Development of a Method for Analyzing the Regional Economic Cycle and Case Study –a New Method for Analyzing Regional Economies in Regional Revitalization–[*]

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Abstract

Because of the slump in Japan's regional economies - mainly in the regional area - the national and local governments are implementing regional revitalization and other regional economic regeneration policies. There are two types of factors behind the slump in Japan's regional economies: external factors, including the contraction of public - works projects and overseas relocation of plants, and an internal factor of the outflow of income in the three phases of production, distribution, expenditure. In this study, to consider measures for regional economies that are fully based on these factors, a method for analyzing the regional economies' strengths, weaknesses, and inflows and outflows of income is proposed. This method of estimating income inflows and outflows is a new way of analyzing regional economies that estimates using data on dependents and territories. In this study, data on dependents and territories of municipalities throughout the country were created, and these

data were used to conduct case‑study analyses of three regions: Kanazawa City, Toyama region, Ishigaki City.

The following points were understood from the results of this analysis. In tourist regions, even if a large amount of money from tourism consumption flows into the region, if a regional income cycle structure is not established, the money will not be returned to local residents. When only a few regional companies engage in regional economic activities and more companies from metropolitan‑city capital do so, income earned during production leaks to the outside of the region. In regions where the manufacturing industry is highly productive, demand for capital investment is strong and capital investment flows into the region. Moreover, in the regional area, such regions are scattered where the percentage of fiscal transfers relative to income other than employer income is high and where income is secured by fiscal transfers. Income flows out of these regions during the expenditure and production phases, and, in this way, fiscal transfers do not contribute to the improvement of their own earning power in some regions.

I.   Introduction

In this study, a new method of regional economic analysis is proposed to investigate measures for regional revitalization and regional activation. The factors behind the slump in Japan's regional economies are external factors, including falling populations due to the declining birthrate and the growing proportion of elderly people, as well as the concentration of the population in Tokyo; the internal factors of the structure of the regional economic cycle and policy actions, including regional revitalization, are spreading to deal with these factors.

In this study, a method for identifying the strengths and weaknesses of regional economies and the inflow and outflow of income is developed, and data are prepared to enable an analysis of regions throughout the country using this method. Further, the objective is to actually apply the analytical method to regions and understand regional problems and other aspects. This way, the comprehensive and practical method used for regional economic analysis in this paper assumes actual regional economic policy planning. However, the prepared economic data are all non‑survey data, which are different from data prepared from a complete survey. In this sense, rather than being a detailed analysis, it is positioned as a basic analysis to grasp the overview of regional economies and investigate the direction of measures.

The structure of this paper is as follows. In II, the factors behind the slump of regional economies and requirements for an analysis of the regional economic cycle to investigate measures for regional revitalization are shown. In III, toward developing a method for

analyzing the regional economic cycle, the structure of the cycle is presented and the regional economic cycle method is explained. Then, the data is prepared for applying the analysis of the regional economic cycle to regions throughout the country. Further, in IV, the method is actually applied to three regions – Kanazawa City, the Toyama region, and Ishigaki City – and an overview of the analysis of the regional economic cycle proposed in this paper is provided. Finally, in V, the conclusions of this paper are described.

II. Factors behind the slump in regional economies and requirement of a method for analyzing the regional economic cycle

II-1. Factors behind the slump in regional economies

In terms of the factors behind the slump in regional economies, there are external factors from the viewpoint of the region, such as changes in Japan and the world economy, and internal factors of the structure of the regional economies themselves.

First, there are two large external factors. The first is the population decline in the regional area and its concentration in the Tokyo area. Japan's birthrate is declining, its population is aging, and it has entered a stage of population decline. This trend is particularly noticeable in the regional area, and there is a state of contraction equilibrium in terms of both demand and supply in regional economies. On the other hand, about 28% of the population and around 32% of gross domestic product (GDP) are concentrated in the Tokyo area, and its percentage of deposits is 44%, which greatly exceeds its percentage of GDP. Moreover, more than half of all loans nationwide are loaned in the Tokyo area, and the over-concentration of finances in this area is very noticeable. Under this over-concentration structure, the functions of approximately 50% of the nationwide headquarters are located in Tokyo, and the value of outgoings as a corporate transfer from regional branches or factories to the headquarters sector is approximately 20 trillion yen[1].

The second factor is the regional area's transition to the service economy. Employment in manufacturing and related industries has become contracted due to the transfer of factories in the regional area to overseas and reduction in public-work projects, and this contracted portion has been absorbed by labor-intensive-type industries, such as accommodation, transportation, and medicine and welfare. In other words, the industrial structure is transitioning from manufacturing and construction industries to service industries, particularly labor-intensive-type service industries, and this transition is progressing in the regional area. In some cases, these labor-intensive-type service industries have low labor productivity

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[1] Data on area are from "Municipalities as Seen from Statistics"; those on population are from "Population, Population Dynamics, and the Number of Households based on the Resident Basic Ledger"; those on workers are from "The Labor-force Survey"; those on GDP are from "Prefectural Accounts Calculations"; those on deposits and loans are from the Bank of Japan's "Deposits, Cash, and Loans by Prefecture"; and those on the value of outgoings from the headquarters sector are from the "Tokyo Inter-Industry Relations Table."

and worker wages compared with other industries, which leads to the slump in regional economies.

In addition to the above‑described external factors, the regional economic structure itself is an internal factor. In many regions in the regional area, the income cycle does not function well, and there are regions in which in the production, distribution, and expenditure (consumption and investment) phases, income flows to outside of the region, which does not lead to an increase in income for the local residents. For example, in some cases, even if a region succeeds in attracting a leading‑edge factory from a metropolitan‑city capital and its production's value addition is greatly increased, this does not lead to improvement in the income for the region's residents, for instance, because of transfer of corporate and property income to the headquarters in the metropolitan area. In the distribution phase as well, even if a large amount of income is obtained in a region by adding fiscal transfers related to the income obtained from production and sales, it is possible that income inflows and outflows will occur in the expenditure phase, such as from consumption and investment. In the case of consumption, there are inflows and outflows from non‑daily activities of tourists and inflows and outflows from daily activities such as shopping behavior. The outflow of capital investment can be to install equipment and establish housing and business establishments outside the region from the income earned by the region's own economic agents, including companies and households.

In this way, a region's income inflows into and outflow out of the region based on the behavior of the economic agents of households and companies, as they may not be aware of the administrative districts. In the event of an excess of outflows, that region may be headed for contraction equilibrium.

There are administrative districts in the regional area, such as of the local and prefectural governments. Although administrative activities take place in the administrative districts, economic activities other than administrative activities are fundamentally conducted without depending on the administrative districts. These activities depend on differences in the places where the economic activities are conducted, such as differences in the place of work and place of residence, or in the place of residence and place of shopping. The analysis of regional economies focuses on such spatial differences in each type of economic activity will cause inflows and outflows of income.

II-2. *Trends in regional revitalization and other policies*

The slump in regional economies is a slump in the economy of Japan as a whole, and regional revitalization and reforms of regional finances have been initiated to deal with this problem. Regional revitalization involves measures by the government as a whole to address the major problems facing Japan: the rapidly declining and super‑aging population. Each region aims to create an autonomous and sustainable society utilizing their respective features, and in 2014, the Community, People, and Work Creation Act was enacted, and the Community, People, and Work Creation Headquarters was established. Then, on December 27, 2014, the

Cabinet resolved on the Community, People, and Work Creation Long-term Vision (Long-term Vision) that shows the present and future states of Japan's population; indicates the direction for the future; and resolves on the Community, People, and Work Creation Comprehensive Strategy (Comprehensive Strategy). The Comprehensive Strategy indicates targets and policies for the next five years as well as the fundamental direction to take to realize the Long-term Vision. Moreover, in June 2016, the Cabinet resolved on the Community, People, and Work Creation Basic Policy 2016 that indicates the directions to be taken in response to this package of policies and individual policies.

The Community, People, and Work Creation Comprehensive Strategy 2015, Revised Edition, requires the realization of a virtuous circle for regional economies in the regional area for improvement in corporate earnings leading to higher wages and employment expansion, which in turn will lead to further improvement in corporate earnings through increases in consumption and investment. The aim is to ensure human resources and funds circulate throughout the country toward realizing local Abenomics (the economic policies of Prime Minister Abe) by building a virtuous circle.

Linked to the above-described trend in regional revitalization, the regeneration of regional economies has also become a focal point in the field of regional finances. In the Fiscal 2015 Financial Administrative Policy presented in 2015, regional financial institutions that are closely related to their respective regions are required to contribute to the development of regional economies as well as of local industries and companies by providing products and services that accurately meet the needs of the customers in their sales regions. They are also required to support the region's economy and industries, which will help to ensure the soundness of their own management.

Moreover, the aim is to improve the productivity of regional industries and companies, promote smooth transitions to new businesses by reforming the attitude toward finances being dependent on collateral and guarantees, appropriately evaluate the content of businesses of business-partner companies including aspects such as their growth potential, and provide finance and support to their main businesses. This is expected to contribute to regional revitalization.

In addition, the Comprehensive Supervision Guidelines for Medium, Small, and Regional Financial Institutions, April 2015, shows solutions tailored to life stages, such as the foundation and start-up stages, of customer companies. Moreover, the Benchmarks for Financial Mediation Functions, September 2016, emphasize the relations with regional companies, and in regional finances, the focus continues to be on contributing to regional economies that follow the flow of relational banking.

II-3.   *Requirements for the method for analyzing regional economies*

Based on the problem awareness in the above-described requirements for the method of analyzing regional economies, the following requirements are necessary to conduct an analysis to plan regional-economic policies.

II-3-1. Requirements from the economic mechanism

For the method for analyzing regional economies, there are three major requirements from the regional-economic mechanism. The first is an analysis of distribution from the viewpoint of local Abenomics. A region's economic policies are ultimately intended to contribute to the improvement in the welfare of the region's residents, so an analysis of distribution that measures the income of residents is indispensable. From the viewpoint of Japan's conventional regional activation, there have been many analyses from the viewpoints of companies' sales and production amounts and productivity, but there are hardly any examples of comprehensive analyses of regional economies' distribution and expenditure phases.

The second is an analysis of the redistribution of a region's income. There are boundaries in a region, such as administrative districts and country borders, and international and regional economics are the same for analyzing the correlations between multiple zones. However, regional economies take place within the same country, and this causes a major difference between international and regional economies; the existence of fiscal transfers by governments. Specifically, there are fiscal transfers, such as the allocation taxes and subsidies, from self-sustaining economies of metropolitan areas to regional economies that are not self-sustaining, and ultimately this structure is aimed at leveling the income nationwide. In this study, analysis of the inflows and outflows of income includes an analysis of these fiscal transfers.

The third is an analysis of dependents and territories. In regional economics, a major difference is whether a region is viewed as "place (area) ≒ territories" and whether the region's residents and others are viewed as "agents (people) ≒ dependents." For example, a tourist region will have a large number of tourists and will be bustling with activity. However, even if tourism consumption is an enormous amount, if the foodstuffs and goods are procured from outside the region, most of the tourism consumption will flow to outside of that region. In the accommodation industry as well, if the capital is from metropolitan cities, the income will be transferred to these cities as corporate income, so there are cases in which the residents' income is low in spite of the bustling activity of the region.

II-3-2. Requirements from the economic data

There are also three major requirements from the economic data. The first is that municipalities are the unit for the comprehensive analysis of regional economies, so economic data on the unit of municipalities that cover production, distribution, and expenditure are required. This is because municipalities' city halls, chambers of commerce, and industries are the smallest units for the planning function of regional economic policies. For conducting economic analysis on the unit of municipalities, although previously there have been data for analysis of the production phase, such as in economic censuses and industrial statistics,

analysis of the distribution and expenditure phases has been difficult.

The second is that because data are not available on the unit of municipalities, even if data are prepared, such as an inter‑industry relations table on a region‑by‑region basis, a comparison with other regions will be difficult. Therefore, it is necessary to prepare data that consistently cover the whole country in order to compare regions.

The third is that the regional economies and economic policies of the national government are linked, and it is necessary to be able to ascertain how national policies affect regional economies. From this viewpoint, added value in the economic census differs from added value in the National Accounts calculations and does not consider aspects such as the consumption of fixed capital and public services. Moreover, the total sum of the added value of the prefectures in the Prefectural Accounts calculations is not consistent with the added value in the National Accounts calculations. In addition, in the prefectures, there are many inconsistencies between the prefectural inter‑industry relations table and the Municipalities Accounts calculations.

III. **Development of the method for analyzing the regional economic cycle**

III-1. *Regional economic cycle structure*

Figure 1 shows the regional economic cycle structure and the viewpoint for analysis of

Figure 1. Regional economic cycle structure and the viewpoint for its analysis
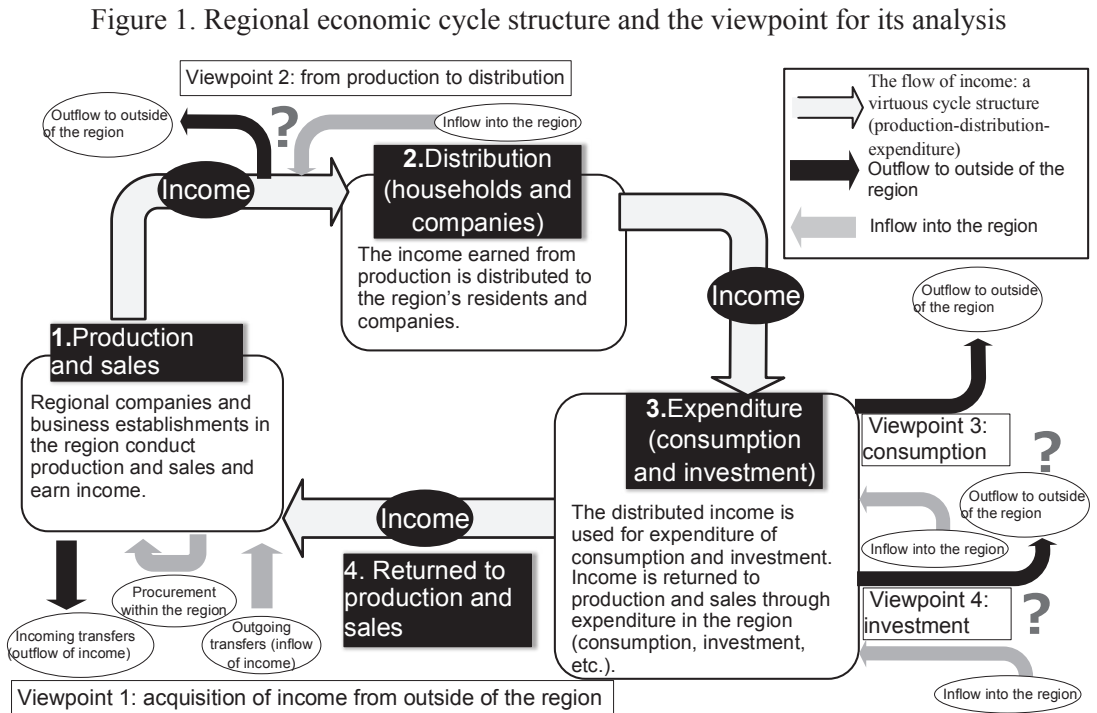
the regional economic cycle. This regional economic cycle structure is shown in detail in Nakamura (2014) and the Ministry of Economy, Trade and Industry (2006), and this study fundamentally follows the concepts in these prior studies. As previously described, analysis of the regional economic cycle is on the unit of municipalities and metropolitan areas and on the three phases of production, distribution, and expenditure. Production entails a region's companies and business establishments conducting production and sales and thereby earning income, and the income earned from this production phase is distributed to households and companies. Then, the distributed income is used for expenditures, such as on consumption and investment. Furthermore, in this expenditure phase, the income used for consumption and investment flows back to the production phase. Up to this point, it is the same as a country's macro economy.

When analyzing a regional economy, as shown in Figure 1, its characteristics include the acquisition of income in the production phase, inflows and outflows of income in the process from production to distribution, and inflows and outflows of income in the expenditure phase. This is shown in accordance with the viewpoints in Figure 1. Viewpoint 1 is regarding the production phase, which shows the region's incoming and outgoing transfers in the event of production and sales, and it also shows the income obtained from outside of the region. Basically, it is considered that superior industries in a region that have comparative advantage earn income from outside of the region, while inferior industries purchase from the region. However, the important point here is not only the transactions of goods and services with outside of the region but the transactions within the region (procurement within the region).

Next, viewpoint 2 is regarding the inflows and outflows of income in the process from production to distribution. For example, in the case of a region, there is the outflow of income to outside of the region, wherein corporate income and property income flow to the headquarters in metropolitan areas, while there are inflows of fiscal transfers, including subsidies and grants from the national and prefectural governments.

Figure 1 Regional economic cycle structure and the viewpoint for its analysis

Viewpoint 3 is regarding the inflows and outflows of consumption, and there are two types of consumption inflows and outflows: non‐daily and daily. The non‐daily inflows and outflows are from tourism; tourism consumption is activated and income flows in from the inflow of tourists. The daily inflows and outflows are mainly from daily shopping. This daily shopping is linked to compact city policies. The promotion of town residences, activation of central urban areas, establishment and improvement of public transportation, and formation of compact cities keeps down the outflow of day‐to‐day consumption, and rather makes it possible for income to flow in from outside of the region. In this sense, the urban structure that is assumed by the regional economic cycle structure is a compact city. However, as described below, even if consumption flows in, when the supply side has low labor productivity, such as in labor‐intensive‐type service industries, it is possible that the Baumol effect will appear and, overall, productivity will be lowered.

Viewpoint 4 is regarding capital investment. Capital investment entails setting‐up business establishments and installing machinery and equipment, and the outflow of

investment is when income from within the region is used to set‑up business establishments and install machinery and equipment outside of the region. Thus, installing equipment outside of the region results in income from within the region contributing to an increase in production outside of the region. When there is no relation between inside and outside of the region, it will not contribute to an increase in production inside the region. In order to activate regional economies, income has to be cycled from the excess inflow of income from viewpoints 1 to 4.

Figure 2 shows an image of a typical vicious circle structure seen from the regional economic cycle structure. The left side of the figure shows a region specializing in manufacturing industries, centered on leading‑edge companies, and this structure is seen from a business castle town. In the production phase, the high productivity of leading‑edge companies is utilized to earn income from outside of the region, but in the process of distributing it to local residents, there is an outflow of income to headquarters and other such establishments in the metropolitan areas, such as in the form of corporate income and property income. Moreover, in the consumption phase, there is tourism and shopping by residents outside of the region, and income earned in the region may be used to install machinery and equipment outside of the region. In this way, even if production grows larger and income flows into the region, in the distribution and expenditure phases, a large amount of income flows out of the region, and the income of the region's residents does not rise. The right side of Figure 2 shows an example of a bad region that is reliant on tourism and fiscal transfers. In the production phase, earning power is small and the region's earnings do not cover the income of the region's residents; such a regional economy is only maintained from fiscal transfers from the national and prefectural governments, including subsidies and grants. Additionally, in the expenditure phase, income flows in from the inflow of tourists, but income obtained from this also flows out to install machinery and equipment and set up business establishments outside of the region. So, only a very small amount of income is returned to the production phase.

Figure 2. Image of the vicious-circle structure of the regional economic cycle structure
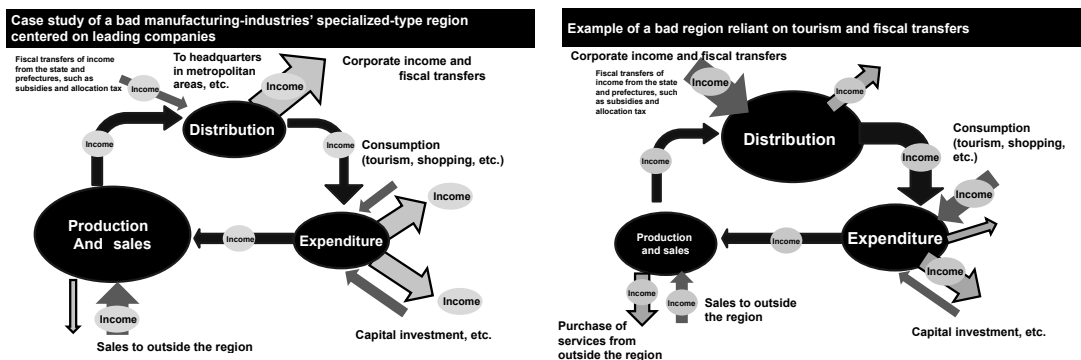
III-2．Method for analyzing the regional economic cycle

III-2-1．Items in the analysis of the regional economic cycle

In the regional economic cycle structure, Figure 3 shows the main items to analyze a region's strengths and weaknesses as well as its income inflows and outflows. Figure 3 does not show all of the regional economic analysis, but with these items it will be possible to present an overview of the regional economic cycle structure.

In the production phase, earning power is analyzed by using the specialization coefficient for comparative-advantage industries, and it is shown from labor productivity for industries that have an absolute advantage in a region and from net outgoing transfers for industries earning from outside of the region. Moreover, industries that will be a region's core industries are analyzed using the indexes of sensitivity dispersion and power of dispersion from the regional inter-industry relations table.

For the distribution phase, the inflows and outflows of income from production to distribution, the autonomy of regional economies, the income per resident, and the fiscal-transfer situation are shown. This analysis of the distribution phase is mainly an analysis of dependents, and the inflows and outflows of income are also analyzed using dependents. Meanwhile, it is considered that indicators of the distribution phase are also indicators of the main outcomes of the regional economic policies. In addition, for the expenditure phase, households' consumption and inflows and outflows of consumption as well as companies' capital investment and inflows and outflow of capital investments are shown. Here, the

Figure 3. Items to be analyzed in the regional economic cycle

inflows and outflows are measured on a territories basis with an awareness of returns to the production phase, as is described below.

III-2-2.　Method for estimating the inflows and outflows of income

Next, the method of analyzing the inflows and outcomes of income in a region‐which is the core of this study's analysis of the regional economic cycle‐will be shown. First, for the production phase's inflows and outflows of income, net outgoing transfers by industry are used. The regional inter‐industry relations table is required for these estimations of inflows and outflows by industry. Next, in the distribution phase, the amounts of inflows and outflows of income are calculated from the dependents and territories' distribution incomes, and the inflow of income is shown by subtracting the territories' distribution income from the dependents' distribution income. Similarly, for expenditure, territories and dependents' expenditure amounts are used, and the inflows and outflows are opposite to those in the distribution phase; that is, the inflow of income into a region is shown by subtracting the dependents' expenditure amount from the territories' expenditure amount.

Thus, the biggest feature of this study is that data on both territories and dependents are used to estimate a region's inflows and outflows of income. The data on dependents used for the inflows and outflows of income were prepared from data covering a region's households and companies' production, distribution, and expenditure; in this study, this is called regional accounts calculations. For the territories' data, the regional inter‐industry relations table on the units of regions, such as municipalities, is used. In a region, a state of equivalence for the three phases of production, distribution, and expenditure is established, but it is difficult to ascertain the income of local residents (the dependents).

As described above, in this study, an important viewpoint is considered to ascertain whether or not income is circulating throughout the country from the viewpoint of local Abenomics. Therefore, the regional accounts calculations data, which is data on dependents, was created to ascertain the dependents' income. These concepts are shown in Figure 4.

Figure 4. Concept of inflows and outflows of income in this study
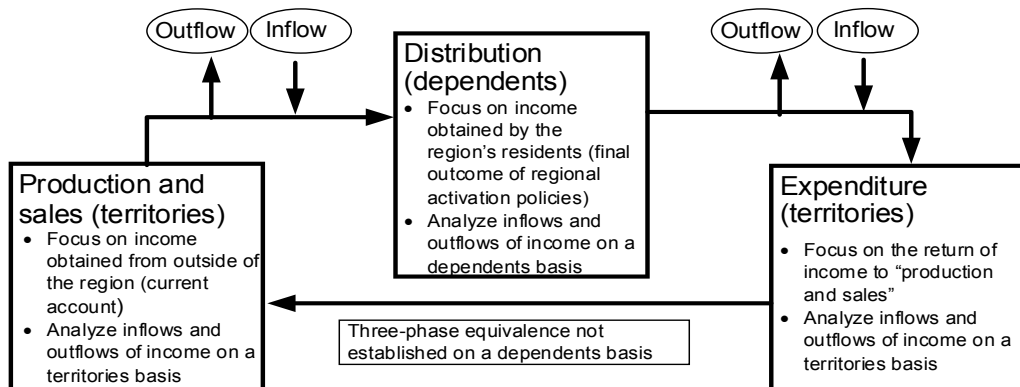
In production and sales, inflows and outflows are analyzed on a territories basis. In this study, production and sales are common for dependents and territories, and they indicate the production and sales by the business establishments in the relevant region. Here, for the inflows and outflows of income, the amounts of net outgoing transfers by industry in the regional inter-industry relations table are used.

The most important parts of this study are the distribution phase, regional revitalization, and regional activation policies to improve the welfare level of the region's residents, and the final outcome should be measured as income improvements for the region's residents. Therefore, by comparing the income earned from production and sales in a region with the income earned by its residents, the inflows and outflows of income are analyzed based on dependents. In actuality, residents' income comprises income from business establishments (places of work) inside and outside of the region, inflows and outflows from fiscal transfers, and outflows to headquarters and other business establishments. Therefore, for the distribution phase, these items are analyzed for the inflows and outflows of income. For the expenditure phase, the inflows and outflows of income on a territories basis are analyzed with an awareness of the return of income to production and sales. Capital investment and private sector final consumption contribute to improvements in production and sales when they are carried out on the land of the relevant region. However, even if consumption and investment expand in other regions, this does not directly contribute to improvements in the relevant region's production and sales.

The method of estimating the amounts of these inflows into a region is shown below. In the production phase, the income-inflow amount is from Formula (1), and it is the net amount of outgoing transfers by industry.

$$IFP = EX - IM \tag{1}$$

IFP: net outgoing transfers by industry, EX: amount of outgoing transfers, IM: amount of incoming transfers.

Next, the distribution phase's amount of incoming income is from Formulas (2) and (3), and focusing on the income obtained by local residents, the estimations were made on a dependents basis.

$$IFDE = pIME - tIME \tag{2}$$
$$IFDO = pIMO - tIMO \tag{3}$$

IFDE: amount of incoming employer income, pIME: dependents' distribution of employer income, tIME: territories' distribution of employer income, IFDO: incoming amount other than employer income, pIMO: dependents' distribution of income other than employer income, tIMO: territories' distribution of income other than employer income.

The expenditure inflows and outflows, such as from private sector consumption and private sector capital investment, are from Formulas (4) and (5). Focus is placed on the return

of income to production and sales, and the estimations are made on a territories basis.

$$IFC = tCONS - pCONS \tag{4}$$
$$IFI = tINV - pINV \tag{5}$$

IFC: amount of incoming consumption, tCONS: territories' amount of consumption, pCONS: dependents' amount of consumption, IFI: amount of incoming investment,
tINV: amount of territories' investment, pINV: amount of dependents' investment.

III-3. *Preparing data for use in the analysis of the regional economic cycle*

III-3-1. Overview of the basis for the database

In this study, two data sets were created: dependents' economic data (hereafter, regional accounts calculations) and territories' economic data (hereafter, the regional inter‑industry relations table)[2]. They were created in 2010. As shown in Table 1, both data sets were created with 22 industries, which is about the same as the number in the medium classification of the prefectural accounts. The classifications are rough, but we hope to address this issue in the future. The regional accounts calculations on a dependents basis are the totals of the economic activities carried out by the region's agents, and it is possible to ascertain the income obtained from production and sales at places of work that is taken home to places of residence (by income transfers, etc.) and then used for expenditure. Therefore, while the three‑phase equivalence is established nationwide, it is not established in a region. Moreover, it is also possible to estimate fiscal transfers by estimating direct and indirect taxes.

Conversely, the regional inter‑industry relations table on a territories basis is the same concept as the municipalities' inter‑industry relations table created by municipalities. It totals the "production" and "expenditure" carried out in the relevant region, and it does not matter which agents carry out the economic activities, such as production and expenditure. That is, ultimately, these are land‑based activities, and the three‑phase equivalence is established in a region, as defined by the inter‑industry relations table. Moreover, in this study, the gross value added in the regional inter‑industry relations table is the value added in the regional accounts calculations to which "consumption other than by households" is added. Additionally, the value added and incoming and outgoing amounts are consistent with the National Accounts calculations.

In both the above‑described data sets, the totals for all the regions are consistent with the National Accounts calculations (GDP statistics), and it is possible to ascertain the effects of international trade on regional economies. Both data sets were created by a non‑survey method, and a questionnaire survey was not carried out to create the data. Further, for data on

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[2] The database created for this study and used for the regional economic cycle analysis are posted on the following website: RECA regional economic cycle analysis model (http://www.vmi.co.jp/reca/index.html). In 2010, there were 22 industry classifications, but in May 2017, data on 39 industry classification were posted.

Table 1. The industry-classifications database used for the analysis of the regional economic cycle

No	Industry-classifications database		Industry classifications in prefectural accounts calculations	
			Medium classification	Small classification
1	Agriculture, forestry, and fisheries industries		Agriculture, forestry, and fisheries industries	Agriculture
				Forestry
				Fisheries
2	Mining		Mining	Mining
3	Manufacturing industries	Foodstuffs	Foodstuffs	Foodstuffs
4		Textiles	Textiles	Textiles
5		Pulp and paper	Pulp and paper	Pulp and paper
6		Chemicals	Chemicals	Chemicals
7		Petroleum and coal products	Petroleum and coal products	Petroleum and coal products
8		Ceramics and soil/stone products	Ceramics and soil/stone products	Ceramics and soil/stone products
9		Primary metals	Primary metals	Steel
				Non-ferrous metals
10		Metal products	Metal products	Metal products
11		General machinery	General machinery	General machinery
12		Electrical machinery	Electrical machinery	Electrical machinery
13		Transportation machinery	Transportation machinery	Transportation machinery
14		Other manufacturing industries	Precision machinery	Precision machinery
			Other manufacturing industries	Clothing and accessories
				Lumber and wood products
				Furniture
				Printing
				Leather and leather goods
				Rubber products
				Other manufacturing industries
15	Construction industry		Construction industry	Construction industry
16	Electricity, gas, and water services		Electricity, gas, and water services	Electricity industry
				Gas, water, and heat supply industries
17	Wholesale and retail industries		Wholesale and retail industries	Wholesale industry
				Retail industry
18	Finance and insurance industries		Finance and insurance industries	Finance and insurance industries
19	Real estate industry		Real estate industry	Housing leasing industry
				Other real estate industry
20	Transportation and communication industries		Transportation industry	Transportation industry
			Information and communication industries	Communication industry
				Broadcasting industry
				Information services / video-character information system industries
21	Public services		Public services	Public services
22	Service industries		Service industries	Public services
				Business-office services
				Personal services

shopping trips to estimate the consumption amounts and data on commuting to estimate income transfers, the inter-city transport model estimations in Koike, Sasaki, and Yamazaki (2014) were used.

The inter-city transport model used estimates the number of trips from nationwide commuting to work between municipalities, commuting to school, private trips (shopping, tourism, etc.), and work trips (business trips, meetings, etc.), while the transportation modes include by air, sea, rail, bus, and vehicle network.

III-3-2. Estimation method for the regional accounts calculations

The regional accounts calculations created for this study may also be considered as the regional version of the National Accounts calculations. The difference between the macro economy and regional economy of a country is the difference in the scope of behavior of the residents. In the case of a country, there are country borders, and fundamentally, no behavior crosses these borders during day-to-day activities. On the other hand, in the case of regional economies, residents are not aware of the administrative districts in their daily activities. Therefore, in regional economies, on a dependents basis, the three-phase equivalence for production, distribution, and expenditure is not established.

For example, when the places of work and residence are different, residents act at the place of work for the production phase; however, for the expenditure phase, such as consumption, many activities occur at places other than the place of work. Moreover, at places of work, even if production and sales are performed and these companies obtain value added, such value added is not returned entirely to the residents of the place of production; instead, in some cases, it is absorbed by headquarters and branch offices in other regions, and so income in production does not match income in distribution. Further, with regard to consumption, consumption by a resident in a different municipality is not recorded in the consumption of the relevant region and is instead recorded in the consumption of this other region. The regional accounts calculations in this study express this type of situation through the data.

In the production phase's data, value added by industry in the National Accounts calculations and prefectures' value added from the distribution of value added in the Prefectural Accounts calculations are divided proportionally among the municipalities using the Municipalities Accounts calculations, economic census, industrial statistics, National Census, and other means. Next, for distribution income, in places of production, value added by industry on the unit of municipalities is divided into employer income and other income using the prefectural inter-industry relations table.

Employer income in places of residence is calculated by allocating it based on the commuting conditions between municipalities in the previously described inter-city transport model. For the expenditure amounts by item on the unit of municipalities (private sector final consumption, private sector investment, government expenditure, etc.), the expenditures in the Prefectural Accounts calculations are divided using the accounts-settlement survey by

the municipality, National Census, employer income, and other means. As the regional accounts calculations are on a dependents basis, there is no distinction between the locations of consumption and investment.

Therefore, only net exports are recorded in the current account, and the totals of each expenditure item are made consistent with the National Accounts calculations. Thus, the regional accounts calculations are based on the GDP statistics, intermediate inputs are not considered, and all the data are on a value‑added basis.

Moreover, as the regional accounts calculations are data on a dependents basis, at the distribution stage, it is possible to estimate fiscal transfers (G‑T) by estimating consumption (C), tax (T), and savings (S) and comparing them with the expenditure items. These fiscal transfers are the amounts after the taxes paid by residents are subtracted from the government expenditure that benefits the residents. Government expenditure (G) comprises government consumption and government investment, and it is the expenditure on the relevant region from multiple organizations, such as municipality offices, prefectural government offices, and national government's local organizations; it includes expenditure such as on large‑scale public‑works projects. Estimations of fiscal transfers have been made on the unit of prefectures in previous studies, such as Sano (2000), but fundamentally, nationwide estimates targeting local governments have not been made.

Taxes are estimations of national and local taxes (prefectures and municipalities). For local tax (municipal tax), data by municipality could be obtained from the Ministry of Internal Affairs' 2010 Accounts Settlement Conditions Survey by Municipality, while data on national and local taxes (prefectural tax) could be obtained for the unit of prefectures; thus, the figures for the prefectures were divided proportionally into the municipalities. For the method of dividing proportionally, as indicators of what can be acquired on the unit of municipalities, the estimations in this study of value added, employer income, final consumption amount of private sector consumption, consumption amount of petroleum and coal products, number of cars owned, and other values were used, and the figures were divided proportionally.

III-3-3. Method of estimating the regional inter-industry relations table

The regional inter‑industry relations table on the unit of municipalities in this study is of the competitive‑import type. In many existing methods, including those of Doi et al. (1996) and Konagaya and Maekawa (2012), the production amounts are set first. However, in this study, to set the value‑added amounts in the regional accounts calculations as the same amounts, the data were created by setting the value added. First, the values in the regional accounts calculations were used for the value added of the gross value‑added amounts. Consumption expenditure other than by households was calculated using the ratios in the prefectural inter‑industry relations table. The production amount was obtained by dividing the gross value added by the value‑added rate, and this production amount was multiplied by the input coefficient to calculate the intermediate input amount.

The input coefficient and value‑added rate were created by using the input coefficients

Figure 5. Approach for creating input coefficients, etc.
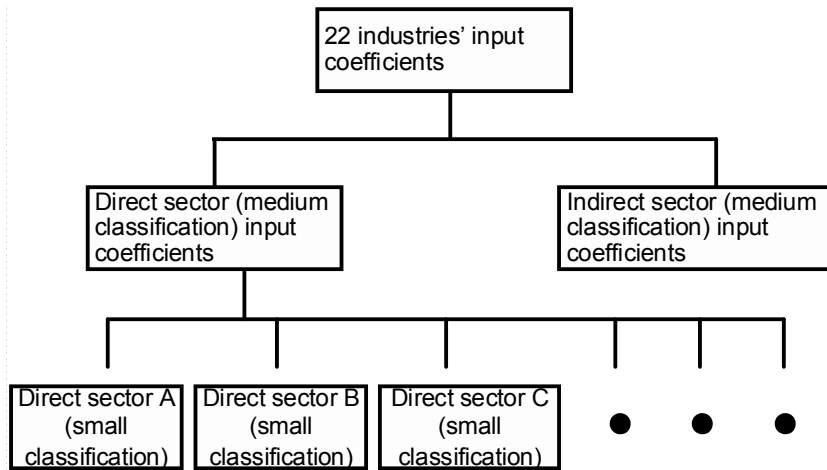
of the basic classifications (401 classifications) in the nationwide table of the inter‑industry relations table, along with data from the economic census medium classifications (97 classifications) and small classifications (519 classifications). The approach for creating the data was the same as in Suga (2015). As shown in Figure 5, industries were allocated into the direct and indirect sectors, and input coefficients were created and combined. Such use of input coefficients in the industries' direct and indirect sectors is because the input structures of both sectors are very different. When creating the inter‑industry relations tables for small regions, such as municipalities, these differences greatly affect the input coefficients. Figure 6 shows a comparison of the input coefficients of the direct sector, electricity and gas sectors, and the indirect sector. The industries with many inputs in the direct sector include mining, petroleum and coal manufacturing, and construction, while in the indirect sector, there are many inputs in the finance, insurance, and service industries. For example, while there are electricity and gas industry business establishments in metropolitan cities, such as in sites of prefectural offices, the majority are in the indirect sector. Therefore, this does not mean that these establishments actually conduct power‑generation or related operations. In this case, there are, in fact, hardly any inputs from the mining and petroleum and coal manufacturing industries, and so using the direct sector input coefficient may be misleading.

With regard to the direct sector, since the basic classifications in the nationwide table include detailed industry classifications, it is assumed that the input coefficient does not change in each region, and the input coefficients of the basic classifications in the nationwide table are estimated from the weighted averages of the municipalities' number of workers. However, strictly speaking, the nationwide table's input coefficient are values that are also included in the indirect sector, but since they are small values when viewed on an all‑industries basis, the nationwide table's input coefficients were deemed to be the direct sector's input coefficients. For the indirect sector, the input coefficients of the headquarters sector in

Figure 6. Comparison of the electricity and gas input coefficient
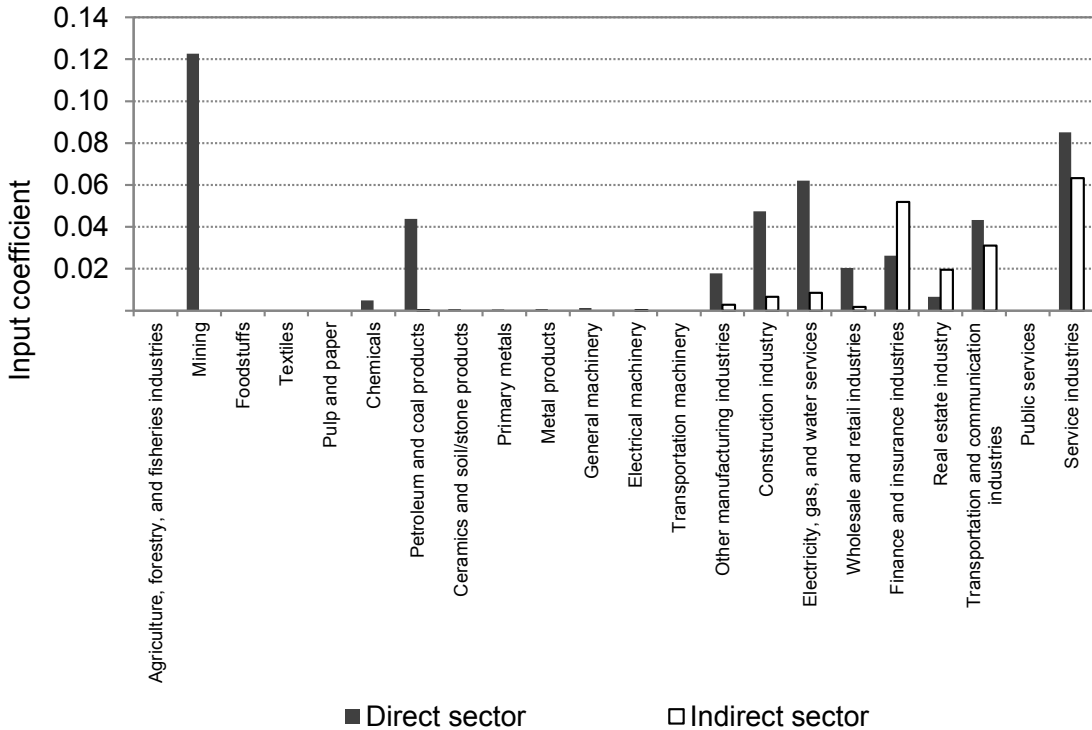
the 2005 Tokyo inter-industry relations table were used. These headquarters sector input coefficients were created from the survey of actual conditions, including of companies' management activities. In this study, in addition to the Metropolitan Tokyo headquarters sector, the input coefficients of the nationwide headquarters sectors (the same as the companies' management sector) by industry, which includes other regions, were used.

For the final demand amounts, the same as the regional accounts calculations, value-added amounts (excluding consumption expenditure other than by households) and the total amounts in the regional accounts calculations were made consistent. As data on territories were used for the proportional divisions among municipalities, for the private sector final consumption amounts, the previously described inter-city transport model was used; the trips for commutes to work and school, tourism, and shopping were totaled and divided proportionally. Then, the prefectural inter-industry relations table was used, and the amounts were divided by industry. The import and export amounts are consistent not with the total of the import and export amounts in the Prefectural Accounts calculations but with the import and export amounts in the National Accounts calculations. The values for outgoing transfers and incoming transfers were calculated using a non-survey method (LQ method) from the existing municipalities' inter-industry relations table and other sources.

The survey method using the Production Distribution Survey and other surveys not only requires an enormous budget, but there is also the possibility of errors in the survey design

and survey process (a low response rate). Thus, when creating an inter‑industry relations table for municipalities nationwide, a complete survey, such as the National Census, is required. Furthermore, in this study, with regard to imports and exports, movements of cargo between municipalities in the previously described inter‑city transport model were referred to.

III-4. *Analysis of the data used for the regional economic cycle*

Next, the database created for use in the analysis of the regional economic cycle will be used, the trends in some of Japan's regional economies will be analyzed, and the main results will be presented. In the production phase, as is shown in Figure 7, regions with the most net outgoing transfers from the most specialized industries in the region were analyzed. According to this analysis, in around 58% of the regions nationwide, the most specialized industries earn the most. In many cases, these industries are electrical machinery, transportation machinery, foodstuffs, manufacturing, and agriculture, forestry, and fisheries. Many regions specialize in and earn the most from agriculture, forestry, and fisheries industries, for instance, including approximately 290 municipalities in Hokkaido, Tohoku, Shikoku, and Kyushu. Conversely, in the regional area, several regions specialize in and earn from the food manufacturing industry. As a result from this, we understand that in several regions, conditions such as for sixth‑sector industrialization are in place.

Next, as shown in Figure 8, looking at the labor productivity (value added / number of workers) by population scale, in the all‑industries average, economies of scale are generated. This trend is especially noticeable in the three metropolitan areas. Looking at the unit of

Figure 7. Relationship between the most specialized industries in a region and net outgoing transfers
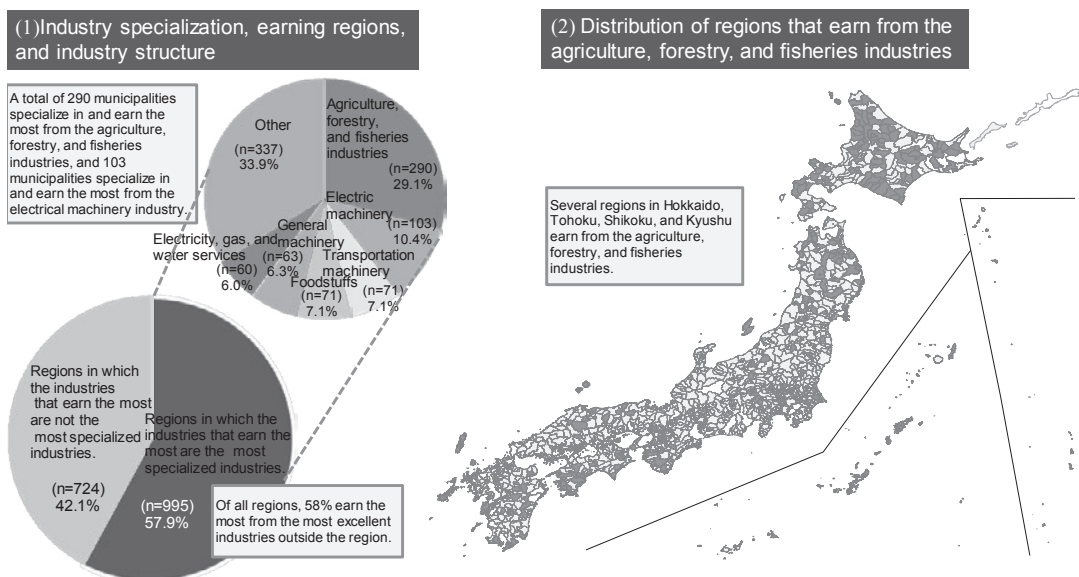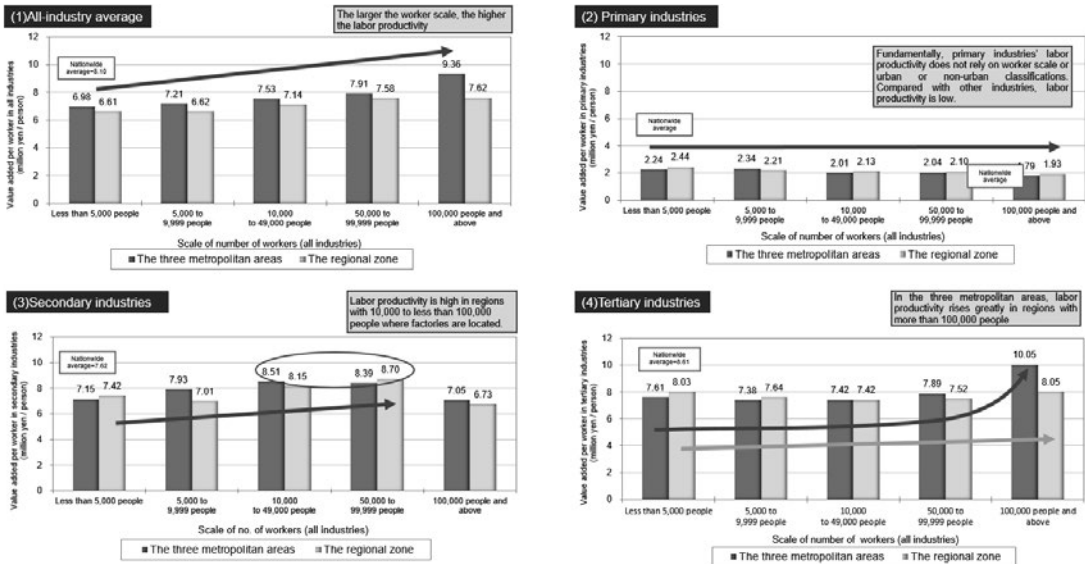
Figure 8. Comparison of labor productivity by industry

companies, as shown in the analysis of Goto (2014), labor productivity rises from expansion in the scale of the number of workers, and the same trend occurs in this study's analysis on the unit of municipalities. However, when observing by industry, we see that the trend is different, and primary industries are not affected by population scale. In secondary industries, in regions with 1 to less than 100,000 people, labor productivity is high in both metropolitan areas and the regional area. It is thought that in both these areas, productivity is higher in regions where manufacturing industries are located. In tertiary industries, productivity is high in metropolitan areas with 100,000 people or more, but in the regional area, it is not high in regions with 100,000 people or more. This is because many tertiary industries with high labor productivity, such as the finance and insurance, agglomerate in the metropolitan areas.

Looking at the analysis of the distribution phase, as shown in Figure 9, on observing income per capita by population scale, we see that income is high in regions with 500,000 people or more in the three metropolitan areas, while it is high in regions with less than 50,000 people and with 500,000 people or more in the regional area. In the case of regional areas with less than 50,000 people, income per capita of the population other than employer income (other income) is large. Other income includes fiscal transfers and other such income. Other income is large in regions with 500,000 people or more in metropolitan areas because corporate income and property income are large. As a result of these factors, income is low in regions with populations of 300,000 to 500,000 people. These regions are the locations of

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[3] The data is used for the analysis of the regional economic cycle are from the point in time when this paper was written. Therefore, it is possible that the values will change, such as from improvements to the estimation method, in the future.

Figure 9. Income by population scale
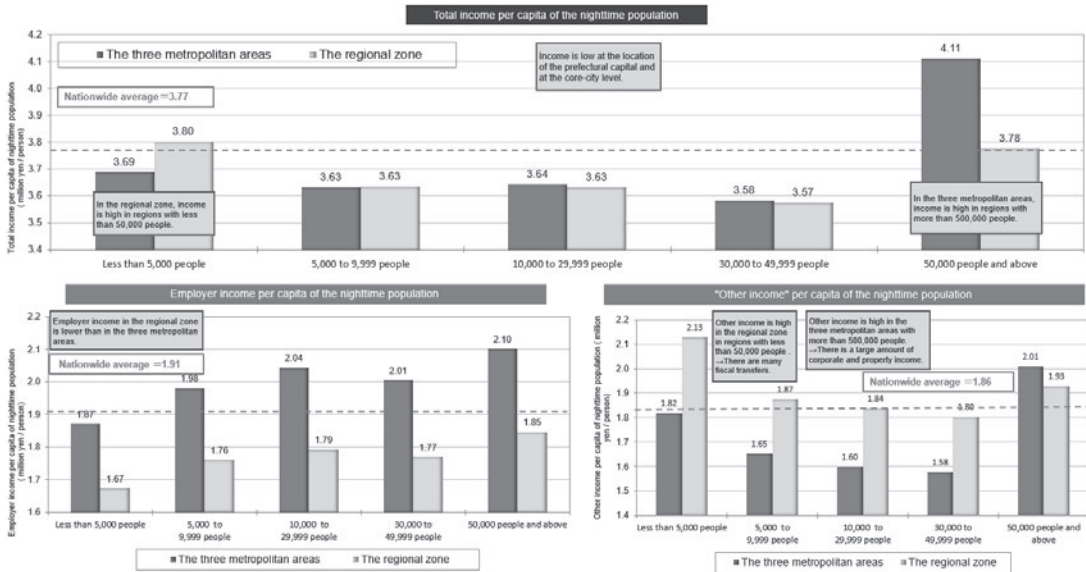
Figure 10. Relationship between consumption inflow and outflow and income
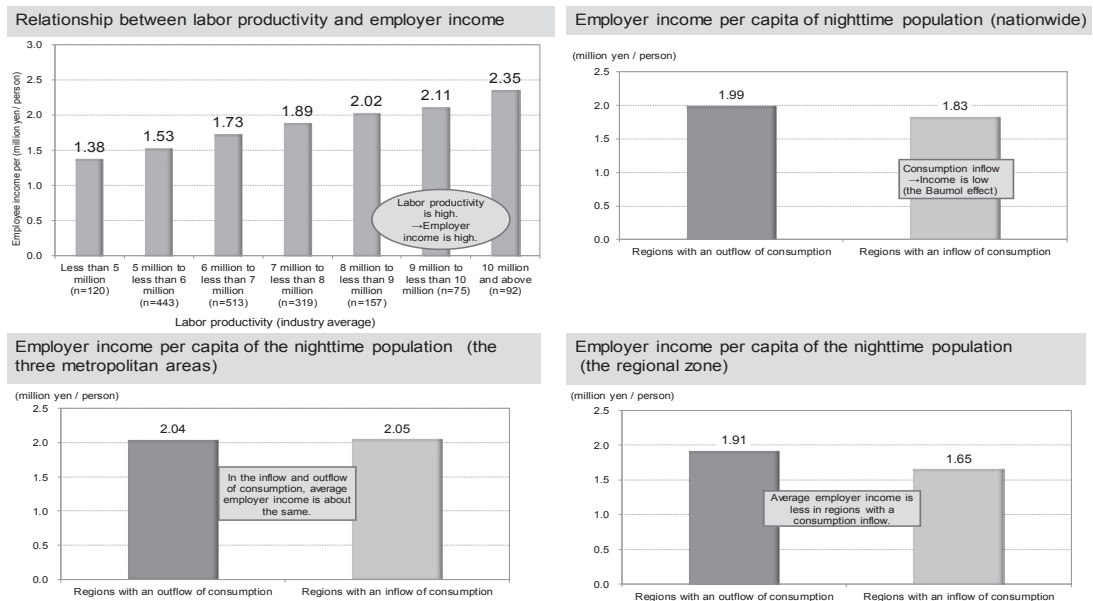
Japan's prefectural capitals and core regions, but their employer income is lower than that in metropolitan areas and regions with 100,000 to 300,000 people, and as other income is also small, total income is low.

For the expenditure phase, first, the relationship between private sector inflows and outflows of consumption and income was analyzed. As shown in Figure 10, in regions with

Figure 11. Relationship between consumption inflow and productivity
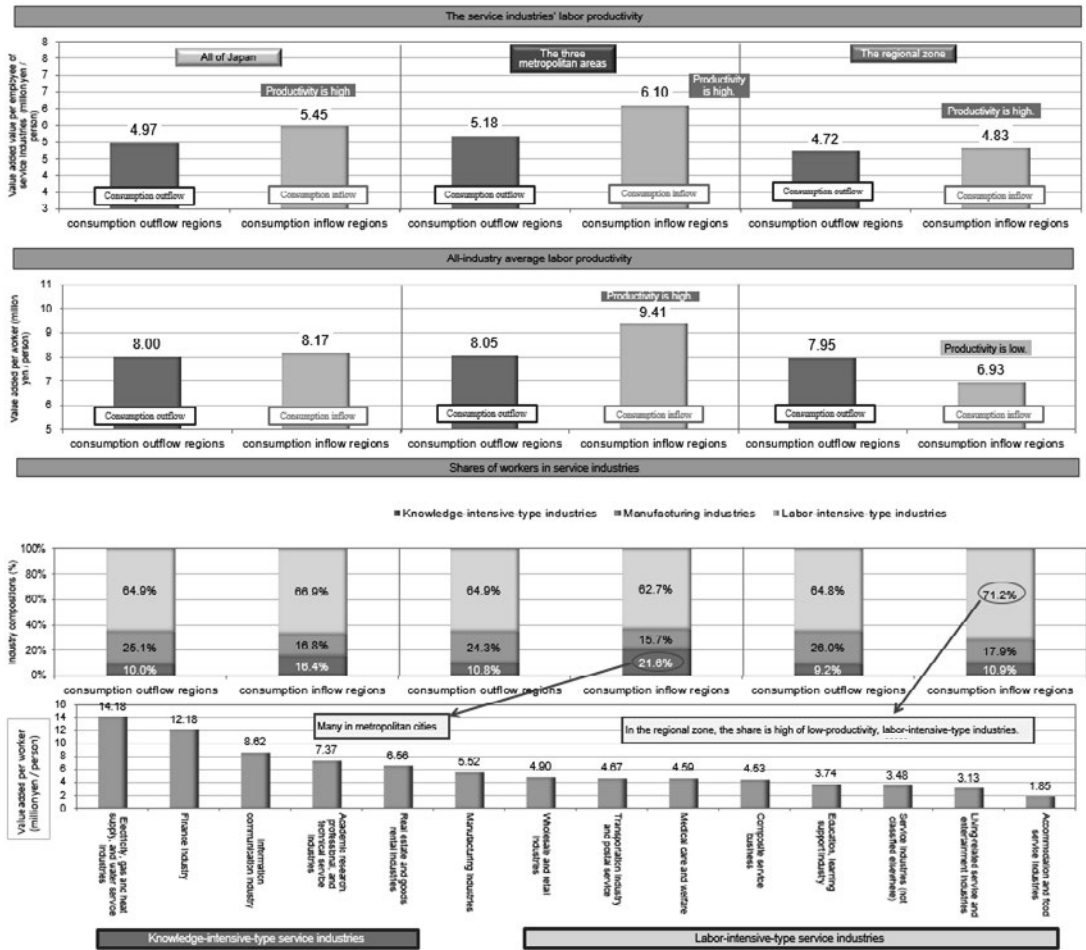
high labor productivity, employer income also tends to be high, and fundamentally, the resident's employer income is high in regions with high earning power. Therefore, in regions with consumption inflow, it was assumed that the productivity of industries such as service industries would be raised, and so employer income would be high. However, on observing the results of the estimations, we see that employer income is lower in regions with consumption inflow.

The reasons for this are as shown in Figure 11. First, in the case of the three metropolitan areas, the productivity of the services industries and local residents' income are higher in consumption-inflow regions, which is basically in line with the assumptions. On the other hand, in the regional area, in the consumption-inflow regions, the productivity of service industries is high, but it is low for the all-industries average. This is because in consumption-inflow regions, the service industries are developed, and so the percentage of workers in the service industries is high. Many of these regions' service industries are of the labor-intensive-

Figure 12. Relationship between investment inflow and productivity
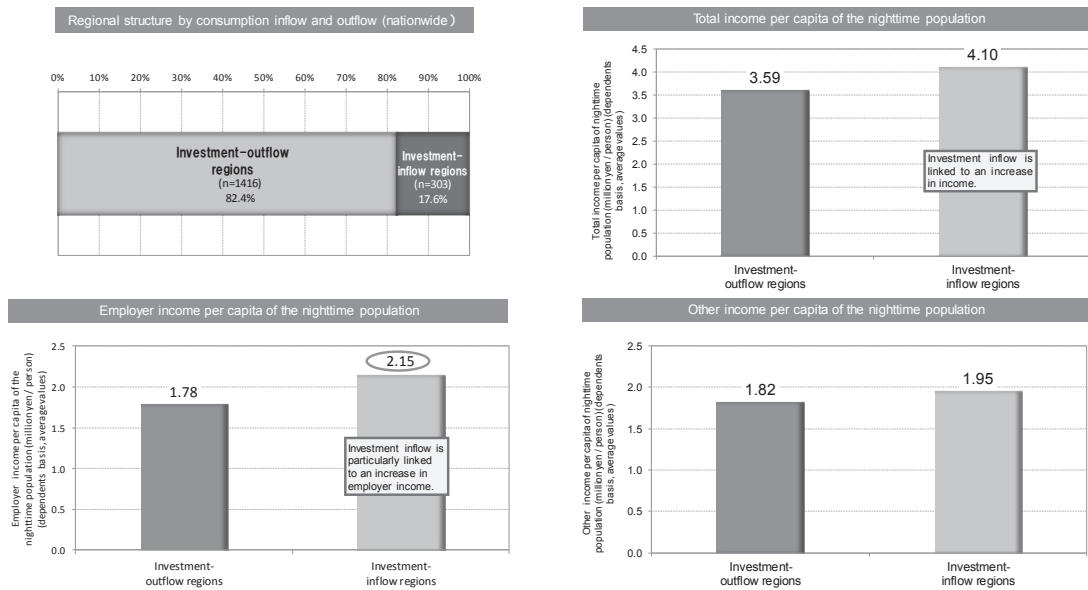
type, such as nursing and welfare or accommodation, and the productivity in these industries is fairly low. The high number of workers in low‑productivity industries reduces overall labor productivity, and as a result, residents' employer income is lowered and the Baumol effect is generated.

In addition, in the regional economic cycle, capital investment is the key part of the return from expenditure to production and sales. Households and companies not only consume but also save, and these savings are cycled into households and companies' investments, thereby cycling into income. Figure 12 shows the relationship between the inflow of investment and income. First, only about 17% of the regions nationwide are capital investment‑inflow regions, so there is an outflow of investment in most regions. In many investment‑inflow regions, income is high, and there are major differences between them as regards to employer income, while income other than employer income, including property income and corporate income, is higher in investment‑inflow regions.

This is because the inflow of investment raises productivity in the manufacturing industries and other secondary industries, and this, in turn, raises the productivity of all industries, which causes the income of the region's residents to increase. As shown in the bottom figure in Figure 11, the manufacturing industries' productivity is lower than that of knowledge‑intensive‑type service industries such as finance and insurance, but it is higher than that of labor‑intensive‑type service industries such as wholesale and retail. Therefore, when productivity in the manufacturing industry rises, it increases the productivity for all industries.

In addition, consumption inflow raises productivity by increasing the sales amount of

service industries. Similar to consumption, the inflow of capital investment not only increases the sales amounts of goods and services, but it also leads to an increase in the companies' production factors and production capacity, which will increase these companies' sales amounts in the future.

IV. Overview of the regional economic cycle analysis

Next, the method for analyzing the regional economic cycle (database used for the regional economic cycle analysis, estimations of the inflows and outflows of income, etc.) that was developed in the previous chapter will be applied to the actual regions of Kanazawa City, Toyama region, and Ishigaki City, and analyses of these regions' regional economic cycles will be attempted.

Figure 13 to Figure 21 in this chapter show an overview of the analysis of the regional economic cycle.

The overview first ascertains the region's income cycle structure, and then the inflows and outflows of income are analyzed. Next, in this study, a region's income per capita is classified into three types of income—employer income, income other than employer income, and total income—and comparisons are made for nationwide, same prefecture, and regions with populations of the same scale. Then, in the production phase, the region's earning power is analyzed. Here, the modified specialization coefficient-as the indicator of excellent industries, inflows and outflows of income from other regions, core industries, and labor productivity showing an absolute competitive advantage-will be analyzed.

IV-1. Results of the analysis of Kanazawa City

The analysis of Kanazawa City's regional economic cycle concluded that the cycle is not functioning well, because although there is income, such as from the enormous amount of tourism, this income is not being cycled within the region, and the residents' income is also not high.

Looking at the income cycle figure in Figure 13, in the distribution phase, the outflow is 290.8 billion yen, which is noticeably high for a regional economy. We can calculate this from Formulas (2) and (3). First, the employer income inflow amount from Formula (2) is the amount after subtracting the employer income in the region, which is the territories' employer income (980.6 billion yen), from the local residents' employer income, which is the dependents' distribution employer income (861.6 billion yen), for a result of -119.0 billion yen. As the inflow amount is negative, it indicates an outflow of 119.0 billion yen. Similarly, from Formula (3), the outflow amount of other income, which is income other than employer income, is 171.8 billion yen for a total outflow of 290.8 billion yen. Next, compared with income of 2,038.0 billion yen within the region of the territories, local residents' income is 1,747.2 billion yen. Therefore, local residents' income is covered by the region's earnings, and the regional economy is independent. In addition, the fiscal-transfers amount is

Figure 13. Regional income cycle structure (Kanazawa City)
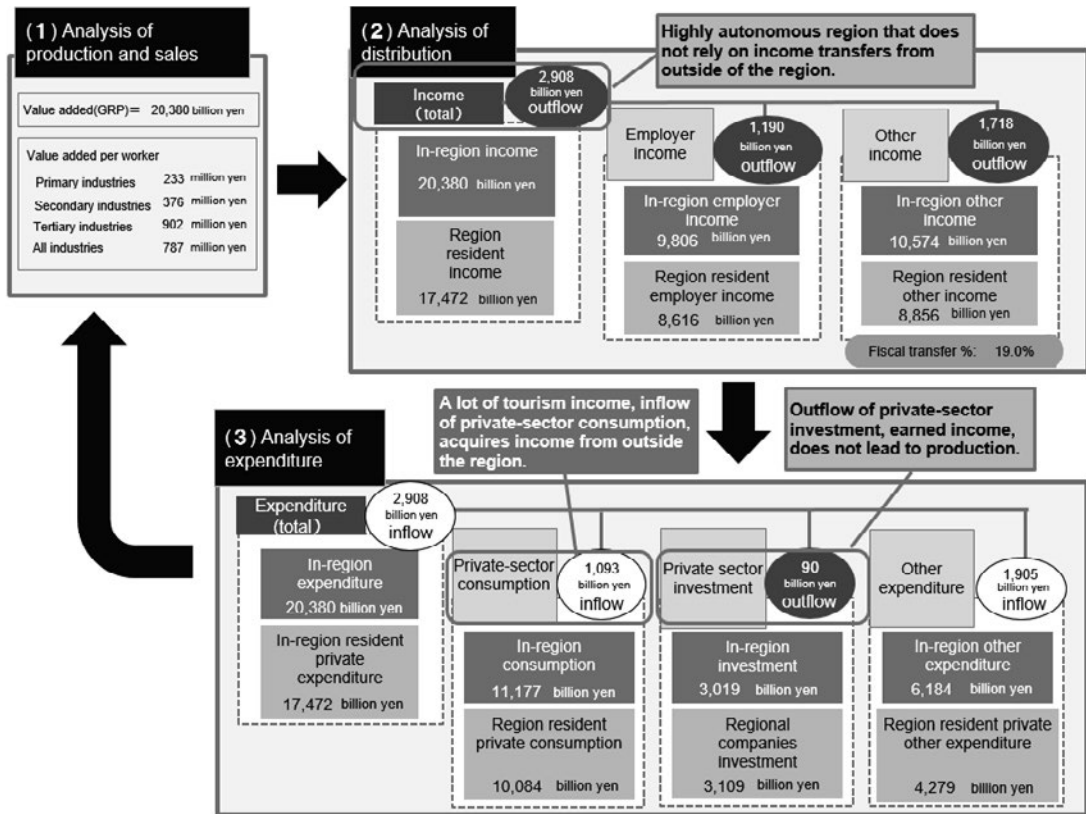
ascertained from inflows and outflows of income other than employer income. At the bottom of local residents' other income is the item of the fiscal-transfer percentage of 19.0%, and this shows the percentage of the fiscal-transfers amount from other regions within local residents' other income on a dependents basis. In the case of Kanazawa City, there is an inflow of around 168.2 billion yen from fiscal transfers. As the other income outflow amount is 171.8 billion yen, the income outflow amount on a private-sector basis, including corporate income and property income, is 340.0 billion yen [=171.8-(-168.2)]. Thus, on a private-sector basis, the distribution phase's outflow is fairly large. It is considered that this is from the outflow of profits to outside of Kanazawa City by companies whose headquarters and other business establishments are located outside of Kanazawa City. In this way, one feature of the analysis in this study is that it makes possible to ascertain the inflows and outflows of income in the distribution phase.

In addition, looking at the expenditure phase in Figure 13, while consumption is an inflow of 109.3 billion yen, private sector capital investment is an outflow of 9.0 billion yen, and the income earned in the distribution phase is not being returned to the production phase. For this outflow of private sector capital investment, the income obtained in the relevant region is

Figure 14. Kanazawa City's income per capita
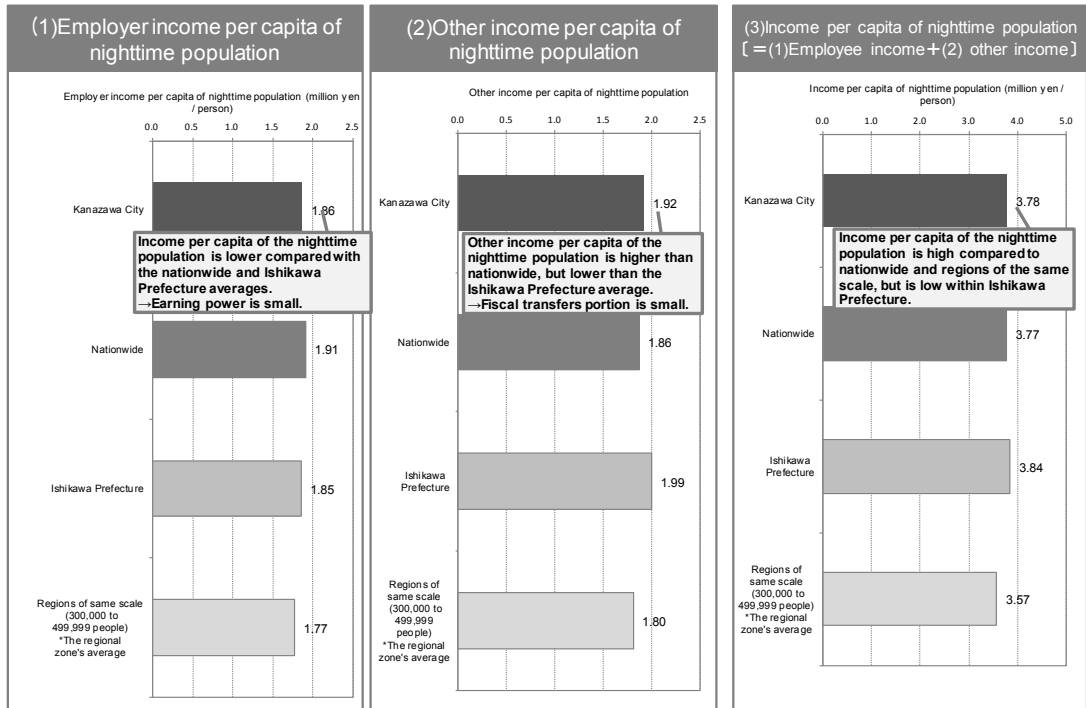
Note 1: Employer income is the amount distributed to employees for the provision of labor from within the value addition created from production activities within the region.

Note 2: Other income is income other than employer income and includes property income, corporate income, fiscal transfers (allocation tax, subsidies, etc.), etc.

used to install machinery and equipment and establish business offices and residences outside of the region. In particular, the installation of machinery and equipment outside of the region contributes to production outside of the region but does not directly contribute to production within the region.

Next, looking at the region's income per capita in Figure 14, we see that although income per capita of the population is slightly higher than the nationwide figure, it is lower than the Ishikawa Prefecture average. Moreover, it cannot be said to be at a high level when considering the bustling activity in Kanazawa City. Employer income is around the same as the prefectural average, lower than the nationwide average, and higher than in regions with the same population scale. This employer income shows a region's earning power, and the earning power cannot be said to be large in the case of Kanazawa City. Looking at other income, it is higher than the nationwide average but lower than the prefectural average. This is because there are many fiscal transfers in regions that are of small-scale economically, such as on the Noto Peninsula, which raises the prefectural average of other income.

Next, Figure 15 shows the results of the analysis of Kanazawa City's production phase. First, the modified specialization coefficient shows the region's excellent industries with a

Figure 15. Analysis of the production phase in Kanazawa City
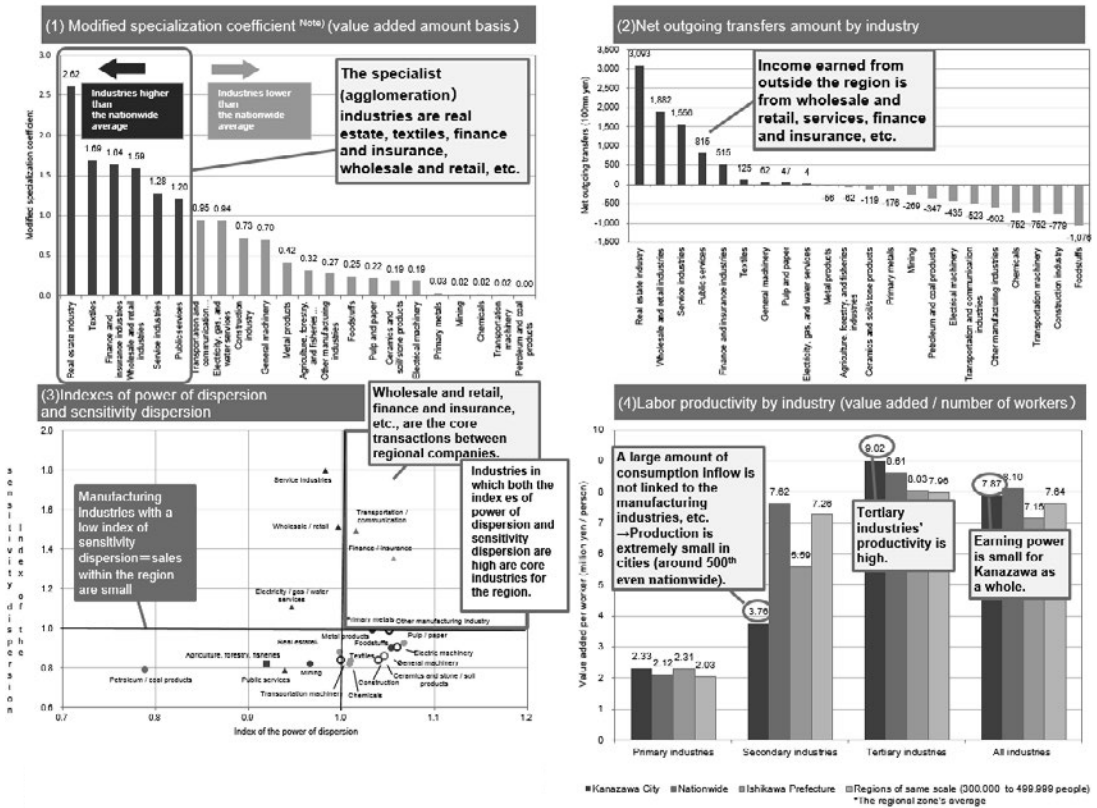
Note: The specialization coefficient, which is obtained by dividing the ratio of added value of the region by industry by the composition rate of the country as a whole, is adjusted based on nationwide imports and exports by industry.

comparative advantage. The right side is net outgoing transfers showing earnings from outside of the region. The first quadrants of the indexes of the sensitivity dispersion and power of dispersion show the industries that become the region's core industries. Looking at these three elements, we see that the finance and insurance industries have a comparative advantage, earn from outside of the region, and constitute the core of the region's transactions. We find that the wholesale and retail, service, and real estate industries also have a comparative advantage and earn from outside of the region. From this result, looking at labor productivity that shows an absolute advantage compared with other regions, we see that although it is slightly higher for tertiary industries compared with nationwide, it is fairly low for secondary industries, and earning power is low for Kanazawa City's production phase as a whole. This is related to the outflow of investment in the expenditure phase in Figure 13, and the outflows, including of capital investment, are causing the manufacturing industries to decline. It seems that much of the income earned by tourism and other means leaks to outside of the region and

does not lead to the development of the regional economy.

In this way, the analysis of a region's economic cycle reveals its weaknesses and strengths as well as its residents' income level, and this information is referenced when investigating measures for regional economies. The basis of measures for regional economies is to utilize their strengths and supplement their weaknesses in a chain-like manner, and in practical terms, it is not effective to supplement weaknesses locally. In the case of Kanazawa City, this would entail utilizing the inflow of consumption from the enormous number of tourists, keeping down the outflow of capital investment, and raising productivity. To achieve this, it is important to manufacture products (foods, souvenirs, etc.) for tourists in the region using the region's own goods and materials. During this manufacturing process, increasing manufacturing and selling more products will result in further capital investment and make it possible to keep down the outflow of capital investment.

IV-2. *Application to the Toyama region*

Next, we attempt an economic analysis of the Toyama region (comprising the five municipalities of Toyama City, Namerikawa City, Funabashi Village, Kamiichi Town, and Tateyama Town), which is of around the same economic scale as Kanazawa City. The scale of the Toyama region's gross regional product (GRP) is approximately 2.2 trillion yen, which is about the same as that of Kanazawa City, and both are sites of prefectural capitals and are core regions within their respective prefectures.

First, looking at the income cycle figure in Figure 16, we see that the broad structure is the same as that of Kanazawa City, and in the distribution phase, income within the region (2,211.3 billion yen) is higher than local residents' income (2,011.8 billion yen); therefore, the region is economically independent.

Next, on calculating its outflow amount from Formulas (2) and (3), which is the same as for Kanazawa City, the total outflow is 199.5 billion yen. This is not as much as Kanazawa City's outflow, which means that income earned in the production phase is being returned to local residents, comparatively speaking. In particular, the amount of income brought in from other regions from commuting to work from other regions is comparatively small at 53.7 billion yen, so the outflow of employer income is also small. In other words, this shows that Toyama region is a more integrated area than Kanazawa City. In addition, the fiscal-transfers amount was ascertained from the inflows and outflows of income other than employer income. The item in the lower part of local residents' other income is the fiscal-transfers percentage of 17.7%, and this shows the percentage of the fiscal-transfers amount from other regions within local residents' other income, on a dependents basis. In the case of Kanazawa City, the inflow from fiscal transfers was around 174.2 billion yen. The amount of outflow of other income is 145.7 billion yen, so the amount of outflow of income on a private-sector basis, such as of corporate income and property income, is 319.9 billion yen [＝174.2‐(‐145.7)], which is a somewhat small amount compared with Kanazawa City's outflow of 340.0 billion yen. This shows that compared with Kanazawa City, the Toyama region has

Figure 16. Income cycle in the Toyama region
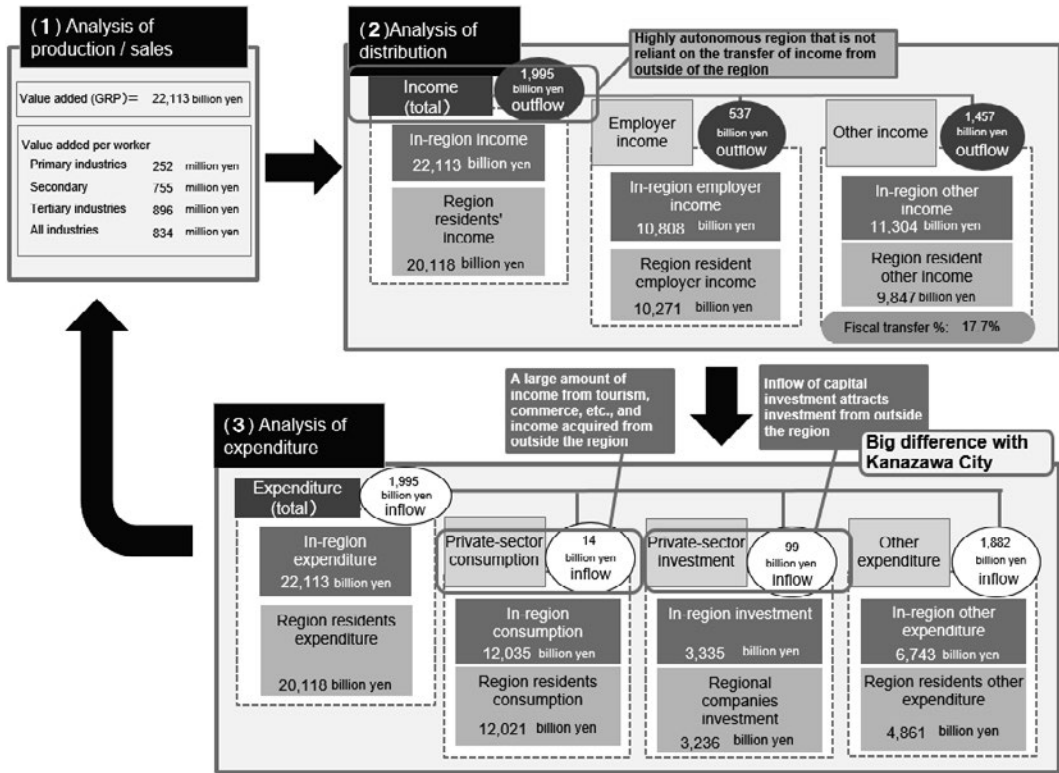
fewer transfers of income to headquarters and other functions in other regions.

Next, looking at the expenditure phase, the inflow of private-sector consumption is fairly small compared with Kanazawa City, but private-sector capital investment is an inflow of around 10.0 billion yen, which is greatly different from Kanazawa City. In particular, the inflow of private-sector capital investment is for the installation of machinery and equipment in the Toyama region using income earned in other regions, which is considered to contribute to improving the productivity of its manufacturing industries.

Moreover, looking at income per capita in Figure 17, we see that total income per capita (employer income + other income) is high compared with within the prefecture, nationwide, and in regions of the same scale, which can mean that the region's economic policies are functioning well. Employer income is particularly high, which is considered to reflect the strength of Toyama region's earning power.

Next, the earning power of the Toyama region is analyzed. First, we looked at the modified specialization coefficient used to ascertain the excellent industries, net outgoing transfers used to ascertain industries earning from outside of the region, and industries with indexes of power of dispersion and sensitivity dispersion of 1.0 and above used to find a region's core industries. We find that the chemical industry is an excellent industry that earns

Figure 17. Income per capita in the Toyama region
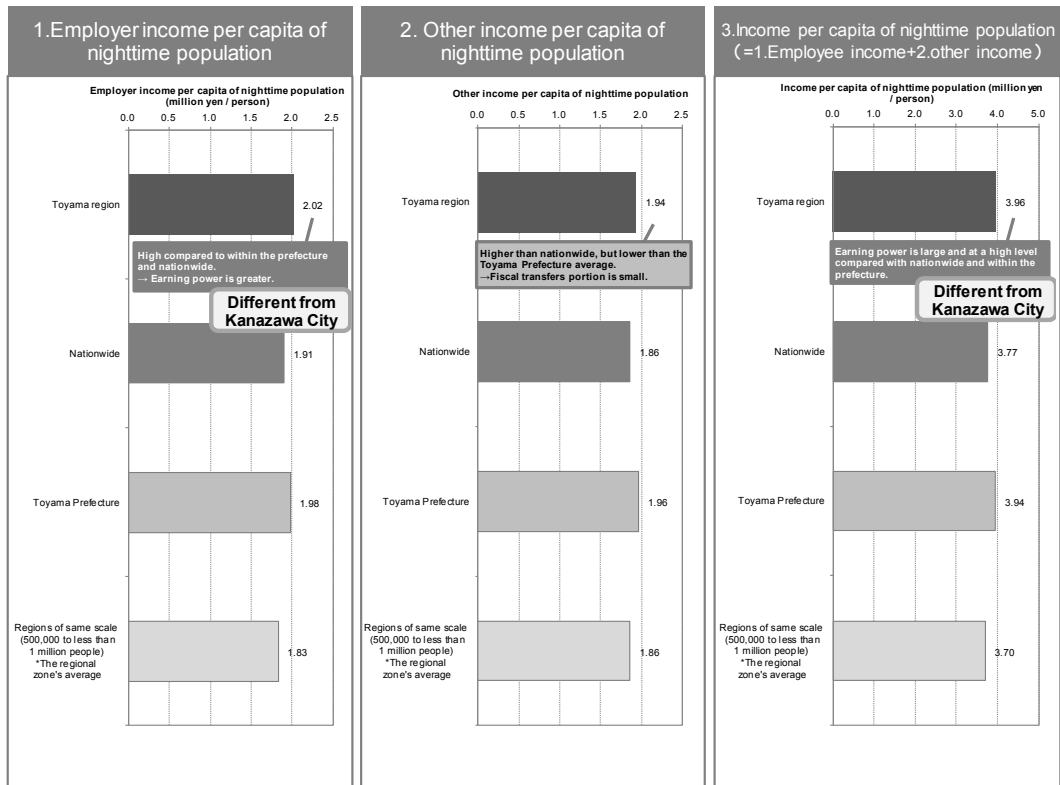
Note 1: Employer income is the amount distributed to employees for the provision of labor from within the value addition created from production activities within the region.
Note 2: Other income is income other than employer income and includes property income, corporate income, fiscal transfers (allocation tax, subsidies, etc.), etc.

from outside of the region and is the region's core industry, and the manufacturing industries are core industries within the region. In the excellent industries, industries that earn from outside of the region are the electricity and gas and service industries. Moreover, the agriculture, forestry, and fisheries industries earn from outside of the region, and all primary, secondary, and tertiary industries are active. As a result, looking at the region's earning power and labor productivity, we see that they are at high levels for all industries, and it can be said that as a whole, the region has high earning power. As is clear from the expenditure phase in the income cycle figure in Figure 16, this is because there are inflows of private-sector consumption and private-sector capital investment that are returned to the region's production, and this creates a virtuous-circle structure for the regional economy. As a result, the local residents' income is at a high level.

The results of the comparison of Kanazawa City and Toyama region contain a wealth of suggestions toward investigating regional economies. First, even if tourism policies are promoted to attract many tourists and tourism consumption expands, if a regional economic

Figure 18. Analysis of the production phase in the Toyama region
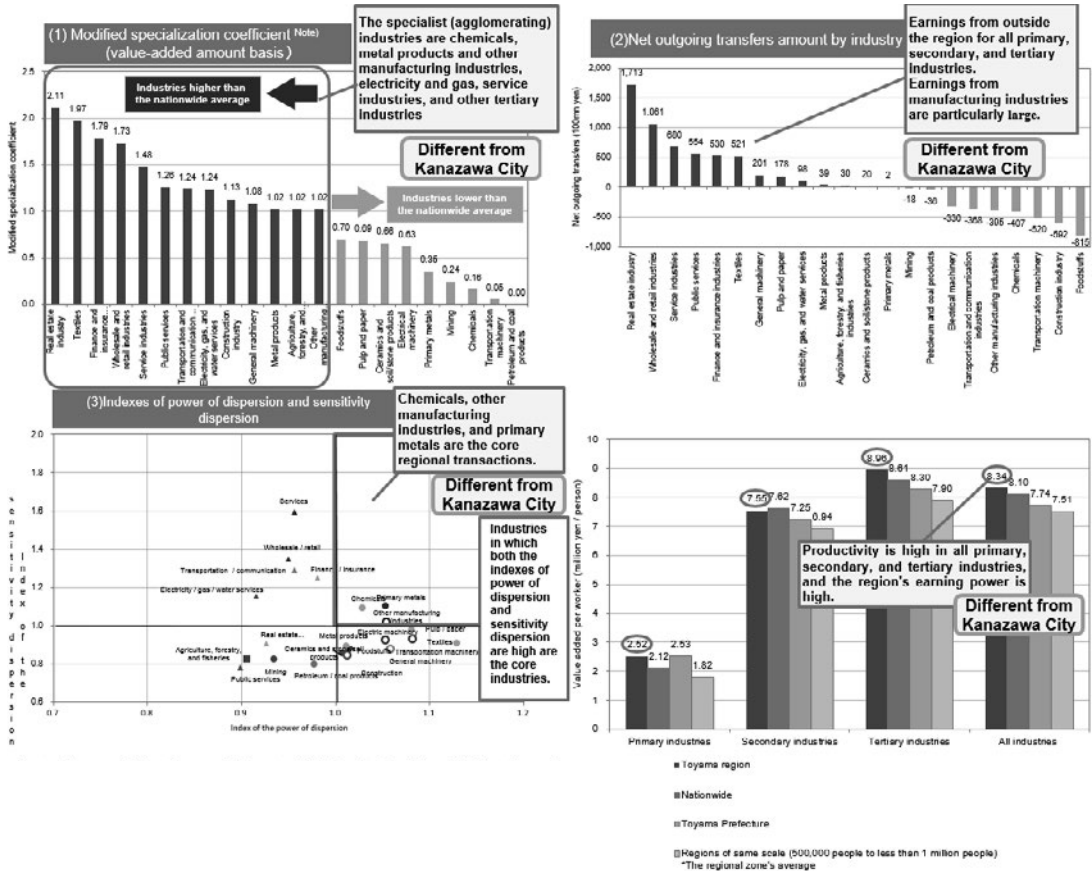
Note: The specialization coefficient, which is obtained by dividing the ratio of added value of the region by industry by the composition rate of the country as a whole, is adjusted based on nationwide imports and exports by industry.

cycle structure is not in place, the income from it will not be returned to local residents' income. Second, if the regional industries are not very active, and companies with capital in other regions are active, then corporate income and property income will flow out of the region to other regions. Even if income is earned in the production phase, it will not be returned to local residents' income. Third, the relationship between capital investment and manufacturing industries, in which an inflow of capital investment contributes to an improvement in the region's labor productivity in the production phase. In the production phase, in regions where the manufacturing industries are excellent, earn from outside the region, become the region's core industries, and have high labor productivity - which is the case in the Toyama region - then the demand for capital investment will also be high, creating a virtuous-circle structure. Moreover, in the event that tertiary industries are the main industries, as in Kanazawa City, the productivity of labor-intensive-type service industries,

including the accommodation, service, and nursing and welfare industries, may be low compared with other industries and cause productivity as a whole to decline. Therefore, it is necessary to combine them with the manufacturing industries and raise the productivity of labor‑intensive‑type service industries.

IV-3. *Application to Ishigaki City*

The final case‑study analysis is of Ishigaki City in Okinawa Prefecture. Looking at Ishigaki City's income cycle structure in Figure 19, we see that compared with production of 117.8 billion yen, local residents' income is 160.4 billion yen, and the inflow of income is 36% compared with income earned in the region. We will look at this inflow of income in the distribution phase in more detail. As Okinawa is a remote island, there are hardly any income outflows due to commuting to work from the relevant region. The percentage of fiscal transfers in the local residents' other income is 40%, and the fiscal‑transfers amount is approximately 37.1 billion yen. In addition, there is an inflow of approximately 5.2 billion yen from property income, corporate income, and related. In this way, in the distribution phase, fiscal transfers constitute slightly less than 90% of income inflow, which is more than 30% of income earned from production, and this structure is often seen in Japan's regions.

However, looking at the expenditure phase, we see the following: there are outflows in consumption, investment, and other (net outgoing transfers); the income obtained in the

Figure 19. The Ishigaki City income cycle
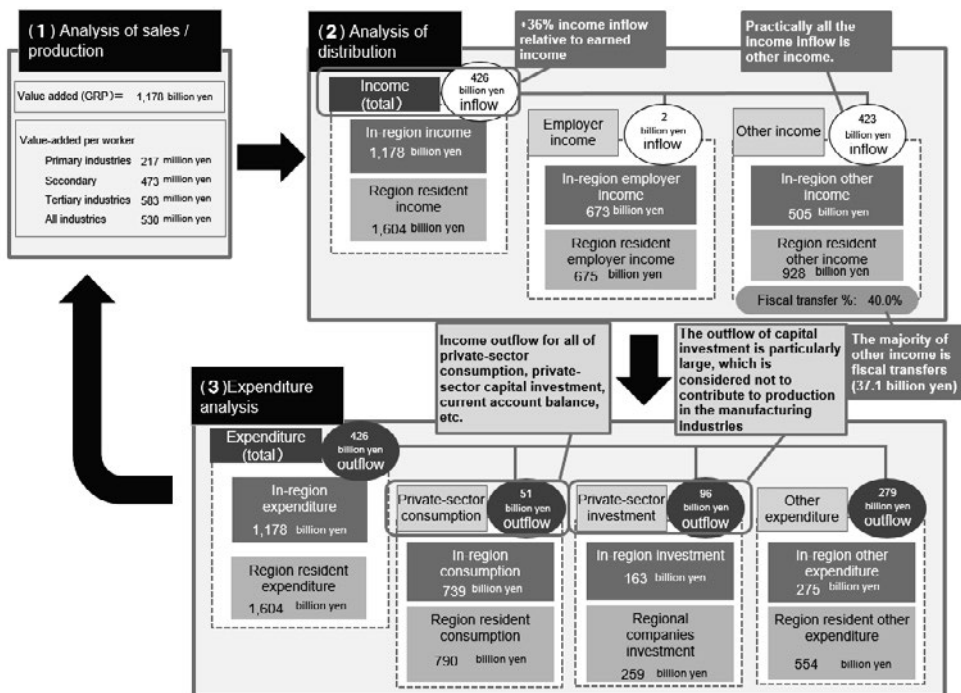
distribution phase, such as from fiscal transfers, leaks in the expenditure phase; and only a small amount is returned to the production phase. This is shown in the figure to the right of the image of the vicious circle in Figure 2.

Next, looking at residents' income per capita in Figure 20, compared with the nationwide figure, total income per capita is fairly low at 3.42 million yen, while other income is fairly high compared with nationwide and within the prefecture. However, it is somewhat low compared with regions of around the same scale in the regional area. Employer income is fairly low compared with the nationwide average and regions of the same scale, and it is also lower than the Okinawa Prefecture average. Thus, while Ishigaki City's earning power is low, income greatly increases from the fiscal-transfers amount. Next, looking at the analysis of the production phase in Figure 21, in the excellent industries, many earn from outside of the region, and the region's core industries are agriculture, forestry, fisheries, and service industries. As a result, labor productivity indicating an absolute advantage is at a high level for the primary industries but low in the secondary and tertiary industries, and the earning power of Ishigaki City as a whole is small. There are many regions with the same structure nationwide as in this case-study analysis of Ishigaki City. The cause and effect relation for

Figure 20. Ishigaki City's income per capita
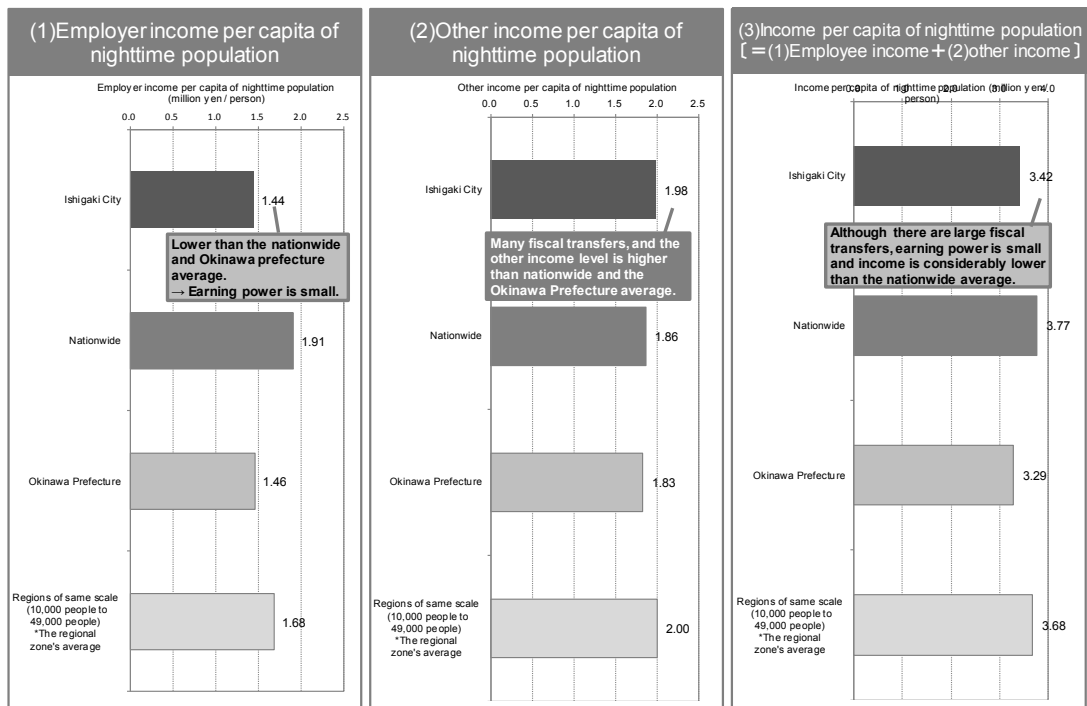
Note 1: Employer income is the amount distributed to employees for the provision of labor from within the value addition created from production activities within the region.
Note 2: Other income is income other than employer income and includes property income, corporate income, fiscal transfers (allocation tax, subsidies, etc.), etc.

Figure 21. Analysis of the production phase in Ishigaki City
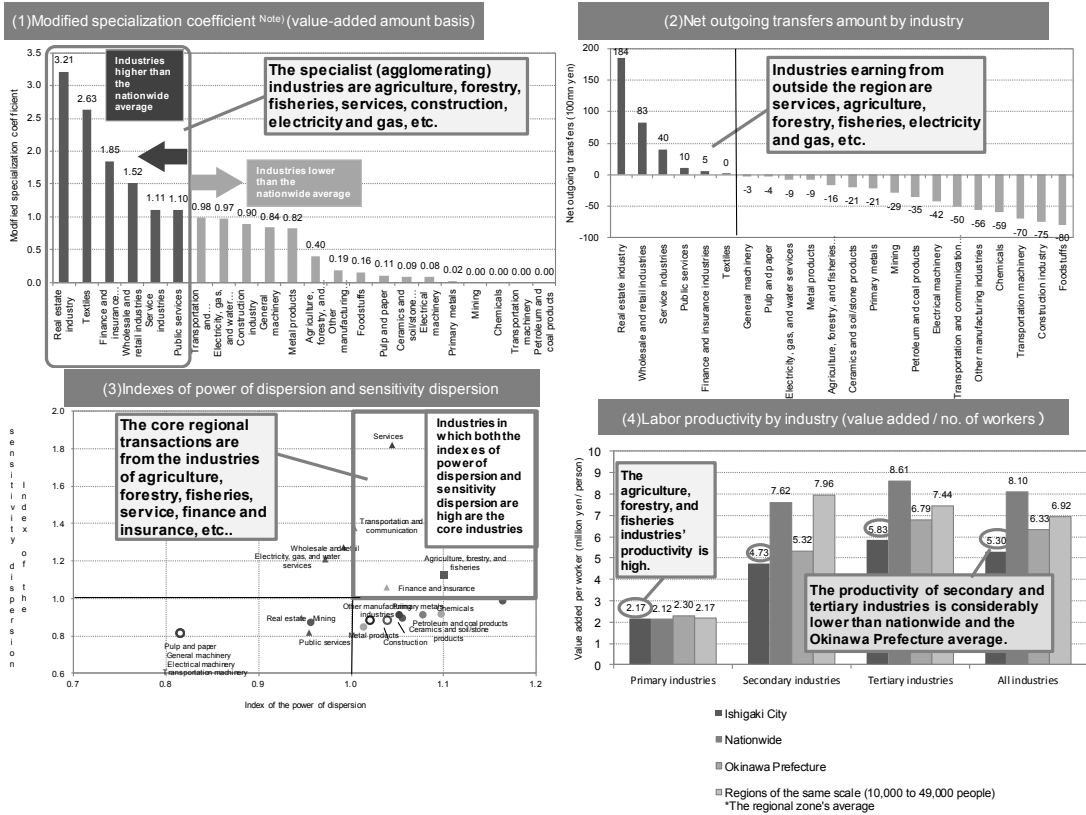
Note: The specialization coefficient, which is obtained by dividing the ratio of added value of the region by industry by the composition rate of the country as a whole, is adjusted based on nationwide imports and exports by industry.

the mechanism that creates this structure is unclear, that is, whether it is "no earning power → many fiscal transfers → outflow of expenditure," or "many fiscal transfers → outflow of expenditure → no earning power." However, as a result, a region with many fiscal transfers becomes a region with low productivity.

V. Conclusion

In this study, to investigate measures for regional revitalization and activation of regional economies and as the mechanism characteristic of regional economies, four viewpoints were enumerated for a region's inflows and outflows of income.

They were then analyzed by combining the three phases of production → distribution → expenditure, and a method for analyzing the regional economic cycle was proposed. Within it, the approach for analyzing the regional economic cycle, the items to be analyzed, and the method for estimating the inflows and outflows of income were shown. The approach for the

analysis was that within the income cycle of production → distribution → expenditure, it is important to ascertain the income from the distribution phase on a dependents basis; it was shown that it is difficult to ascertain this from an analysis that only uses the conventional inter-industry relations table. Next, the items to be analyzed that were consistent with this approach were enumerated, and the method for estimating the inflows and outflows of income, which is the core of an analysis of a regional economic cycle, was shown. The inflows and outflows of income are different in the distribution and expenditure phases because, in the distribution phase, inflows and outflows are seen from a dependents basis, while in the expenditure phase, inflows and outflows are seen from a territories basis when considering the return of income to the production phase.

Then, to apply this study's analytical method to municipalities nationwide, a database was constructed to be used for the analysis of a region's economic cycle. The fiscal-transfer amounts were estimated from the regional accounts calculations on a dependents basis consistent with the totals for all municipalities in the National Accounts calculations, the inter-industry relations table on a territories basis, and in regional accounts calculations from the IS balance formula. As these data were created using a non-survey method, the results of the analysis provide an overview of the regional economy in question.

Next, the data created for the analysis of the regional economic cycle were used, and Japan's regional economies were analyzed. In the production phase, economies of scale appeared the same as for companies. Meanwhile, in the distribution phase, there are fiscal transfers in regions with less than 50,000 people, and in metropolitan areas, employer income is large. As a result, it was understood that income is low in regions with 100,000 to 300,000 people. In the expenditure phase, in the regional area, while the productivity of service industries is high in consumption-inflow regions, this productivity is low compared with that of other industries. In particular, it was found that because the weight of labor-intensive-type service industries, such as the nursing and welfare and accommodation industries, is high in the regional area, this lowers total labor productivity, and local residents' income is also lowered.

Finally, case-study analyses were conducted for Kanazawa City, Toyama region, and Ishigakijima City. The results of these analyses showed the following: Even when an administration actively develops tourism policies and tourism consumption expands, if a regional economic cycle structure has not been constructed, the income from it will not be returned to local residents' income. When the activities of regional companies are few, the income earned in the production phase leaks to outside of the region. In regions where the productivity of manufacturing industries is high, demand for capital investment is great, and capital investment flows into the region. Moreover, it was found that in the regional area, the percentage of fiscal transfers relative to other income is high, and in Ishigaki City, the amount was more than 30% of the income. Thus, applying this study's method of analyzing the regional economic cycle makes it possible to conduct an analysis from a viewpoint that is different from the analyses of regional economies till date.

An issue for research in the future is to refine and create more detailed data for analysis

of the regional economic cycle, which in turn will help obtain more refined analysis results. For this refinement, it will be necessary to incorporate a survey method when creating the data. In particular, when making the data more detailed, increasing the number of industry sectors will make it possible to view the details of the regional area's industries.

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