         | 1st Ripple Effect                          |                                                     |
|------------------|--------------|-----------------------------------|----------------------------|---------------|-----------------------------|--------------------------------------------|-----------------------------------------------------|
| Tajima Region    | Asago City   | General Division                  | Open Economy               | 535,203.71    | 210,916.01                  | 746,119.72                                 |                                                     |
|                  |              | Agricultural Products Division    | Self-sufficiency rate 100% | 296,452.70    | 168,500.82                  | 464,953.52                                 |                                                     |
|                  |              |                                   | Closed Economy             | 296,452.70    | 335,936.78                  | 632,389.48                                 |                                                     |
|                  | Kami-cho     | General Division                  | Open Economy               | 158,618.78    | 41,985.92                   | 200,604.71                                 |                                                     |
|                  |              | Agricultural Products Division    | Self-sufficiency rate 100% | 39,740.00     | 18,861.88                   | 58,601.88                                  |                                                     |
|                  |              |                                   | Closed Economy             | 39,740.00     | 36,386.06                   | 76,126.06                                  |                                                     |
|                  | Yabu City    | General Division                  | Open Economy               | 167,624.03    | 64,090.42                   | 231,714.45                                 |                                                     |
|                  |              | Agricultural Products Division    | Self-sufficiency rate 100% | 102,900.00    | 60,989.31                   | 163,889.31                                 |                                                     |
|                  |              |                                   | Closed Economy             | 102,900.00    | 139,443.87                  | 242,343.87                                 |                                                     |
|                  | Toyooka City | General Division                  | Open Economy               | 54,680.41     | 20,552.90                   | 75,233.31                                  |                                                     |
|                  |              | Agricultural Products Division    | Self-sufficiency rate 100% | 29,573.70     | 18,238.56                   | 47,812.26                                  |                                                     |
|                  |              |                                   | Closed Economy             | 29,573.70     | 37,598.44                   | 67,172.14                                  |                                                     |
| Hanshin Region   | Inagawa-cho  | General Division                  | Open Economy               | 410,844.68    | 158,367.15                  | 569,211.84                                 |                                                     |
|                  |              | Agricultural Products Division    | Self-sufficiency rate 100% | 371,146.35    | 154,531.97                  | 525,678.32                                 |                                                     |
|                  |              |                                   | Closed Economy             | 371,146.35    | 278,573.92                  | 649,720.27                                 |                                                     |
| Kobe City Region | Kobe City    | General Division                  | Open Economy               | 186,495.15    | 99,291.54                   | 285,786.68                                 |                                                     |
|                  |              | Agricultural Products Division    | Self-sufficiency rate 100% | 147,000.00    | 91,425.42                   | 238,425.42                                 |                                                     |
|                  |              |                                   | Closed Economy             | 147,000.00    | 157,879.98                  | 304,879.98                                 |                                                     |
| Region           | Municipality | 1st Ripple Effect / Direct Effect | 2nd Ropple Effect          | Total Effect  | Ripple-effect Magnification | Nominal GDP on each City and Town (2014FY) | Total Effect /Nominal GDP on each City and Town (%) |
| Tajima Region    | Asago City   | 1.39                              | 47,502.81                  | 793,622.53    | 1.48                        | 1,301,021                                  | 0.61%                                               |
|                  |              | 1.57                              | 34,776.32                  | 499,729.84    | 1.69                        |                                            |                                                     |
|                  |              | 2.13                              | 51,448.33                  | 683,837.82    | 2.31                        |                                            |                                                     |
|                  | Kami-cho     | 1.26                              | 9,291.27                   | 209,895.98    | 1.32                        | 499,752                                    | 0.42%                                               |
|                  |              | 1.47                              | 2,326.12                   | 60,928.00     | 1.53                        |                                            |                                                     |
|                  |              | 1.92                              | 3,282.30                   | 79,408.36     | 2.00                        |                                            |                                                     |
|                  | Yabu City    | 1.38                              | 1,878.66                   | 233,593.11    | 1.39                        | 865,160                                    | 0.27%                                               |
|                  |              | 1.59                              | 1,009.80                   | 164,899.12    | 1.60                        |                                            |                                                     |
|                  |              | 2.36                              | 2,749.11                   | 245,092.98    | 2.38                        |                                            |                                                     |
|                  | Toyooka City | 1.38                              | 3,543.14                   | 78,776.45     | 1.44                        | 2,625,882                                  | 0.03%                                               |
|                  |              | 1.62                              | 2,206.81                   | 50,019.07     | 1.69                        |                                            |                                                     |
|                  |              | 2.27                              | 3,895.57                   | 71,067.71     | 2.40                        |                                            |                                                     |
| Hanshin Region   | Inagawa-cho  | 1.39                              | 6,295.86                   | 575,507.70    | 1.40                        | 612,242                                    | 0.94%                                               |
|                  |              | 1.42                              | 3,726.87                   | 529,405.18    | 1.43                        |                                            |                                                     |
|                  |              | 1.75                              | 11,422.63                  | 661,142.91    | 1.78                        |                                            |                                                     |
| Kobe City Region | Kobe City    | 1.53                              | 11,315.89                  | 297,102.57    | 1.59                        | 6,370,100,000                              | 0.00%                                               |
|                  |              | 1.62                              | 6,483.16                   | 244,908.59    | 1.67                        |                                            |                                                     |
|                  |              | 2.07                              | 20,501.99                  | 325,381.96    | 2.21                        |                                            |                                                     |

Inagawa-cho (1.40), and the 5th was Yabu City (1.39). On the other hand, by region, the 2nd was Inagawa-cho (1.55), the 3rd was Yabu City (1.54), the 4th was Asago City (1.53), and the 5th was Toyooka City (1.38). In other words, Asago City and Toyooka City, which ranked the second and the third respectively by municipality, fell to the fourth and the fifth respectively by region, while Inagawa-cho and Yabu City, which ranked the fourth and the fifth respectively by municipality, ranked the second and the third respectively by region. These results indicate that the economic ripple effect of a Roadside Station varies in degree depending on the ripple effect range. As mentioned above, the ripple effect refers to the effect that final demand generated in an industry induces production in each industry one after another. In this section, I will examine in more detail how this effect varies depending on the measurement range.

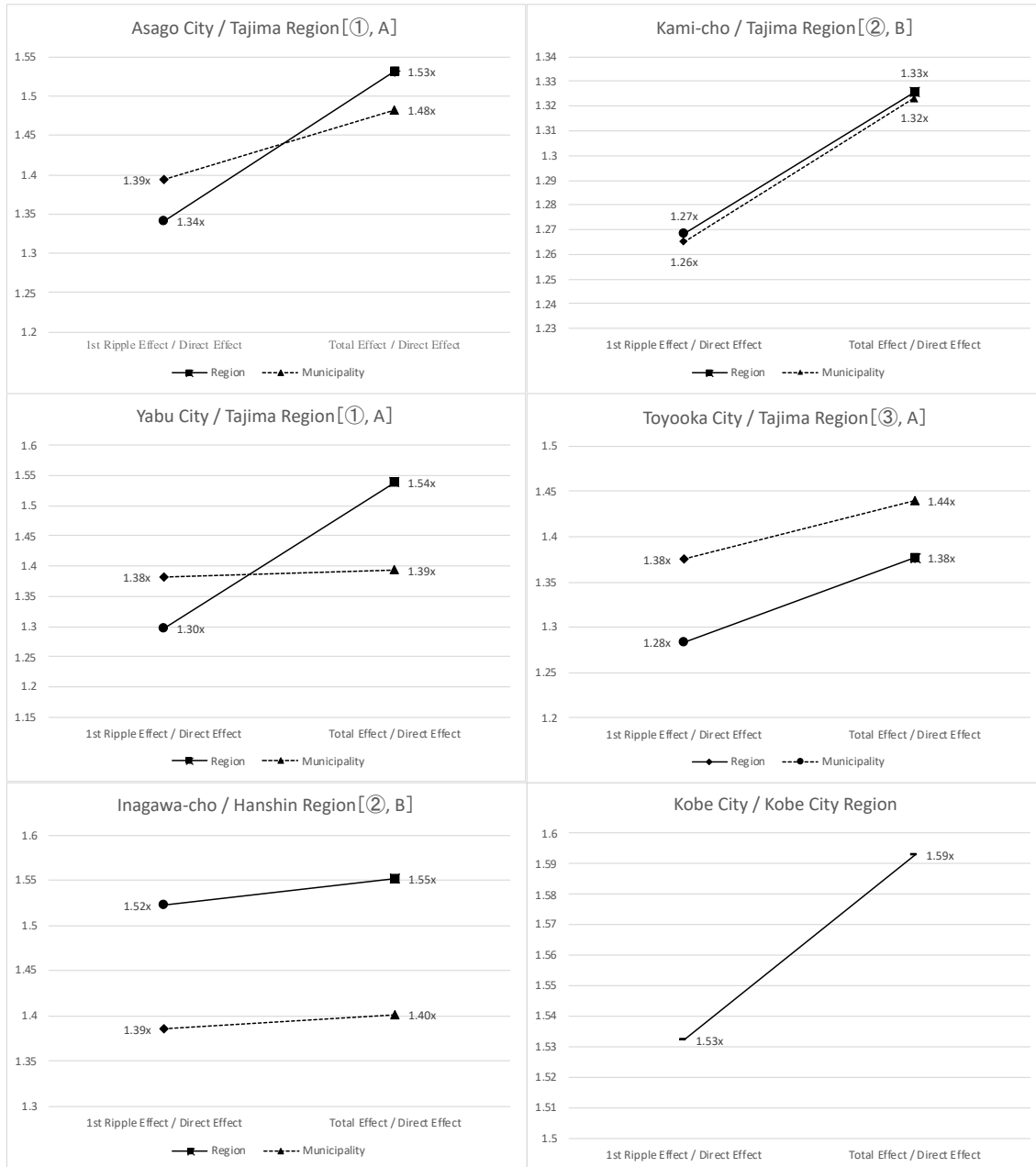
The specific examination method will be carried out in the following two steps. First, in addition to the Ripple-effect magnification (Total Effect/Direct Effect), an index obtained by dividing the 1st ripple effect by the direct effect was newly established. Then, both indexes were compared. The reason for setting this new indicator is as follows. In the estimation process of "ripple effect magnification", the total effect which becomes a numerator is the sum of "primary ripple effect" and "second ripple effect". In other words, "second ripple effect" represents the extent of the inducement effect of consumption converted from a portion of the income distributed from the inducement effect of "1st ripple effect". Therefore, the total effect is a value obtained by adding the effect of consumption brought about by income distribution to the "1st ripple effect".

This makes it possible to examine the difference in the spread of the ripple effect before and after income distribution from the difference in the ripple effect magnification (Total Effect/Direct Effect) and the value of the 1st ripple effect/direct effect. By applying such a method, it is possible to simultaneously compare the size of the area to be measured for the ripple effect and the gradual change in which the ripple effect is derived. In other words, the degree of economic ripple effects induced by Roadside Stations in each city and town can be analyzed from both "spatial extent" and "temporal spread", and the effect of regional supply can be verified in more detail. The estimation results of ripple effect magnification for each city and town at each stage are shown in Figure 1.

## 5.2 1st Ripple Effect/Direct Effect and Ripple-effect Magnification

In 4.1, using regional input-output tables, I compared the magnifications of the ripple effect on each region, which is induced by Roadside Station in each city and town (Table 4). Here, I compare the ripple effect magnifications for regions and cities and compare the ripple effect magnifications before and after each income is distributed. In this way, the effects of economic revitalization in Roadside Stations will be discussed in more detail. In Figure 1, the magnification (1st ripple effect/direct effect) before the distribution of income for a region is indicated by a solid line at a left end point ●, the magnification after the distribution of income is indicated by a solid line at a right end point ■, the magnification before the distribution of income for a city or town is indicated by a dashed line at a left end point ◆, and the magnification after the distribution of income is indicated by a dashed line at a right end point ▲. Here, measurement points indicating the magnifications before and after the income distribution for the region are shown by a solid line, and measurement points indicating the magnifications before and after the income distribution for the city and town are shown by a dashed line. Comparing the positional relationship between these 2 curves (Solid and Dashed Lines) and the

Figure 1 Comparison of the ripple effect for the region and the ripple effect for cities and Towns



positional relationship between the 4 measurement points (● points, ■ points, ◆ points, ▲ points), they can be classified into the following 3 types.

Type (1): The type where the line indicating the ripple effect magnification for each region (Solid) crosses the line indicating the ripple effect magnification for each city and town (Dash) (Asago City and Yabu City).

Type (2): A type in which a line indicating a ripple effect magnification for each region (Solid) and a line indicating a ripple effect magnification for each city and town (Dash) are parallel to each other, and the former (Solid) is above the latter (Dash) (Kami-cho and Inagawa-cho).

Type (3): A type in which a line indicating a ripple effect magnification for each region

(Solid) and a line indicating a ripple effect magnification for each city and town (Dash) are parallel to each other, and the former (Solid) is below the latter (Dash) (Toyooka City).

With regard to these three types, the characteristics of each type are discussed from the point of view of positional relationship of each type. In type (1), in the stage of the 1st ripple effect (before income is distributed), the ripple effect on each city and town (Dashed lines, ◆) is larger than the ripple effect on each region (Solid line, ●), and in the stage after income distribution, the ripple effect on each region (solid lines, ■) exceeds the ripple effect on each city/town (dashed lines, ▲), and the 2 curves are crossed. The first ripple effect is the sum of the amount of final demand and the induced first indirect effect within the region. Therefore, at the stage of the 1st ripple effect, the effect within the municipality is greater than the effect within the region. This means that production, collection, and sales through the Roadside Station have a greater economic effect within the limited municipality range than within the regional economic zone. In other words, this indicates that the supply within the region is established in a narrower range.

Asago City and Yabu City correspond to this type of city and town. There are many Roadside Stations in these cities that are focused on selling agricultural and marine products ("Tajima no Mahoroba" (Asago City), "Yoka Tajima no Kura" (Yabu City), etc.<sup>14)</sup>). This is the result of the management focusing on agricultural products shipped from neighboring shippers. In both cities, the Roadside Station produced a greater ripple effect in a limited area in each city, and the measurements also demonstrated that the Roadside Station has become a key facility for both cities, contributing significantly to the economic revitalization of the city.

In type (2), from the stage of the 1st ripple effect to the stage of the 2nd effect, the ripple effect for each region (Solid line) consistently exceeds the effect for each city and town (Dashed line). The municipalities corresponding to this type are Kami-cho and Inagawa-cho. However, the two towns are located in a rural area (former) and a suburban area (latter) and have completely different industrial structures. Thus, although these towns are of the same type (2), the economic ripple effect on their areas is quite different. The reasons for this are discussed below. Firstly, Kami-cho is located in a heavy snowfall area, and its "Amarube" and "Hachi Kita" are mainly selling local specialties such as souvenirs as shown in Table 2. The ratio of specialty products (Souvenirs, etc.) to total sales was 85% at both stations, and the Roadside Station's economic ripple effect derived from industries in the neighborhood was small, and there were few industries in the town, so it seems to have become type (2).

On the other hand, Inagawa-cho is located in a suburban area and "Inagawa" is characterized by its management focusing on selling agricultural products shipped from farmers in the area. The main reason for Inagawa-cho to be classified as type (2) is as follows. "Inagawa" is considered to be that production goods such as fertilizer and seeds, which are necessary for agricultural production, are supplied mainly from the service area of JA Hyogo Rokko (Mainly neighboring Kawanishi City) (From the results of my interviews)<sup>15)</sup>. The difference in these factors between Kami-cho and Inagawa-cho can be seen in the difference in the size of the ripple-effect magnification in both towns.

Finally, type (3) has a positional relationship in which the effect on each city and town (Dashed line) exceeds the effect on each region (Solid line) consistently from the stage of the 1st ripple effect to the stage of the 2nd ripple effect. In Toyooka City, which corresponds to this type, there is "Kannabe Kogen". The station's characteristics are that its direct effect on the Tajima region is as small as 54 million yen, the ratio of agricultural

and marine product sales to total sales is as small as 13%, and the main sales of the station are local specialties and souvenirs (53%), hot springs, and restaurants (34%) (Table 2). The fact that hot spring and restaurant employees are both employed in the area (See Table 2) is considered to be the reason why the ripple effect of Roadside Station on the city is consistently larger than the ripple effect on the region from the stage of the 1st ripple effect to the stage of the 2nd ripple effect.

Furthermore, the ripple effect remains larger in the city than in the region after income distribution, indicating that regional supply to the Roadside Stations also contributes to regional revitalization within the city even in consumption derived from income distribution. However, the total effect of 79 million yen of the city, which is smaller than that of other cities and towns, is also an important indication. In other words, if management focuses only on the sale of local products and souvenirs and the management of hot springs and restaurants, the total effect is small due to the limited scale of management. The results show that, in order for the Roadside Station to have a significant economic effect, it is first and foremost necessary to increase the sales of the Roadside Station by focusing on agricultural products as in the case of Asago City and Yabu City. Next, I will focus on the effects of regional supply before the distribution of income by the Roadside Station. This consideration further clarifies the importance of promoting the regional supply to Roadside Stations, which are more restricted to a narrow range of municipalities.

### **5.3 Effect of the Roadside Station on Local Supply**

The results before income distribution for each city and town can be classified into the following two types.

Type A: This type shows the magnification (1st ripple effect/direct effect) for the city and town (◆) exceeding the magnification (1st ripple effect/direct effect) for the region (●) before income is distributed (Asago City, Yabu City, Toyooka City).

Type B: This type shows the opposite magnitude relationship to type A. (Kami-cho and Inagawa-cho).

First, in Type A, the ripple effect before income distribution is greater in limited areas such as cities and towns. In Asago, Yabu, and Toyooka cities, the Roadside Station operates regional supply within the city and town, i.e., within a limited area, and shows a significant revitalization effect within the city at the production, collection, and sales stages. Next, type B municipalities are Kami-cho and Inagawa-cho. As mentioned above, these two towns have different industrial structures, and therefore have different causes for such results. This result indicates that the effect of regional supply to Roadside Station has already had a large ripple effect in the area beyond the city and town from the pre-income distribution stage. Therefore, it can be seen that the city and town of Type B do not maximize the effect of regional supply limited to the city and town of the Roadside Station.

The Roadside Station is a public facility established by a municipality. Municipal governments have high expectations for Roadside Station as a measure for regional development. In order to enhance the economic ripple effect including the effect derived from consumption at Roadside Station, it is the first and foremost important issue for

Roadside Station policy to be promoted by cities and towns that the management of Roadside Stations within cities and towns before income distribution is fully effective in the provision of local products within the region. From this point of view, the results verified that the regional revitalization policies based on the Roadside Station of Type A cities and towns are effective.

## **6. Effects of Employment on Cities and Towns**

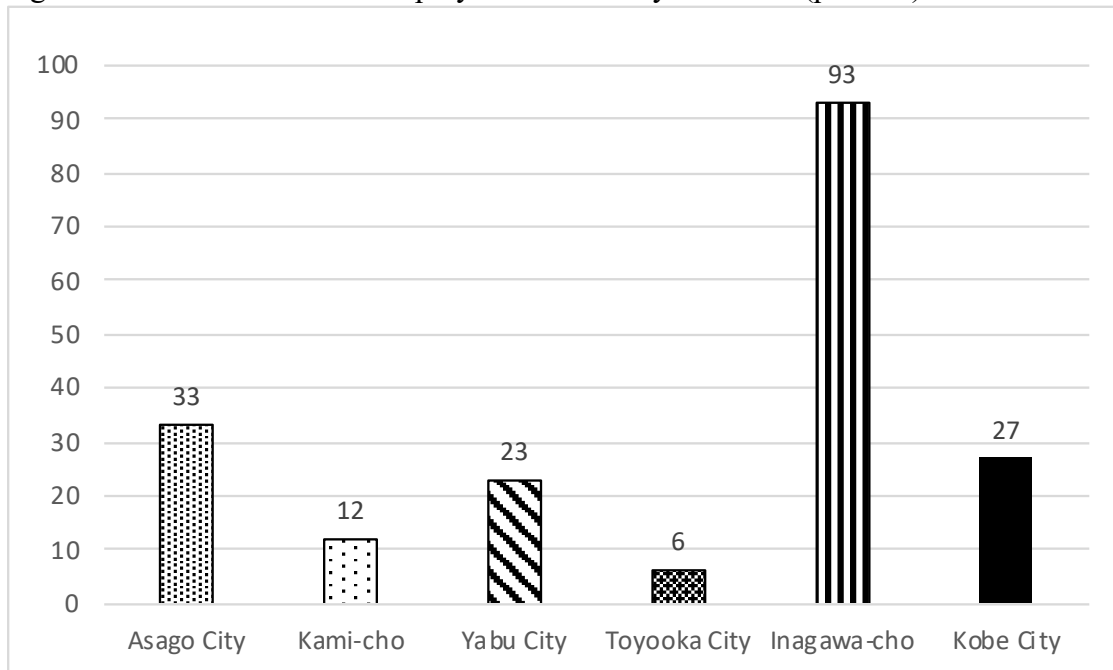
Next, the employment inducement effect created by the Roadside Stations is examined by the number of induced employees. The number of induced employees was estimated by multiplying the estimated total effect obtained from the input-output analysis by the employment coefficient obtained from the employment table. The employment coefficient is obtained by dividing the number of employees in each department in each city or town by the production value of the department. Each coefficient was calculated using the values in the appendix table of the input-output tables by city and town. That is to say, this coefficient shows the input of the employer required for the production per unit of the department.

Figure 2 shows the estimated number of induced employees for each city and town. First, I consider the Tajima region. The total number of induced employees across the region was 74. The number of induced employees by municipality was 33 in Asago City, 12 in Kami-cho, 23 in Yabu City, and 6 in Toyooka City. Within the Tajima region, it has the greatest employment induced effect on Asago City. Asago City has the aforementioned "Tajima no Mahoroba". The Farm Stand "Marugoto Sanchoku Market" directly sells agricultural products from the Tajima region. Thanks to community-based initiatives such as selling fresh vegetables and fruits, handmade pickles and bread, and providing restaurant menus using local ingredients, the area of the stand has been doubled, and the number of shippers has increased (Kobe Shimbun: 2015/10/17). The estimation that the number of induced employees is the largest in the region is consistent with this business situation.

In the Hanshin area, the number of induced employees was 93, the largest among the 6 cities and towns. This is comparable in size to the entire Tajima region's employment inducement effect. Considering that the Roadside Station in the Hanshin region is a "Inagawa," only 1 station, the employment inducement effect for the local area can be said to be large. According to the interviews conducted in this study, the products manufactured by the processing group "Inanosato" belonging to "Inagawa" in their processing plant "Inakko Club" are popular with consumers. Therefore, the estimated result of the employment inducement effect is consistent with the result of the interview. Furthermore, the large employment effect of Inagawa-cho can be attributed to the industrial structure of the city, where Inagawa-cho is located in the Hanshin region and where there are many industries and many employment opportunities.

And the number of induced employees for Kobe City was 27. Kobe City belongs to the urban area, and the employment inducement effect by the Roadside Station is equivalent to that of Yabu City, and it can be seen that the Roadside Station has a sufficient effect in terms of employment. In this way, the estimation results of the good employment inducement effect were obtained in the Hanshin and Kobe City regions, and it was found that the Roadside Station showed the effective employment effect even in the suburban and urban areas, and that the employment creation effect by the Roadside Station was large even in the areas other than the hilly and mountainous areas.

Figure 2 Number of induced employees in each city and town (persons)



## 7. Conclusion

In this study, I analyzed the economic ripple effect of Roadside Station on the regional and municipal levels of Tajima region as a rural area, Hanshin region as a suburban area, and Kobe region as an urban area. First, economic ripple effects between regions and between cities and towns were compared and analyzed. In addition, from the results of ripple effect magnification using input-output tables by region and city and town, the economic ripple effect on the region and the economic ripple effect on the city and town were compared by dividing them into the effect before and after income distribution. By this, the effect of the regional supply by the Roadside Station was analyzed in detail. Then the employment inducement effects for cities and towns were analyzed and compared. The results obtained are summarized as follows.

The analysis of regional input-output tables can be summarized in the following three points. (1) The total effect of each region was 1849.72 million yen for the Tajima region, 685.82 million yen for the Hanshin region, and 297.1 million yen for the Kobe City region. The Tajima region, where 11 stations are located, has the largest total effect. It is quite characteristic that the total effect of the Hanshin region is large even though there is only one station in the region. (2) The ripple effect magnification of the Tajima region was 1.49 times, that of the Hanshin region was 1.55 times, and that of the Kobe region was 1.59 times. Among the three regions, the reason for the lowest ripple effect magnification in rural areas is considered to be the structural difference between urban and rural inter-industry relations. This is because there are less industries in rural areas than in urban areas, and the number of regional imports is larger than in urban areas. Excluding structural factors, it can be said that the economic ripple effect of a Roadside Station in a hilly and mountainous area is more than a numerical value. (3) Ripple effect magnification by agricultural products alone was high in the all regions, with 1.62 times in Tajima, 1.61 times in Hanshin, and 1.67 times in Kobe City region respectively. As the result shows that the ripple effect magnification of agricultural products, which is based

on regional supply, is high, the management policy of Roadside Station, which emphasizes regional supply, will increase the economic ripple effect of Roadside Station on the region.

The results of the analysis using the input-output tables by city and town can be summarized in the following two points. (4) The total effect of Roadside Station on each city and town was the largest in Asago City among the 6 cities and towns (790 million yen). (5) Inagawa-cho (93 persons) had the largest number of employees induced by Roadside Station among the 6 cities and towns. In the Tajima region, Asago City had the largest number of induced employees (33 persons). The results of the comparative analysis of economic effects on regions and municipalities are summarized as follows. (6) In both region and city, the ripple effect magnification was the first place in Kobe City and the sixth place in Kami-cho. (7) The cities of type (1) (The type in which the ripple effect magnification for each city and town exceeds the ratio for the region before income distribution, but the magnitude is reversed after income distribution) are Asago City and Yabu City. (8) Looking only at the ripple effect magnification before income distribution, type A cities and towns are Asago City, Yabu City, and Toyooka City, where the magnification for each city and town exceeds that for the region. The findings obtained from (7) and (8) are comprehensively considered as follows. According to the ripple effect magnification of Asago City, Yabu City, and Toyooka City in (7), the Roadside Station was supplied within the city and town before income distribution, and it contributed greatly to regional revitalization. However, the ripple effect magnification of the region is larger than in these cities after income distribution, indicating that the derived consumption is more effective in the region than in the city. In Toyooka City (8), on the other hand, the ripple effect magnification in the city consistently exceeds the magnification in the region before and after income distribution, but the effect is not sufficient in terms of the amount of money.

Therefore, the economic ripple effect in terms of the amount of money is small even if the effect in Toyooka City exceeds that in the area even after the distribution of income. On the other hand, the economic ripple effect itself is large in Asago and Yabu City. The above results indicate that, in order to achieve the full effect of regional revitalization, it is most important to implement policies that achieve a large monetary economic ripple effect through management focusing on agricultural product sales. So, the conditions under which a Roadside Station can exert its maximum effect on economic revitalization within a city or town can be summarized as follows. [1] it is important that the Roadside Station places an emphasis on the sale of agricultural products and manages the supply within the region, and [2] it is important to provide more consumption opportunities within the city and town so that the consumption generated by the income distribution derived from the Roadside Station can take place within the city and town. With regard to item [2], it can be said that, for example, it is important to establish facilities that lead to large-scale consumption within a city or town.

And the employment effect on cities and towns can be summarized as follows. (9) The results showed that the number of induced employees for the Inagawa-cho and Kobe City areas was large at 93 and 27, respectively. This can be attributed to the presence of many industries in urban areas. In contrast, the number of induced employees in the Tajima region was 33 in Asago City, 12 in Kami-cho, 23 in Yabu City, and 6 in Toyooka City. Apart from the difference in industrial structure between urban and rural areas, the importance of these employment effects is high. In this study, the economic effect of the

regional supply of Roadside Station was analyzed. I believe that the use of two types of data, regional and municipal input-output tables, provided a more detailed direction for regional revitalization policies based on Roadside Station.

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### **Notes**

- 1) The basic policy of the Roadside Station is to create an economic cycle within the region by consciously establishing inter-industry relations within the region. This is indicated in the All Nippon Michi-no-Eki Network and NPO Hito to Michi Kenkyukai, Cooperation by Ministry of Land, Infrastructure and Tourism (2017),159.
- 2) For a definition of endogenous development, see Miyamoto (2007) pp. 316-323. I have theoretically developed the effects of the Roadside Station on regional economies based on the theory of endogenous development (Matsuo, R. (2017), Chapter 2, Matsuo, R. (2014), pp. 67 - 71).
- 3) These Roadside Stations have been selected as a nationwide model "Roadside Station" for their regional development through management focusing on sales of local agricultural products (All Nippon Michi-no-Eki Network and NPO Hito to Michi Kenkyukai, Cooperation by Ministry of Land, Infrastructure and Tourism (2017),81-129)
- 4) See Headquarter for Overcoming Population Decline and Vitalizing Local Economy in Japan (2015).
- 5) The input-output tables by city and town in Hyogo Prefecture are based on data compiled by Regional Policy and Statistics Study Group (2017).
- 6) The method by which I conducted input-output analysis for an economic zone in this study is based on the method by Watanabe (2014). Watanabe (2014) pointed out that for analyzing the effects of tourism policies, the target area is too wide for each prefecture. Considering the fact that there are several subregions with different industrial structures in the prefecture, he analyzes the economic ripple effect by creating a subregional input-output table with strong economic ties. Watanabe called this area division "subregion". In this article, based on Ashiya and Goto (2015), they are called "regional economic zone". Ashiya and Goto refer to the effectiveness of creating an input-output table that divides Hyogo Prefecture into seven economic zones.
- 7) Regarding the actual location of "Inagawa" (Inagawa-cho) and "Ogo" (Kobe City), I thought that there were different conditions because the regional economic zone to which they belonged was different from "urban area" and "suburban area".
- 8) The method was based on Kawamura (2011), but interviews with several Roadside Stations in Hyogo Prefecture showed these values to be reasonable, so I adopted them.
- 9) Kawamura (2011) made this assumption for a passenger car in Gifu Prefecture." Interviews with the Yoka Tajimano Kura found that about 1/3 of cars refuel in the area. The advantage of adopting this approach is that I could obtain estimates as close to current conditions as possible with limited funds. However, it is certain that the economic effect can be obtained more accurately by the whole investigation.
- 10) Ministry of Internal Affairs and Communications, Statistics Bureau, "Results of the 2015. Population Census (definitive value)" Hyogo Prefecture website.
- 11) See 2014 Overview of Gross Municipal Product by Region "2014 Municipal Accounts (summary version)". In addition, the economic ripple effect will not end in that year and will

continue in the following fiscal year, although the figure will decrease. Therefore, the value of the ripple effect becomes larger.

- 12) Hyogo Prefecture "2014 Municipal Accounts (summary version)", Hyogo Prefecture. website.
- 13) See Matsuo, Y. (2014) pp 79-82.
- 14) The "Yoka Tajimano Kura" limits the range of farmers who ship agricultural products to. those who live near Roadside Stations (Matsuo. R. and M. Yamaguchi (2015), p 78). "Yoka Tajima Mahoroba" focuses on agricultural product sales and is selected as one of the "Priority road stations" (Matsuo. R. and M. Yamaguchi (2018), p43).
- 15) See Matsuo, Y. (2014), p.80.

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