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Increase in Inbound Tourists and Long-Term Decline of Rural Economy in Japan: A Multi-Regional Computable General Equilibrium Analysis*

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Abstract: Growth in inbound tourism is expected to stimulate the Japanese economy because expenditure incurred by tourists could compensate for the decrease in consumption owing to the country's declining population. This study conducted a simulation analysis using a multi-regional computable general equilibrium model to examine the economic impact of inbound tourists on 47 Japanese prefectural level regions. As inbound tourists visit all the regions, their economy grows in the short term. However, the impact is greater in the urban areas, which receive a higher number of tourists than the rural areas. Moreover, over the long term, people migrate from rural to urban areas where there is higher growth, leading to further growth and commercialization of urban areas. Therefore, rural regions could still suffer even if tourism leads to overall economic growth. For the development of rural regions, it is necessary to attract inbound tourists specifically to these areas.

Keywords: rural economy, economic decline, inbound tourists, spatial spillover effect, labor migration, multi-regional CGE

JEL Codes: R12, Z32

1. INTRODUCTION

1.1. Inbound Tourists and Decreasing Population

Inbound tourism is developing worldwide. Tourist arrivals increased from 0.69 billion in 2003 to 1.46 billion in 2019 (World Tourism Organization (2005, 2020)). The Japanese government started the "Visit Japan" campaign (Japan Tourism Agency, 2016), a tourism promotion project, in 2003. The Japan National Tourism Organization (JNTO) (2021) reported that

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the inbound tourists increased from 5.2 million in 2003 to 31.9 million in 2019 and decreased to 4.1 million in 2020 because of the COVID-19 pandemic.

The economic effects of increased inbound tourism on the nation and different regions–including benefits to industries directly impacted by tourism and indirect spillover benefits to other industries–are garnering attention. Tourists spent 29.2 trillion yen in 2019, resulting in a production spillover effect of 55.8 trillion yen, a value-add spillover of 28.4 trillion yen, and an employment spillover effect of 4.6 million people (Japan Tourism Agency, 2021). The 29.2 trillion yen spent by all tourists included 5.4 trillion yen on inbound tourist travel expenses, 18.4% of the total value consumed by tourists in Japan in 2019. Applying this ratio, the production spillover effect due to the value consumed by inbound tourists was 10.3 trillion yen, the added spillover value was 5.2 trillion yen, and the employment spillover effect was about 839,000 people in 2019.

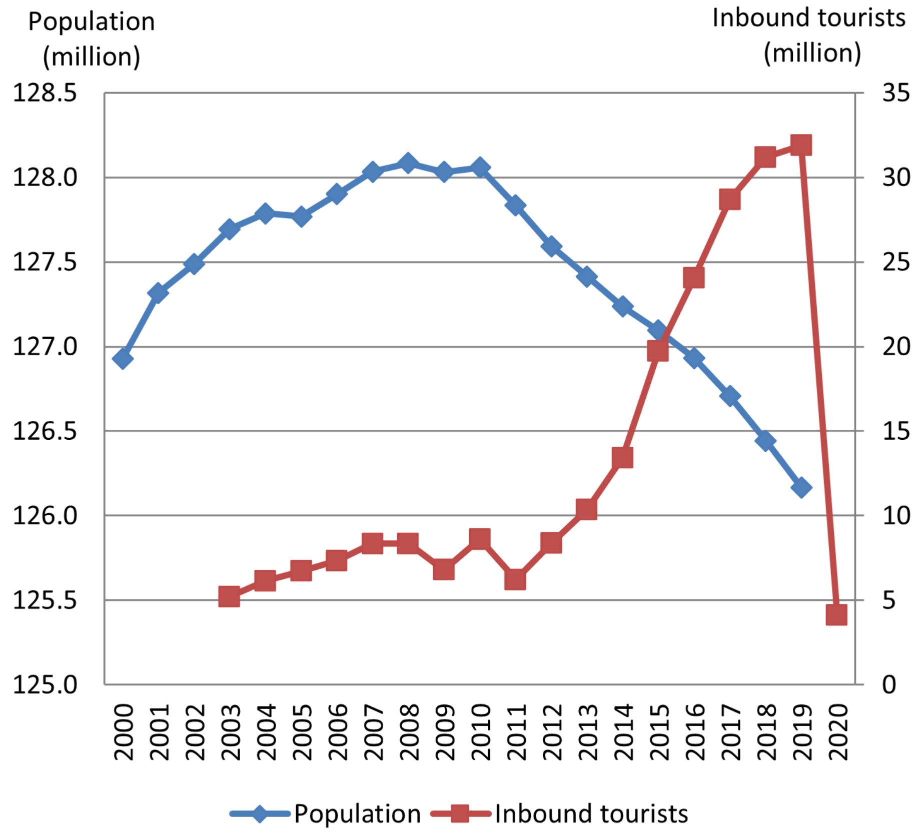
With a declining birthrate and aging population, the Japanese population is exhibiting a declining trend. With more people migrating to the Tokyo Metropolitan Area, the rural population is declining, leading to a fall in rural consumption, thereby impacting the rural economy. Consequently, the local economy wants the consumption from inbound tourists visiting Japan to increase. However, this research uses simulation to show that an increase in inbound tourists can harm the rural economy after an initial boost.

Figure 1 compares the annual variations in Japan's population and the number of inbound tourists; it does not depict a causal relationship between the two. The left vertical axis shows the population, while the right vertical axis shows the number of inbound tourists. Japan's population declined consistently from 128.06 million in 2010 to 126.17 million in 2019, with a sharp decrease of about 0.22%, or 276,000 people, from 2018 to 2019 Statistics Bureau (2019). An increase in consumption by inbound tourists may compensate for the decline in domestic demand and consumption due to this declining population. The Japan Tourism Agency (2014) calculated that the expenditures incurred by ten inbound tourists could compensate for decreases in expenditures caused by a population loss of one individual. Figure 1 presents how the growing number of inbound tourists in Japan contrasts with the recently declining population; despite being affected by the severe acute respiratory syndrome (SARS) outbreak and the Iraq war in 2003, the 2008-09 global financial crisis, the Great East Japan Earthquake in 2011, and the COVID-19 pandemic in 2020.

However, our concern with economic expectations from inbound tourism is that the declining population is not uniform across all 47 prefectures in Japan. Figure 2a illustrates the population of each prefecture in 2010, and Figure 2b shows the population growth from 2010 to 2015. Urban prefectures and their suburbs have experienced a population increase, while most rural prefectures have experienced a severe decline. Table 1 summarizes Figure 2 and shows that while the total population in Japan declined (-0.8%) over these five years, it increased in 8 prefectures and decreased in the remaining 39. As population growth is concentrated in metropolitan areas, the Japanese government aims to redistribute it by revitalizing rural economies. Huang and Zong (2021) demonstrated that population redistribution is a challenge in many countries. Under these conditions, equitable distribution of benefits from inbound tourism among urban and rural individuals has received scholarly attention (Shi et al., 2020)

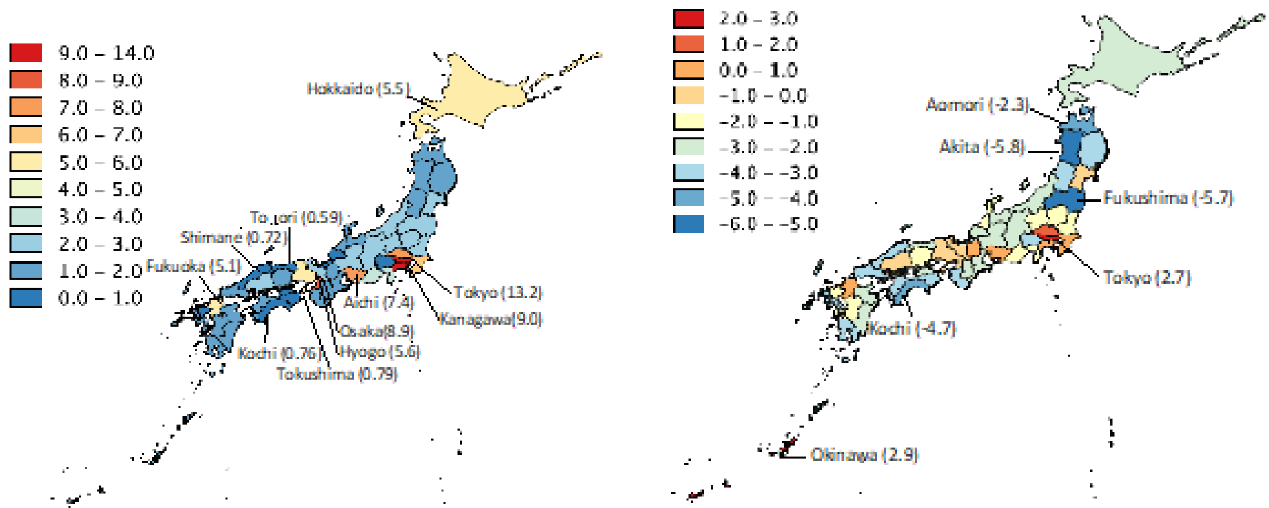
The tourism industry has gained popularity as an economic stimulant for less devel-

Figure 1: Changes in population and inbound tourists in Japan (created using the data from the Statistics Bureau (2019), and the Japan National Tourism Organization (JNTO) (2021))



oped rural areas (Frederick, 1993; Briedenhann and Wickens, 2004); this is applicable in Japan, where the rural population is declining. Wickramasinghe and Naranpanawa (2022) emphasized the importance of computational general equilibrium (CGE) analysis to guide post-COVID tourism research. This study examines the contribution of the increase of inbound tourists to the growth of rural prefectures in Japan, which suffer from economic decline due to decreasing population. One way to analyze the impact of inbound tourism on rural regions would be to model such regions and examine the economic impact there. Another way would be to use a multi-regional model that includes both rural and urban regions. In this study, we used a multi-regional CGE approach to examine the regional economic impact of inbound tourism in Japan during normal times. The COVID-19 period, wherein international and domestic tourism is prohibited in several countries, is a typical example of a non-normal time. Other examples of non-normal times include natural disasters and economic crises, during which tourism decreases, although it is not prohibited.

In this study, we simulated the case where inbound tourists visit and consume in all prefectures in Japan. As a result, the overall Japanese economy may grow, but the economy may decline in rural prefectures. This negative effect on the rural economy, observed in multi-regional CGE analysis, is rare to observe in the input-output (I-O) analysis, which



(a) Population in 2010 (million) **(b)** Population growth from 2010 to 2015 (%)

Figure 2: Japan's population in 2010 and population growth from 2010 to 2015 (created using e-Stat, 2017)

is often used to estimate the economic effect of tourism. Therefore, to understand why the economy of rural prefectures declines despite the increase in consumption by inbound tourists, we conducted a short- to long-term analysis. We found that in the short run, the economy grows in all the rural prefectures. However, in the long run, the economy of the rural prefectures declines due to the migration of labor from the rural prefectures to the urban ones, which receive more tourists and have a more active economy than the rural prefectures.

This study analyzes the economy before the COVID-19 pandemic; however, it provides significant insights into the post-COVID-19 tourism economy. The declining population, aging society, and low birth rate have become serious issues. The economic and demographic gaps between the urban and rural areas still exist, and even though the tourism industry is affected by COVID-19, it will continue to be an important sector for the economy even after the pandemic is over. The capital and large cities will remain major destinations for inbound tourists, while countryside trips may increase. Therefore, the results and implications from

Table 1: Summary of Figure 2

	Population in 2010 (million)	Rate of change from 2010 to 2015 (%)
Japan	128.1	-0.8
Maximum	13.2	2.9
Minimum	0.6	-5.8
Average	2.7	-2
Median	1.7	-2.3
Number of positive	N/A	8
Number of negative	N/A	39

this research will be crucial for the tourism economy even after the COVID-19 pandemic is over.

2. ECONOMIC EFFECTS OF TOURISM

I-O tables, satellite accounts, and social accounting tables are well-known methods for analyzing the tourism industry's influence on national or regional economies (Jones et al., 2003). Witt et al. (2004) conducted an I-O analysis on Denmark to explore the relationship between international tourism and employment. CGE analysis is another method that utilizes an I-O table (Rokicki et al., 2021). Both methods have been compared in several papers (Zhou et al., 1997; Dwyer et al., 2004; Frechtling, 2013). For example, Zhou et al. (1997) compared I-O table analysis to CGE analysis based on the actual values calculated from tourism's impact in Hawaii's economy. Therefore, the economic change rate from the I-O table analysis was larger than that from the CGE analysis. The advantages of CGE analysis are emphasized in Dwyer's studies (Dwyer, 2015; Dywer, 2015).

An important difference between I-O table analysis and CGE analysis is resource availability. In I-O analysis, both demand and its spillover effects are distributed among related industries. Therefore, when demand occurs in a certain industry, positive economic effects appear in other industries. In industries where the benefits of the economic effects are not obtained, the influence could be zero, but would not be negative. Even if there is a negative term in the process of calculation, in most cases, it is positive when calculated with other terms. The original data in the I-O table, however, could contain negative values in some cases.

The assumption that demand could be distributed is based on another assumption that resources are unlimited and supply can adjust to accommodate all demand. As a CGE model employs an I-O table, the spillover effect exists in CGE analysis. However, as the CGE model assumes that resources are constrained, to satisfy the demand in a certain industry, it is necessary to use resources that have not been used or could be utilized in other industries. Therefore, the revitalization of a particular industry may adversely affect other industries; for example, productivity may decline in some industries because of the revitalization of the tourism industry (Inchausti-Sintes, 2015). However, the aggregate economy would grow with the revitalization of some industries, even if other industries are affected. It should be noted that the negative effect could occur in industry due to the revitalization of any other industry; for example, Pham et al. (2015) showed that the tourism industry may have declined in Australia because of the revitalization of mining.

In their CGE analysis of the one-region model, Burnett et al. (2007) pointed out that tourism-driven migration and commuting are responsible for the revitalization of small cities. They analyzed cases where the local population exogenously increased. However, as migration to a certain area is a population outflow from other areas, we should also analyze the source regions.

While inbound tourists in Japan visit all prefectures, there is a bias toward urban prefectures such as Tokyo, Chiba, Osaka, and Kyoto (Figure 3 and Table 3). Inbound tourism to a certain prefecture affects other prefectures' economies through spatial spillover effects

Jiao et al. (2019); Kim et al. (2021), such as an increase in trade of input goods among prefectures. We can use the interregional I-O table to capture the economic effects among regions. As one regional I-O analysis would not capture the spatial spillover effects, there is a downward bias compared to the interregional I-O analysis (Fleischer and Freeman, 1997).

Figure 3: Visiting probability of inbound tourists by prefecture in 2015 (%) (Japan Tourism Agency, 2015)

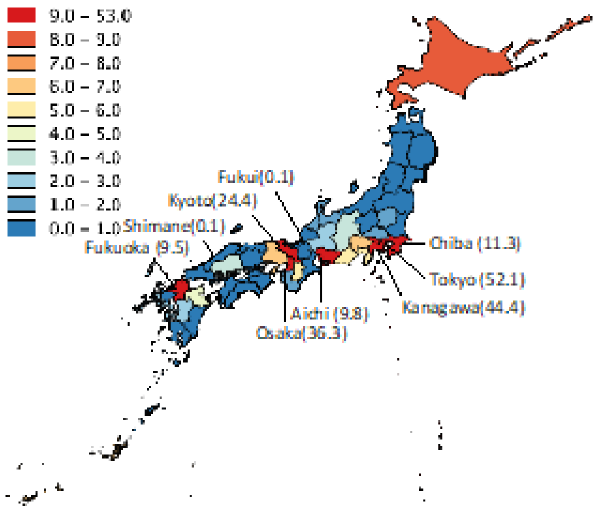


Table 2: Summary of Figure 3

	Visiting probability (%)
Maximum	52.1
Minimum	0.1
Average	5.6
Median	1.2

As in the case of industries, another prefecture may also decline when a certain prefecture is activated. In the case of industries, some industries may gain direct or indirect benefits while others may not benefit at all. However, in the case of tourism, as inbound tourists visit all prefectures, every prefecture benefits through direct and indirect effects. Yet, only a few prior studies have investigated the impact of inbound tourists in multiple regions together. In their multi-regional analysis based on China, Yang and Li (2020) found that inbound tourists paid great attention to high-speed rail, which had a significant influence on regional tourism revenues. In the tourism field, the differences in the influence of inbound tourists across regional economies have not received sufficient attention, especially the fact that inbound tourism might lead to a decline in economic activity in some regions. Multi-regional CGE models can be used for such an analysis.

The economic effects of inbound tourism using the multi-regional CGE model have not been studied extensively. Adams and Parmenter (1995) noted that in Queensland, Australia, agriculture, mining, and traditional export sectors were crowded out by the activation of international tourism, with Queensland set to be a net loser from the tourism boom. However, although this research is important for introducing multiple regions, the main discussion centers on industries. Thus, there is a lack of a discussion on regional impacts.

Dwyer et al. (2003) conducted various simulation analyses using a CGE model of two regions in Australia–New South Wales (NSW) and the rest of Australia–and showed that if expenditure by inbound tourists increased only in NSW, the economy of the rest of Australia would decline. However, the study makes an extreme and unrealistic assumption that the total number of workers in two regions is constant–it is self-evident that as workers increase in one region, they decrease in another. If the inbound tourists increase in both regions, both economies grow. Dwyer et al. (2003) also emphasized the industrial structure modeling, although they incorporated multiple regions. However, their discussions on the results were limited and their explanations insufficient.

As policymakers pay more attention to tourism, assessments of the economy-wide impact are needed. The CGE approach is suitable. Wickramasinghe and Naranpanawa (2022) and Inchausti-Sintes (2015) reviewed recent CGE studies, most of which analyze spillover among industries. Other studies analyzed external impacts on tourism, such as climate change (Berrittella et al., 2006), bombing (Pambudi et al., 2009), and high-speed rail (Hiramatsu, 2018). Furthermore, Pratt (2013) surveyed broad topics in tourism studied by CGE, that is, generic tourism booms and busts, tourism and trade, tourism, taxation and disasters, special events, inter-industry modelling, and environmental and energy accounts. Additionally, most previous studies are single-region models and do not address spatial spillover effects. This study, therefore, analyzes the regional economic effects of inbound tourism in Japan using a multi-regional CGE model covering 47 prefectures.

3. MODEL

3.1. Consumers and Inbound Tourists

3.1.1. Consumers

The consumption of inbound tourists can be categorized as exports. However, inbound tourists make overseas trips to consume goods that cannot be traded (Zeng and Zhu, 2011). Thus, in this research, the consumption of inbound tourists is treated as increased demand in each prefecture. To analyze tourism in Japan, we modified Anas and Liu's (2007) model by incorporating the tourism industry and inbound tourist consumption patterns. In the simulation, each prefecture in Japan is treated as one region.

Consumers choose a working or non-working status e, residential prefecture i, working prefecture j, and housing type (single- or multiple-family housing) k, considering the attainable utility level under these choices. Conditional on these choices, they maximize utility by choosing daily consumption goods purchased in residential prefectures X_{eijk}, living spaces B_{eijk}, domestic tourism consumption goods purchased by visiting each prefecture $Z_{z|eijk}$, and leisure time H_{eijk}. The utility is defined as a CES utility function.

$$U_{eijk} = (\frac{1}{\sigma_i}) \ln\left(\alpha_{ei} X_{eijk}^{\sigma_i} + \beta_{ei} B_{eijk}^{\sigma_i} + \kappa_{ei} \underbrace{\left(\sum_z \iota_{eijz} Z_{z|eijk}^{\eta_i} \right)^{\frac{\sigma_i}{\eta_i}}}_{Z_{eijk}^{\sigma_i}} + \chi_{ei} H_{eijk}^{\sigma_i} \right)$$

The composite domestic tourism consumption goods Z_{eijk} are purchased in all prefectures, including residential prefectures. Consumers love destination variety in tourism.[1] It takes a sub-CES utility function of $Z_{z|eijk}$, the domestic tourism consumption goods at destination z. Here, α_{ei}, β_{ei}, κ_{ei}, χ_{ei}, and ι_{eijz} are weights.

Regarding unit prices, the daily consumption goods price ψ_{ij} and the domestic tourism consumption goods price φ_{ijz} include transportation costs. The housing rent is r_{ik}, and the time value is the wage w_j. The disposable income is the total income minus the cost of commuting.

$$\Psi_{eij} = \psi_{ij} X_{eijk} + r_{ik} B_{eijk} + \sum_z \varphi_{ijz} Z_{z|eijk} + w_j H_{eijk}$$

The annual time constraint consists of the given time $\bar{H}$, commuting time G_{ij}, the number of working days d, time to purchase one unit of daily consumption goods G_{ii}, and domestic tourism consumption goods G_{iz}. It has the parameters c_i and f_{iz} for the number of trips made to purchase a unit of daily consumption goods and domestic tourism consumption goods. The remaining time is considered as working hours.

$$\bar{H} - dG_{ij} - c_i X_{eijk} G_{ii} - \sum_z f_{iz} Z_{z|eijk} G_{iz} - H_{eijk} \geq 0$$

3.1.2. Inbound tourists

Inbound tourists are assumed to affect this economy through expenditure on inbound tourism consumption goods. They visit prefecture z, expend a constant value of money M_z^{inb}, and consume tourism consumption goods Z_z^{inb}. Expenditure is calculated by multiplying the average expenditure by inbound tourists m_z^{inb} and the number of annual inbound tourists n^{inb}, M_z^{inb}=$n^{inb} m_z^{inb}$. Here, m_z^{inb} and n^{inb} are exogenous. To simulate the increase of inbound tourists, n^{inb} is changed. This leads to the change in m_z^{inb} and effects on the Japanese economy. As the price of the inbound tourism consumption goods $p_{z\bar{r}}$ is decided endogenously, the annual demand of inbound tourism consumption goods of inbound tourists in each prefecture is obtained by dividing the consumption amount by the price, $Z_z^{inb} = M_z^{inb}/p_{z\bar{r}}$.

[1] Adachi (2018) showed that the number of genres that a destination offers affects its consideration as a tourist destination.

3.2. Producer

3.2.1. Basic Industries

The producers of industry r in prefecture j produce goods at a minimum cost to meet the demand. The industries are basic industries (i.e., agriculture, manufacturing, and service), final goods industries (i.e., daily consumption goods, domestic tourism consumption goods, and inbound tourism consumption goods), and construction industries. Their inputs include intermediate goods produced by the industry s of prefecture n, Y_{snrj}, labor input L_{rj}, building input B_{rj}, and capital input K_{rj}. Their unit prices are the prices of the intermediate goods, including its delivery cost ξ_{snrj}, wage rate w_j, rent r_{rj}, and interest rate i_{rj}. The cost function is as follows:

$$\sum_{s,n} \xi_{snrj} Y_{snrj} + w_j L_{rj} + r_{rj} B_{rj} + \rho K_{rj}$$

Production is expressed by the CES production function. The composite intermediate input goods take a sub-CES production function.

$$X_{rj} = A_{rj} \left(\gamma_{rj} \left(\sum_{s,n} \upsilon_{snrj} Y_{snrj}^{\epsilon_r} \right)^{\frac{\zeta_r}{\epsilon_r}} + \delta_{rj} L_{rj}^{\zeta_r} + \mu_{rj} B_{rj}^{\zeta_r} + \nu_{rj} K_{rj}^{\zeta_r} \right)^{\frac{1}{\zeta_r}}$$

In this equation, A_{rj} is productivity, and γ_{rj}, δ_{rj}, μ_{rj}, ν_{rj}, and υ_{snrj} are weights. The final goods are produced from intermediate goods. This production function is based on inter-regional input-output table, where intermediate inputs Y_{snrj} flow from industry s in prefecture n to receiving industry r in prefecture j.

3.2.2. Developer

Land in each prefecture can be utilized for residents (single- or multiple-family housing) for consumers or businesses (agricultural land, manufacturing factories, or offices) for producers.

Buildings that are in high demand are constructed on vacant land while buildings that are in low demand are demolished by the developer. They gain the value of constructing type k buildings Π_{i0k}, and the value of demolishing type k buildings Π_{ik0}. The probability that developers will construct the stock is:

$$Q_{i0k} = \frac{\exp(\Phi_{i0}\Pi_{i0k})}{\exp(\Phi_{i0}\Pi_{i00}) + \sum_{s=1}^{\aleph} \exp(\Phi_{i0}\Pi_{i0s})}$$

and demolish is

$$Q_{ik0} = \frac{\exp(\Phi_{ik}\Pi_{ik0})}{\exp(\Phi_{ik}\Pi_{ik0}) + \exp(\Phi_{ik}\Pi_{ikk})}$$

where Φ_{i0} and Φ_{ik} are dispersion parameters.

3.3. General Equilibrium

In the final goods market of each prefecture, the demand for goods of daily consumption, domestic tourism consumption, and inbound tourism consumption was consistent with their supply. The government sector, which includes consumption and tax, and investment are out of the scope of this study. These are exogenous or not included in the model. In the intermediate goods market of each prefecture, demand and supply were consistent, where the demand for intermediate goods was aggregated across industries and prefectures. In these goods markets, international exports and imports are exogenous. In the labor market of each prefecture, the labor supply, that is, the total labor hours of commuters from prefectures, was consistent with the total labor demanded by industries in each prefecture. In the land market of each prefecture, the supplied space of each land-use type was consistent with the space demanded by households and producers in each prefecture.

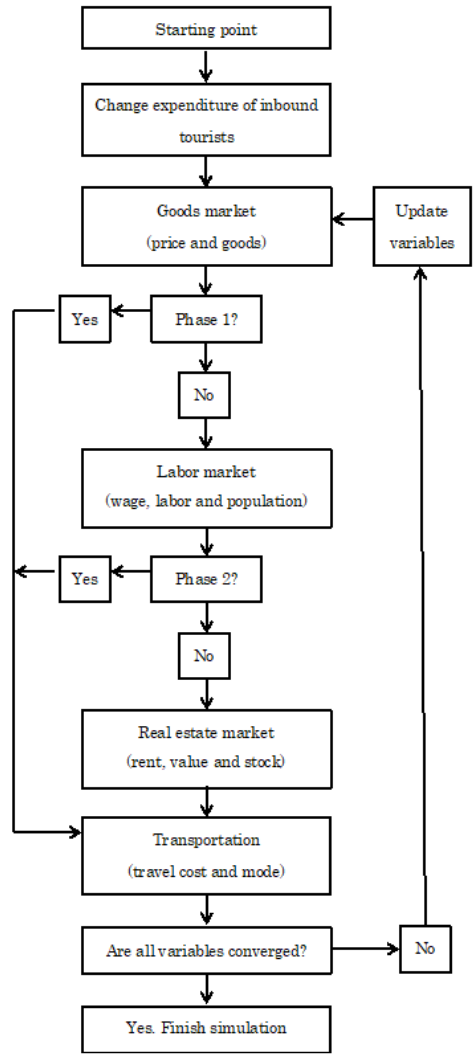
While three kinds of markets are cleared in the general equilibrium, it is possible to adjust one (partial equilibrium) or more independently, keeping other markets constant. In the simulation where there is a time gap in the impact of increased inbound tourists, the goods market that reacts immediately to consumption by increased inbound tourists is adjusted. Then, the labor market follows and migration occurs because firms increase labor input. In the simulation, the labor market is adjusted and the goods market is re-adjusted together. In the end, floor space demand changes, and developers construct/demolish building stocks to match the floor space demand. To simulate this general equilibrium, three markets are adjusted together in the simulation.

Figure 4 shows the flow of the simulation. Section 5.1 simulates the cases where the inbound tourists increase (for 15, 30, 45, and 60 million), and Section 5.2 simulates the cases where the inbound tourists increase for 30 million in different phases (from phase 1 to 3). To simulate the different phases, the goods markets change in Phase 1, goods and labor markets change in Phase 2, and all markets change in Phase 3. The markets that do not change in each phase are kept constant. When the number of inbound tourists increased to 30 million, as seen in Section 5.1, it is the same as the simulation in Phase 3, as seen in Section 5.2. The simulation converges when the variables in each market (i.e., prices and goods quantity in the goods market, wages and labor hours in the labor market, rent, and values and stock amount in the real estate market) and other variables such as population changes less than 0.0001. Simulation when the inbound tourism increases show the change from the base, which is calibrated from the data set. Hence, the result is a reasonably realistic equilibrium from the data and current model settings. However, the other equilibrium may exist, which could be another realistic or unrealistic equilibrium. It is difficult to prove the uniqueness of equilibrium as in many CGE models.

4. DATA

The model was calibrated using data from the Ministry of Land, Infrastructure, Transport and Tourism (2020) and data on the origin and destination of trips, travel modes, traveling

Figure 4: Flow chart to simulate the increased inbound tourist by phases.



time, and monetary cost by prefecture from the Statistics Bureau (2010b). The data on employment and residential places were also sourced from the Statistics Bureau (2011), on consumption behavior, including sightseeing, from the Statistics Bureau (2010a,d,c), and on production behavior from the I-O table of each prefecture in 2005. The number of inbound tourists in Japan, expenditure per inbound tourist, and proportion of expenditure attributed to each industry were gathered from the Japan Tourism Agency (2010a,b, 2015) and Japan National Tourism Organization (2016).

To make the simulation result realistic, the elasticities were calibrated based on the information obtained from studies set in Japan. The elasticity of work or non-work choice with respect to wage disposable income was set at 0.02, referring to Araki (2015); the elasticity of workplace location choice with respect to wage disposable income was set at 0.3, referring to Asada and Takuma (2013) and Ota and Okusa (1996); the elasticity of residential location choice with respect to rent was set at -0.2, referring to Asada and Takuma (2013) and Nakamura (1994b); the elasticity of land use with respect to stock value was set at 0.15, referring to Nakamura (1994a); the elasticity of stock occupancy with respect to rent was set at 0.75, referring to Nakamura (1994b); and the elasticity of transportation mode choice with respect to travel cost was set at -1.5, referring to Koike (2011).

5. SIMULATION OF INBOUND TOURISM

5.1. Growth of the Japanese Economy through Inbound Tourism

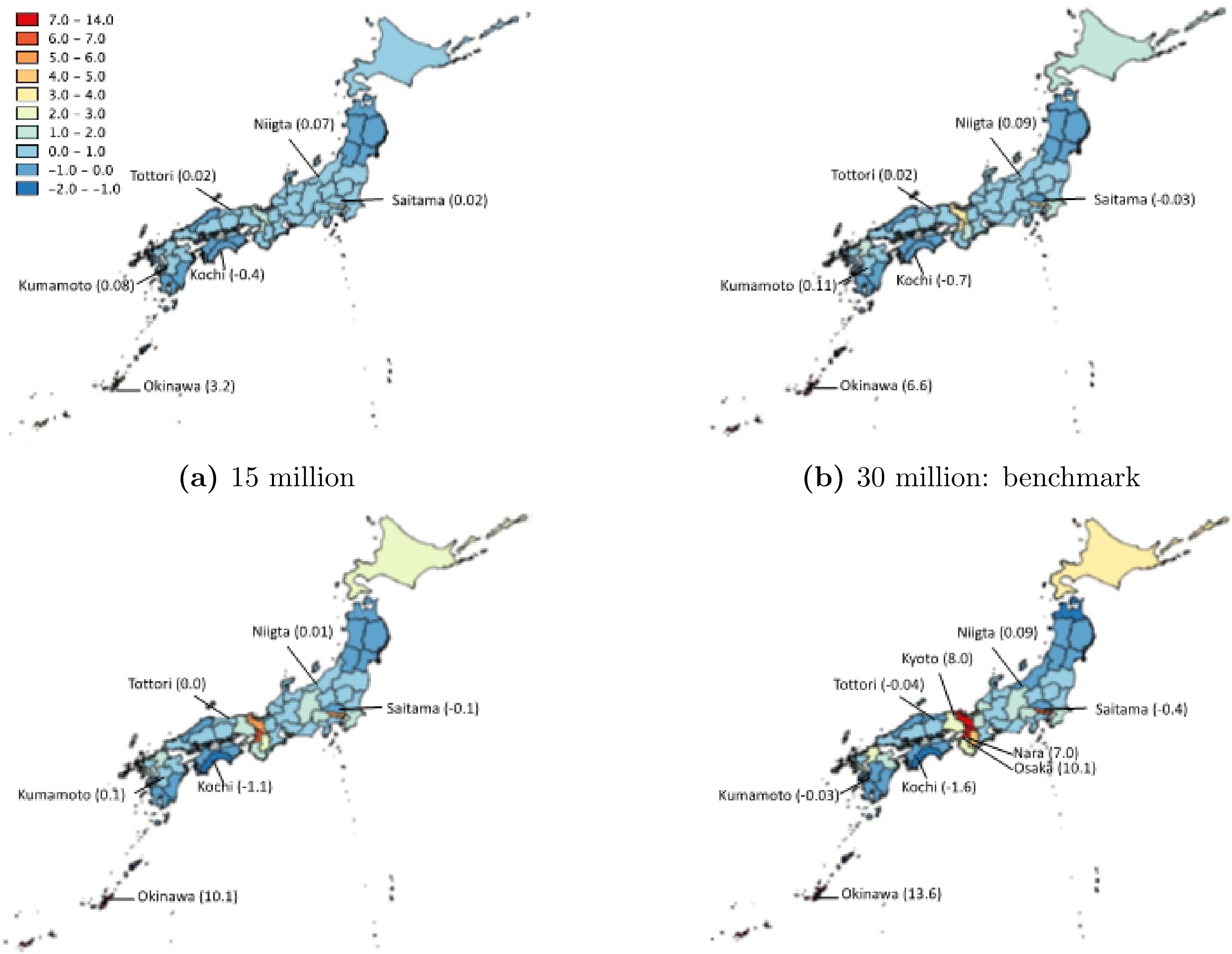
According to the Japan Tourism Agency (2015), travel expenditure per inbound tourist was 176,168 yen (including domestic revenue in package tour participation fees), and the annual travel expenditure by inbound tourists was 3,477 billion yen in 2015. This study calculated 112,010 yen to be the expenditure per inbound tourist based on the expenditure in each prefecture. The additional 30 million inbound tourists are treated as the benchmark case in the analysis, and the 8.612 million inbound tourists in 2010 are set as the base. The number of inbound tourists is proportional to the total expenditure–the total expenditure from an additional 30 million inbound tourists is 3.36 trillion yen; if the inbound tourists increase, the Japanese economy will be revitalized, and production will increase. As inbound tourists visit all prefectures, economic growth is expected in all prefectures. In particular, growth expectations are high in the rural prefectures, where the economy has been declining because of the diminishing population. However, the increase in inbound tourists is high in urban areas and low in rural prefectures (Figure 3). To analyze the impact of this difference, simulation analysis is conducted by changing the number of inbound tourists n^{inb}.

Figure 5 and columns 2–5 of Table 3 present the prefectural growth rates of production value of final goods corresponding to a different number of additional inbound tourists. It demonstrates a growth in the Japanese economy as the number of inbound tourists increases; for instance, it increases by 1% for an additional 30 million inbound tourists. However, the prefectural growth rate ranges from -0.7% in Kochi to 6.6% in Okinawa. The prefectures, where the number of inbound tourists is relatively large compared to the size of the regional economy, show higher growth rates than that of the Japanese economy. Twelve prefectures in rural areas experienced negative growth rates (see the "number of negatives" in columns 2–5 of Table 3). Although this research uses actual data to reflect a realistic estimation of visits, the decline in rural economies still happens. This is true even with the unrealistic assumption in Dwyer et al. (2003) study where inbound tourists increase only in one area.

Table 3: Summary of Figure 5

	Growth rate from the base (%)				Growth rate from the previous phase (%)		
Number of extra inbound tourists (million)	15	30	45	60	15-30	30-45	45-60
Japan	0.5	1	1.6	2.2	0.5	0.6	0.6
Maximum	3.2	6.6	10.1	13.6	3.3	3.3	4
Minimum	-0.4	-0.7	-1.1	-1.6	-0.4	-0.4	-0.4
Average	0.3	0.6	1	1.3	0.3	0.3	0.3
Median	0.2	0.3	0.4	0.5	0.1	0.1	0
Number of positives	36	35	35	32	34	30	25
Number of negatives	11	12	12	15	13	17	22

Columns 6–8 of Table 3 show the production value growth rates when inbound tourists



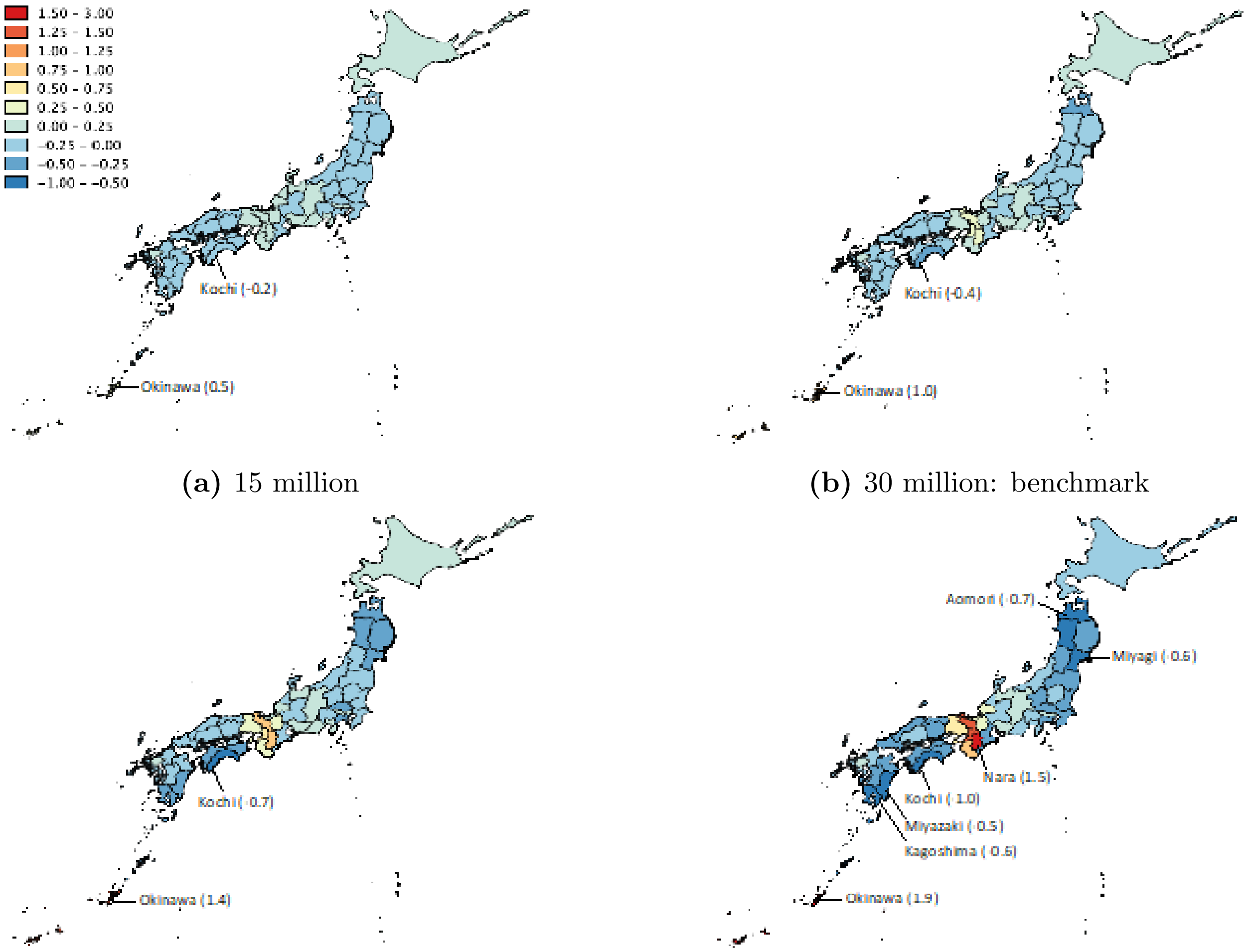
(a) 15 million **(b)** 30 million: benchmark

(c) 45 million **(d)** 60 million

Figure 5: Prefectural growth rates of production value corresponding to different numbers of additional inbound tourists (%)

increase by 15 million. In some prefectures, the production value grows when the number of inbound tourists is small. However, it starts to decrease when the number of inbound tourists becomes large. As the number of additional inbound tourists increases by 15 million (from 45 million to 60 million), production value decreases in 22 prefectures (see the "number of negative" in columns 6–8 of Table 3). A typical example is Saitama, where the production value grows 0.02% when the inbound tourists increase by 15 million (Figure 5[a]). However, it becomes -0.03%, -0.1%, and -0.4% when the number of inbound tourists increases by 30 million, 45 million, and 60 million, respectively (Figures 4[b], 4[c], and 4[d]). This implies that the influence of inbound tourists can be both positive and negative; the dominant effects could be reversed as the inbound tourists increases.

This may be because while the small number of inbound tourists leads to employment and economic revitalization in an area, the effect of population outflow becomes progressively more significant with a further increase in tourism. This is because people migrate from areas that are less active in tourist movement to those that are more active; this happens even



(a) 15 million

(b) 30 million: benchmark

(c) 45 million

(d) 60 million

Figure 6: Rate of change in the population after accounting for additional inbound tourists by prefecture (%)

when both areas are more active than before. We can confirm this migration by analyzing Figure 6 and Table 4. Comparing Figures 4 and 5, we can see a correlation tendency between the growth in production value and population migration.

Figure 7 shows the relation between the share of inbound tourists among prefectures in 2012 and the percentage change in population share among prefectures from 2012 to 2015. Although the economic environment changed during this period, impacting population growth, we assumed these factors to remain constant while undertaking the simulation analysis, as it is beyond the scope of the current study.

Figure 8 shows the rate of change in welfare in Japan with an increase in inbound tourists. It is evaluated based on the inclusive value of consumers' choice, expressed by the nested multinomial logit function for the model structure. As additional inbound tourists increase, the rate of welfare increases for workers and decreases for non-workers. However, the overall welfare increases only marginally.

Table 4: Summary of Figure 6

	Growth rate from the base (%)				Growth rate from the previous phase (%)		
Number of extra inbound tourists (million)	15	30	45	60	15-30	30-45	45-60
Japan	0	0	0	0	0	0	0
Maximum	0.5	1	1.4	1.9	0.5	0.5	0.7
Minimum	-0.2	-0.4	-0.7	-1	-0.2	-0.3	-0.3
Average	0	0	0	-0.1	0	0	0
Median	0	-0.1	-0.2	-0.3	-0.1	-0.1	-0.1
Number of positives	16	15	15	13	15	13	9
Number of negatives	31	32	32	34	32	34	38

5.2. Growth Rate of Production Value by Phase

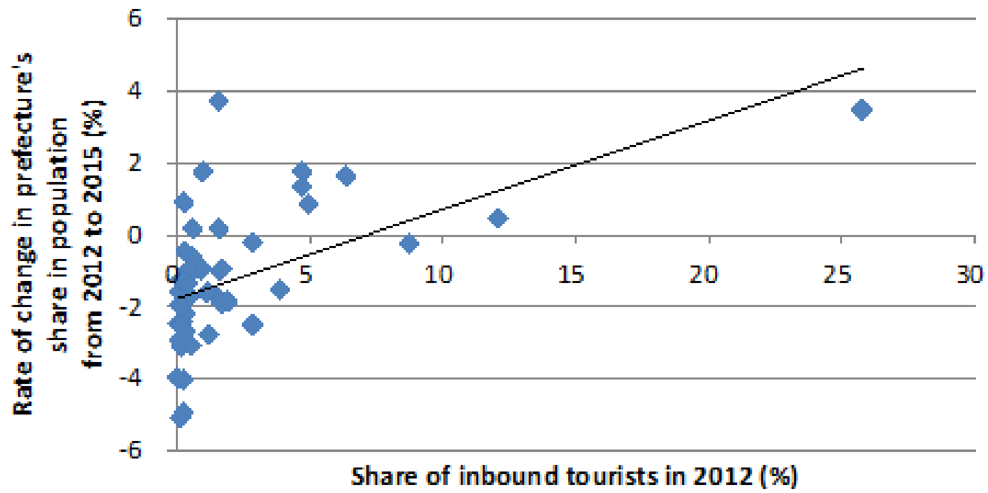
We expected all prefectures to grow as inbound tourists spend money in all prefectures. However, the economies of some prefectures declined in the long-run general equilibrium (Figure 5). If consumption by inbound tourists can be a remedy for a regional economy, it could have some "side effects" as well. The suspected causes of these side effects are explored in this section. The most intuitive analysis would be looking at the time axis to check when production value decreases with increased demand from inbound tourists. Blake et al. (2006) analyzed the economic impact of tourism on the regional economy from short- to long-run by CGE. Markets react to economic environmental change at different paces. To clarify the spatial spillover effect, we divide the time axis into three phases: when the goods market is adjusted (phase 1) in the short run, the variables in the labor market and land market are kept constant because these markets cannot react immediately. When the labor market, including migration (phase 2), is adjusted with the goods market to respond to the change in demands, the variables in the land market are kept constant. In the end, the land market is also adjusted with the goods and labor markets when land use is adjusted in the long run, that is general equilibrium (phase 3).

5.2.1. Growth of Production Value of Prefectures by Phase

In phase 1, we added the expenditure made by inbound tourists, and the goods market was adjusted to this shock. To increase the supply to meet the increased demand, the producers of final goods increased the demand for intermediate goods. This is partly like the I-O analysis idea, although not entirely the same. In this phase, the production value may decrease because consumers' demand changes and the intermediate goods markets are readjusted. However, as the expenditure of inbound tourists is added in all prefectures, it is unlikely to decrease the production value. As only the goods markets are adjusted in phase 1, other intermediate inputs (labor, land or buildings, and capital inputs) are not changed. Figure 9 and Table 5 show the growth rate of production value for each of these phases. No prefecture has experienced negative growth. In particular, the growth rate tends to be high in prefectures where inbound tourists' expenditures are relatively large compared to the production value.

Thus, in phase 1, even if there is little consumption by inbound tourists in a prefecture, an increase in direct production value will occur. However, if no inbound tourists are visiting a certain prefecture, the change in the demand for final goods will be zero. Meanwhile,

Figure 7: Share of inbound tourists in 2012 and the rate of change in the prefecture's share of the population from 2012 to 2015 (created using e-Stat)



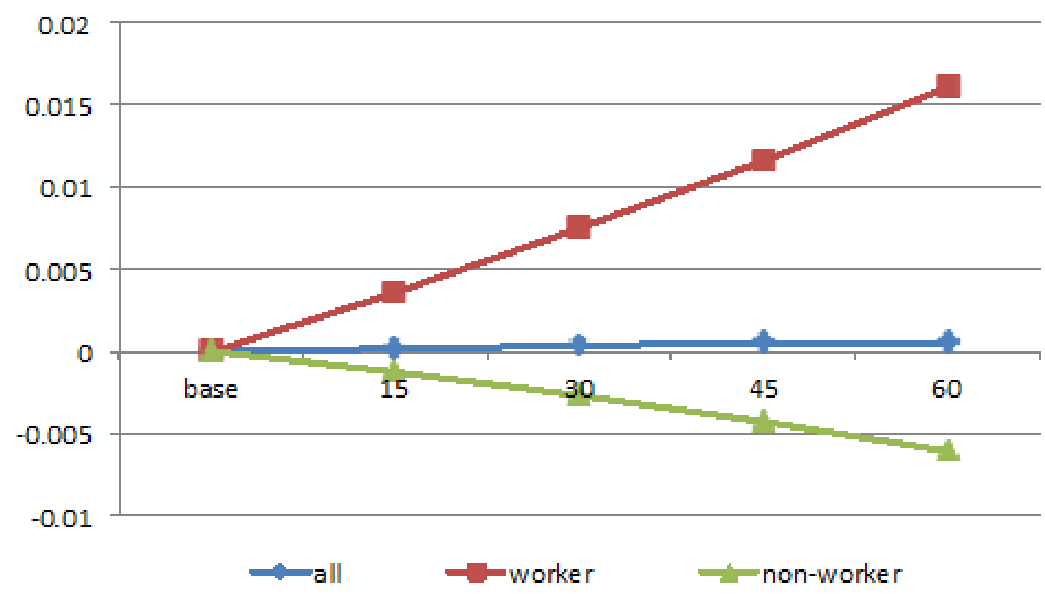
Source: e-Stat. https://www.e-stat.go.jp/

this demand increases in other prefectures due to inbound tourists. Producers in these prefectures demand more intermediate goods from inside and outside the prefecture to satisfy the increased final goods demand. Therefore, even in the prefecture not visited by inbound tourists, the intermediate goods demand will increase as a spatial spillover effect, and the production value in the prefecture can also increase.

In phase 2, in addition to the goods market, the labor market is in equilibrium. To increase the supply, the producers demand more labor as an intermediate input. Then, the unemployed enter the labor market, and the working population of prefectures increases. The labor demand increases significantly in prefectures where more inbound tourists invigorate the economy. However, the labor demand increases only slightly in other prefectures. This gap leads workers to migrate in search of employment. In prefectures where labor and residents have increased, the economy is further activated because of the increase in production and consumption for the migrants; the opposite happens in prefectures from which workers migrate. Despite the increase in consumption by inbound tourists in these prefectures, the demand for final goods could decrease owing to the reduced population. In phase 2 (Figure 9), Kochi prefecture had a production value smaller than the base (-0.08%). As per Table 5 (columns 5 and 6), the production value in most prefectures grew more than it did in Phase 1. The exceptions are Aomori and Kochi, which witnessed a gradual decrease in production value from Phase 1 to Phase 2.

Phase 3 indicates a general equilibrium. The land market, in addition to all the other markets, is in equilibrium, and buildings are reconstructed, and land use changes. Buildings for production may be demolished to increase the housing supply in prefectures where the population has increased. Residential buildings may be torn down in prefectures where the production value has increased so that more land may be made available for producing

Figure 8: Rate of change in Japan's welfare (%)



goods. Thus, the production value may further increase for land use modification, leading to further adjustments in the goods and labor markets. However, in prefectures where the population declined, various stocks could be demolished. As shown in phase 3 in Figure 9, some prefectures showed negative growth from the base case. As per Table 5 (columns 2–4), 12 prefectures showed a negative growth compared to the base case, and 28 prefectures showed a negative growth from phase 2 to phase 3.

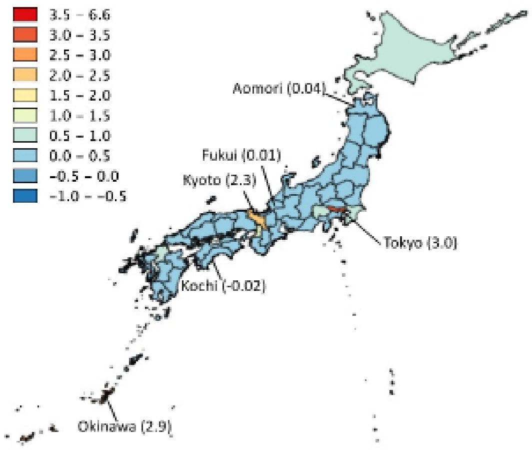
Table 5: Summary of Figure 9

	Growth rate from the base (%)			Growth rate from the previous phase (%)	
	Phase 1: Goods M.	Phase 2: Labor M.	Phase 3: G. E.	Phase 1-2	Phase 2-3
Japan	0.6	0.9	1	0.2	0.2
Maximum	3	4.5	6.6	1.6	2
Minimum	0.01	-0.08	-0.7	-0.1	-0.7
Average	0.4	0.6	0.7	0.2	0.1
Median	0.1	0.3	0.3	0.2	-0.1
Number of positives	47	46	35	45	19
Number of negatives	0	1	12	2	28

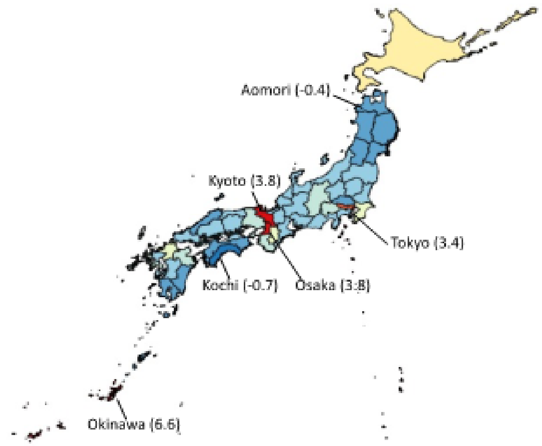
5.2.2. Migration in Prefectures by Phase

The population migration factor

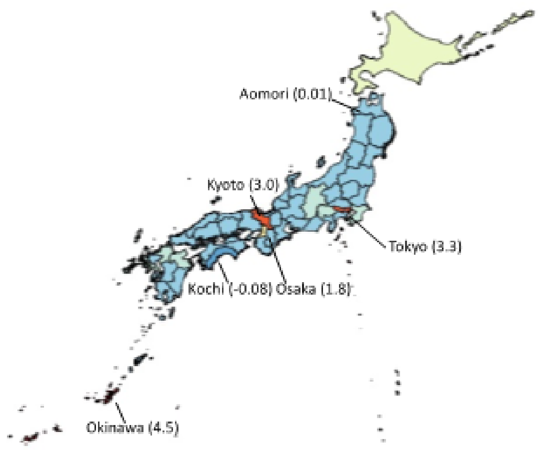
In considering the population migration factor, the changes in population and employment in each prefecture were analyzed. Population change directly affects the final demand. In Kochi, the production value decreased in phase 2 due to the labor market clearing. In



(a) Phase 1: Goods market



(b) Phase 2: Labor market



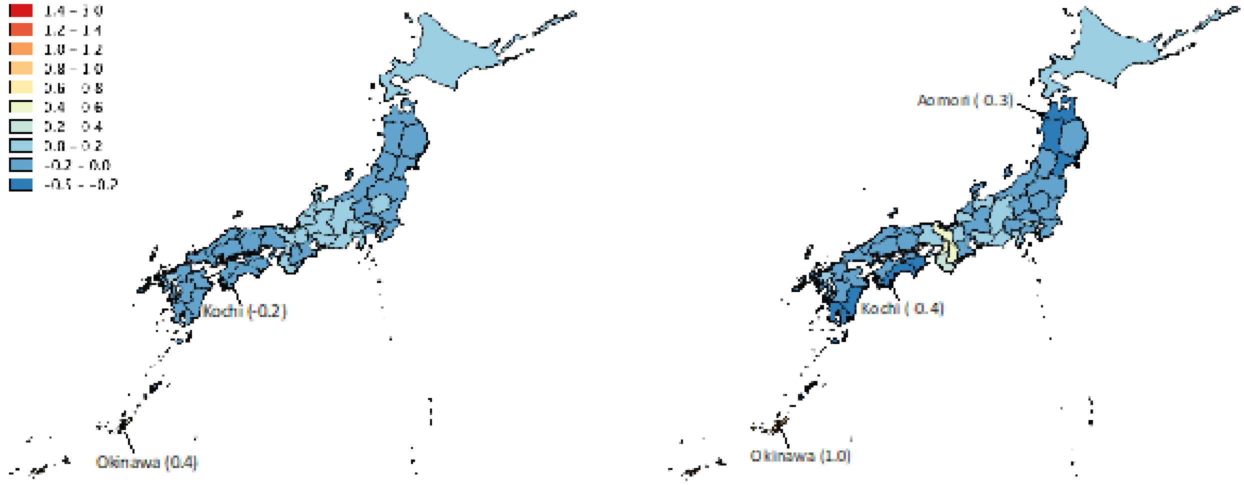
(c) Phase 3: General equilibrium

Figure 9: The growth rate of production value by phase (%)

that prefecture, the negative impact of a decrease in consumption by residents exceeded the positive impact of expenditure by inbound tourists. Changes in population and labor showed a strong relationship with consumption by phase.

Change in the population of prefectures is explained by migration because Japan's population is kept constant in the simulation. Figure 10 shows the percentage change by phase in the prefecture population. Table 6 shows the number of prefectures that negatively grew, from the base of 30. The Kochi prefecture, where there was a reduction in the production value, witnessed the greatest population decrease (-0.2%).

Table 6 shows that 32 prefectures grew negatively from the base in phase 3. Production value declined in 12 prefectures (Table 5). Moreover, the population declined in all prefectures where production value decreased. From phase 2 to phase 3, 36 prefectures exhibited negative growth. The production value was directly affected by population change through migration. Thus, the migration of the population from rural prefectures owing to increased inbound tourism was not desirable for revitalizing the rural economy.



(a) Phase 2: Labor market **(b)** Phase 3: General equilibrium

Figure 10: Rate of change in population by phase (%)

Work type and labor migration factor

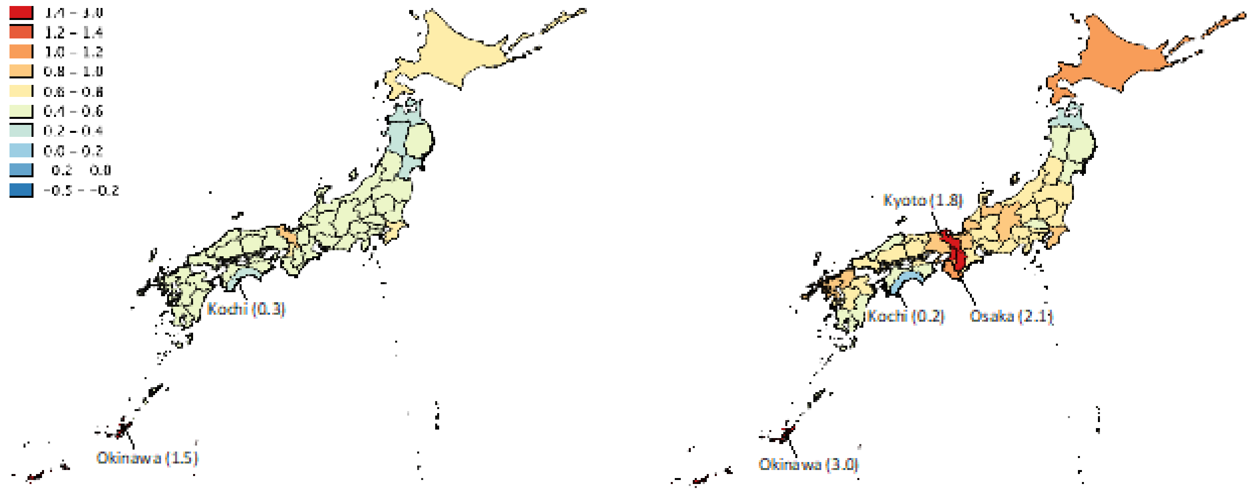
The aggregate number of jobs is endogenous, contrary to the aggregate population that is fixed. Even so, a discussion analogous to that surrounding change in population applies to change in jobs. Figure 11 shows the percentage change in jobs by phase. Table 7 demonstrates that the number of negative growth prefectures is zero compared to the base case in phases 2 and 3. This situation occurred because the employment rate increased even in prefectures where the population decreased. It was linked with the employment rate of the surrounding prefectures and the commuting rates to and from these prefectures. Kochi (-0.1%) is the only prefecture that experienced negative growth from Phase 2 to Phase 3.

5.2.3. Modification in Land Use in Prefectures by Phase

In phase 3, considering the land-use modification factor, change in building construction and demolition in each prefecture was analyzed. Changes in land use also affected job location

Table 6: Summary of Figure 10

	Growth rate from the base (%)		Growth rate from the previous phase (%)
	Phase 2 Labor	Phase 3 G. E.	Phase 2-3
Japan	0	0	0
Maximum	0.4	1	0.5
Minimum	-0.2	-0.4	0.3
Average	0	0	0
Median	0	-0.1	0.1
Number of positives	17	15	11
Number of negatives	30	32	36



(a) Phase 2: Labor market **(b)** Phase 3: General equilibrium

Figure 11: Rate of change in jobs by phase (%)

and population migration. For example, more people could inhabit a prefecture if houses were constructed. It should be noted that the growth in Osaka took place principally in phase 3. Land availability is low in Osaka because Osaka is a highly populated prefecture with a small area; hence, land use modification had an impact on Osaka. In phase 2, population inflow to Osaka was restricted and migration did not proceed sufficiently due to housing supply constraints. Economic growth became higher in Osaka after land use changes in phase 3, population migration, and an increase in the scope of employment. Thus, it is confirmed that to achieve high growth in prefectures, a change in the supply of buildings according to demand must occur. Figure 12 and Table 8 show the rate of change in the stock of houses, apartment complexes, agricultural lands, factories, and commercial offices. The building stock increased in prefectures with a high number of inbound tourists. By contrast, the area under farmlands decreased in such prefectures, particularly in Osaka (-9.1%).

Table 7: Summary of Figure 11

	Growth rate from the base (%)		Growth rate from the previous phase (%)
	Phase 2 Labor	Phase 3 G. E.	Phase 2-3
Japan	0.5	0.9	0.4
Maximum	1.5	3	1.5
Minimum	0.3	0.2	-0.1
Average	0.5	0.8	0.3
Median	0.5	0.7	0.2
Number of positives	47	47	46
Number of negatives	0	0	1

Table 8: Summary of Figure 12

	Growth rate from the base (%)				
	S. F. housing	M. F. housing	Farmland	Factory	Office
Japan	0.4	0.6	-0.3	0.6	0.4
Maximum	2.8	6.2	0.2	3.6	2.7
Minimum	-0.8	-0.8	-9.1	-0.6	-0.6
Average	0.3	0.5	-0.6	0.5	0.3
Median	0.2	0.2	-0.1	0.3	0.2
Number of positives	38	38	6	41	41
Number of negatives	9	9	41	6	6

6. CONCLUSION

This study applied the multi-regional CGE model to the economy of Japan and conducted a simulation analysis to identify the economic effects of inbound tourism. This is because gains from increasing inbound tourism are expected to make up for the decline in consumption due to a falling domestic population in Japan. This expectation from inbound tourists is greater in rural prefectures facing a declining population than in urban prefectures facing an increasing population. Therefore, the interests of this study include examining how an increase in the number of inbound tourists helps the rural economy in Japan. This study, thus, contributes to the scant literature on the economic effects of inbound tourism in Japan through a multi-regional CGE, a less-researched area.

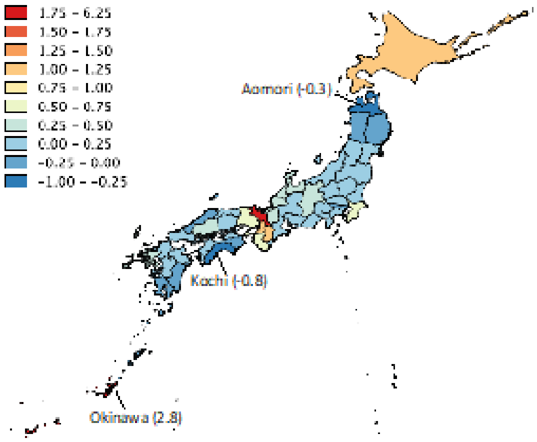
The results and contributions of our analysis are as follows. First, we showed that even though the Japanese economy grew as a result of the rising number of inbound tourists, the economy of rural prefectures declined, mainly because of the smaller number of inbound tourists visiting these areas. This result was derived from the multi-regional CGE analysis, as regional growth does not usually decline in an I-O analysis.

The second contribution pertains to the analysis of the timing of the economic decline in these prefectures. Growth is classified into three phases. Phase 1 illustrates a goods market equilibrium. The final demand for inbound tourists increased; thus, the production value grew in all prefectures. Phase 2 depicts a labor market equilibrium. People migrated from rural prefectures with a low economic growth rate, where fewer inbound tourists visited, to urban prefectures with higher economic growth and appeal for inbound tourists, widening the gaps in the economic growth rate among prefectures. The result decreased from phase 1 in the two prefectures where one is from the base. Finally, phase 3 portrays a general equilibrium. Stocks of buildings were modified by demolishing less-in-demand buildings and constructing more-in-demand buildings. Land use modification occurred more in urban prefectures with less available land areas; 19 prefectures, mainly urban prefectures, grew, while the other 28 prefectures declined compared to phase 2, with 12 prefectures growing negatively compared to the base case.

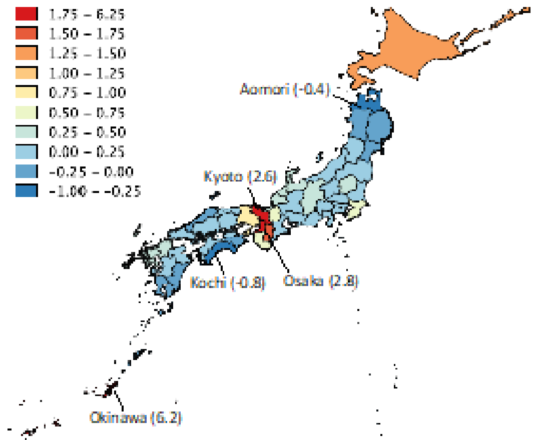
The most plausible factor behind the economic decline of some rural prefectures found in this research was that inbound tourists spent more in urban and some specific prefectures than in rural prefectures. To deal with it, we suggest direct overseas flight connections to rural prefectures, which can result in an increase in the number of repeat visitors to these areas. Typically, on a first trip to a country, a visitor tends to visit the capital, big cities, and famous tourist destinations. However, repeat visitors tend to visit other prefectures. Developing rapid transportation systems, such as high-speed rail (Yang and Li, 2020), to improve access from urban to rural prefectures will also increase tourist visits to rural prefectures.

Future research could extend the current finding by refining the behavior of inbound tourists in the model. For example, many inbound tourists visit not only one but multiple prefectures. By modeling the trips of inbound tourists between multiple prefectures, we can analyze the visit patterns in accordance with transportation conditions in local prefectures. More interesting simulations can be conducted to inform on policies aimed at revitalizing local and national Japanese economies utilizing inbound tourism.

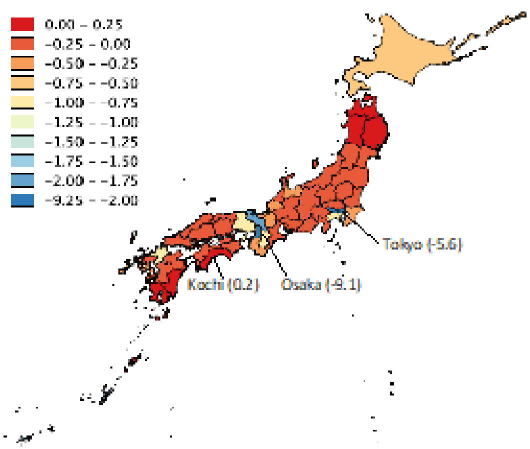
The study results are easily generalizable, as they show that the economic growth of different Japanese regions was triggered by increasing inbound tourism; similar results can be derived for other countries too. Furthermore, they can also be applied to any industry other than the tourism industry.



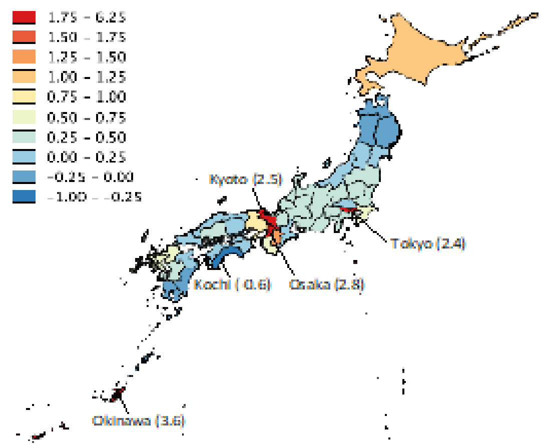
(a) Single-family housing



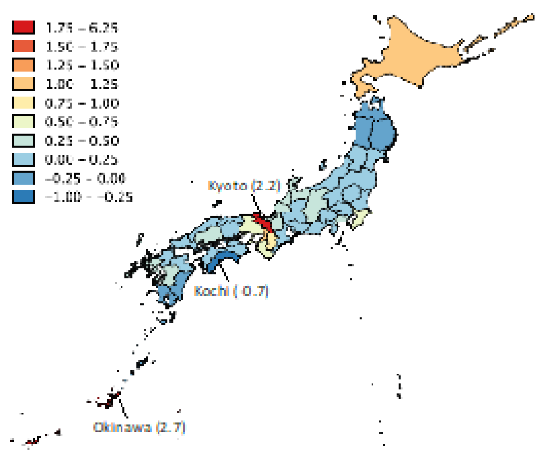
(b) Multiple-family housing



(c) Farmland



(d) Factory



(e) Office

Figure 12: Rate of change in stock by phase 3: general equilibrium (%)

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