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The Revitalization of Shrinking Cities: Lessons from the Japanese Service Sector [*]

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Abstract

This study evaluates urban policy on revitalization in city centers focusing on the Japanese service sector. Many Japanese cities have experienced a decline in population and economic activity in city centers. The 2006 Amended Act on Vitalization in City Centers shows a renewed effort toward city center revitalization. Local governments that applied for the related subsidies have implemented policies in targeted areas (generally, the area surrounding the main train station) to attract residents and employment from the suburbs and to revitalize economic activity. Using matching difference-in-differences estimations, this study finds that revitalization policies have improved the economic performance of service establishments only in city centers of regional core cities, but finds no evidence of similar effects in regional non-core cities.

JEL classification: R10, R11, R12
Keywords: City center revitalization, Service sector, Micro-geographic data

[*] We thank Nobuaki Hamaguchi, Masayuki Morikawa, Hajime Tadokoro, Makoto Yano, and participants of the RIETI DP seminar for their useful comments and suggestions. Naturally, any remaining errors are our own. This research was conducted under the project "An Empirical Study on Compact City: Evaluating place-based policies in Japan" at RIETI. This study uses microdata (questionnaire information) from the 2004 Survey on Service Industries (Ministry of Internal Affairs and Communications, MIC), the 2006 Establishment and Enterprise Census (MIC), the 2009 and 2014 Economic Censuses for Business Frame (MIC), and the 2012 and 2016 Economic Censuses for Business Activity (MIC and Ministry of Economy, Trade and Industry, METI) with permission under the Statistics Act. This study uses Grid Square Statistics and shape files of the Population Census (MIC), the Establishment and Enterprise Census (MIC), the Economic Census for Business Frame (MIC), and the Economic Census for Business Activity (MIC and METI).
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1. Introduction

Many developed countries have experienced a decline in economic activity in rural city centers. Big retailers and shopping centers constructed in the suburbs of cities are easily accessible to residents by car. As a result, rural city centers have become desolate, and many small and medium shops have suffered significantly reduced sales and some have shut down. The share of vacant shops in shopping districts of the city centers recently reached 13.8% (Small and Medium Enterprise Agency, 2019). Revitalizing these city centers has therefore become a major policy issue for regional cities. To achieve this, intensive support has been provided to small and medium enterprises. Public infrastructure, including main streets, parking spaces, and railway stations, is being renovated in regional city centers.

Our paper investigates the case of Japan, where many regional cities have experienced social and economic problems such as depopulation, population aging, and the decline of economic activity. To revitalize city centers, the Act on Vitalization in City Centers was passed in 1998. The new policy differed substantially from the previous regional policies implemented by the Ministry of Economy, Trade and Industry (METI). Local cities were given the authority to initiate city plans and establish local organizations, called Town Management Organizations (TMOs), to produce and manage specific projects. However, the policy did not work as expected. According to a report of the Administrative Evaluation Bureau of Ministry of Internal Affairs and Communications (2004), many revitalization programs were unable to stop the decline of local populations, numbers of commercial establishments, and commercial sales in city centers. Some studies have addressed the failure of this revitalization policy (e.g., Bi-Matsui, 2009; Balsas, 2016). According to Bi-Matsui (2009), one main problem was in the top-down decision-making system established by the national government without a rigorous review process.[1]

Afterward, the Act was amended in 2006. The 2006 Amended Act was better designed, such that municipalities would be designated for assistance from the national government after proposals on revitalization schemes from local governments in collaboration with the local City Center Councils were forwarded. The new policy scheme involves some new key aspects, two of which are explained here. First, local governments must develop a Basic Plan

[1] Bi-Matsui (2009) also drew attention to another problem. It was hard to reach consensus regarding revitalization projects between landowners and tenants (retailers/shop owners), resulting in a lack of acceptable solutions for the problem of vacant shops in shopping districts.

for City Center Revitalization looking forward five years, only promising plans are implemented after the national government reviews them. Then, the local governments that receive national government approval must evaluate their plans each year and publish follow-up reports. This is in sharp contrast with the former Act, which did not have a rigorous review and evaluation process. Second, the new policy puts more stress on compact city positioning as a part of city planning. Local governments provide subsidies for relocation to city centers from the suburbs. The big retailers are prohibited from locating themselves in the suburbs and are instead accommodated in city centers. Public facilities are also housed in city centers to increase local amenities.

Zoning is an important aspect of city center revitalization policy in Japan. Economic zones and industrial clusters are often used for planning in many developed countries. Recent empirical studies investigate the impact of economic zones on firm productivity, employment, R&D, and exports using firm-level data (e.g., Bondonio and Engberg, 2000; Devereux et al., 2007; Martin et al., 2011; Martin et al., 2011; Okubo and Tomiura, 2012; Fontagné et al., 2013; Lu et al, 2019). The economic zoning policies examined in previous studies mainly target manufacturing firms, and the size of zoning is relatively large, i.e., at the city, town, or county level. By contrast, zoning for the city center revitalization policy mainly targets the service sector in small districts inside specific cities or towns (e.g., Busso et al., 2013; Givord et al., 2013; Hanson and Rohlin, 2013).

Because the city center revitalization policy anticipates positive spillovers from the interaction of establishments within city centers, our estimation uses a matching estimation approach instead of a border discontinuity design. A novel aspect of our approach is considering employment and population conditions in neighborhoods around the service establishments, which often receive less attention in matching estimations. However, as the currently growing literature on urban neighborhood impacts suggests (e.g., Brueckner and Rosenthal, 2009; Schuetz et al., 2012), neighborhood market size affects the performance and location of service establishments. Glaeser et al. (2001) explore the role of urban density, and particularly commercial density, in facilitating consumption and promoting urban growth. Combining establishment-level panel data with the micro-geographic data, our empirical approach can improve our causal inferences about the policy intervention.

To the best of our knowledge, this is the first paper that econometrically investigates the impact of the 2006 Amended Act on Vitalization in City Centers on local service establishments, such as real estate, restaurants, accommodation, medical and health services,

education, professional services, repair services, rentals, and leasing. Using a matching difference-in-differences (DID) estimation, we find that the revitalization policy has positive effects only in regional core cities (i.e., prefectural capitals), but no evidence of such an effect in regional non-core cities, suggesting that the effects of the city center revitalization policy depend on a mixture of characteristics such as city size and services.

This study contributes to the literature on urban revitalization policy by presenting the heterogeneous impacts of a particular urban policy on service industries in Japan. Previous studies have mainly focused on the retail sectors.[2] Using matching estimations, Honda and Kawanishi (2019) and Iwata and Kondo (2019) hardly found evidence that the city center revitalization policy benefits incumbent retailers in Kumamoto city and Toyama city, respectively. In contrast, our findings show that the city center revitalization policy benefits service establishments, such as restaurants and accommodations, only in regional core cities.

Unlike the retail sector, service sector businesses that have strong characteristics of non-tradability, non-storability, and intangibility, such as restaurants and accommodations in regional core cities benefit from positive industrial interactions within city centers. Regional core cities often have better access to airports and train stations, which attract branches of firms and stores that provide more differentiated services. Locational attractiveness increases travel demand, which further increases the demand for local services such as food and drink. These areas are also attractive for workers because of active job creation. The city center revitalization policy boosts outside demand, leading to positive industrial interactions in regional core cities, while it may end up increasing local competition among service suppliers in regional non-core cities.[3]

Our findings have important policy implications, as revitalizing city centers in local areas has become a vital issue across the world (e.g., Moretti, 2012).[4] The recent literature in urban economics has emphasized the importance of evaluating the economic impacts of place-based policy (e.g., Busso et al., 2013; Givord et al., 2013; Hanson and Rohlin, 2013; Neumark and

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[2] Using the grid square statistics of the Census of Commerce (Ministry of Economy, Trade and Industry) to investigate the impacts of the Former Act in the retail sector, Matsuura and Motohashi (2006) find that big retailers are complimentary to small and medium retailers. Karato (2006) discusses the Former and Amended Acts in terms of land property. Suga (2010) investigates the impact of the 2006 Amended Act and finds a positive impact of the new policy on the location of large-scale retailers in city centers.

[3] To empirically support these discussions, Online Appendix provides additional regression analyses.

[4] In UK, PPG6 (Planning Policy Guidance 6) is basic policy on revitalizing city centers, which was made by the central government in 1988 and revised afterward several times. Big retailers are required to be located in the suburbs of cities.

Simpson, 2015; Mayer et al., 2017). The literature on urban planning and city governance focuses extensively on the revitalization of local town centers (e.g., Ravenscroft, 2000; Thomas and Bromley, 2002; Cook, 2008; Wahlberg, 2016). The marketing and industrial organization literature also studies retailer location, locational regulation on big retailers, and protections for small retailers in cities (e.g., Sadun, 2015).

The rest of this paper is organized as follows. Section 2 discusses three case studies of city center revitalization in Japan. Section 3 describes establishment-level microdata in the service industries and micro-geographic data. Section 4 explains our matching DID estimation. Section 5 presents the estimation results. Section 6 concludes the paper.

2. City Center Revitalization Policy in Japan

City center revitalization policy is not peculiar to Japan. Business improvement districts (BID) are often organized in the United States. In BIDs, small districts first decide whether to initiate a revitalization program by voting and, if the program is accepted, additional taxes are levied on properties in the district allowing some supplementary public services, such as street cleaning and public security, to be covered by the tax payments (e.g., Brooks, 2007; Brooks and Strange, 2011; Meltzer, 2012). Some studies find that BIDs have a positive impact on property values (e.g., Ellen et al., 2007) and reduce crime in the district (e.g., Brooks, 2008; Cook and MacDonald, 2011; Hoyt, 2005).

By contrast, there is no similar system of tax authorities and voting mechanisms for City Center Councils in the urban revitalization zones targeted by government policy in Japan. Revitalization policy in Japan can be classified as a traditional type of regional policy: setting policy zones, local government (in collaboration with the City Center Council) intensively supports public infrastructure (e.g., main streets, public transportation, parking spaces, and parks) to improve convenience for residents and passes regulation requiring large-scale retailers to be located in the city outskirts in order to revitalize retailers in city centers. Local governments also promote residential relocation to city centers by offering subsidies. Another objective of the policy is to increase employment and retail sales in city centers by attracting consumers.

There are 141 municipalities with Basic Plans for City Center Revitalization that were approved by the national government as of March 24, 2017. The entire map of municipalities and their targeted zones is provided in the Online Appendix. Some municipalities have already started the second or third period of their Basic Plans. As of March 24, 2017, the total

number of municipalities is 1,741 in Japan, and thus approximately 8% of municipalities are conducting city center revitalization policies using subsidies offered by the national government.[5] Here, three case studies are provided.[6]

2.1. Case Study 1: Aomori City, Aomori Prefecture

Aomori city is a case of large-scale urban planning and the construction of infrastructure at the public expense, in line with classical public regional policies. Aomori city developed as a port city to connect the main island and Hokkaido. The city is located in an area with heavy snowfall, and the cost of the snow removal system increases with urban sprawl. Aomori city has tackled issues of the rapid population decline in the city center and suburbanization.

Aomori city was approved as the first case for the 2006 Amended Act on Vitalization in City Centers along with Toyama city. First, the city was split into three zones: Inner, Mid, and Outer. In the Outer area, the development of economic activity is limited, and academic and cultural activities are promoted. The budget is intensively allocated to the Inner area, which is designated as an urban revitalization zone in the Basic Plan, as shown in Figure 1. Roads were largely improved. Residential apartments for older people and hotels were constructed. Notably, one driver for revitalizing the central area is a big commercial building, named "Auga," in front of the main station of Aomori city, which had many shops, retailers, a fish market, a parking area associated with a public library, and a meeting space. The building was managed by a semi-public institution. At first many people visited the building, but the business deteriorated over time and was on the verge of collapse in 2016. In the same year, the Aomori city mayor resigned, taking responsibility for the failure. Ultimately, all commercial shops in Auga were shut down in 2017 and instead city offices moved into the building.

[Figure 1]

2.2. Case Study 2: Toyama City, Toyama Prefecture

Toyama city is known as a case of successfully stimulating a city center by establishing public transportation networks. The OECD (2012) also discusses the compact city policy of Toyama city. Toyama city has the highest percentage of home ownership and the largest per-

[5] The approval of a Basic Plan for City Center Revitalization under the 2006 Amended Act on Vitalization in City Centers does not mean that municipalities paid less attention to city center revitalization previously. There are municipalities that promoted city center revitalization before the passage of the Plans.

[6] See Yahagi and Seta (2006) for a survey of all cases.

house area in Japan. However, as house construction spread into the suburbs, the population density of Toyama city has continued to decrease.

Figure 2 shows the urban revitalization zone designated in the Basic Plan of City Center Revitalization. Public facilities are relocated and geographically concentrated in the targeted areas. However, residential clusters are allowed in suburbs, provided that they are within about 500 meters of public transportation. Toyama city provides subsidies for those who move to designated areas. Public transportation networks of trams, buses, and trains were comprehensively reinforced, which tightly connected the central business district with residential clusters in the suburbs. This development of the public transportation system stimulates the mobility of residential people. Residents have better access to the central area due to the well-developed transportation system. In the central area, an atrium, named "Grand Plaza," was opened, contiguous to a main shopping street. Many events and festivals are held there.

[Figure 2]

2.3. Case Study 3: Nichinan City, Miyazaki Prefecture

Nichinan city is also viewed as a successful case of revitalizing a main shopping street by attracting IT entrepreneurs from Tokyo. Nichinan city developed as a large fishery and port city in Miyazaki Prefecture. However, the city has struggled with population decline and aging for a long time.

The Basic Plan of City Center Revitalization for Nichinan city was approved by the national government in December 2012. Figure 3 shows the urban revitalization zone designated in the Basic Plan. In 2013, a young mayor was elected, taking leadership for the reform of city management. He has sought to revitalize the city by saving on public expenses, using the internet, and collaborating with young residents. The Mayor first advertised Nichinan city online and asked for young people to migrate to Nichinan city and engage in the revitalization. The Mayor entrusted the revitalization to a "marketing specialist" and initiated many projects based on brand-new ideas.

One main shopping street, "Aburatsu Shopping Street," where there had previously been many unoccupied shops, was largely renovated as a city center. Nichinan city subsidizes promising entrepreneurs and individuals. In response, some IT entrepreneurs have migrated to the shopping street and created new businesses. Other IT companies established branch

offices or satellite offices on the main street. As a result, young IT workers migrated from Tokyo with their families. Additionally, the shopping street provides kindergartens and open space for kids and organizes a number of festivals for residents. This also attracts many tourists.

[Figure 3]

2.4. The Potential Effects of City Center Revitalization Policy

This study considers the heterogeneous effects of the city center revitalization policy in terms of city size and industry. For example, the entry of large-scale firms increases local market competition, which can reduce sales for small firms. Such pro-competitive effects vary across service industries. Retail stores tend to face more competition from a wide range of markets (e.g., Sadun, 2015).

Simultaneously, city center revitalization policy can have positive spillover effects. An increase in consumers from outside the area generates benefits for neighboring service suppliers. For example, accommodations attract travelers, increasing sales at neighboring service suppliers, such as restaurants, cafés, and bars. Such positive interactions across industries are related to population size. The Ministry of Land, Infrastructure, Transport and Tourism (2014, Appendix 3, p. 35) shows that entry decisions for service firms are highly related to the city size, and regional core cities tend to attract more differentiated services. Municipalities of prefectural capitals have locational advantages for train stations and airports, which attract more firm branches and employment from outside the city.

The total policy effects depend on which of the pro-competitive and positive spillover effects are dominant. To disentangle them, this study divides treated establishments of each municipality into two groups. The first group consists of establishments in regional core cities, the prefectural capitals, except for government ordinance-designated cities (*Seirei Shitei Toshi*). There are 47 prefectures in Japan, of which 22 municipality prefectural capitals are examined in this study (the capitals of Aomori, Iwate, Akita, Yamagata, Fukushima, Toyama, Ishikawa, Fukui, Yamanashi, Nagano, Shiga, Nara, Wakayama, Tottori, Shimane, Yamaguchi, Kagawa, Ehime, Kochi, Kumamoto, Miyazaki, and Kagoshima prefectures). The second group is the sample of regional non-core cities, except for the prefectural capitals listed above. This subsample analysis allows us to uncover the heterogeneous effects of the city center revitalization policy.

3. Data

3.1. Establishment-Level Panel Data in the Japanese Service Sector

This study uses establishment-level microdata from the 2004 Survey on Service Industries (Ministry of Internal Affairs and Communications; hereafter MIC), which is linked with data from the 2012 and 2016 Economic Censuses for Business Activity (MIC and Ministry of Economy, Trade and Industry; hereafter METI) to create the panel dataset. The 2004 Survey on Service Industries is designed to survey the basic characteristics and business operations of service establishments at the national and regional levels for policymaking. The data include basic information on business activities such as sales, costs, total wage payments, employment by gender, and type of work at the establishment level.

The 2004 Survey on Service Industries is a sample survey and covers approximately 430,000 establishments nationwide that belong to the following service sector classifications: H. Information and Communications; L. Real Estate; M. Eating and Drinking Places, Accommodations; N. Medical, Health Care and Welfare; O. Education, Learning Support; P. Compound Services; Q. Services; and "not else classified" (Japan Standard Industrial Classification, 11th revision). However, it should be noted that the following service industries are not included in the Survey: G. Electricity, Gas, Heat Supply and Water; I. Transport; J. Wholesale and Retail Trade; K. Finance and Insurance.

The 2004 Survey on Service Industries covers all incumbent establishments with 30 employees or more between 2001 and 2004 and all new establishments with 30 employees or more in designated survey areas. Establishments with 30 employees or less are sampled based on the sampling ratio of the survey areas.

This study constructs establishment-level panel data in the 2004–2012–2016 period. The 2004 Survey on Service Industries includes the same establishment codes as those of the 2004 Establishment and Enterprise Census. Then, the 2012 and 2016 Economic Censuses for Business Activity include the entablement codes of the previous surveys, which allows to make panel dataset of the 2004–2012–2016 period.[7]

[7] The panel converter table is constructed from the 2006 Establishment and Enterprise Census (MIC), the 2009 and 2014 Economic Censuses for Business Frame (MIC), and the 2012 and 2016 Economic Censuses for Business Activity (MIC and METI) in Japan. Each census includes the establishment codes of the previous census. The 2006 Establishment and Enterprise Census includes the establishment codes of the 2004 Establishment and Enterprise Census. The 2009 Economic Census for Business Frame includes establishment codes of the 2006 Establishment

3.2. Outcome Variables and Covariates for Establishments

The outcome variables for the matching estimation are annual sales, annual profit, and average wage per worker at the establishment level. The annual profit is calculated as the difference between total sales and total costs. The average wage per worker is calculated as the ratio of total wage payments to the total number of workers.

The establishment-level covariates used in the matching estimation are the annual sales, annual costs, total wage payments, the number of employees, the share of female workers, and the share of full-time workers.

3.3. Covariates for Neighboring Markets

The novel approach used in this study is considering neighboring market conditions as covariates. Matching estimations are sensitive to the choice of covariates. Especially, being unable to control for unobserved factors violates the assumption of parallel trends when unobserved factors significantly alter the trends between treatment and control groups. Locational factors often receive less attention in matching estimations owing to the difficulties in establishing and measuring variables. This study addresses this issue by combining geocoding techniques and micro-geographic data.

Following the urban economics literature, this study introduces local employment and population as neighboring market variables (e.g., Morikawa, 2011; Combes et al, 2012). These variables are constructed by combining micro-geographic data with geocoding techniques. First, the geographic locations of establishments are identified (i.e., longitude and latitude) using geocoding. The location information (longitude and latitude) of each establishment is obtained through the Address Geocoding of ArcGIS, which can be conducted offline (i.e., requirement for the use of confidential information). For the cases of establishments with unrecognized addresses, we use location information obtained from the shape files at the survey unit area level of the 2006 Establishment and Enterprise Census and the 2009 and 2014 Economic Censuses for Business Frame. We exclude establishments that have no locational

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and Enterprise Census. The 2012 Economic Census for Business Activity includes the establishment codes of the 2009 Economic Census for Business Frame. The 2016 Economic Census for Business Activity includes the establishment codes of the 2014 Economic Census for Business Frame and the 2012 Economic Census for Business Activity. The panel converter table for establishment codes is constructed in sequence. Using the panel converter table, this study merges the 2004 Survey on Service Industries and the 2012 and 2016 Economic Censuses for Business Activity.

information from this study.

The next step is matching the location information with the mesh code of the Grid Square Statistics (Ministry of Internal Affairs and Communications) at the level of approximately 1 km by 1 km. Figure 4 shows the case of Toyama-city to see how the geographical range of the neighboring market can be extended with a circle of 3 km intervals until it reaches a total of 9 km. In the matching estimation, we use the neighboring variables of employment and population within the circles of 3 km, 3–6 km, and 6–9 km.

[Figure 4]

4. Matching Difference-in-Differences Estimation

This study estimates average treatment effects on the treated (ATET) to measure the effects of city center revitalization policies in targeted areas using the matching DID estimation developed by Heckman et al., (1997). The treatment group is comprised of establishments located in targeted areas of the policy. The start of policy application in year t_i differs across municipalities after the 2006 Amended Act (see the Online Appendix for the list). Toyama city and Aomori city developed the first Basic Plans, which were approved by the Cabinet Office in February 2007. Therefore, the 2004 Survey on Service Industries covers data in the pre-treatment period, and the 2012 and 2016 Economic Censuses cover data in the post-treatment period.

To see the policy effects, we limit the sample to municipalities that experienced policy interventions of three years or more after the approval of their Basic Plan (i.e., municipalities that received approval before 2010 for the analysis in the 2004–2012 period, and municipalities that received approval before 2014 for the analysis in the 2004–2016 period).

The control group is selected in two steps. First, we select establishments located in municipalities at the city (*Shi*) level, not at the town (*Cho*) and village (*Son*) level, because only municipalities at the city level have been approved as of March 24, 2017. This is the potential set of the control group. Second, the Mahalanobis matching algorithm is used to find the counterfactual pair of treated establishments from the potential set of the control group.

Let $T_{im,t_i} = 1$ denote an establishment i in targeted area of the municipality m (i.e., the treated establishment). The ATET of matching DID can be estimated as follows:

$$\delta_1 = \mathrm{E}\left[\Delta Y_{im,\tau}(1) - \Delta Y_{im,\tau}(0) | T_{im,t_i} = 1, \boldsymbol{X}_{im,2004}\right],$$

where $\Delta Y_{im,\tau}(1) = Y_{im,\tau}(1) - Y_{im,2004}(1)$ and $\Delta Y_{im,\tau}(0) = Y_{im,\tau}(0) - Y_{im,2004}(0)$ are the before-after differences in outcome variables (Y_{im}), and, $Y_{im}(1)$, and $Y_{im}(0)$ are the potential outcomes given the active treatment and the control treatment, respectively, and $\tau \in (2012, 2016)$ and the vector $\boldsymbol{X}_{im,2004}$ represent the characteristics of establishment i in the pre-treatment period.

Simple manipulation yields the following equation:

$$\delta_1 = \mathrm{E}\left[\Delta Y_{im,\tau}(1) | T_{im,t} = 1, \boldsymbol{X}_{im,2004}\right] - \mathrm{E}\left[\Delta Y_{im,\tau}(0) | T_{im,t} = 1, \boldsymbol{X}_{im,2004}\right],$$

where the second term on the right-hand side cannot be observed directly, because it represents the average growth in the outcome variables in the counterfactual situation where establishment i is not treated by the policy. Therefore, the objective of the matching estimation is to statistically estimate the second term from the control group using observable covariates (Rubin, 1977). After the matching, the sample ATET can be estimated as follows:

$$\hat{\delta}_1 = \frac{1}{N_1} \sum_{i \in N_1} \left[\Delta Y_{im,\tau}(1) - \Delta \hat{Y}_{im,\tau}(0)\right],$$

where N_1 is the number of treated establishments and the second term is estimated from the control group establishments matched with treated establishments as follows:

$$\Delta \hat{Y}_{im,\tau}(0) = \sum_{j \in N_0} W_{ij} \cdot \Delta Y_{j,\tau}(0),$$

where N_0 is the set of the control group, W_{ij} is the weight for the matched pair i and j, which depends on the type of matching algorithm. This study uses one-to-one nearest neighbor matching, and therefore the weight takes a value of 1. Note that $\Delta Y_{j,\tau}(0)$ does not include the index of the municipality m, because the establishment j matched from the control group is not necessarily in the same municipality as the treated establishment i.

This study uses Mahalanobis distance to find matching pairs. In the case of propensity score matching, the vector of establishment characteristics is reduced to a scalar measure, propensity score, and then the distance of propensity scores between establishments is used to find pairs. In contrast, the Mahalanobis distance is defined as the distance measured by the vector of variables as follows:

$$\left\| \boldsymbol{x}_{im,2004} - \boldsymbol{x}_{j,2004} \right\|_{\boldsymbol{S}} = \sqrt{\left(\boldsymbol{x}_{im,2004} - \boldsymbol{x}_{j,2004}\right)' \boldsymbol{S}^{-1} \left(\boldsymbol{x}_{im,2004} - \boldsymbol{x}_{j,2004}\right)}$$

where $\boldsymbol{x}_{im,2004} = (x_{im1,2004}, x_{im2,2004}, \dots, x_{imp,2004})$ is the $p \times 1$ vector of covariates for establishment i in 2004, $\boldsymbol{S}$ is the $p \times p$ covariance matrix of the vector of establishment characteristics. The matching based on Mahalanobis distance finds the pairs i and j with the smallest distance.[8]

Matching in the pre-treatment period assumes parallel trends before the policy intervention between the treatment and control groups. If the trend changed after the policy intervention, we interpret as a causal inference that the policy caused this change and is the only factor. In that sense, neighboring market conditions should be used in the matching process, because the difference in neighboring market conditions violates the assumption of parallel trends in the long run.

5. Estimation Results

Table 1 presents the results of the matching DID estimation, in which three cases are shown. The first case focuses on the full nationwide sample. The second case considers a sample limited to establishments in regional core cities, the prefectural capitals except for government ordinance-designated cities (*Seirei Shitei Toshi*). The third case considers the sample of regional non-core cities, except for the prefectural capitals in the second sample. Balancing tests for the Mahalanobis matching of each case are provided in the Appendix A. The use of neighboring market conditions is highly important.

First, estimation results for the full nationwide sample do not show any significant treatment effects on economic performance in the service industries, implying that the city center revitalization policies do not effectively stop the decline of economic activity in city centers. However, there is significant heterogeneity across approved municipalities. For example, municipalities in prefectural capitals play an important role in local governance, which tends to provide a more sustainable economic base within each region. This characteristic may attract more residents and firms to these city centers. However, the city center revitalization policy does not provide sufficient incentives for residents and firms to change their behavior, because regional non-core cities are often commuter suburbs.

The estimation results for the sample of prefectural capitals show significantly positive

[8] Abadie and Imbens (2006) showed that the bias does not disappear if simple nearest neighbor matching estimator is used even for large sample size. Abadie and Imbens (2011) proposed a bias-corrected estimator to address this problem. This study also use bias-corrected estimator with the covariates. We used the `teffects nnmatch` command in Stata 15.1. Abadie et al. (2004) provide the details of the matching estimation procedure.

treatment effects on sales and average wages per worker, whereas the estimation results for the sample of other cities show significantly negative treatment effects on sales. These findings suggest that city center revitalization policies contributed to halting the decline of service industries in regional core cities, like municipalities of prefectural capitals. However, the policy intervention contrarily has negative effects on sales in regional non-core cities.

The opposite sign implies that the city center revitalization policy has heterogeneous effects. Unlike regional non-core cities, municipalities of prefectural capitals often have better access to airports and rail stations, which attract branches of firms and stores that provide differentiated services. Such locational advantages increase the travel demand from outside the cities, which further increases the demand for local services like food and drink. On the other hand, retailers face fierce competition if they sell homogeneous goods in city centers. The city center revitalization policy may end up increasing local competition among service suppliers in regional non-core cities if it cannot boost service demand from the outside.

[Tables 1]

6. Conclusion

This study has evaluated an urban revitalization policy in city centers focusing on the Japanese service sector. The 2006 Amended Act on Vitalization in City Centers opened a new period of concentration on city centers, and many revitalization projects were implemented in targeted areas in Japanese city centers as a result. The novel approach of this study is its use of geocoding techniques to identify which establishments are treated by the policy intervention. In addition, the neighboring market condition is introduced as a covariate in the matching estimation, which is important to ensure the assumption of parallel trends.

Using the matching DID estimations, this study finds that revitalization policies have improved the economic performance of service establishments only in regional core cities (prefectural capitals), but finds no evidence for regional non-core cities, suggesting that the outcomes of the city center revitalization policy depend on city characteristics.

A policy implication from this study is that the city center revitalization policy should be evaluated in terms of its heterogenous effects across service industries. Our findings should be distinguished from previous studies that focused on the retail sector. Localization and concentration in city centers may intensify competition between retailers. However, other service industries, such as restaurants and accommodations, may benefit from positive

interactions inside the city centers of regional core cities. Unlike the retail sector, these services industries exhibit stronger characteristics of non-tradability, non-storability, and intangibility. A policy implication from these results is that the promotion of a monocentric urban structure for economic revitalization will have different impacts for different segments of the service sector within the city centers.

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Appendix A. Balancing Test for Matching Estimation

Tables A.1–A.3 present matching results of balancing tests for sales between the treatment and control groups. Tables A.4–A.6 present matching results of the balancing tests for profits between the treatment and control groups. Tables A.7–A.9 present the matching results of the balancing tests for wages between the treatment and control groups. To consider regional heterogeneity with respect to city size, the sample is divided into two groups. The first group consists of regional core cities (i.e., prefectural capitals). The second group consists of regional non-core cities.

The performance of the balancing test depends on the neighboring variables. Before the matching, the standardized differences in neighboring market variables are large in Column "Raw." However, the Mahalanobis matching algorithm in Column "Matched" decreases these gaps, suggesting that matching estimation will be biased if the neighboring variables are omitted. In general, the location information is limited and not used for matching estimation. This study emphasizes the importance of considering the neighboring economic environment.

[Figure A.1-A.9]

Table 1 Estimation Results, Average Treatment Effects on the Treated

Variables	Period: 2004–2012				Period: 2004–2016			
	ATET	S.E.	Treatment	Control	ATET	S.E.	Treatment	Control
	Full Sample							
Growth Rate of Sales	−0.006	(0.020)	3,005	44,958	−0.012	(0.019)	4,212	49,478
Growth Rate of Profits	−0.032	(0.035)	1,999	30,342	−0.029	(0.036)	2,339	28,445
Growth Rate of Average Wage per Worker	0.030	(0.031)	1,725	27,211	0.032	(0.029)	2,253	27,169
	Sample: Prefectural Capital							
Growth Rate of Sales	0.059**	(0.028)	1,832	44,958	0.055**	(0.027)	2,296	49,478
Growth Rate of Profits	−0.003	(0.046)	1,265	30,342	0.045	(0.051)	1,289	28,445
Growth Rate of Average Wage per Worker	0.112***	(0.042)	1,065	27,211	0.112***	(0.039)	1,260	27,169
	Sample: Other Cities							
Growth Rate of Sales	−0.062**	(0.027)	1,173	44,958	−0.070***	(0.026)	1,916	49,478
Growth Rate of Profits	−0.063	(0.050)	734	30,342	−0.065	(0.050)	1,050	28,445
Growth Rate of Average Wage per Worker	−0.065	(0.047)	660	27,211	−0.053	(0.041)	993	27,169

Note: Standard errors proposed by Abadie and Imbens (2006, 2012) are in parentheses. * denotes statistical significance at the 10% level, ** at the 5% level, and *** at the 1% level. The 1-to-1 nearest neighbor matching based on Mahalanobis distance is implemented by `teffect nnmatch` of Stata ver. 15.1. The covariates are log of local employment within 3km, log of local employment within 3–6km, log of local employment within 6–9km, log of sales, log of costs, log of wages, share of female workers, share of full-time workers as of 2004.

Table A.1 Balancing Test for Sales for Full Sample

	Period: 2004–2012				Period: 2004–2016			
	Standardized differences		Variance ratio		Standardized differences		Variance ratio	
Variables	Raw	Matched	Raw	Matched	Raw	Matched	Raw	Matched
Establishment Variables								
log(Sales) in 2004	0.093	0.063	1.011	1.203	0.040	0.048	0.966	1.208
log(Costs) in 2004	0.075	0.046	1.000	1.184	0.026	0.032	0.944	1.181
log(Total Wage Payment) in 2004	0.064	0.019	0.933	1.177	0.015	0.003	0.918	1.200
log(Employment) in 2004	−0.022	0.019	1.048	1.192	−0.067	0.002	1.011	1.171
Share of Female Workers in 2004	0.076	0.006	1.015	1.172	0.086	0.007	1.009	1.178
Share of Full-Time Workers in 2004	0.167	0.053	1.031	1.087	0.128	0.036	1.036	1.098
Neighboring Market Variables								
log(Residents within a 3km Radius Circle) in 2004	0.848	0.088	0.205	0.977	0.796	0.077	0.209	0.971
log(Employment within a 3km Radius Circle) in 2004	1.146	0.092	0.266	0.979	1.075	0.080	0.265	0.976
log(Establishments in Secondary Sector within a 3km Radius Circle) in 2004	0.816	0.054	0.278	1.032	0.745	0.052	0.272	1.016
log(Establishments in Tertiary Sector within a 3km Radius Circle) in 2004	1.252	0.105	0.254	0.982	1.190	0.093	0.250	0.981
log(Residents within a 3–6km Radius Circle) in 2004	0.519	0.024	0.328	0.983	0.464	0.013	0.330	0.976
log(Employment within a 3–6km Radius Circle) in 2004	0.245	−0.039	0.428	0.974	0.193	−0.047	0.411	0.963
log(Establishments in Secondary Sector within a 3–6km Radius Circle) in 2004	0.716	0.021	0.365	0.997	0.656	0.012	0.356	0.985
log(Establishments in Tertiary Sector within a 3–6km Radius Circle) in 2004	0.183	−0.054	0.517	0.982	0.139	−0.060	0.491	0.966
log(Residents within a 6–9km Radius Circle) in 2004	0.288	0.010	0.369	0.973	0.234	0.001	0.372	0.967
log(Employment within a 6–9km Radius Circle) in 2004	−0.112	−0.002	0.555	1.014	−0.167	−0.015	0.537	0.993
log(Establishments in Secondary Sector within a 6–9km Radius Circle) in 2004	0.433	0.016	0.394	0.989	0.369	0.006	0.389	0.975
log(Establishments in Tertiary Sector within a 6–9km Radius Circle) in 2004	−0.162	−0.012	0.571	1.017	−0.212	−0.021	0.552	0.992

Note: The one-to-one nearest neighbor matching based on Mahalanobis distance is implemented by `teffect nnmatch` of Stata ver. 15.1. The covariates are log of local employment within 3 km, log of local employment within 3–6 km, log of local employment within 6–9 km, log of sales, log of costs, log of wages, share of female workers, share of full-time workers as of 2004.

Table A.2 Balancing Test for Sales for Sample of Prefectural Capital

	Period: 2004–2012				Period: 2004–2016			
	Standardized differences		Variance ratio		Standardized differences		Variance ratio	
Variables	Raw	Matched	Raw	Matched	Raw	Matched	Raw	Matched
Establishment Variables								
log(Sales) in 2004	0.080	0.056	0.867	1.327	0.035	0.048	0.870	1.447
log(Costs) in 2004	0.052	0.035	0.844	1.264	0.003	0.025	0.848	1.382
log(Total Wage Payment) in 2004	0.049	0.006	0.819	1.212	−0.007	−0.014	0.787	1.280
log(Employment) in 2004	−0.045	0.042	0.968	1.328	−0.114	0.016	0.927	1.407
Share of Female Workers in 2004	0.151	0.007	0.891	1.133	0.146	−0.016	0.894	1.181
Share of Full-Time Workers in 2004	0.136	0.026	0.989	1.030	0.126	0.011	0.999	1.034
Neighboring Market Variables								
log(Residents within a 3km Radius Circle) in 2004	1.281	0.252	0.048	0.621	1.247	0.269	0.055	0.687
log(Employment within a 3km Radius Circle) in 2004	1.711	0.275	0.050	0.505	1.673	0.293	0.057	0.584
log(Establishments in Secondary Sector within a 3km Radius Circle) in 2004	1.229	0.116	0.105	0.790	1.191	0.159	0.110	0.806
log(Establishments in Tertiary Sector within a 3km Radius Circle) in 2004	1.792	0.285	0.060	0.552	1.756	0.293	0.068	0.625
log(Residents within a 3–6km Radius Circle) in 2004	1.043	0.140	0.062	0.646	0.995	0.147	0.071	0.701
log(Employment within a 3–6km Radius Circle) in 2004	0.773	−0.014	0.076	0.661	0.714	−0.021	0.085	0.714
log(Establishments in Secondary Sector within a 3–6km Radius Circle) in 2004	1.326	0.140	0.068	0.628	1.273	0.142	0.080	0.683
log(Establishments in Tertiary Sector within a 3–6km Radius Circle) in 2004	0.751	−0.049	0.098	0.730	0.689	−0.052	0.113	0.773
log(Residents within a 6–9km Radius Circle) in 2004	0.769	0.090	0.087	0.718	0.720	0.099	0.096	0.771
log(Employment within a 6–9km Radius Circle) in 2004	0.211	0.028	0.209	0.970	0.162	0.021	0.213	1.025
log(Establishments in Secondary Sector within a 6–9km Radius Circle) in 2004	0.989	0.124	0.077	0.669	0.932	0.126	0.091	0.734
log(Establishments in Tertiary Sector within a 6–9km Radius Circle) in 2004	0.139	0.004	0.245	0.971	0.093	0.004	0.247	1.010

Note: The one-to-one nearest neighbor matching based on Mahalanobis distance is implemented by `teffect nnmatch` of Stata ver. 15.1. The covariates are log of local employment within 3 km, log of local employment within 3–6 km, log of local employment within 6–9 km, log of sales, log of costs, log of wages, share of female workers, share of full-time workers as of 2004.

Table A.3 Balancing Test for Sales for Sample of Other Cities

	Period: 2004–2012				Period: 2004–2016			
	Standardized differences		Variance ratio		Standardized differences		Variance ratio	
Variables	Raw	Matched	Raw	Matched	Raw	Matched	Raw	Matched
Establishment Variables								
log(Sales) in 2004	−0.006	0.018	1.029	1.144	−0.036	0.006	0.970	1.158
log(Costs) in 2004	−0.026	−0.002	1.035	1.141	−0.046	−0.012	0.957	1.141
log(Total Wage Payment) in 2004	−0.048	−0.027	0.938	1.131	−0.067	−0.051	0.930	1.169
log(Employment) in 2004	−0.067	−0.016	1.004	1.136	−0.085	−0.034	1.010	1.104
Share of Female Workers in 2004	0.162	0.049	1.041	1.169	0.160	0.049	1.023	1.172
Share of Full-Time Workers in 2004	0.066	0.035	1.016	1.105	0.031	0.014	1.014	1.111
Neighboring Market Variables								
log(Residents within a 3km Radius Circle) in 2004	0.441	0.028	0.288	1.003	0.449	0.026	0.263	0.963
log(Employment within a 3km Radius Circle) in 2004	0.594	0.033	0.279	1.021	0.602	0.028	0.241	0.960
log(Establishments in Secondary Sector within a 3km Radius Circle) in 2004	0.381	0.018	0.347	1.112	0.356	0.016	0.286	1.041
log(Establishments in Tertiary Sector within a 3km Radius Circle) in 2004	0.717	0.036	0.244	1.013	0.736	0.038	0.209	0.963
log(Residents within a 3–6km Radius Circle) in 2004	0.023	−0.020	0.474	0.991	0.058	−0.024	0.436	0.968
log(Employment within a 3–6km Radius Circle) in 2004	−0.274	−0.060	0.629	0.976	−0.223	−0.062	0.556	0.955
log(Establishments in Secondary Sector within a 3–6km Radius Circle) in 2004	0.116	−0.027	0.423	0.996	0.160	−0.030	0.378	0.962
log(Establishments in Tertiary Sector within a 3–6km Radius Circle) in 2004	−0.391	−0.070	0.717	0.980	−0.310	−0.070	0.639	0.961
log(Residents within a 6–9km Radius Circle) in 2004	−0.167	−0.022	0.561	0.988	−0.136	−0.027	0.518	0.964
log(Employment within a 6–9km Radius Circle) in 2004	−0.425	−0.015	0.928	1.029	−0.418	−0.027	0.802	0.980
log(Establishments in Secondary Sector within a 6–9km Radius Circle) in 2004	−0.109	−0.024	0.545	1.000	−0.078	−0.029	0.485	0.958
log(Establishments in Tertiary Sector within a 6–9km Radius Circle) in 2004	−0.465	−0.020	0.921	1.040	−0.454	−0.029	0.803	0.985

Note: The one-to-one nearest neighbor matching based on Mahalanobis distance is implemented by `teffect nnmatch` of Stata ver. 15.1. The covariates are log of local employment within 3 km, log of local employment within 3–6 km, log of local employment within 6–9 km, log of sales, log of costs, log of wages, share of female workers, share of full-time workers as of 2004.

Table A.4 Balancing Test for Profit for Full Sample

	Period: 2004–2012				Period: 2004–2016			
	Standardized differences		Variance ratio		Standardized differences		Variance ratio	
Variables	Raw	Matched	Raw	Matched	Raw	Matched	Raw	Matched
Establishment Variables								
log(Sales) in 2004	0.040	0.059	0.876	1.259	0.021	0.054	0.861	1.254
log(Costs) in 2004	0.018	0.034	0.870	1.256	0.007	0.032	0.851	1.228
log(Total Wage Payment) in 2004	0.014	0.011	0.837	1.195	0.001	0.007	0.827	1.156
log(Employment) in 2004	−0.064	0.059	0.899	1.359	−0.070	0.038	0.917	1.311
Share of Female Workers in 2004	0.180	0.024	0.911	1.130	0.177	0.011	0.925	1.148
Share of Full-Time Workers in 2004	0.079	−0.006	1.001	1.034	0.063	−0.016	1.001	1.064
Neighboring Market Variables								
log(Residents within a 3km Radius Circle) in 2004	0.919	0.090	0.186	0.898	0.875	0.111	0.203	0.900
log(Employment within a 3km Radius Circle) in 2004	1.204	0.096	0.240	0.902	1.138	0.121	0.254	0.896
log(Establishments in Secondary Sector within a 3km Radius Circle) in 2004	0.850	0.056	0.249	0.948	0.790	0.078	0.258	0.931
log(Establishments in Tertiary Sector within a 3km Radius Circle) in 2004	1.303	0.110	0.233	0.905	1.245	0.134	0.241	0.894
log(Residents within a 3–6km Radius Circle) in 2004	0.585	0.026	0.309	0.931	0.535	0.043	0.325	0.932
log(Employment within a 3–6km Radius Circle) in 2004	0.301	−0.034	0.406	0.923	0.252	−0.021	0.404	0.926
log(Establishments in Secondary Sector within a 3–6km Radius Circle) in 2004	0.771	0.025	0.347	0.941	0.716	0.047	0.352	0.929
log(Establishments in Tertiary Sector within a 3–6km Radius Circle) in 2004	0.229	−0.050	0.499	0.943	0.186	−0.037	0.491	0.940
log(Residents within a 6–9km Radius Circle) in 2004	0.354	0.014	0.351	0.923	0.307	0.028	0.365	0.928
log(Employment within a 6–9km Radius Circle) in 2004	−0.077	0.001	0.530	0.967	−0.114	0.000	0.512	0.976
log(Establishments in Secondary Sector within a 6–9km Radius Circle) in 2004	0.490	0.022	0.373	0.936	0.436	0.039	0.382	0.932
log(Establishments in Tertiary Sector within a 6–9km Radius Circle) in 2004	−0.129	−0.011	0.547	0.968	−0.164	−0.006	0.525	0.973

Note: The one-to-one nearest neighbor matching based on Mahalanobis distance is implemented by `teffect nnmatch` of Stata ver. 15.1. The covariates are log of local employment within 3 km, log of local employment within 3–6 km, log of local employment within 6–9 km, log of sales, log of costs, log of wages, share of female workers, share of full-time workers as of 2004.

Table A.5 Balancing Test for Profit for Sample of Prefectural Capital

	Period: 2004–2012				Period: 2004–2016			
	Standardized differences		Variance ratio		Standardized differences		Variance ratio	
Variables	Raw	Matched	Raw	Matched	Raw	Matched	Raw	Matched
Establishment Variables								
log(Sales) in 2004	0.096	0.061	0.833	1.228	0.105	0.058	0.830	1.198
log(Costs) in 2004	0.076	0.051	0.812	1.218	0.085	0.044	0.799	1.166
log(Total Wage Payment) in 2004	0.077	0.035	0.803	1.198	0.081	0.023	0.794	1.155
log(Employment) in 2004	−0.042	0.053	0.912	1.291	−0.041	0.022	0.923	1.189
Share of Female Workers in 2004	0.145	0.003	0.891	1.152	0.132	−0.012	0.882	1.165
Share of Full-Time Workers in 2004	0.132	0.058	0.996	1.017	0.141	0.050	1.006	1.054
Neighboring Market Variables								
log(Residents within a 3km Radius Circle) in 2004	1.257	0.259	0.046	0.649	1.263	0.286	0.053	0.684
log(Employment within a 3km Radius Circle) in 2004	1.686	0.364	0.048	0.583	1.687	0.377	0.056	0.595
log(Establishments in Secondary Sector within a 3km Radius Circle) in 2004	1.188	0.142	0.106	0.824	1.198	0.163	0.108	0.816
log(Establishments in Tertiary Sector within a 3km Radius Circle) in 2004	1.768	0.326	0.061	0.650	1.770	0.333	0.068	0.636
log(Residents within a 3–6km Radius Circle) in 2004	1.027	0.201	0.056	0.620	1.014	0.205	0.070	0.701
log(Employment within a 3–6km Radius Circle) in 2004	0.767	0.081	0.071	0.704	0.738	0.083	0.085	0.759
log(Establishments in Secondary Sector within a 3–6km Radius Circle) in 2004	1.304	0.222	0.065	0.684	1.290	0.218	0.081	0.730
log(Establishments in Tertiary Sector within a 3–6km Radius Circle) in 2004	0.745	0.041	0.091	0.777	0.711	0.035	0.115	0.843
log(Residents within a 6–9km Radius Circle) in 2004	0.763	0.136	0.081	0.663	0.745	0.143	0.096	0.735
log(Employment within a 6–9km Radius Circle) in 2004	0.215	0.034	0.203	0.933	0.183	0.032	0.214	0.957
log(Establishments in Secondary Sector within a 6–9km Radius Circle) in 2004	0.974	0.185	0.072	0.647	0.953	0.179	0.092	0.724
log(Establishments in Tertiary Sector within a 6–9km Radius Circle) in 2004	0.148	0.008	0.239	0.927	0.114	0.009	0.247	0.947

Note: The one-to-one nearest neighbor matching based on Mahalanobis distance is implemented by `teffect nnmatch` of Stata ver. 15.1. The covariates are log of local employment within 3 km, log of local employment within 3–6 km, log of local employment within 6–9 km, log of sales, log of costs, log of wages, share of female workers, share of full-time workers as of 2004.

Table A.6 Balancing Test for Profit for Sample of Other Cities

	Period: 2004–2012				Period: 2004–2016			
	Standardized differences		Variance ratio		Standardized differences		Variance ratio	
Variables	Raw	Matched	Raw	Matched	Raw	Matched	Raw	Matched
Establishment Variables								
log(Sales) in 2004	−0.055	0.009	0.938	1.158	−0.081	0.018	0.881	1.157
log(Costs) in 2004	−0.079	−0.026	0.956	1.181	−0.086	−0.005	0.900	1.163
log(Total Wage Payment) in 2004	−0.093	−0.054	0.878	1.106	−0.096	−0.032	0.854	1.086
log(Employment) in 2004	−0.102	0.004	0.877	1.216	−0.106	0.008	0.909	1.226
Share of Female Workers in 2004	0.241	0.076	0.940	1.105	0.232	0.042	0.973	1.141
Share of Full-Time Workers in 2004	−0.012	−0.075	0.998	1.081	−0.034	−0.062	0.980	1.075
Neighboring Market Variables								
log(Residents within a 3km Radius Circle) in 2004	0.459	0.048	0.238	0.890	0.491	0.072	0.230	0.883
log(Employment within a 3km Radius Circle) in 2004	0.612	0.045	0.223	0.860	0.646	0.089	0.208	0.858
log(Establishments in Secondary Sector within a 3km Radius Circle) in 2004	0.383	0.036	0.287	0.991	0.381	0.061	0.250	0.941
log(Establishments in Tertiary Sector within a 3km Radius Circle) in 2004	0.732	0.054	0.201	0.853	0.774	0.106	0.183	0.847
log(Residents within a 3–6km Radius Circle) in 2004	0.003	−0.012	0.395	0.912	0.072	0.003	0.381	0.918
log(Employment within a 3–6km Radius Circle) in 2004	−0.319	−0.051	0.536	0.905	−0.229	−0.048	0.493	0.916
log(Establishments in Secondary Sector within a 3–6km Radius Circle) in 2004	0.101	−0.015	0.353	0.891	0.181	0.011	0.333	0.898
log(Establishments in Tertiary Sector within a 3–6km Radius Circle) in 2004	−0.455	−0.069	0.619	0.913	−0.330	−0.062	0.578	0.927
log(Residents within a 6–9km Radius Circle) in 2004	−0.205	−0.013	0.473	0.915	−0.130	−0.007	0.454	0.921
log(Employment within a 6–9km Radius Circle) in 2004	−0.492	−0.003	0.838	0.954	−0.428	−0.017	0.718	0.961
log(Establishments in Secondary Sector within a 6–9km Radius Circle) in 2004	−0.144	−0.012	0.450	0.907	−0.067	0.003	0.421	0.913
log(Establishments in Tertiary Sector within a 6–9km Radius Circle) in 2004	−0.534	−0.009	0.829	0.961	−0.463	−0.018	0.718	0.966

Note: The one-to-one nearest neighbor matching based on Mahalanobis distance is implemented by `teffect nnmatch` of Stata ver. 15.1. The covariates are log of local employment within 3 km, log of local employment within 3–6 km, log of local employment within 6–9 km, log of sales, log of costs, log of wages, share of female workers, share of full-time workers as of 2004.

Table A.7 Balancing Test for Average Wage per Worker for Full Sample

	Period: 2004–2012				Period: 2004–2016			
	Standardized differences		Variance ratio		Standardized differences		Variance ratio	
Variables	Raw	Matched	Raw	Matched	Raw	Matched	Raw	Matched
Establishment Variables								
log(Sales) in 2004	0.033	0.043	0.925	1.309	−0.017	0.048	0.894	1.295
log(Costs) in 2004	0.005	0.015	0.917	1.262	−0.038	0.027	0.889	1.263
log(Total Wage Payment) in 2004	−0.004	−0.019	0.859	1.187	−0.057	−0.022	0.834	1.171
log(Employment) in 2004	−0.062	0.025	0.947	1.309	−0.114	0.019	0.929	1.295
Share of Female Workers in 2004	0.173	0.035	0.932	1.138	0.183	0.023	0.938	1.177
Share of Full-Time Workers in 2004	0.086	−0.013	0.985	1.020	0.057	−0.024	0.978	1.043
Neighboring Market Variables								
log(Residents within a 3km Radius Circle) in 2004	0.924	0.114	0.199	0.932	0.872	0.116	0.200	0.943
log(Employment within a 3km Radius Circle) in 2004	1.201	0.112	0.256	0.926	1.135	0.117	0.253	0.944
log(Establishments in Secondary Sector within a 3km Radius Circle) in 2004	0.865	0.068	0.268	0.969	0.790	0.084	0.265	0.979
log(Establishments in Tertiary Sector within a 3km Radius Circle) in 2004	1.301	0.126	0.244	0.922	1.241	0.129	0.239	0.937
log(Residents within a 3–6km Radius Circle) in 2004	0.581	0.039	0.334	0.972	0.533	0.039	0.323	0.973
log(Employment within a 3–6km Radius Circle) in 2004	0.290	−0.027	0.433	0.952	0.250	−0.034	0.399	0.951
log(Establishments in Secondary Sector within a 3–6km Radius Circle) in 2004	0.767	0.038	0.369	0.970	0.713	0.037	0.351	0.973
log(Establishments in Tertiary Sector within a 3–6km Radius Circle) in 2004	0.217	−0.043	0.532	0.968	0.184	−0.049	0.487	0.962
log(Residents within a 6–9km Radius Circle) in 2004	0.347	0.024	0.375	0.963	0.303	0.024	0.364	0.965
log(Employment within a 6–9km Radius Circle) in 2004	−0.077	0.004	0.540	1.001	−0.110	0.000	0.503	0.991
log(Establishments in Secondary Sector within a 6–9km Radius Circle) in 2004	0.488	0.034	0.400	0.970	0.432	0.032	0.382	0.974
log(Establishments in Tertiary Sector within a 6–9km Radius Circle) in 2004	−0.131	−0.006	0.556	1.000	−0.162	−0.008	0.518	0.988

Note: The one-to-one nearest neighbor matching based on Mahalanobis distance is implemented by `teffect nnmatch` of Stata ver. 15.1. The covariates are log of local employment within 3 km, log of local employment within 3–6 km, log of local employment within 6–9 km, log of sales, log of costs, log of wages, share of female workers, share of full-time workers as of 2004.

Table A.8 Balancing Test for Average Wage per Worker for Sample of SePrefectural Capital

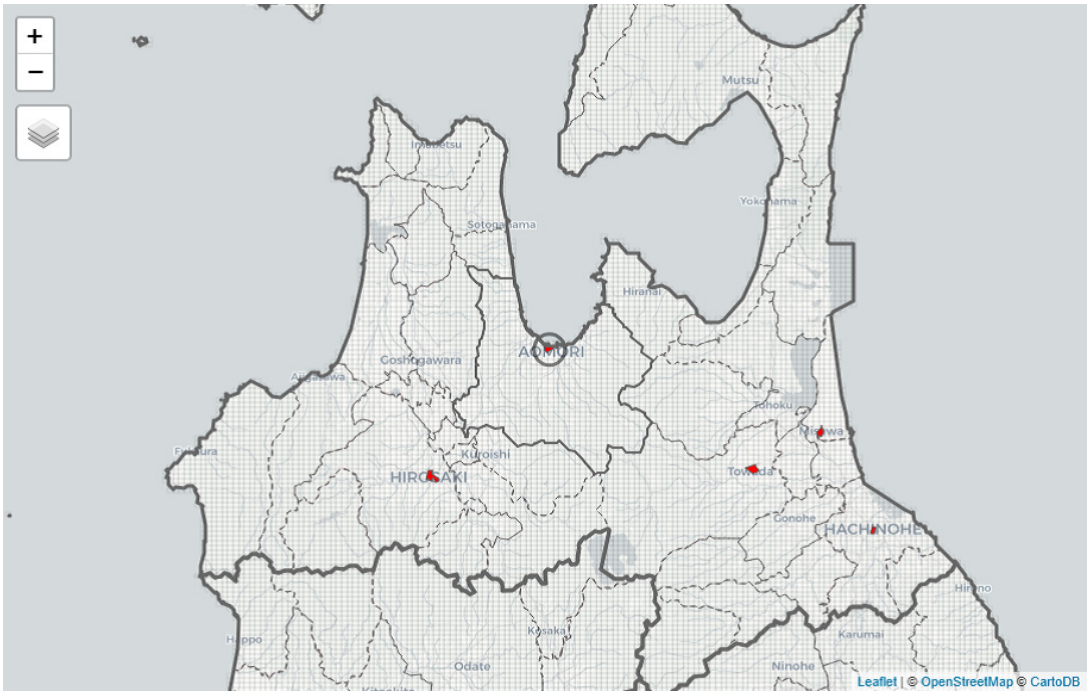
	Period: 2004–2012				Period: 2004–2016			
	Standardized differences		Variance ratio		Standardized differences		Variance ratio	
Variables	Raw	Matched	Raw	Matched	Raw	Matched	Raw	Matched
Establishment Variables								
log(Sales) in 2004	0.080	0.056	0.867	1.327	0.035	0.048	0.870	1.447
log(Costs) in 2004	0.052	0.035	0.844	1.264	0.003	0.025	0.848	1.382
log(Total Wage Payment) in 2004	0.049	0.006	0.819	1.212	−0.007	−0.014	0.787	1.280
log(Employment) in 2004	−0.045	0.042	0.968	1.328	−0.114	0.016	0.927	1.407
Share of Female Workers in 2004	0.151	0.007	0.891	1.133	0.146	−0.016	0.894	1.181
Share of Full-Time Workers in 2004	0.136	0.026	0.989	1.030	0.126	0.011	0.999	1.034
Neighboring Market Variables								
log(Residents within a 3km Radius Circle) in 2004	1.281	0.252	0.048	0.621	1.247	0.269	0.055	0.687
log(Employment within a 3km Radius Circle) in 2004	1.711	0.275	0.050	0.505	1.673	0.293	0.057	0.584
log(Establishments in Secondary Sector within a 3km Radius Circle) in 2004	1.229	0.116	0.105	0.790	1.191	0.159	0.110	0.806
log(Establishments in Tertiary Sector within a 3km Radius Circle) in 2004	1.792	0.285	0.060	0.552	1.756	0.293	0.068	0.625
log(Residents within a 3–6km Radius Circle) in 2004	1.043	0.140	0.062	0.646	0.995	0.147	0.071	0.701
log(Employment within a 3–6km Radius Circle) in 2004	0.773	−0.014	0.076	0.661	0.714	−0.021	0.085	0.714
log(Establishments in Secondary Sector within a 3–6km Radius Circle) in 2004	1.326	0.140	0.068	0.628	1.273	0.142	0.080	0.683
log(Establishments in Tertiary Sector within a 3–6km Radius Circle) in 2004	0.751	−0.049	0.098	0.730	0.689	−0.052	0.113	0.773
log(Residents within a 6–9km Radius Circle) in 2004	0.769	0.090	0.087	0.718	0.720	0.099	0.096	0.771
log(Employment within a 6–9km Radius Circle) in 2004	0.211	0.028	0.209	0.970	0.162	0.021	0.213	1.025
log(Establishments in Secondary Sector within a 6–9km Radius Circle) in 2004	0.989	0.124	0.077	0.669	0.932	0.126	0.091	0.734
log(Establishments in Tertiary Sector within a 6–9km Radius Circle) in 2004	0.139	0.004	0.245	0.971	0.093	0.004	0.247	1.010

Note: The one-to-one nearest neighbor matching based on Mahalanobis distance is implemented by `teffect nnmatch` of Stata ver. 15.1. The covariates are log of local employment within 3 km, log of local employment within 3–6 km, log of local employment within 6–9 km, log of sales, log of costs, log of wages, share of female workers, share of full-time workers as of 2004.

Table A.9 Balancing Test for Average Wage per Worker for Sample of Other Cities

	Period: 2004–2012				Period: 2004–2016			
	Standardized differences		Variance ratio		Standardized differences		Variance ratio	
Variables	Raw	Matched	Raw	Matched	Raw	Matched	Raw	Matched
Establishment Variables								
log(Sales) in 2004	−0.040	0.023	1.012	1.258	−0.082	0.048	0.918	1.162
log(Costs) in 2004	−0.067	−0.013	1.027	1.255	−0.090	0.028	0.938	1.157
log(Total Wage Payment) in 2004	−0.088	−0.057	0.915	1.156	−0.119	−0.034	0.887	1.077
log(Employment) in 2004	−0.090	−0.003	0.912	1.274	−0.114	0.021	0.934	1.181
Share of Female Workers in 2004	0.206	0.074	0.998	1.158	0.228	0.072	0.990	1.162
Share of Full-Time Workers in 2004	0.006	−0.076	0.970	1.012	−0.031	−0.067	0.939	1.042
Neighboring Market Variables								
log(Residents within a 3km Radius Circle) in 2004	0.472	0.068	0.254	0.932	0.488	0.064	0.232	0.929
log(Employment within a 3km Radius Circle) in 2004	0.619	0.064	0.240	0.907	0.636	0.070	0.213	0.914
log(Establishments in Secondary Sector within a 3km Radius Circle) in 2004	0.402	0.052	0.319	1.024	0.375	0.057	0.267	1.007
log(Establishments in Tertiary Sector within a 3km Radius Circle) in 2004	0.740	0.072	0.214	0.879	0.764	0.082	0.185	0.894
log(Residents within a 3–6km Radius Circle) in 2004	0.015	−0.007	0.430	0.969	0.071	−0.005	0.394	0.963
log(Employment within a 3–6km Radius Circle) in 2004	−0.307	−0.056	0.574	0.944	−0.222	−0.057	0.509	0.942
log(Establishments in Secondary Sector within a 3–6km Radius Circle) in 2004	0.114	−0.011	0.383	0.945	0.173	−0.010	0.342	0.950
log(Establishments in Tertiary Sector within a 3–6km Radius Circle) in 2004	−0.440	−0.071	0.667	0.948	−0.327	−0.069	0.598	0.945
log(Residents within a 6–9km Radius Circle) in 2004	−0.187	−0.013	0.512	0.967	−0.126	−0.011	0.474	0.957
log(Employment within a 6–9km Radius Circle) in 2004	−0.459	−0.015	0.849	0.991	−0.406	−0.015	0.729	0.961
log(Establishments in Secondary Sector within a 6–9km Radius Circle) in 2004	−0.121	−0.010	0.496	0.969	−0.069	−0.011	0.440	0.956
log(Establishments in Tertiary Sector within a 6–9km Radius Circle) in 2004	−0.498	−0.018	0.844	1.003	−0.444	−0.018	0.731	0.965

Note: The one-to-one nearest neighbor matching based on Mahalanobis distance is implemented by `teffect nnmatch` of Stata ver. 15.1. The covariates are log of local employment within 3 km, log of local employment within 3–6 km, log of local employment within 6–9 km, log of sales, log of costs, log of wages, share of female workers, share of full-time workers as of 2004.

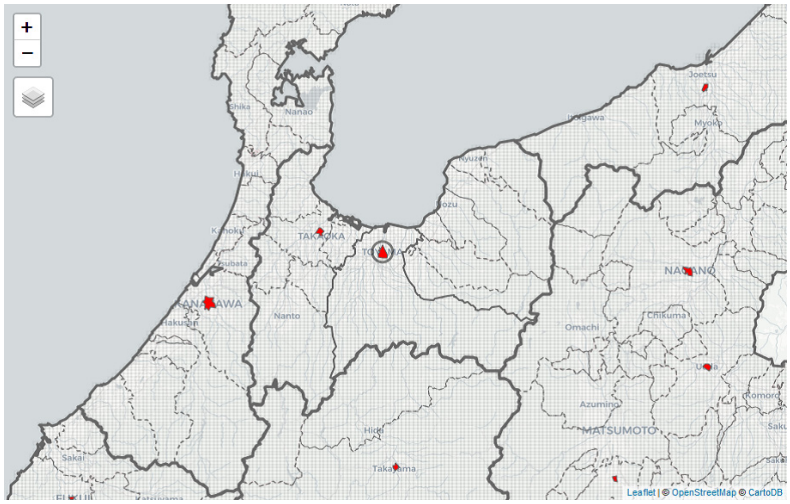


(a) Aomori City

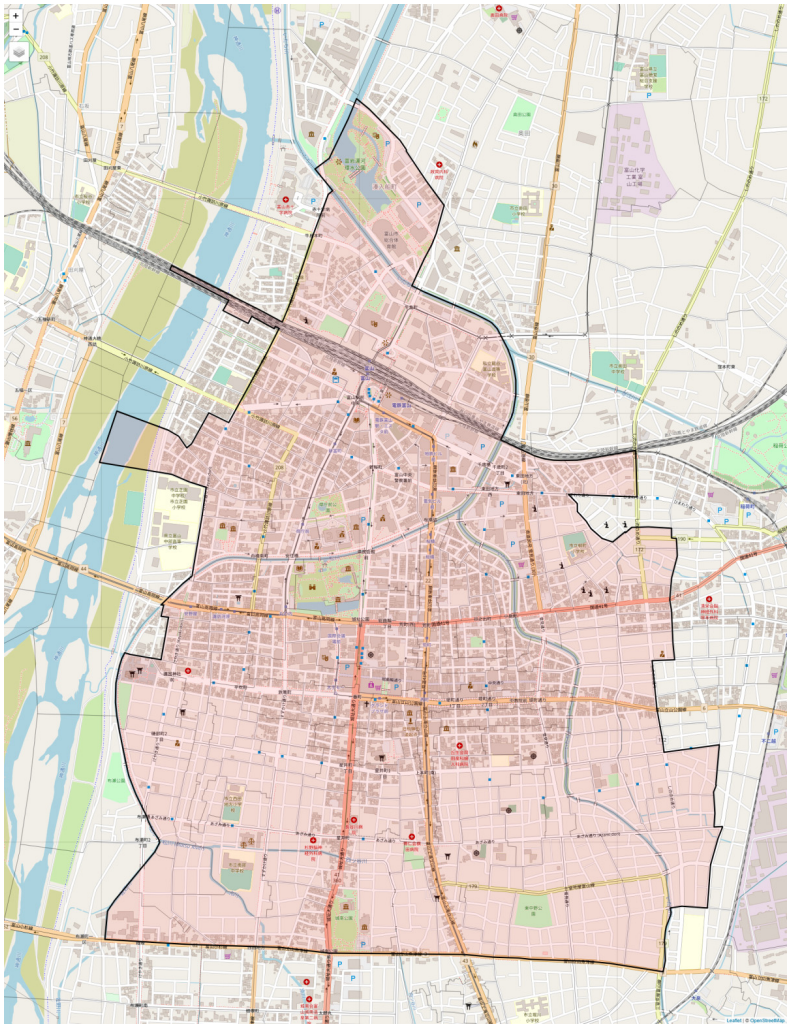
(b) URZ in Aomori City

Figure 1 Urban Revitalization Zone in Aomori City, Aomori Prefecture

Note: Created by authors. The boundary of the urban revitalization zone (URZ) in this figure is not exactly identical to the official one because the shape file data used here is based on the block (*Cho-Cho-Aza*) level. See the official Basic Plan for City Revitalization Policy of Aomori city (`https://www.city.aomori.aomori.jp/`).



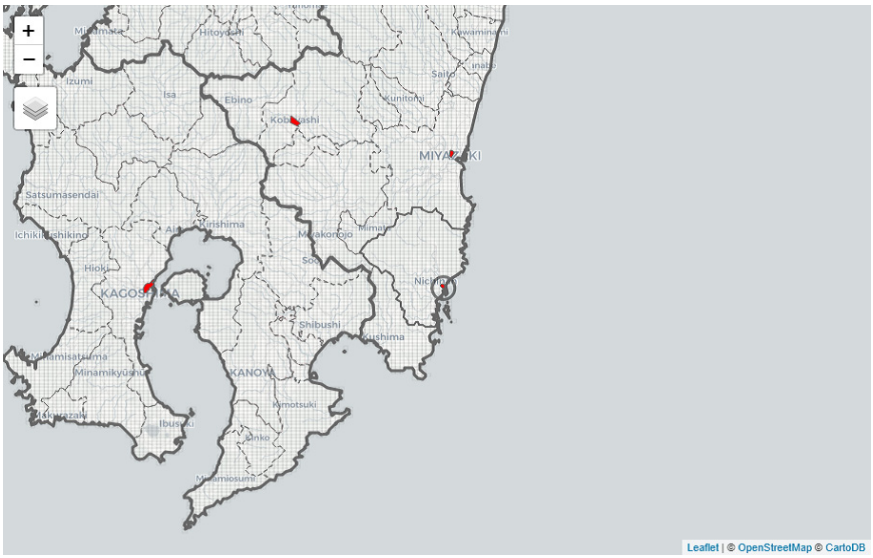
(a) Toyama City



(b) URZ in Toyama City

Figure 2 Urban Revitalization Zone in Toyama City, Toyama Prefecture

Note: Created by authors. The boundary of the urban revitalization zone (URZ) in this figure is not exactly identical to the official one because the shape file data used here is based on the block (*Cho-Cho-Aza*) level. See the official Basic Plan for City Revitalization Policy of Toyama city (`https://www.city.toyama.toyama.jp/`).



(a) Nichinan City

(b) URZ in Nichinan City

Figure 3　Urban Revitalization Zone in Nichinan City, Miyazaki Prefecture

Note: Created by authors. The boundary of the urban revitalization zone (URZ) in this figure is not exactly identical to the official one because the shape file data used here is based on the block (*Cho-Cho-Aza*) level. See the official Basic Plan for City Revitalization Policy of Nichinan city (`https://www.city.nichinan.lg.jp/`).

Figure 4 Construction of Neighboring Market Variables based on Grid Square Statistics

Note: Neighboring market variables are constructed from the Grid Square Statistics (Ministry of Internal Affairs and Communications). This example depicts the 3 km ring circles (3 km, 6 km, and 9 km) from the centroid of the grid square where the Prefectural Government of Toyama is located. This study calculates neighboring employment of each firm based on the Grid Square Statistics at the approximately a 1 km by 1 km level.

Online Appendix for

The Revitalization of Shrinking Cities: Lessons from the Japanese Service Sector

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This online appendix provides additional estimation results.

Contents

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Online Appendix A.

Regression Analysis for Neighboring Markets

A.1 Empirical Framework

To measure the impacts of neighboring markets on sales, profits, and average wage, we estimate a first-difference regression using the establishment panel data. In this regression, we use the pooled data of the average annual growth rate (2004–2012 and 2004–2016).

$$\frac{1}{T_t}\Delta \log Y_{it} = \alpha_1 \frac{1}{T_t}\Delta \log\left(M_{it}^{d\text{km}}\right) + \alpha_2 \frac{1}{T_t}\log\left(M_{it}^{d\text{km}}\right) + \frac{1}{T_t}\Delta \boldsymbol{X}_{it}\boldsymbol{\beta} + \pi_t + \Delta u_{it}, \quad t = 2012, 2016 \quad \text{(A.1)}$$

where Y_{it} is the variable of interest (sales, profits, and average wages per worker) for establishment i, $1/T_t \Delta \log Y_{it} = 1/T_t(\log Y_{it} - \log Y_{i,2004})$ is the average annual growth rate of the variable, T_t is the time period between year t and 2004 (i.e., $T_{2012} = 8$ and $T_{2016} = 12$), $M_{it}^{d\text{km}}$ are the neighboring market variables that measures neighboring employment and residents within a $d \in (3, 6, 9, 12, 15, 18)$ km radius from the location of the establishment i, $\Delta \boldsymbol{X}_{it}$ is the growth rate of the control variables (employment, the share of female workers, and the share of full-time workers). Note that $\log M_{i,2004}^{d\text{km}}$ is additionally introduced to measure how the size of neighboring market increases the growth rate of dependent variables since simply taking a temporal difference annihilates scale effects.

The purpose of this regression is to differentiate neighboring market variables into employment and population. In the Japanese literature on urban economics, the market size or agglomeration variables are based on the municipality level, which does not allow us to distinguish between employment and population as the geographical units are relatively large. Using the micro-geographic data based on 1 km by 1 km Grid Square Statistics (Ministry of Internal Affairs and Communications), this study can clarify how neighboring employment and the number of residents around service establishments differently affects business activity.

A.2 Descriptive Statistics

Tables OA.A. 1–OA.A. 2 present descriptive statistics for regression (A.1). This study uses pooled data of the difference variables in the period from 2004–2012 and the period from 2004–2016. Note that the difference in the period from 2012–2016 is not used in the regression.

[Tables OA.A. 1–OA.A. 2]

Table OA.A. 1 Descriptive Statistics

	Period: 2004–2012, 2004–2016		
Variables	Obs.	Mean	S.D.
Regression for Sales Growth			
Annual Growth Rate of Sales	180,971	−0.029	0.071
Annual Growth Rate of Neighboring Employment	180,971	−0.009	0.013
Lag of log(Neighboring Employment)	180,971	1.062	0.275
Annual Growth Rate of log(Employment)	180,971	−0.011	0.048
Annual Growth Rate of Share of Female Workers	180,971	−0.001	0.020
Annual Growth Rate of Share of Full-Time Workers	180,971	−0.004	0.026
Regression for Profit Growth			
Annual Growth Rate of Profits	123,409	−0.045	0.094
Annual Growth Rate of Neighboring Employment	123,409	−0.010	0.013
Lag of log(Neighboring Employment)	123,409	1.066	0.280
Annual Growth Rate of log(Employment)	123,409	−0.010	0.047
Annual Growth Rate of Share of Female Workers	123,409	−0.001	0.022
Annual Growth Rate of Share of Full-Time Workers	123,409	−0.004	0.027
Regression for Wage Growth			
Annual Growth Rate of Average Wage per Worker	89,376	−0.033	0.079
Annual Growth Rate of Neighboring Employment	89,376	−0.010	0.013
Lag of log(Neighboring Employment)	89,376	1.071	0.278
Annual Growth Rate of log(Employment)	89,376	−0.011	0.046
Annual Growth Rate of Share of Female Workers	89,376	−0.001	0.020
Annual Growth Rate of Share of Full-Time Workers	89,376	−0.004	0.028

Note: Descriptive statistics are based on sample used for regressions on a 3 km radius circle.

Table OA.A. 2 Descriptive Statistics

	Period: 2004–2012, 2004–2016		
Variables	Obs.	Mean	S.D.
Regression for Sales Growth			
Annual Growth Rate of Sales	183,356	−0.029	0.071
Annual Growth Rate of Neighboring Residents	183,356	−0.001	0.009
Lag of log(Neighboring Residents)	183,356	1.125	0.270
Annual Growth Rate of log(Employment)	183,356	−0.011	0.048
Annual Growth Rate of Share of Female Workers	183,356	−0.001	0.020
Annual Growth Rate of Share of Full-Time Workers	183,356	−0.004	0.026
Regression for Profit Growth			
Annual Growth Rate of Profits	125,338	−0.045	0.094
Annual Growth Rate of Neighboring Residents	125,338	−0.001	0.009
Lag of log(Neighboring Residents)	125,338	1.133	0.275
Annual Growth Rate of log(Employment)	125,338	−0.010	0.047
Annual Growth Rate of Share of Female Workers	125,338	−0.001	0.022
Annual Growth Rate of Share of Full-Time Workers	125,338	−0.004	0.027
Regression for Wage Growth			
Annual Growth Rate of Average Wage per Worker	90,514	−0.033	0.079
Annual Growth Rate of Neighboring Residents	90,514	−0.001	0.009
Lag of log(Neighboring Residents)	90,514	1.133	0.272
Annual Growth Rate of log(Employment)	90,514	−0.011	0.046
Annual Growth Rate of Share of Female Workers	90,514	−0.001	0.020
Annual Growth Rate of Share of Full-Time Workers	90,514	−0.004	0.028

Note: Descriptive statistics are based on sample used for regressions on a 3 km radius circle.

A.3 Estimation Results from Full Sample

Table OA.A. 3 presents the estimation results for the first-difference regression, in which the neighboring market variable is measured by neighboring employment within a $d \in (3, 6, 9, 12, 15, 18)$ km radius. First, the growth of neighboring markets significantly increases the rate of growth of sales but has no effects on the growth of profits and average wages. The scale effects of local neighboring markets also have impacts on the growth rates of the outcome variables. The localized areas as of 2004 experienced high growth in sales and wages. In particular, the magnitude on sales growth is large within a small geographical range.

Table OA.A. 4 presents the estimation results for the first-difference regression, in which the neighboring market variable is measured by neighboring residents within a $d \in (3, 6, 9, 12, 15, 18)$ km radius. The main findings are similar to the case of neighboring employment but capture a different mechanism between employment and population agglomeration. The magnitude of the effect of neighboring population growth on the sales growth is larger than that of neighboring employment. In addition, the growth of neighboring population increases the growth in profit, suggesting that demand concentration, not the concentration in the supply side, plays an important role in improving economic performance in the service sector.

[Tables OA.A. 3–OA.A. 4]

Table OA.A. 3 Estimation Results of First-Difference Regression in 2004–2012–2016 using Neighboring Employment (All Service Industries)

Variables	Circle of a $d$km Radius for Neighboring Markets: 3km	6km	9km	12km	15km	18km
	Dependent Variable: Δ log(Sales)					
Neighboring Market Variable						
Δ log(Neighboring Employment)	0.130***	0.160***	0.184***	0.202***	0.202***	0.221***
	(0.016)	(0.025)	(0.031)	(0.036)	(0.041)	(0.045)
log(Neighboring Employment) in 2004	0.009***	0.007***	0.006***	0.005**	0.005**	0.003
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Establishment Variable						
Δ log(Employment)	0.466***	0.465***	0.465***	0.466***	0.465***	0.465***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Δ Share of Female Workers	−0.075***	−0.075***	−0.078***	−0.077***	−0.076***	−0.074***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Δ Share of Full-Time Workers	0.237***	0.238***	0.237***	0.237***	0.237***	0.238***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Number of Observations	180,971	181,386	181,639	181,964	182,469	182,593
Adjusted R-Squared	0.113	0.112	0.112	0.112	0.112	0.112
	Dependent Variable: Δ log(Profits)					
Neighboring Market Variable						
Δ log(Neighboring Employment)	−0.012	0.027	0.009	0.014	0.076	0.051
	(0.025)	(0.038)	(0.047)	(0.055)	(0.061)	(0.068)
log(Neighboring Employment) in 2004	−0.006***	−0.009***	−0.010***	−0.011***	−0.014***	−0.014***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)
Establishment Variable						
Δ log(Employment)	0.161***	0.159***	0.159***	0.160***	0.160***	0.160***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Δ Share of Female Workers	−0.049***	−0.047***	−0.049***	−0.050***	−0.050***	−0.048***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
Δ Share of Full-Time Workers	0.040***	0.042***	0.038***	0.037***	0.038***	0.038***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Number of Observations	123,409	123,762	124,001	124,259	124,612	124,715
Adjusted R-Squared	0.029	0.028	0.028	0.028	0.028	0.028
	Dependent Variable: Δ log(Average Wage per Worker)					
Neighboring Market Variable						
Δ log(Neighboring Employment)	0.045*	0.010	−0.052	−0.092	−0.161**	−0.186**
	(0.026)	(0.040)	(0.050)	(0.058)	(0.065)	(0.071)
log(Neighboring Employment) in 2004	0.010***	0.012***	0.013***	0.015***	0.020***	0.021***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
Establishment Variable						
Δ log(Employment)	−0.307***	−0.307***	−0.309***	−0.308***	−0.309***	−0.308***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Δ Share of Female Workers	−0.063***	−0.068***	−0.071***	−0.069***	−0.068***	−0.067***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Δ Share of Full-Time Workers	0.387***	0.387***	0.389***	0.388***	0.389***	0.390***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Number of Observations	89,376	89,606	89,725	89,873	90,142	90,215
Adjusted R-Squared	0.064	0.065	0.065	0.065	0.065	0.065

Note: Heteroskedasticity-consistent standard errors are in parentheses. * denotes statistical significance at the 10% level, ** at the 5% level, and *** at the 1% level. Industyry and prefecture dummies are included.

Table OA.A. 4 Estimation Results of First-Difference Regression in 2004–2012–2016 using Neighboring Residents (All Service Industries)

Variables	Circle of a $d$km Radius for Neighboring Markets: 3km	6km	9km	12km	15km	18km
	Dependent Variable: Δ log(Sales)					
Neighboring Market Variable						
Δ log(Neighboring Residents)	0.337***	0.374***	0.402***	0.426***	0.450***	0.423***
	(0.031)	(0.044)	(0.051)	(0.058)	(0.063)	(0.068)
log(Neighboring Residents) in 2004	−0.004*	−0.003	−0.004	−0.004	−0.004	−0.003
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
Establishment Variable						
Δ log(Employment)	0.465***	0.466***	0.465***	0.465***	0.465***	0.465***
	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
Δ Share of Female Workers	−0.074***	−0.076***	−0.076***	−0.076***	−0.075***	−0.075***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Δ Share of Full-Time Workers	0.236***	0.236***	0.236***	0.237***	0.238***	0.238***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Number of Observations	183,356	183,715	183,545	183,251	183,002	182,963
Adjusted R-Squared	0.112	0.112	0.112	0.112	0.112	0.112
	Dependent Variable: Δ log(Profits)					
Neighboring Market Variable						
Δ log(Neighboring Residents)	0.018	0.123*	0.197**	0.208**	0.197**	0.108
	(0.049)	(0.067)	(0.080)	(0.091)	(0.098)	(0.106)
log(Neighboring Residents) in 2004	−0.005	−0.010***	−0.014***	−0.016***	−0.017***	−0.014***
	(0.003)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)
Establishment Variable						
Δ log(Employment)	0.161***	0.160***	0.160***	0.160***	0.159***	0.160***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Δ Share of Female Workers	−0.045***	−0.046***	−0.046***	−0.048***	−0.047***	−0.048***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Δ Share of Full-Time Workers	0.039***	0.038***	0.040***	0.041***	0.040***	0.037***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Number of Observations	125,338	125,535	125,492	125,299	125,083	124,990
Adjusted R-Squared	0.028	0.028	0.029	0.028	0.028	0.028
	Dependent Variable: Δ log(Average Wage per Worker)					
Neighboring Market Variable						
Δ log(Neighboring Residents)	0.109**	0.021	0.001	0.001	0.030	−0.036
	(0.048)	(0.070)	(0.083)	(0.093)	(0.100)	(0.107)
log(Neighboring Residents) in 2004	0.002	0.009**	0.011**	0.011**	0.013***	0.015***
	(0.003)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)
Establishment Variable						
Δ log(Employment)	−0.307***	−0.307***	−0.308***	−0.308***	−0.307***	−0.307***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Δ Share of Female Workers	−0.066***	−0.070***	−0.070***	−0.068***	−0.067***	−0.068***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Δ Share of Full-Time Workers	0.390***	0.391***	0.389***	0.390***	0.389***	0.388***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Number of Observations	90,514	90,672	90,589	90,535	90,441	90,364
Adjusted R-Squared	0.064	0.064	0.064	0.065	0.065	0.065

Note: Heteroskedasticity-consistent standard errors are in parentheses. * denotes statistical significance at the 10% level, ** at the 5% level, and *** at the 1% level. Industyry and prefecture dummies are included.

A.4 Estimation Results by Industry

Tables OA.A. 5–OA.A. 18 present estimation results of regression (A.1) by two-digit level industry.

[Tables OA.A. 7–OA.A. 18]

Table OA.A. 5 Estimation Results of First-Difference Regression in 2004–2012–2016 using Neighboring Employment (Real Estate Lessors and Managers)

Variables	Circle of a $d$km Radius for Neighboring Markets: 3km	6km	9km	12km	15km	18km
	Dependent Variable: Δ log(Sales)					
Neighboring Market Variable						
Δ log(Neighboring Employment)	0.329***	0.266*	0.153	0.033	−0.003	−0.135
	(0.096)	(0.145)	(0.178)	(0.204)	(0.224)	(0.251)
log(Neighboring Employment) in 2004	0.002	0.001	0.002	0.012	0.017	0.025*
	(0.009)	(0.010)	(0.011)	(0.012)	(0.012)	(0.014)
Establishment Variable						
Δ log(Employment)	0.228***	0.227***	0.227***	0.227***	0.228***	0.228***
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
Δ Share of Female Workers	−0.040	−0.035	−0.042	−0.036	−0.039	−0.040
	(0.037)	(0.037)	(0.037)	(0.037)	(0.037)	(0.037)
Δ Share of Full-Time Workers	0.075*	0.072*	0.073*	0.079*	0.077*	0.077*
	(0.041)	(0.041)	(0.041)	(0.041)	(0.041)	(0.041)
Number of Observations	9,781	9,785	9,775	9,779	9,802	9,816
Adjusted R-Squared	0.031	0.029	0.029	0.029	0.029	0.029
	Dependent Variable: Δ log(Profits)					
Neighboring Market Variable						
Δ log(Neighboring Employment)	0.322***	0.260	0.113	−0.029	−0.014	0.015
	(0.111)	(0.157)	(0.198)	(0.231)	(0.253)	(0.276)
log(Neighboring Employment) in 2004	−0.029***	−0.028**	−0.020	−0.013	−0.012	−0.013
	(0.010)	(0.011)	(0.012)	(0.014)	(0.014)	(0.016)
Establishment Variable						
Δ log(Employment)	0.114***	0.111***	0.113***	0.117***	0.116***	0.115***
	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)
Δ Share of Female Workers	0.053	0.062	0.054	0.051	0.054	0.054
	(0.040)	(0.040)	(0.040)	(0.040)	(0.040)	(0.040)
Δ Share of Full-Time Workers	0.065	0.060	0.059	0.058	0.061	0.060
	(0.051)	(0.051)	(0.051)	(0.051)	(0.051)	(0.051)
Number of Observations	8,771	8,771	8,756	8,757	8,780	8,786
Adjusted R-Squared	0.022	0.021	0.019	0.020	0.020	0.020
	Dependent Variable: Δ log(Average Wage per Worker)					
Neighboring Market Variable						
Δ log(Neighboring Employment)	−0.008	−0.420	−0.825**	−0.818*	−1.178**	−1.305**
	(0.192)	(0.312)	(0.370)	(0.411)	(0.481)	(0.488)
log(Neighboring Employment) in 2004	−0.003	−0.008	0.017	0.019	0.041	0.048
	(0.016)	(0.019)	(0.023)	(0.026)	(0.029)	(0.030)
Establishment Variable						
Δ log(Employment)	−0.491***	−0.496***	−0.487***	−0.494***	−0.491***	−0.491***
	(0.040)	(0.040)	(0.040)	(0.040)	(0.039)	(0.039)
Δ Share of Female Workers	0.104	0.101	0.101	0.103	0.104	0.103
	(0.080)	(0.080)	(0.080)	(0.080)	(0.080)	(0.080)
Δ Share of Full-Time Workers	0.003	0.000	0.005	0.003	0.001	0.002
	(0.055)	(0.055)	(0.055)	(0.055)	(0.055)	(0.055)
Number of Observations	3,071	3,067	3,068	3,070	3,083	3,086
Adjusted R-Squared	0.081	0.084	0.083	0.085	0.085	0.085

Note: Heteroskedasticity-consistent standard errors are in parentheses. * denotes statistical significance at the 10% level, ** at the 5% level, and *** at the 1% level. Industyry and prefecture dummies are included.

Table OA.A. 6 Estimation Results of First-Difference Regression in 2004–2012–2016 using Neighboring Residents (Real Estate Lessors and Managers)

Variables	Circle of a $d$km Radius for Neighboring Markets: 3km	6km	9km	12km	15km	18km
	Dependent Variable: Δ log(Sales)					
Neighboring Market Variable						
Δ log(Neighboring Residents)	0.865***	0.406	0.276	0.033	−0.066	−0.313
	(0.177)	(0.259)	(0.304)	(0.339)	(0.376)	(0.400)
log(Neighboring Residents) in 2004	−0.023*	0.001	0.010	0.022	0.030*	0.043**
	(0.012)	(0.014)	(0.015)	(0.016)	(0.018)	(0.018)
Establishment Variable						
Δ log(Employment)	0.226***	0.227***	0.227***	0.229***	0.227***	0.228***
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
Δ Share of Female Workers	−0.032	−0.033	−0.032	−0.037	−0.035	−0.034
	(0.036)	(0.036)	(0.037)	(0.037)	(0.037)	(0.037)
Δ Share of Full-Time Workers	0.077*	0.079*	0.078*	0.073*	0.078*	0.079*
	(0.041)	(0.041)	(0.041)	(0.041)	(0.041)	(0.041)
Number of Observations	9,900	9,913	9,905	9,902	9,876	9,881
Adjusted R-Squared	0.033	0.030	0.030	0.030	0.030	0.030
	Dependent Variable: Δ log(Profits)					
Neighboring Market Variable						
Δ log(Neighboring Residents)	0.271	0.165	0.082	−0.077	−0.160	−0.273
	(0.194)	(0.284)	(0.336)	(0.377)	(0.396)	(0.436)
log(Neighboring Residents) in 2004	−0.031**	−0.021	−0.014	−0.008	−0.001	0.003
	(0.013)	(0.015)	(0.016)	(0.018)	(0.018)	(0.019)
Establishment Variable						
Δ log(Employment)	0.119***	0.119***	0.120***	0.114***	0.112***	0.112***
	(0.023)	(0.023)	(0.023)	(0.024)	(0.024)	(0.024)
Δ Share of Female Workers	0.048	0.049	0.048	0.050	0.058	0.061
	(0.040)	(0.040)	(0.040)	(0.040)	(0.040)	(0.040)
Δ Share of Full-Time Workers	0.061	0.060	0.060	0.065	0.059	0.059
	(0.051)	(0.051)	(0.051)	(0.051)	(0.051)	(0.051)
Number of Observations	8,912	8,920	8,915	8,881	8,851	8,846
Adjusted R-Squared	0.022	0.021	0.021	0.020	0.020	0.021
	Dependent Variable: Δ log(Average Wage per Worker)					
Neighboring Market Variable						
Δ log(Neighboring Residents)	−0.163	−0.296	−0.075	−0.108	−0.280	−0.601
	(0.315)	(0.511)	(0.604)	(0.664)	(0.739)	(0.801)
log(Neighboring Residents) in 2004	−0.002	−0.004	−0.012	−0.007	0.004	0.016
	(0.023)	(0.027)	(0.030)	(0.033)	(0.035)	(0.036)
Establishment Variable						
Δ log(Employment)	−0.489***	−0.491***	−0.490***	−0.493***	−0.492***	−0.493***
	(0.039)	(0.039)	(0.039)	(0.039)	(0.039)	(0.039)
Δ Share of Female Workers	0.090	0.096	0.091	0.094	0.105	0.093
	(0.080)	(0.080)	(0.080)	(0.080)	(0.080)	(0.080)
Δ Share of Full-Time Workers	0.002	0.004	0.000	0.010	0.013	0.011
	(0.055)	(0.055)	(0.055)	(0.055)	(0.055)	(0.055)
Number of Observations	3,087	3,091	3,090	3,097	3,087	3,084
Adjusted R-Squared	0.081	0.082	0.082	0.083	0.083	0.083

Note: Heteroskedasticity-consistent standard errors are in parentheses. * denotes statistical significance at the 10% level, ** at the 5% level, and *** at the 1% level. Industyry and prefecture dummies are included.

Table OA.A. 7 Estimation Results of First-Difference Regression in 2004–2012–2016 using Neighboring Employment (General Eating and Drinking Places)

Variables	Circle of a $d$km Radius for Neighboring Markets: 3km	6km	9km	12km	15km	18km
	Dependent Variable: Δ log(Sales)					
Neighboring Market Variable						
Δ log(Neighboring Employment)	−0.022	0.136	0.293**	0.300**	0.252	0.211
	(0.067)	(0.101)	(0.120)	(0.144)	(0.156)	(0.178)
log(Neighboring Employment) in 2004	0.021***	0.014**	0.004	0.003	0.005	0.005
	(0.006)	(0.007)	(0.007)	(0.008)	(0.009)	(0.010)
Establishment Variable						
Δ log(Employment)	0.336***	0.336***	0.335***	0.338***	0.337***	0.336***
	(0.019)	(0.019)	(0.018)	(0.018)	(0.018)	(0.018)
Δ Share of Female Workers	−0.030	−0.036	−0.038	−0.037	−0.039	−0.034
	(0.038)	(0.038)	(0.038)	(0.038)	(0.038)	(0.038)
Δ Share of Full-Time Workers	0.156***	0.149***	0.154***	0.152***	0.151***	0.156***
	(0.028)	(0.028)	(0.028)	(0.028)	(0.028)	(0.028)
Number of Observations	11,285	11,310	11,327	11,338	11,359	11,363
Adjusted R-Squared	0.065	0.065	0.065	0.065	0.065	0.065
	Dependent Variable: Δ log(Profits)					
Neighboring Market Variable						
Δ log(Neighboring Employment)	−0.154*	0.065	0.159	0.131	0.048	0.189
	(0.089)	(0.136)	(0.171)	(0.188)	(0.210)	(0.240)
log(Neighboring Employment) in 2004	−0.002	−0.009	−0.013	−0.010	−0.006	−0.011
	(0.008)	(0.009)	(0.010)	(0.011)	(0.013)	(0.014)
Establishment Variable						
Δ log(Employment)	0.099***	0.098***	0.097***	0.100***	0.099***	0.098***
	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
Δ Share of Female Workers	−0.093**	−0.093**	−0.087*	−0.086*	−0.082*	−0.077*
	(0.045)	(0.044)	(0.045)	(0.044)	(0.044)	(0.044)
Δ Share of Full-Time Workers	0.028	0.018	0.014	0.013	0.021	0.023
	(0.040)	(0.040)	(0.040)	(0.040)	(0.040)	(0.040)
Number of Observations	9,286	9,312	9,322	9,342	9,360	9,359
Adjusted R-Squared	0.029	0.028	0.029	0.028	0.028	0.028
	Dependent Variable: Δ log(Average Wage per Worker)					
Neighboring Market Variable						
Δ log(Neighboring Employment)	−0.022	−0.149	0.007	0.031	0.084	−0.044
	(0.125)	(0.190)	(0.231)	(0.278)	(0.310)	(0.335)
log(Neighboring Employment) in 2004	0.032***	0.041***	0.036**	0.036**	0.035*	0.038*
	(0.011)	(0.013)	(0.015)	(0.016)	(0.018)	(0.019)
Establishment Variable						
Δ log(Employment)	−0.345***	−0.336***	−0.342***	−0.339***	−0.343***	−0.343***
	(0.036)	(0.036)	(0.036)	(0.036)	(0.036)	(0.036)
Δ Share of Female Workers	−0.031	−0.040	−0.035	−0.034	−0.043	−0.037
	(0.069)	(0.069)	(0.070)	(0.069)	(0.069)	(0.069)
Δ Share of Full-Time Workers	0.366***	0.356***	0.379***	0.370***	0.365***	0.371***
	(0.054)	(0.054)	(0.053)	(0.054)	(0.054)	(0.054)
Number of Observations	4,980	5,004	5,006	5,021	5,029	5,029
Adjusted R-Squared	0.059	0.058	0.060	0.059	0.059	0.058

Note: Heteroskedasticity-consistent standard errors are in parentheses. * denotes statistical significance at the 10% level, ** at the 5% level, and *** at the 1% level. Industyry and prefecture dummies are included.

Table OA.A. 8 Estimation Results of First-Difference Regression in 2004–2012–2016 using Neighboring Residents (General Eating and Drinking Places)

Variables	Circle of a $d$km Radius for Neighboring Markets: 3km	6km	9km	12km	15km	18km
	Dependent Variable: Δ log(Sales)					
Neighboring Market Variable						
Δ log(Neighboring Residents)	0.281**	0.212	0.347*	0.445**	0.578**	0.622**
	(0.120)	(0.168)	(0.194)	(0.212)	(0.231)	(0.245)
log(Neighboring Residents) in 2004	0.007	0.006	0.001	−0.003	−0.007	−0.007
	(0.008)	(0.009)	(0.010)	(0.010)	(0.011)	(0.011)
Establishment Variable						
Δ log(Employment)	0.333***	0.334***	0.334***	0.339***	0.337***	0.338***
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Δ Share of Female Workers	−0.033	−0.035	−0.037	−0.037	−0.036	−0.033
	(0.038)	(0.038)	(0.038)	(0.038)	(0.038)	(0.038)
Δ Share of Full-Time Workers	0.154***	0.156***	0.160***	0.159***	0.159***	0.158***
	(0.028)	(0.028)	(0.028)	(0.028)	(0.028)	(0.028)
Number of Observations	11,454	11,463	11,436	11,422	11,390	11,391
Adjusted R-Squared	0.064	0.063	0.064	0.066	0.065	0.066
	Dependent Variable: Δ log(Profits)					
Neighboring Market Variable						
Δ log(Neighboring Residents)	0.099	0.451*	0.280	0.286	0.462	0.440
	(0.173)	(0.229)	(0.277)	(0.308)	(0.336)	(0.360)
log(Neighboring Residents) in 2004	−0.008	−0.022*	−0.020	−0.020	−0.027	−0.024
	(0.010)	(0.012)	(0.014)	(0.015)	(0.016)	(0.017)
Establishment Variable						
Δ log(Employment)	0.103***	0.103***	0.104***	0.103***	0.104***	0.103***
	(0.022)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
Δ Share of Female Workers	−0.083*	−0.091**	−0.087*	−0.097**	−0.089**	−0.087*
	(0.044)	(0.044)	(0.044)	(0.044)	(0.044)	(0.044)
Δ Share of Full-Time Workers	0.016	0.017	0.016	0.018	0.016	0.017
	(0.040)	(0.040)	(0.040)	(0.040)	(0.040)	(0.040)
Number of Observations	9,462	9,470	9,448	9,426	9,398	9,393
Adjusted R-Squared	0.029	0.030	0.030	0.030	0.029	0.029
	Dependent Variable: Δ log(Average Wage per Worker)					
Neighboring Market Variable						
Δ log(Neighboring Residents)	0.256	0.039	0.191	0.229	0.434	0.373
	(0.225)	(0.317)	(0.369)	(0.412)	(0.450)	(0.488)
log(Neighboring Residents) in 2004	0.016	0.030*	0.024	0.020	0.011	0.018
	(0.014)	(0.017)	(0.019)	(0.020)	(0.022)	(0.023)
Establishment Variable						
Δ log(Employment)	−0.347***	−0.340***	−0.343***	−0.344***	−0.345***	−0.341***
	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)
Δ Share of Female Workers	−0.019	−0.025	−0.035	−0.049	−0.049	−0.050
	(0.069)	(0.069)	(0.069)	(0.069)	(0.069)	(0.069)
Δ Share of Full-Time Workers	0.377***	0.378***	0.364***	0.360***	0.368***	0.366***
	(0.053)	(0.053)	(0.053)	(0.053)	(0.053)	(0.053)
Number of Observations	5,085	5,090	5,075	5,064	5,046	5,039
Adjusted R-Squared	0.060	0.059	0.058	0.058	0.059	0.058

Note: Heteroskedasticity-consistent standard errors are in parentheses. * denotes statistical significance at the 10% level, ** at the 5% level, and *** at the 1% level. Industyry and prefecture dummies are included.

Table OA.A. 9 Estimation Results of First-Difference Regression in 2004–2012–2016 using Neighboring Employment (Accommodations)

Variables	Circle of a $d$km Radius for Neighboring Markets: 3km	6km	9km	12km	15km	18km
	Dependent Variable: Δ log(Sales)					
Neighboring Market Variable						
Δ log(Neighboring Employment)	0.044	0.101	0.042	0.013	0.114	0.136
	(0.047)	(0.066)	(0.081)	(0.095)	(0.107)	(0.129)
log(Neighboring Employment) in 2004	0.012***	0.010**	0.011**	0.008	0.005	0.002
	(0.004)	(0.004)	(0.005)	(0.006)	(0.007)	(0.008)
Establishment Variable						
Δ log(Employment)	0.435***	0.439***	0.434***	0.434***	0.431***	0.425***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Δ Share of Female Workers	−0.027	−0.041	−0.077*	−0.053	−0.045	−0.047
	(0.039)	(0.040)	(0.039)	(0.039)	(0.039)	(0.039)
Δ Share of Full-Time Workers	0.233***	0.234***	0.233***	0.241***	0.243***	0.245***
	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.026)
Number of Observations	11,703	11,800	11,934	12,016	12,136	12,208
Adjusted R-Squared	0.136	0.138	0.135	0.134	0.133	0.131
	Dependent Variable: Δ log(Profits)					
Neighboring Market Variable						
Δ log(Neighboring Employment)	−0.037	−0.125	0.005	−0.080	0.117	0.058
	(0.074)	(0.105)	(0.127)	(0.151)	(0.170)	(0.198)
log(Neighboring Employment) in 2004	−0.005	−0.004	−0.011	−0.014	−0.023**	−0.024**
	(0.006)	(0.007)	(0.008)	(0.009)	(0.010)	(0.012)
Establishment Variable						
Δ log(Employment)	0.148***	0.151***	0.150***	0.143***	0.148***	0.145***
	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
Δ Share of Female Workers	0.026	0.024	0.004	−0.008	−0.003	0.019
	(0.053)	(0.053)	(0.053)	(0.053)	(0.053)	(0.053)
Δ Share of Full-Time Workers	0.026	0.056	0.035	0.032	0.027	0.026
	(0.044)	(0.044)	(0.044)	(0.044)	(0.044)	(0.043)
Number of Observations	8,818	8,833	8,967	9,045	9,153	9,198
Adjusted R-Squared	0.052	0.049	0.049	0.049	0.050	0.049
	Dependent Variable: Δ log(Average Wage per Worker)					
Neighboring Market Variable						
Δ log(Neighboring Employment)	0.128	0.029	−0.013	−0.162	−0.395**	−0.383*
	(0.078)	(0.113)	(0.136)	(0.158)	(0.180)	(0.212)
log(Neighboring Employment) in 2004	0.043***	0.045***	0.046***	0.053***	0.069***	0.073***
	(0.006)	(0.007)	(0.008)	(0.010)	(0.011)	(0.012)
Establishment Variable						
Δ log(Employment)	−0.374***	−0.376***	−0.380***	−0.370***	−0.372***	−0.372***
	(0.027)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)
Δ Share of Female Workers	−0.035	−0.047	−0.068	−0.069	−0.068	−0.067
	(0.063)	(0.063)	(0.063)	(0.062)	(0.062)	(0.062)
Δ Share of Full-Time Workers	0.469***	0.471***	0.477***	0.486***	0.490***	0.496***
	(0.044)	(0.044)	(0.044)	(0.044)	(0.044)	(0.044)
Number of Observations	7,204	7,221	7,310	7,351	7,418	7,457
Adjusted R-Squared	0.095	0.098	0.097	0.096	0.099	0.099

Note: Heteroskedasticity-consistent standard errors are in parentheses. * denotes statistical significance at the 10% level, ** at the 5% level, and *** at the 1% level. Industyry and prefecture dummies are included.

Table OA.A. 10 Estimation Results of First-Difference Regression in 2004–2012–2016 using Neighboring Residents (Accommodations)

Variables	Circle of a *d*km Radius for Neighboring Markets: 3km	6km	9km	12km	15km	18km
	Dependent Variable: Δ log(Sales)					
Neighboring Market Variable						
Δ log(Neighboring Residents)	0.272***	0.336***	0.378***	0.291*	0.377**	0.397**
	(0.092)	(0.117)	(0.137)	(0.160)	(0.173)	(0.197)
log(Neighboring Residents) in 2004	−0.001	−0.004	−0.007	−0.006	−0.008	−0.010
	(0.005)	(0.006)	(0.007)	(0.008)	(0.008)	(0.009)
Establishment Variable						
Δ log(Employment)	0.435***	0.436***	0.425***	0.429***	0.425***	0.425***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Δ Share of Female Workers	−0.032	−0.031	−0.044	−0.030	−0.039	−0.031
	(0.039)	(0.039)	(0.038)	(0.039)	(0.039)	(0.039)
Δ Share of Full-Time Workers	0.216***	0.228***	0.228***	0.242***	0.239***	0.241***
	(0.027)	(0.026)	(0.026)	(0.026)	(0.027)	(0.027)
Number of Observations	12,035	12,170	12,174	12,202	12,175	12,189
Adjusted R-Squared	0.137	0.137	0.133	0.134	0.132	0.132
	Dependent Variable: Δ log(Profits)					
Neighboring Market Variable						
Δ log(Neighboring Residents)	−0.045	0.067	0.381	0.427	0.325	0.287
	(0.156)	(0.201)	(0.240)	(0.283)	(0.304)	(0.338)
log(Neighboring Residents) in 2004	−0.005	−0.009	−0.023*	−0.027*	−0.026*	−0.027*
	(0.009)	(0.010)	(0.012)	(0.014)	(0.014)	(0.016)
Establishment Variable						
Δ log(Employment)	0.152***	0.151***	0.161***	0.155***	0.147***	0.150***
	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
Δ Share of Female Workers	0.034	0.020	0.027	0.022	0.019	0.012
	(0.053)	(0.053)	(0.052)	(0.052)	(0.052)	(0.052)
Δ Share of Full-Time Workers	0.028	0.032	0.044	0.050	0.038	0.038
	(0.044)	(0.044)	(0.044)	(0.044)	(0.044)	(0.044)
Number of Observations	9,062	9,157	9,174	9,192	9,176	9,169
Adjusted R-Squared	0.050	0.050	0.051	0.051	0.051	0.052
	Dependent Variable: Δ log(Average Wage per Worker)					
Neighboring Market Variable						
Δ log(Neighboring Residents)	0.159	0.073	0.088	−0.072	0.099	−0.319
	(0.154)	(0.205)	(0.242)	(0.273)	(0.289)	(0.330)
log(Neighboring Residents) in 2004	0.038***	0.045***	0.049***	0.054***	0.057***	0.067***
	(0.008)	(0.010)	(0.012)	(0.013)	(0.014)	(0.015)
Establishment Variable						
Δ log(Employment)	−0.371***	−0.380***	−0.379***	−0.377***	−0.372***	−0.376***
	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)
Δ Share of Female Workers	−0.034	−0.069	−0.050	−0.033	−0.020	−0.020
	(0.063)	(0.062)	(0.062)	(0.062)	(0.062)	(0.062)
Δ Share of Full-Time Workers	0.461***	0.475***	0.471***	0.470***	0.476***	0.477***
	(0.043)	(0.043)	(0.044)	(0.044)	(0.044)	(0.044)
Number of Observations	7,363	7,456	7,439	7,479	7,466	7,453
Adjusted R-Squared	0.093	0.100	0.099	0.095	0.096	0.095

Note: Heteroskedasticity-consistent standard errors are in parentheses. * denotes statistical significance at the 10% level, ** at the 5% level, and *** at the 1% level. Industyry and prefecture dummies are included.

Table OA.A. 11 Estimation Results of First-Difference Regression in 2004–2012–2016 using Neighboring Employment (Miscellaneous Education, Learning Support)

Variables	Circle of a $d$km Radius for Neighboring Markets: 3km	6km	9km	12km	15km	18km
	Dependent Variable: Δ log(Sales)					
Neighboring Market Variable						
Δ log(Neighboring Employment)	−0.061	−0.113	−0.132	−0.254	−0.405	−0.105
	(0.105)	(0.155)	(0.202)	(0.235)	(0.267)	(0.287)
log(Neighboring Employment) in 2004	0.001	0.001	0.002	0.013	0.022	0.011
	(0.011)	(0.012)	(0.013)	(0.015)	(0.016)	(0.016)
Establishment Variable						
Δ log(Employment)	0.520***	0.515***	0.518***	0.520***	0.521***	0.521***
	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
Δ Share of Female Workers	−0.029	−0.019	−0.031	−0.035	−0.034	−0.033
	(0.064)	(0.064)	(0.065)	(0.064)	(0.064)	(0.065)
Δ Share of Full-Time Workers	0.375***	0.380***	0.367***	0.369***	0.376***	0.370***
	(0.060)	(0.060)	(0.059)	(0.060)	(0.060)	(0.060)
Number of Observations	5,226	5,206	5,219	5,237	5,247	5,251
Adjusted R-Squared	0.140	0.137	0.138	0.140	0.140	0.140
	Dependent Variable: Δ log(Profits)					
Neighboring Market Variable						
Δ log(Neighboring Employment)	0.251	0.713***	0.629**	0.417	0.587	0.754*
	(0.160)	(0.231)	(0.309)	(0.352)	(0.383)	(0.404)
log(Neighboring Employment) in 2004	−0.017	−0.030	−0.025	−0.010	−0.012	−0.017
	(0.016)	(0.019)	(0.021)	(0.022)	(0.024)	(0.025)
Establishment Variable						
Δ log(Employment)	0.264***	0.264***	0.265***	0.266***	0.263***	0.263***
	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)
Δ Share of Female Workers	−0.104	−0.107	−0.112	−0.111	−0.110	−0.114
	(0.092)	(0.093)	(0.093)	(0.093)	(0.093)	(0.093)
Δ Share of Full-Time Workers	0.063	0.081	0.073	0.077	0.078	0.075
	(0.099)	(0.099)	(0.100)	(0.099)	(0.099)	(0.099)
Number of Observations	3,486	3,472	3,475	3,489	3,500	3,502
Adjusted R-Squared	0.033	0.035	0.033	0.032	0.032	0.032
	Dependent Variable: Δ log(Average Wage per Worker)					
Neighboring Market Variable						
Δ log(Neighboring Employment)	−0.124	−0.039	−0.429	−0.461	−0.732*	−0.806*
	(0.159)	(0.249)	(0.328)	(0.357)	(0.405)	(0.446)
log(Neighboring Employment) in 2004	0.020	0.021	0.036*	0.046**	0.054**	0.058**
	(0.016)	(0.018)	(0.021)	(0.022)	(0.024)	(0.026)
Establishment Variable						
Δ log(Employment)	−0.226***	−0.230***	−0.223***	−0.225***	−0.224***	−0.226***
	(0.043)	(0.043)	(0.043)	(0.043)	(0.043)	(0.043)
Δ Share of Female Workers	−0.035	−0.050	−0.039	−0.050	−0.033	−0.038
	(0.110)	(0.110)	(0.110)	(0.109)	(0.110)	(0.111)
Δ Share of Full-Time Workers	0.454***	0.440***	0.455***	0.430***	0.451***	0.443***
	(0.092)	(0.093)	(0.092)	(0.091)	(0.092)	(0.091)
Number of Observations	2,566	2,557	2,559	2,571	2,579	2,578
Adjusted R-Squared	0.053	0.052	0.052	0.052	0.053	0.052

Note: Heteroskedasticity-consistent standard errors are in parentheses. * denotes statistical significance at the 10% level, ** at the 5% level, and *** at the 1% level. Industyry and prefecture dummies are included.

Table OA.A. 12 Estimation Results of First-Difference Regression in 2004–2012–2016 using Neighboring Residents (Miscellaneous Education, Learning Support)

Variables	Circle of a $d$km Radius for Neighboring Markets: 3km	6km	9km	12km	15km	18km
	Dependent Variable: Δ log(Sales)					
Neighboring Market Variable						
Δ log(Neighboring Residents)	0.206	0.119	−0.356	−0.065	0.177	0.319
	(0.216)	(0.281)	(0.333)	(0.372)	(0.398)	(0.419)
log(Neighboring Residents) in 2004	−0.010	−0.001	0.021	0.013	0.009	0.003
	(0.015)	(0.016)	(0.017)	(0.019)	(0.020)	(0.021)
Establishment Variable						
Δ log(Employment)	0.521***	0.520***	0.522***	0.518***	0.513***	0.513***
	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
Δ Share of Female Workers	−0.039	−0.039	−0.040	−0.041	−0.040	−0.038
	(0.064)	(0.064)	(0.064)	(0.064)	(0.064)	(0.064)
Δ Share of Full-Time Workers	0.364***	0.361***	0.365***	0.370***	0.365***	0.353***
	(0.060)	(0.060)	(0.060)	(0.060)	(0.060)	(0.060)
Number of Observations	5,307	5,315	5,306	5,267	5,276	5,270
Adjusted R-Squared	0.141	0.139	0.140	0.137	0.136	0.135
	Dependent Variable: Δ log(Profits)					
Neighboring Market Variable						
Δ log(Neighboring Residents)	0.492	0.666	0.280	0.463	0.900	0.889
	(0.317)	(0.405)	(0.479)	(0.559)	(0.598)	(0.634)
log(Neighboring Residents) in 2004	−0.027	−0.021	0.000	0.001	−0.008	−0.004
	(0.021)	(0.024)	(0.026)	(0.029)	(0.031)	(0.032)
Establishment Variable						
Δ log(Employment)	0.270***	0.269***	0.267***	0.272***	0.267***	0.261***
	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)
Δ Share of Female Workers	−0.132	−0.133	−0.133	−0.139	−0.145	−0.138
	(0.093)	(0.093)	(0.093)	(0.093)	(0.094)	(0.094)
Δ Share of Full-Time Workers	0.063	0.065	0.066	0.070	0.070	0.057
	(0.098)	(0.098)	(0.099)	(0.098)	(0.098)	(0.098)
Number of Observations	3,547	3,554	3,547	3,533	3,539	3,533
Adjusted R-Squared	0.034	0.034	0.032	0.034	0.034	0.034
	Dependent Variable: Δ log(Average Wage per Worker)					
Neighboring Market Variable						
Δ log(Neighboring Residents)	0.069	0.056	−0.480	−0.536	−0.760	−0.757
	(0.332)	(0.467)	(0.520)	(0.576)	(0.605)	(0.651)
log(Neighboring Residents) in 2004	0.008	0.023	0.037	0.043	0.061**	0.060*
	(0.022)	(0.025)	(0.027)	(0.028)	(0.030)	(0.030)
Establishment Variable						
Δ log(Employment)	−0.220***	−0.226***	−0.221***	−0.224***	−0.226***	−0.229***
	(0.043)	(0.043)	(0.043)	(0.043)	(0.043)	(0.043)
Δ Share of Female Workers	−0.035	−0.036	−0.031	−0.047	−0.033	−0.034
	(0.110)	(0.110)	(0.110)	(0.111)	(0.110)	(0.111)
Δ Share of Full-Time Workers	0.446***	0.452***	0.455***	0.441***	0.453***	0.453***
	(0.091)	(0.092)	(0.092)	(0.092)	(0.092)	(0.092)
Number of Observations	2,601	2,606	2,599	2,579	2,591	2,586
Adjusted R-Squared	0.050	0.053	0.052	0.052	0.054	0.054

Note: Heteroskedasticity-consistent standard errors are in parentheses. * denotes statistical significance at the 10% level, ** at the 5% level, and *** at the 1% level. Industyry and prefecture dummies are included.

Table OA.A. 13 Estimation Results of First-Difference Regression in 2004–2012–2016 using Neighboring Employment (Professional Services, n.e.c.)

Variables	Circle of a $d$km Radius for Neighboring Markets: 3km	6km	9km	12km	15km	18km
	Dependent Variable: Δ log(Sales)					
Neighboring Market Variable						
Δ log(Neighboring Employment)	0.053	0.159	0.206	0.650*	0.639	0.664
	(0.171)	(0.261)	(0.315)	(0.349)	(0.386)	(0.413)
log(Neighboring Employment) in 2004	0.044***	0.041**	0.033*	0.012	0.014	0.014
	(0.015)	(0.018)	(0.019)	(0.021)	(0.022)	(0.024)
Establishment Variable						
Δ log(Employment)	0.448***	0.444***	0.445***	0.442***	0.440***	0.443***
	(0.045)	(0.045)	(0.045)	(0.045)	(0.045)	(0.044)
Δ Share of Female Workers	0.026	0.039	0.019	0.016	0.014	0.009
	(0.090)	(0.091)	(0.091)	(0.090)	(0.090)	(0.090)
Δ Share of Full-Time Workers	0.285***	0.299***	0.295***	0.294***	0.297***	0.291***
	(0.062)	(0.063)	(0.063)	(0.063)	(0.063)	(0.063)
Number of Observations	2,070	2,066	2,069	2,071	2,070	2,074
Adjusted R-Squared	0.124	0.124	0.121	0.121	0.120	0.121
	Dependent Variable: Δ log(Profits)					
Neighboring Market Variable						
Δ log(Neighboring Employment)	−0.041	−0.024	−0.153	−0.132	0.063	0.323
	(0.225)	(0.340)	(0.415)	(0.482)	(0.576)	(0.578)
log(Neighboring Employment) in 2004	0.015	0.018	0.020	0.017	0.004	−0.016
	(0.019)	(0.022)	(0.025)	(0.029)	(0.032)	(0.033)
Establishment Variable						
Δ log(Employment)	0.158***	0.164***	0.159***	0.151***	0.153***	0.154***
	(0.054)	(0.055)	(0.055)	(0.054)	(0.054)	(0.054)
Δ Share of Female Workers	0.116	0.119	0.112	0.111	0.117	0.109
	(0.096)	(0.096)	(0.096)	(0.095)	(0.095)	(0.096)
Δ Share of Full-Time Workers	0.091	0.102	0.094	0.092	0.095	0.096
	(0.078)	(0.078)	(0.078)	(0.078)	(0.078)	(0.078)
Number of Observations	1,871	1,860	1,865	1,872	1,874	1,877
Adjusted R-Squared	0.024	0.023	0.023	0.022	0.022	0.023
	Dependent Variable: Δ log(Average Wage per Worker)					
Neighboring Market Variable						
Δ log(Neighboring Employment)	−0.064	0.229	0.071	0.093	0.248	0.520
	(0.267)	(0.390)	(0.479)	(0.503)	(0.585)	(0.640)
log(Neighboring Employment) in 2004	0.026	0.018	0.020	0.019	0.013	−0.001
	(0.024)	(0.027)	(0.033)	(0.033)	(0.036)	(0.038)
Establishment Variable						
Δ log(Employment)	−0.366***	−0.361***	−0.350***	−0.365***	−0.361***	−0.361***
	(0.062)	(0.062)	(0.063)	(0.063)	(0.063)	(0.062)
Δ Share of Female Workers	−0.100	−0.103	−0.143	−0.122	−0.136	−0.135
	(0.137)	(0.138)	(0.139)	(0.139)	(0.139)	(0.137)
Δ Share of Full-Time Workers	0.407***	0.393***	0.395***	0.397***	0.398***	0.387***
	(0.104)	(0.104)	(0.105)	(0.105)	(0.105)	(0.104)
Number of Observations	1,241	1,241	1,238	1,240	1,242	1,242
Adjusted R-Squared	0.058	0.058	0.057	0.059	0.057	0.058

Note: Heteroskedasticity-consistent standard errors are in parentheses. * denotes statistical significance at the 10% level, ** at the 5% level, and *** at the 1% level. Industyry and prefecture dummies are included.

Table OA.A. 14 Estimation Results of First-Difference Regression in 2004–2012–2016 using Neighboring Residents (Professional Services, n.e.c.)

Variables	Circle of a $d$km Radius for Neighboring Markets: 3km	6km	9km	12km	15km	18km
	Dependent Variable: Δ log(Sales)					
Neighboring Market Variable						
Δ log(Neighboring Residents)	0.624**	0.907**	1.104**	1.309**	1.446**	1.744***
	(0.300)	(0.412)	(0.481)	(0.550)	(0.585)	(0.649)
log(Neighboring Residents) in 2004	0.031	0.015	0.002	−0.004	−0.006	−0.015
	(0.022)	(0.024)	(0.026)	(0.028)	(0.029)	(0.032)
Establishment Variable						
Δ log(Employment)	0.439***	0.437***	0.439***	0.434***	0.432***	0.428***
	(0.044)	(0.044)	(0.044)	(0.044)	(0.044)	(0.044)
Δ Share of Female Workers	0.043	0.032	0.029	0.032	0.030	0.010
	(0.089)	(0.089)	(0.089)	(0.089)	(0.089)	(0.089)
Δ Share of Full-Time Workers	0.291***	0.294***	0.298***	0.302***	0.303***	0.300***
	(0.062)	(0.062)	(0.062)	(0.062)	(0.062)	(0.062)
Number of Observations	2,104	2,111	2,104	2,101	2,094	2,090
Adjusted R-Squared	0.127	0.126	0.125	0.123	0.125	0.122
	Dependent Variable: Δ log(Profits)					
Neighboring Market Variable						
Δ log(Neighboring Residents)	1.217***	1.625***	2.277***	2.440***	2.295***	2.235**
	(0.393)	(0.511)	(0.591)	(0.687)	(0.794)	(0.878)
log(Neighboring Residents) in 2004	−0.040	−0.056*	−0.084**	−0.090**	−0.089**	−0.091**
	(0.027)	(0.029)	(0.032)	(0.036)	(0.040)	(0.043)
Establishment Variable						
Δ log(Employment)	0.159***	0.153***	0.148***	0.146***	0.153***	0.155***
	(0.053)	(0.053)	(0.053)	(0.053)	(0.053)	(0.053)
Δ Share of Female Workers	0.126	0.118	0.117	0.117	0.114	0.101
	(0.094)	(0.094)	(0.094)	(0.094)	(0.095)	(0.095)
Δ Share of Full-Time Workers	0.071	0.072	0.075	0.075	0.074	0.069
	(0.077)	(0.077)	(0.077)	(0.077)	(0.078)	(0.078)
Number of Observations	1,899	1,907	1,903	1,897	1,891	1,891
Adjusted R-Squared	0.028	0.028	0.031	0.028	0.027	0.026
	Dependent Variable: Δ log(Average Wage per Worker)					
Neighboring Market Variable						
Δ log(Neighboring Residents)	−0.094	0.001	0.375	−0.026	−0.152	0.386
	(0.474)	(0.628)	(0.691)	(0.780)	(0.835)	(0.916)
log(Neighboring Residents) in 2004	0.033	0.032	0.017	0.025	0.034	0.007
	(0.035)	(0.036)	(0.038)	(0.042)	(0.044)	(0.046)
Establishment Variable						
Δ log(Employment)	−0.354***	−0.361***	−0.351***	−0.361***	−0.365***	−0.371***
	(0.061)	(0.062)	(0.061)	(0.062)	(0.063)	(0.062)
Δ Share of Female Workers	−0.112	−0.133	−0.129	−0.127	−0.130	−0.141
	(0.137)	(0.137)	(0.136)	(0.137)	(0.137)	(0.137)
Δ Share of Full-Time Workers	0.381***	0.387***	0.379***	0.392***	0.392***	0.384***
	(0.104)	(0.104)	(0.103)	(0.103)	(0.103)	(0.103)
Number of Observations	1,253	1,259	1,255	1,251	1,247	1,244
Adjusted R-Squared	0.056	0.058	0.054	0.056	0.056	0.060

Note: Heteroskedasticity-consistent standard errors are in parentheses. * denotes statistical significance at the 10% level, ** at the 5% level, and *** at the 1% level. Industyry and prefecture dummies are included.

Table OA.A. 15 Estimation Results of First-Difference Regression in 2004–2012–2016 using Neighboring Employment (Machine, etc. Repair Services, Except Otherwise Classified)

Variables	Circle of a $d$km Radius for Neighboring Markets: 3km	6km	9km	12km	15km	18km
	Dependent Variable: Δ log(Sales)					
Neighboring Market Variable						
Δ log(Neighboring Employment)	0.130*	0.223**	0.481***	0.498***	0.699***	0.737***
	(0.073)	(0.110)	(0.140)	(0.164)	(0.184)	(0.212)
log(Neighboring Employment) in 2004	0.007	−0.005	−0.020**	−0.022**	−0.036***	−0.042***
	(0.006)	(0.007)	(0.008)	(0.010)	(0.011)	(0.012)
Establishment Variable						
Δ log(Employment)	0.558***	0.557***	0.556***	0.556***	0.559***	0.559***
	(0.020)	(0.020)	(0.020)	(0.021)	(0.020)	(0.020)
Δ Share of Female Workers	−0.165***	−0.160***	−0.142***	−0.153***	−0.156***	−0.145***
	(0.049)	(0.049)	(0.050)	(0.050)	(0.050)	(0.050)
Δ Share of Full-Time Workers	0.263***	0.266***	0.262***	0.261***	0.260***	0.261***
	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)
Number of Observations	8,346	8,367	8,357	8,382	8,394	8,382
Adjusted R-Squared	0.156	0.156	0.156	0.154	0.157	0.157
	Dependent Variable: Δ log(Profits)					
Neighboring Market Variable						
Δ log(Neighboring Employment)	−0.178	−0.188	−0.032	−0.051	0.021	0.072
	(0.112)	(0.170)	(0.229)	(0.264)	(0.294)	(0.323)
log(Neighboring Employment) in 2004	−0.030***	−0.031***	−0.040***	−0.045***	−0.053***	−0.053***
	(0.010)	(0.012)	(0.013)	(0.015)	(0.017)	(0.019)
Establishment Variable						
Δ log(Employment)	0.191***	0.187***	0.190***	0.192***	0.200***	0.199***
	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)
Δ Share of Female Workers	−0.058	−0.069	−0.054	−0.053	−0.062	−0.062
	(0.066)	(0.065)	(0.065)	(0.065)	(0.064)	(0.064)
Δ Share of Full-Time Workers	0.049	0.050	0.044	0.044	0.045	0.042
	(0.048)	(0.048)	(0.048)	(0.048)	(0.047)	(0.047)
Number of Observations	5,642	5,667	5,662	5,675	5,685	5,678
Adjusted R-Squared	0.033	0.033	0.035	0.035	0.036	0.035
	Dependent Variable: Δ log(Average Wage per Worker)					
Neighboring Market Variable						
Δ log(Neighboring Employment)	0.058	0.078	0.092	0.335	0.723**	0.892***
	(0.105)	(0.165)	(0.210)	(0.229)	(0.270)	(0.309)
log(Neighboring Employment) in 2004	0.010	0.006	0.005	−0.005	−0.014	−0.025
	(0.010)	(0.011)	(0.013)	(0.014)	(0.016)	(0.017)
Establishment Variable						
Δ log(Employment)	−0.265***	−0.265***	−0.263***	−0.263***	−0.266***	−0.263***
	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)
Δ Share of Female Workers	−0.060	−0.055	−0.073	−0.059	−0.050	−0.048
	(0.077)	(0.077)	(0.076)	(0.076)	(0.076)	(0.077)
Δ Share of Full-Time Workers	0.410***	0.405***	0.398***	0.402***	0.399***	0.405***
	(0.048)	(0.048)	(0.048)	(0.047)	(0.047)	(0.047)
Number of Observations	4,487	4,506	4,496	4,499	4,504	4,494
Adjusted R-Squared	0.048	0.046	0.046	0.046	0.050	0.050

Note: Heteroskedasticity-consistent standard errors are in parentheses. * denotes statistical significance at the 10% level, ** at the 5% level, and *** at the 1% level. Industyry and prefecture dummies are included.

Table OA.A. 16 Estimation Results of First-Difference Regression in 2004–2012–2016 using Neighboring Residents (Machine, etc. Repair Services, except Otherwise Classified)

Variables	Circle of a $d$km Radius for Neighboring Markets: 3km	6km	9km	12km	15km	18km
	Dependent Variable: Δ log(Sales)					
Neighboring Market Variable						
Δ log(Neighboring Residents)	0.304**	0.591***	0.801***	0.800***	0.868***	0.876***
	(0.133)	(0.195)	(0.238)	(0.271)	(0.286)	(0.299)
log(Neighboring Residents) in 2004	−0.011	−0.015	−0.028**	−0.028**	−0.030**	−0.033**
	(0.009)	(0.010)	(0.011)	(0.013)	(0.013)	(0.014)
Establishment Variable						
Δ log(Employment)	0.556***	0.558***	0.557***	0.556***	0.554***	0.551***
	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
Δ Share of Female Workers	−0.142***	−0.144***	−0.140***	−0.138***	−0.134***	−0.137***
	(0.049)	(0.050)	(0.049)	(0.050)	(0.050)	(0.050)
Δ Share of Full-Time Workers	0.257***	0.254***	0.255***	0.255***	0.258***	0.262***
	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)
Number of Observations	8,511	8,526	8,488	8,434	8,406	8,414
Adjusted R-Squared	0.154	0.154	0.155	0.153	0.152	0.152
	Dependent Variable: Δ log(Profits)					
Neighboring Market Variable						
Δ log(Neighboring Residents)	−0.319	−0.356	0.123	0.229	0.299	0.023
	(0.221)	(0.323)	(0.402)	(0.432)	(0.480)	(0.510)
log(Neighboring Residents) in 2004	−0.020	−0.027*	−0.049**	−0.050**	−0.053**	−0.043*
	(0.013)	(0.016)	(0.019)	(0.020)	(0.022)	(0.023)
Establishment Variable						
Δ log(Employment)	0.190***	0.185***	0.186***	0.191***	0.187***	0.184***
	(0.029)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)
Δ Share of Female Workers	−0.049	−0.049	−0.055	−0.067	−0.059	−0.062
	(0.065)	(0.064)	(0.064)	(0.065)	(0.064)	(0.064)
Δ Share of Full-Time Workers	0.049	0.044	0.046	0.050	0.046	0.052
	(0.047)	(0.047)	(0.047)	(0.048)	(0.048)	(0.047)
Number of Observations	5,789	5,797	5,780	5,730	5,707	5,713
Adjusted R-Squared	0.033	0.032	0.032	0.033	0.033	0.032
	Dependent Variable: Δ log(Average Wage per Worker)					
Neighboring Market Variable						
Δ log(Neighboring Residents)	0.337*	0.556*	0.693**	0.165	0.526	0.604
	(0.199)	(0.277)	(0.342)	(0.434)	(0.461)	(0.464)
log(Neighboring Residents) in 2004	−0.013	−0.020	−0.021	−0.003	−0.011	−0.015
	(0.014)	(0.015)	(0.017)	(0.020)	(0.021)	(0.021)
Establishment Variable						
Δ log(Employment)	−0.262***	−0.263***	−0.268***	−0.270***	−0.271***	−0.271***
	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)
Δ Share of Female Workers	−0.051	−0.059	−0.052	−0.056	−0.054	−0.051
	(0.076)	(0.076)	(0.076)	(0.078)	(0.077)	(0.077)
Δ Share of Full-Time Workers	0.407***	0.411***	0.410***	0.394***	0.393***	0.393***
	(0.047)	(0.047)	(0.047)	(0.047)	(0.047)	(0.047)
Number of Observations	4,573	4,569	4,550	4,524	4,496	4,499
Adjusted R-Squared	0.047	0.048	0.048	0.046	0.047	0.047

Note: Heteroskedasticity-consistent standard errors are in parentheses. * denotes statistical significance at the 10% level, ** at the 5% level, and *** at the 1% level. Industyry and prefecture dummies are included.

Table OA.A. 17 Estimation Results of First-Difference Regression in 2004–2012–2016 using Neighboring Employment (Goods Rental and Leasing)

Variables	Circle of a $d$km Radius for Neighboring Markets: 3km	6km	9km	12km	15km	18km
	Dependent Variable: Δ log(Sales)					
Neighboring Market Variable						
Δ log(Neighboring Employment)	0.456***	0.356***	0.332*	0.242	0.522**	0.469*
	(0.085)	(0.131)	(0.168)	(0.195)	(0.222)	(0.255)
log(Neighboring Employment) in 2004	0.002	0.007	0.002	0.003	−0.012	−0.013
	(0.008)	(0.010)	(0.011)	(0.012)	(0.013)	(0.014)
Establishment Variable						
Δ log(Employment)	0.569***	0.568***	0.570***	0.568***	0.570***	0.569***
	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
Δ Share of Female Workers	−0.143**	−0.125**	−0.109*	−0.117*	−0.118*	−0.112*
	(0.060)	(0.061)	(0.061)	(0.061)	(0.061)	(0.061)
Δ Share of Full-Time Workers	0.210***	0.212***	0.211***	0.210***	0.211***	0.213***
	(0.041)	(0.041)	(0.042)	(0.042)	(0.042)	(0.042)
Number of Observations	6,538	6,568	6,549	6,575	6,587	6,579
Adjusted R-Squared	0.176	0.173	0.172	0.170	0.171	0.171
	Dependent Variable: Δ log(Profits)					
Neighboring Market Variable						
Δ log(Neighboring Employment)	−0.011	0.091	−0.243	0.377	0.871*	0.568
	(0.193)	(0.300)	(0.373)	(0.443)	(0.517)	(0.591)
log(Neighboring Employment) in 2004	−0.002	−0.001	0.001	−0.010	−0.040	−0.027
	(0.017)	(0.020)	(0.024)	(0.026)	(0.028)	(0.031)
Establishment Variable						
Δ log(Employment)	0.211***	0.214***	0.214***	0.212***	0.215***	0.211***
	(0.045)	(0.044)	(0.045)	(0.044)	(0.044)	(0.044)
Δ Share of Female Workers	0.012	0.017	−0.014	−0.007	0.002	−0.006
	(0.106)	(0.104)	(0.105)	(0.104)	(0.105)	(0.105)
Δ Share of Full-Time Workers	−0.037	−0.041	−0.041	−0.045	−0.040	−0.041
	(0.080)	(0.079)	(0.080)	(0.079)	(0.079)	(0.079)
Number of Observations	2,067	2,089	2,078	2,102	2,105	2,105
Adjusted R-Squared	0.046	0.045	0.044	0.045	0.047	0.046
	Dependent Variable: Δ log(Average Wage per Worker)					
Neighboring Market Variable						
Δ log(Neighboring Employment)	0.436***	0.442*	0.102	−0.178	−0.329	−0.748
	(0.154)	(0.243)	(0.329)	(0.377)	(0.419)	(0.491)
log(Neighboring Employment) in 2004	0.019	0.023	0.034	0.048**	0.051**	0.058**
	(0.016)	(0.018)	(0.021)	(0.023)	(0.025)	(0.028)
Establishment Variable						
Δ log(Employment)	−0.262***	−0.250***	−0.256***	−0.255***	−0.254***	−0.251***
	(0.043)	(0.043)	(0.043)	(0.043)	(0.043)	(0.043)
Δ Share of Female Workers	−0.137	−0.101	−0.079	−0.073	−0.082	−0.080
	(0.117)	(0.119)	(0.119)	(0.118)	(0.118)	(0.119)
Δ Share of Full-Time Workers	0.213***	0.206**	0.204**	0.196**	0.208**	0.205**
	(0.078)	(0.079)	(0.079)	(0.079)	(0.079)	(0.079)
Number of Observations	1,962	1,985	1,975	1,994	1,994	1,994
Adjusted R-Squared	0.046	0.043	0.040	0.040	0.041	0.039

Note: Heteroskedasticity-consistent standard errors are in parentheses. * denotes statistical significance at the 10% level, ** at the 5% level, and *** at the 1% level. Industyry and prefecture dummies are included.

Table OA.A. 18 Estimation Results of First-Difference Regression in 2004–2012–2016 using Neighboring Residents (Goods Rental and Leasing)

Variables	Circle of a $d$km Radius for Neighboring Markets: 3km	6km	9km	12km	15km	18km
	Dependent Variable: Δ log(Sales)					
Neighboring Market Variable						
Δ log(Neighboring Residents)	0.658***	0.728***	0.778***	0.872***	0.765**	0.811**
	(0.165)	(0.235)	(0.263)	(0.301)	(0.322)	(0.340)
log(Neighboring Residents) in 2004	−0.015	−0.014	−0.018	−0.027*	−0.023	−0.025
	(0.011)	(0.013)	(0.014)	(0.015)	(0.016)	(0.017)
Establishment Variable						
Δ log(Employment)	0.573***	0.571***	0.571***	0.564***	0.561***	0.562***
	(0.023)	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)
Δ Share of Female Workers	−0.119*	−0.121**	−0.123**	−0.118*	−0.122**	−0.122**
	(0.060)	(0.060)	(0.060)	(0.060)	(0.060)	(0.060)
Δ Share of Full-Time Workers	0.216***	0.215***	0.213***	0.212***	0.211***	0.211***
	(0.041)	(0.041)	(0.041)	(0.041)	(0.041)	(0.041)
Number of Observations	6,627	6,636	6,628	6,619	6,609	6,622
Adjusted R-Squared	0.176	0.175	0.174	0.171	0.169	0.169
	Dependent Variable: Δ log(Profits)					
Neighboring Market Variable						
Δ log(Neighboring Residents)	0.088	−0.118	0.172	0.811	0.708	0.807
	(0.422)	(0.533)	(0.628)	(0.722)	(0.854)	(0.908)
log(Neighboring Residents) in 2004	−0.003	0.002	−0.012	−0.034	−0.032	−0.037
	(0.025)	(0.027)	(0.030)	(0.033)	(0.037)	(0.039)
Establishment Variable						
Δ log(Employment)	0.210***	0.212***	0.211***	0.213***	0.214***	0.211***
	(0.043)	(0.043)	(0.043)	(0.043)	(0.044)	(0.044)
Δ Share of Female Workers	0.027	0.031	0.024	0.040	0.039	0.030
	(0.105)	(0.105)	(0.104)	(0.105)	(0.104)	(0.105)
Δ Share of Full-Time Workers	−0.022	−0.019	−0.037	−0.052	−0.035	−0.035
	(0.078)	(0.078)	(0.077)	(0.077)	(0.078)	(0.078)
Number of Observations	2,124	2,125	2,120	2,108	2,104	2,101
Adjusted R-Squared	0.047	0.048	0.047	0.047	0.048	0.047
	Dependent Variable: Δ log(Average Wage per Worker)					
Neighboring Market Variable						
Δ log(Neighboring Residents)	0.523	0.527	0.807	0.624	0.241	−0.410
	(0.324)	(0.459)	(0.529)	(0.589)	(0.630)	(0.669)
log(Neighboring Residents) in 2004	0.001	0.001	−0.007	0.009	0.023	0.037
	(0.021)	(0.024)	(0.026)	(0.029)	(0.030)	(0.031)
Establishment Variable						
Δ log(Employment)	−0.245***	−0.246***	−0.247***	−0.254***	−0.251***	−0.255***
	(0.043)	(0.043)	(0.043)	(0.043)	(0.043)	(0.043)
Δ Share of Female Workers	−0.078	−0.071	−0.087	−0.089	−0.092	−0.101
	(0.116)	(0.116)	(0.117)	(0.117)	(0.117)	(0.117)
Δ Share of Full-Time Workers	0.203**	0.202**	0.196**	0.211**	0.220***	0.214***
	(0.078)	(0.078)	(0.079)	(0.079)	(0.079)	(0.079)
Number of Observations	2,011	2,015	2,013	2,004	1,996	1,993
Adjusted R-Squared	0.035	0.034	0.035	0.037	0.036	0.036

Note: Heteroskedasticity-consistent standard errors are in parentheses. * denotes statistical significance at the 10% level, ** at the 5% level, and *** at the 1% level. Industyry and prefecture dummies are included.

Online Appendix B.

Targeted Areas

Figures OA.B. 1–OA.B. 47 show the boundary of the urban revitalization zones (URZs) by prefecture. The URZs shown here are not exactly identical to the official ones because the shape file data used here is based on the block (*Cho-Cho-Aza*) level.

[Figures OA.B. 1–OA.B. 47]

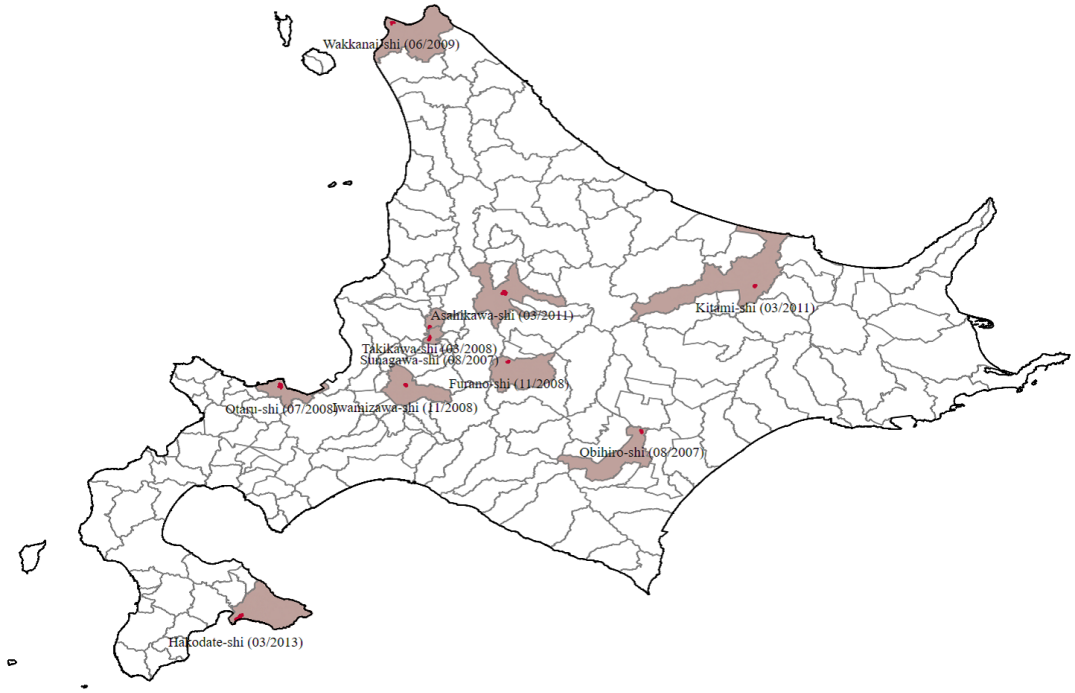

Figure OA.B. 1 Hokkaido

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

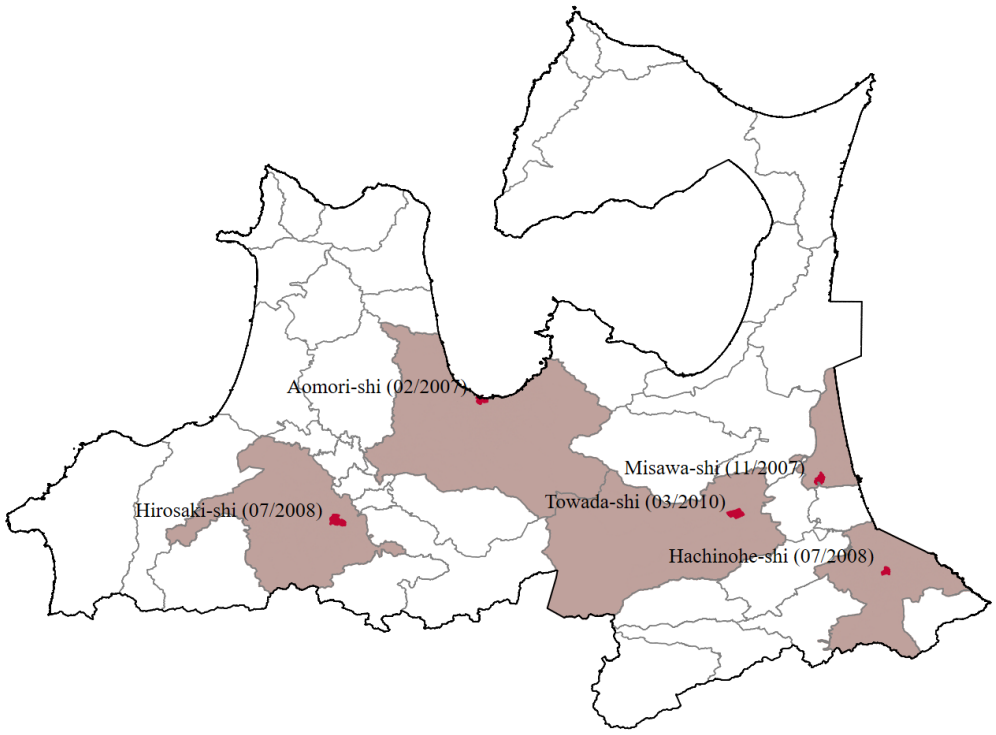

Figure OA.B. 2 Aomori

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

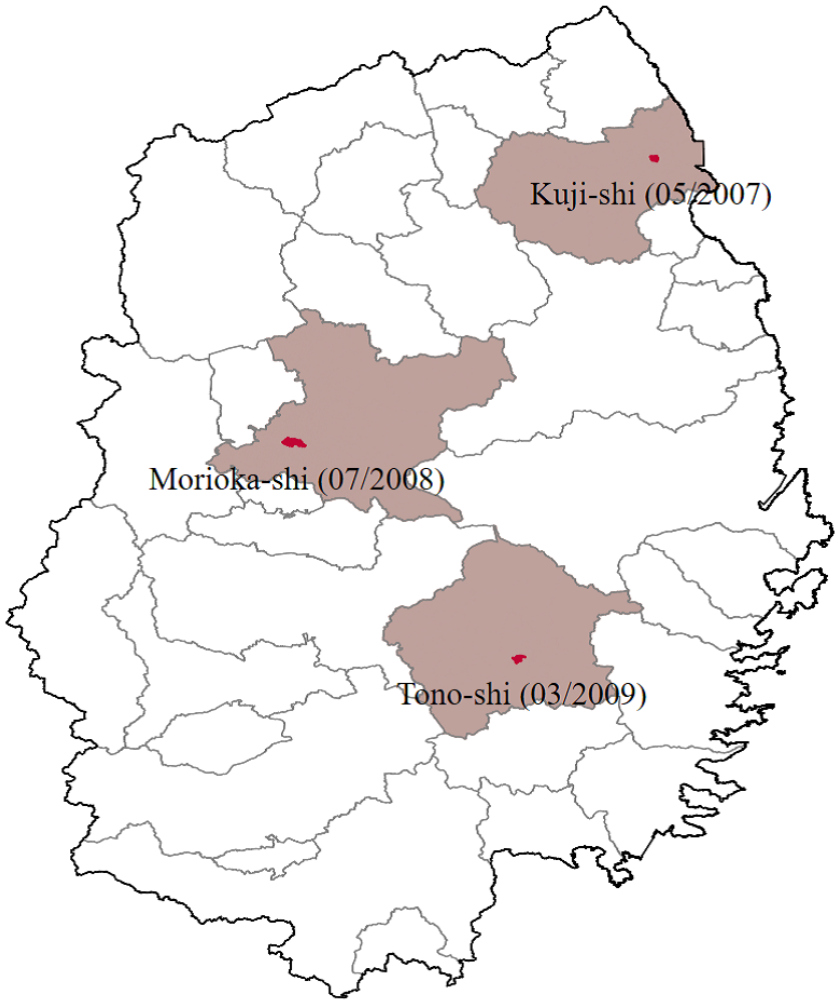

Figure OA.B. 3 Iwate

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

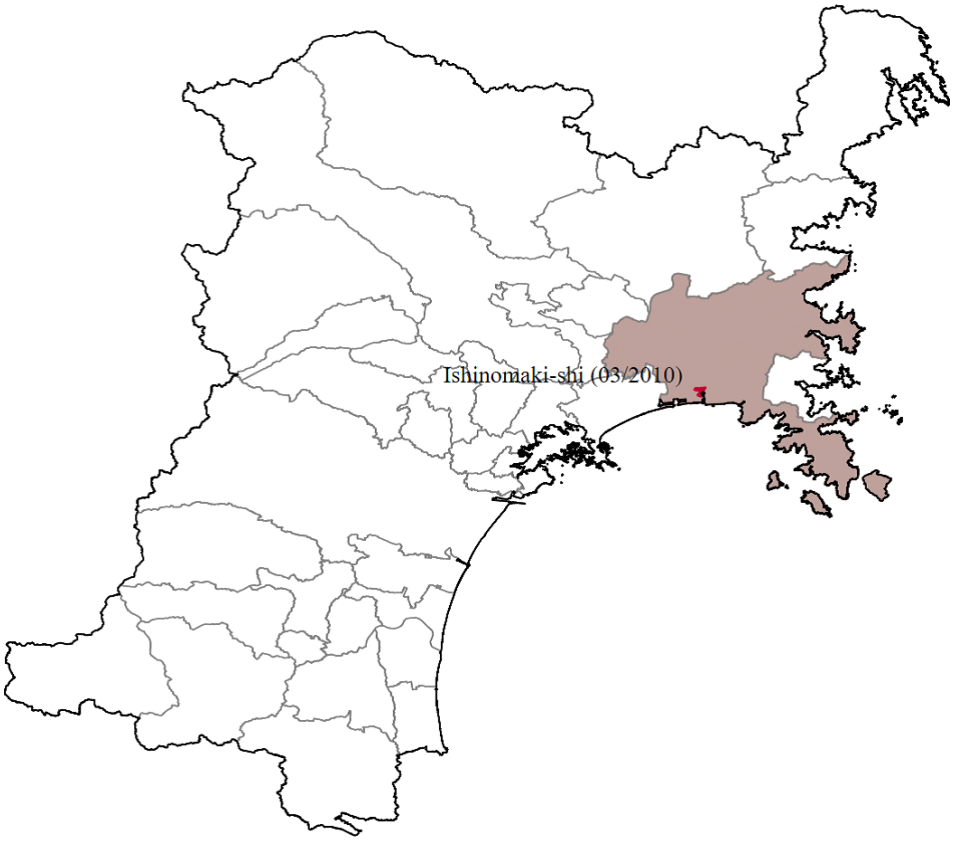

Figure OA.B. 4 Miyagi

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

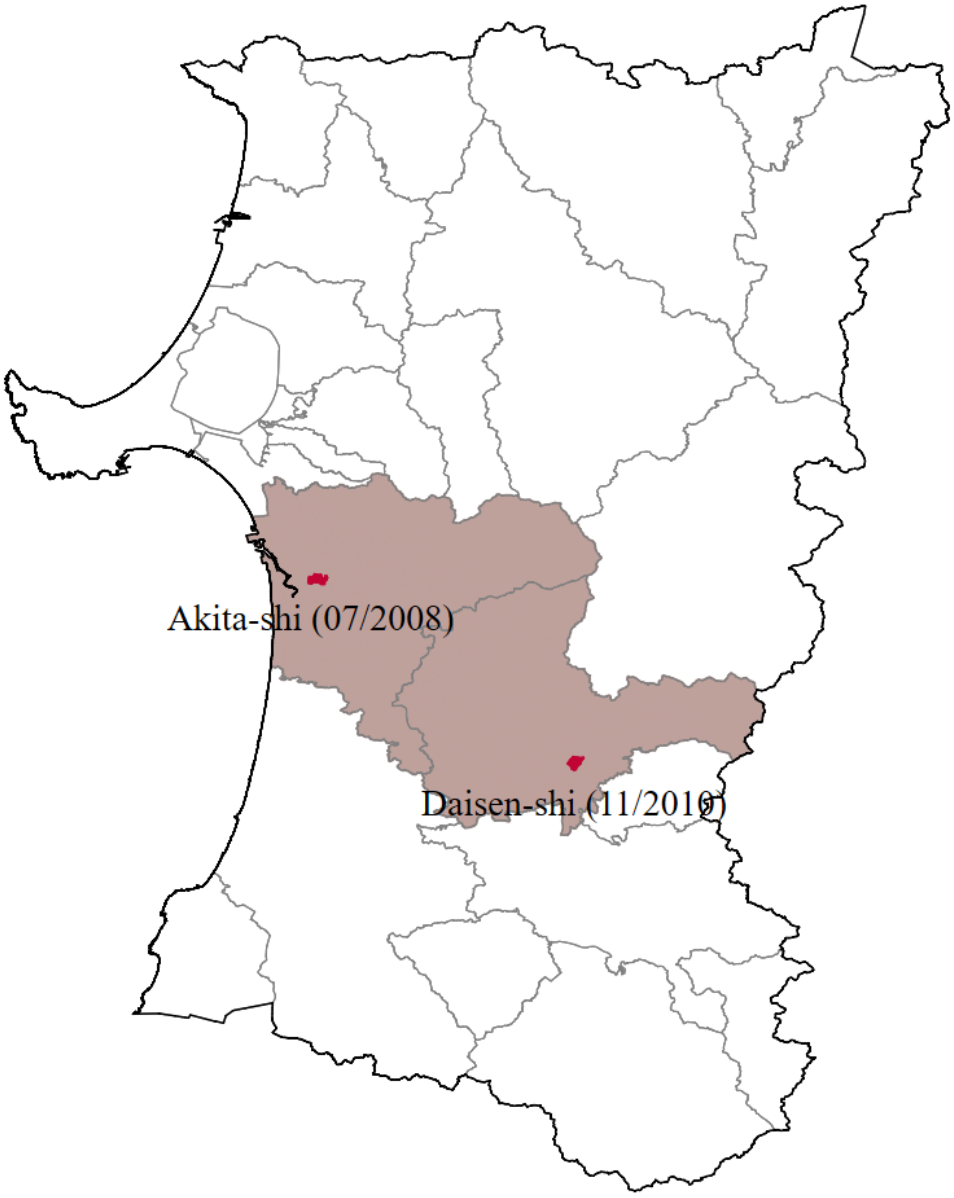

Figure OA.B. 5 Akita

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

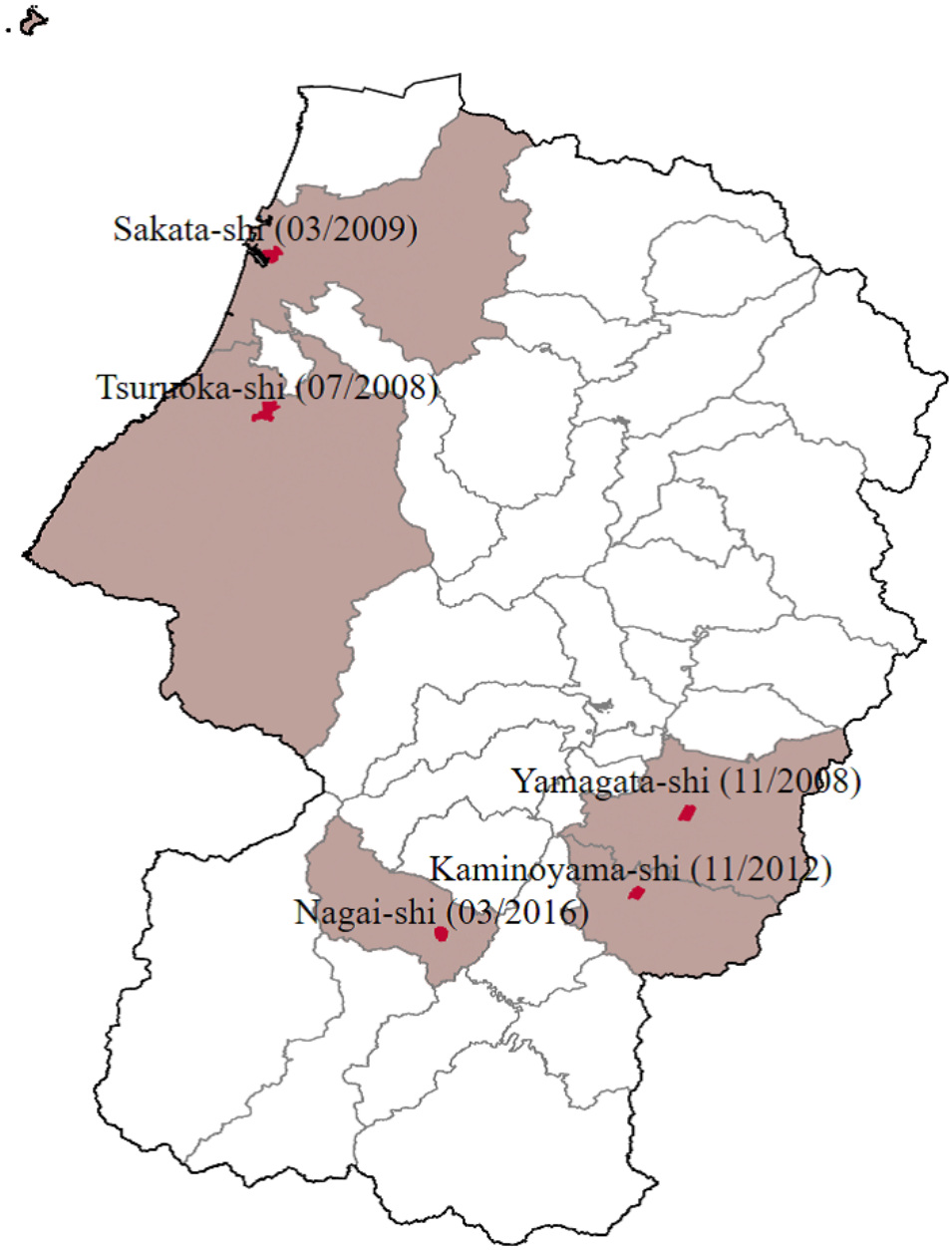

Figure OA.B. 6 Yamagata

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

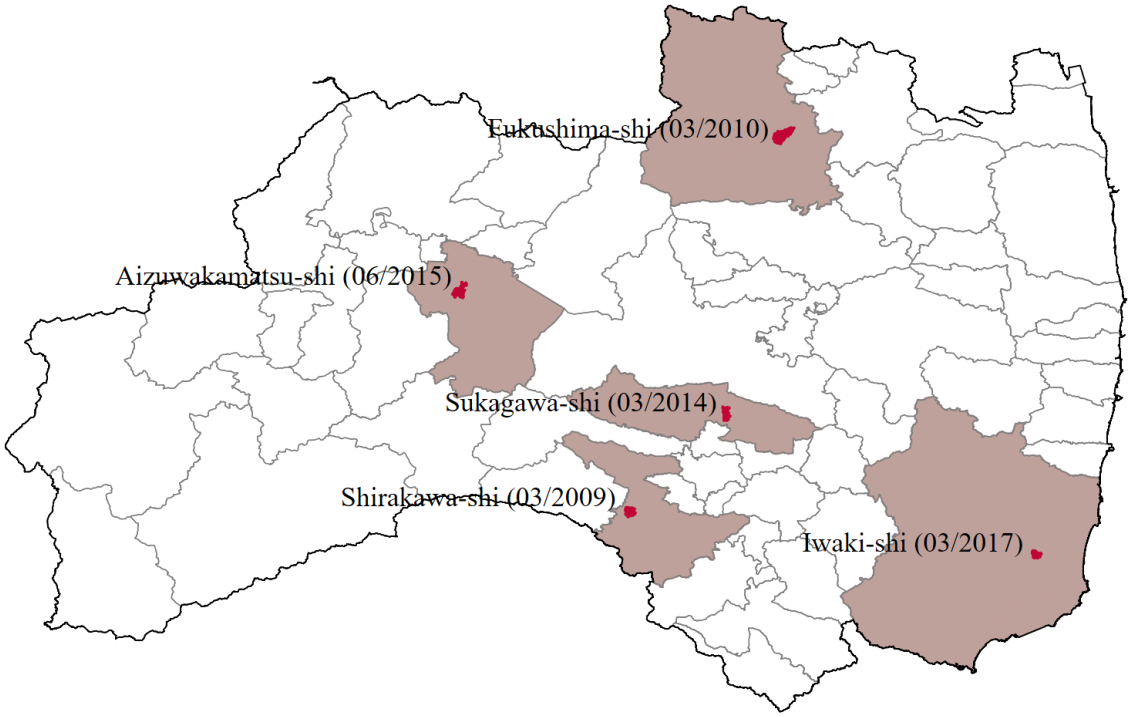

Figure OA.B. 7 Fukushima

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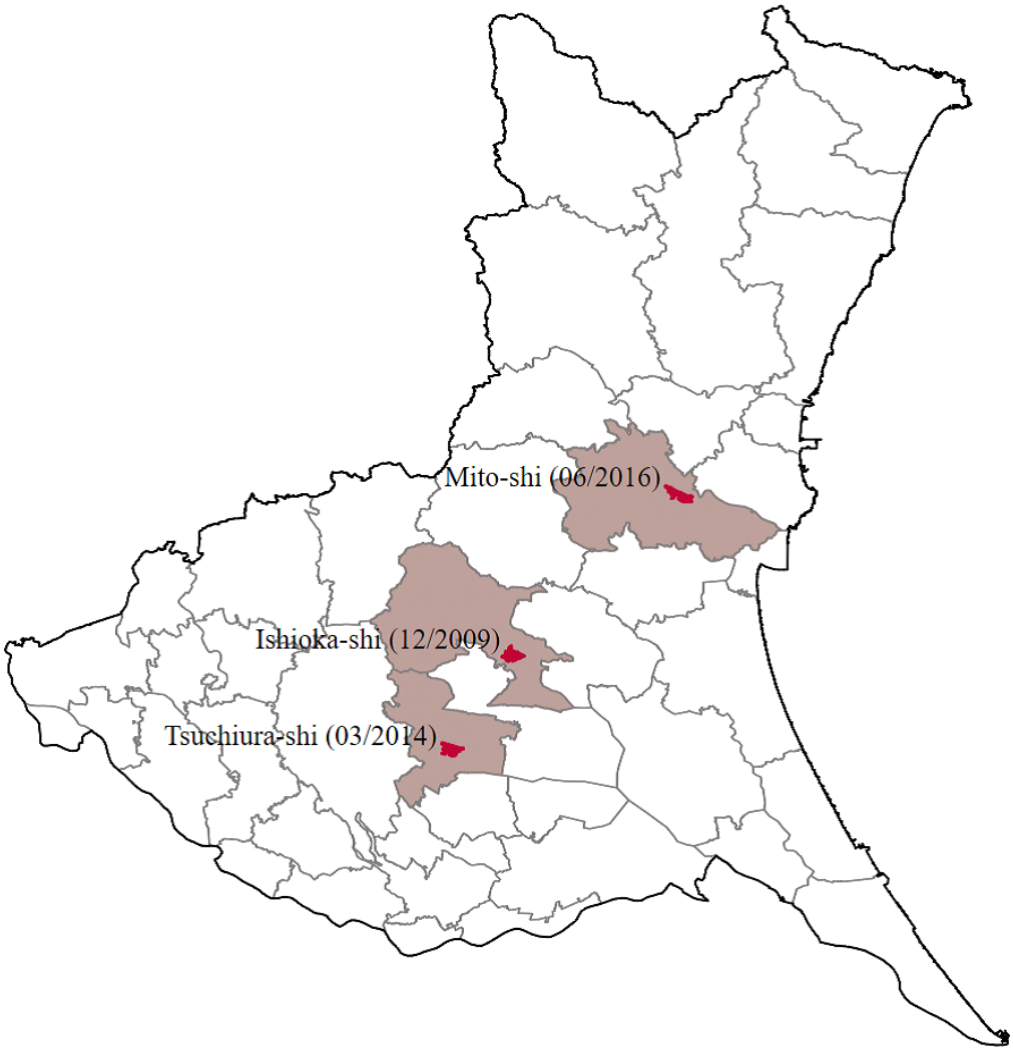

Figure OA.B. 8 Ibaraki

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

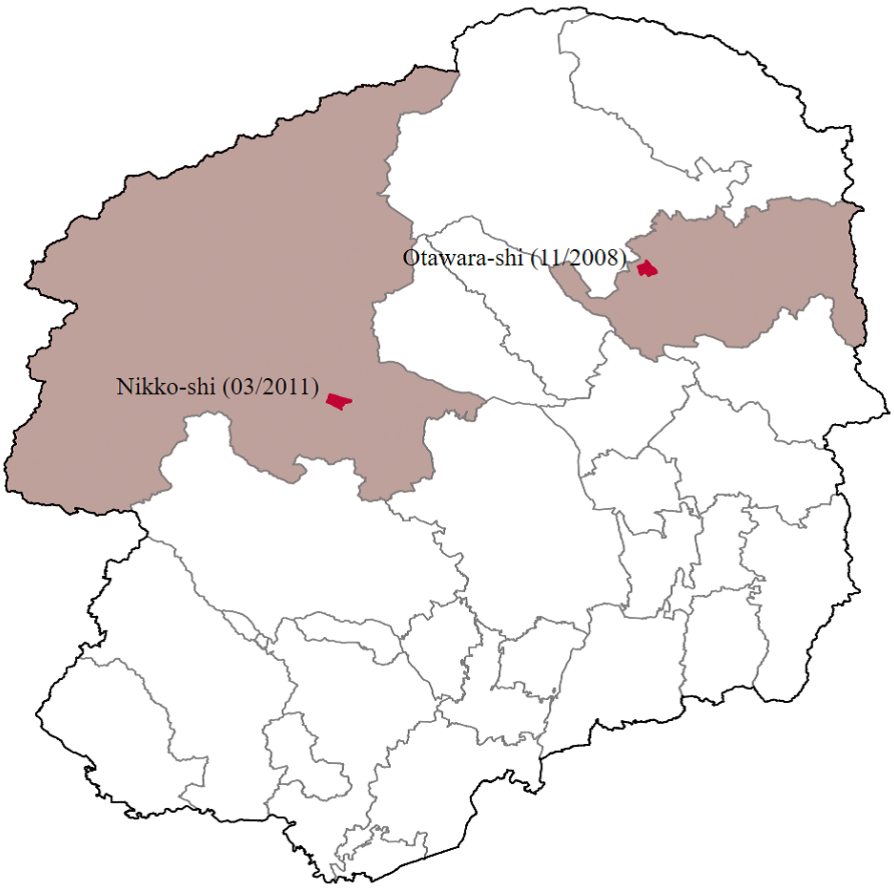

Figure OA.B. 9 Tochigi

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

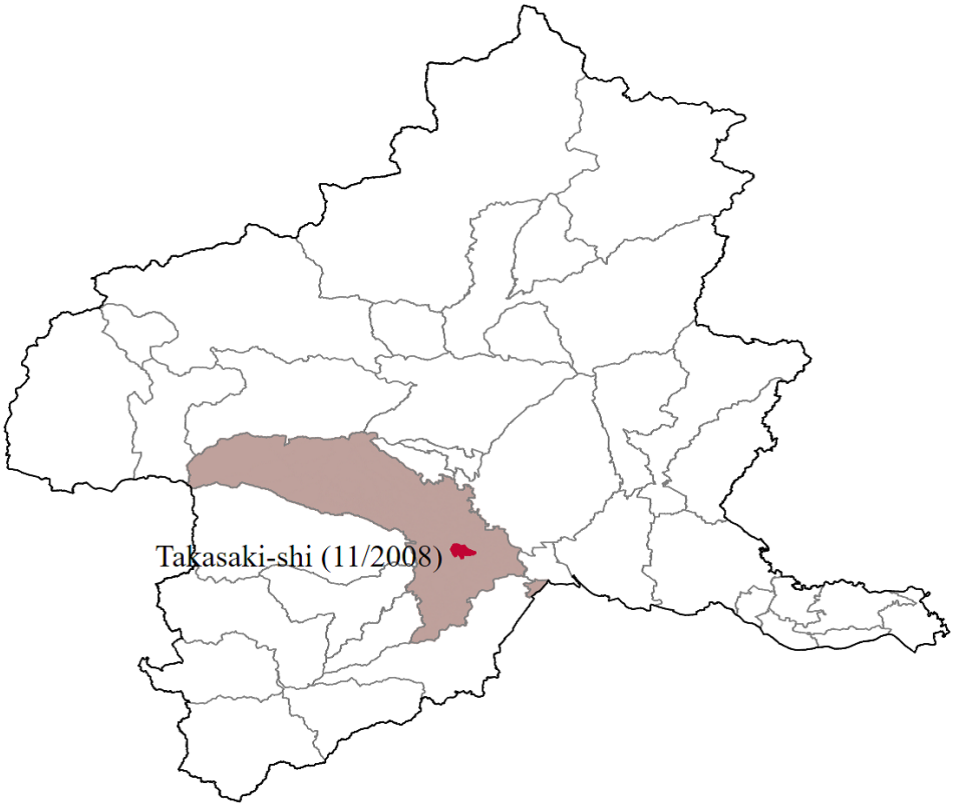

Figure OA.B. 10 Gunma

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

Figure OA.B. 11 Saitama

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

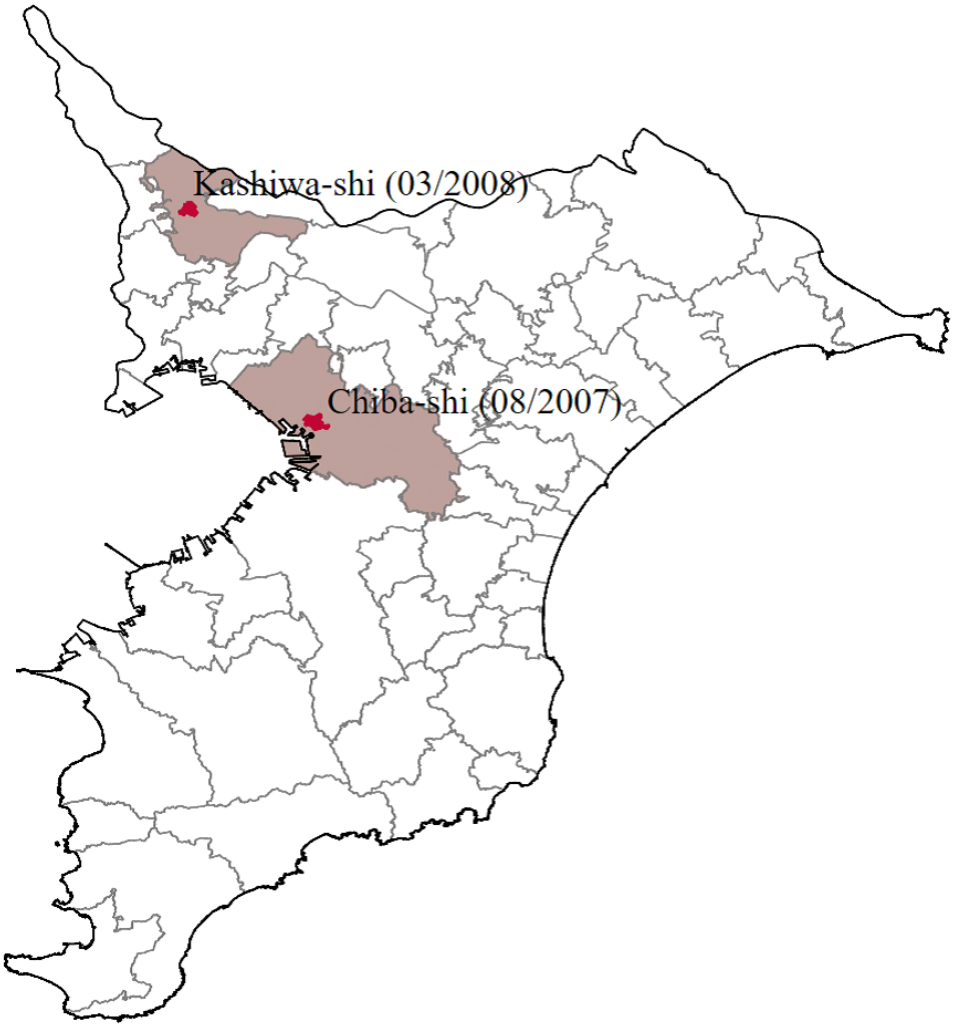

Figure OA.B. 12 Chiba

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

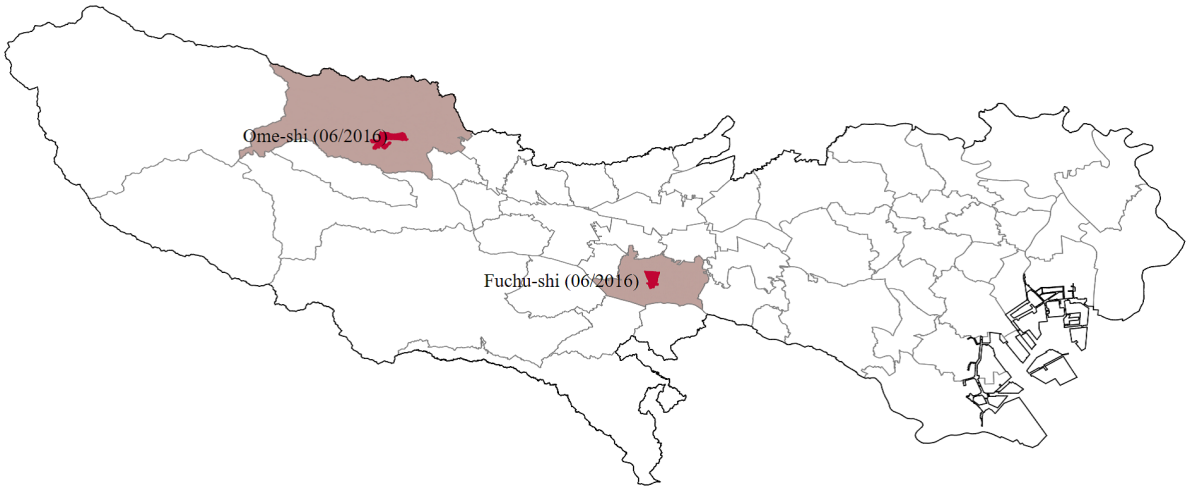

Figure OA.B. 13 Tokyo

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

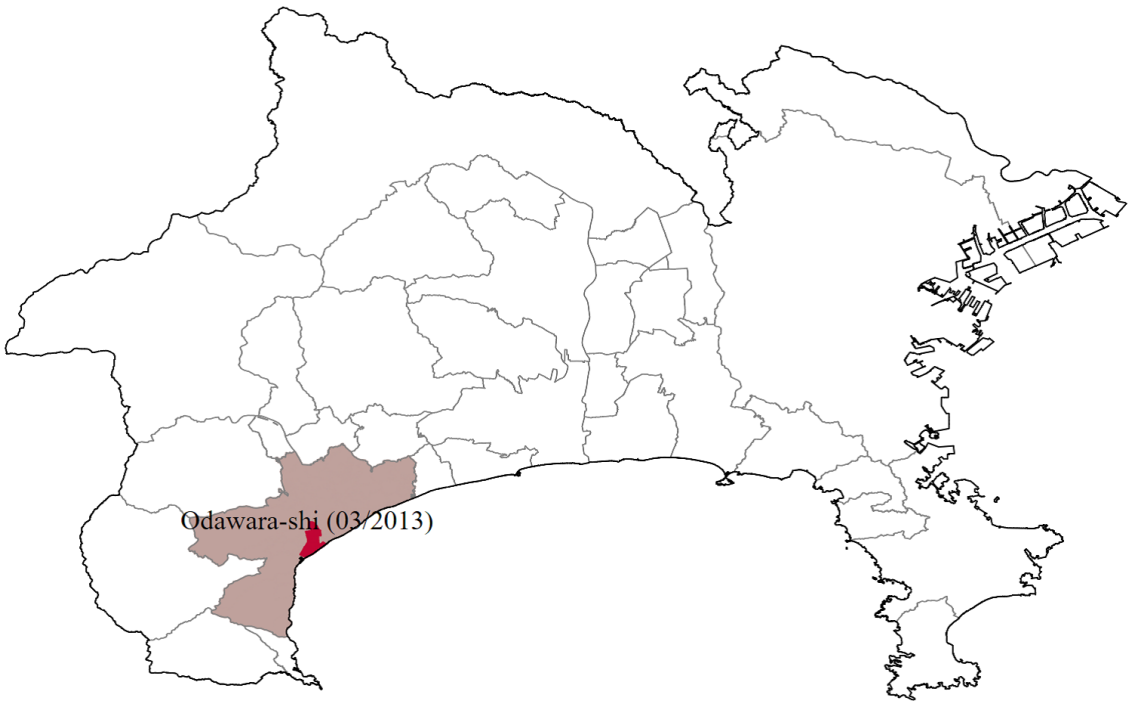

Figure OA.B. 14 Kanagawa

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

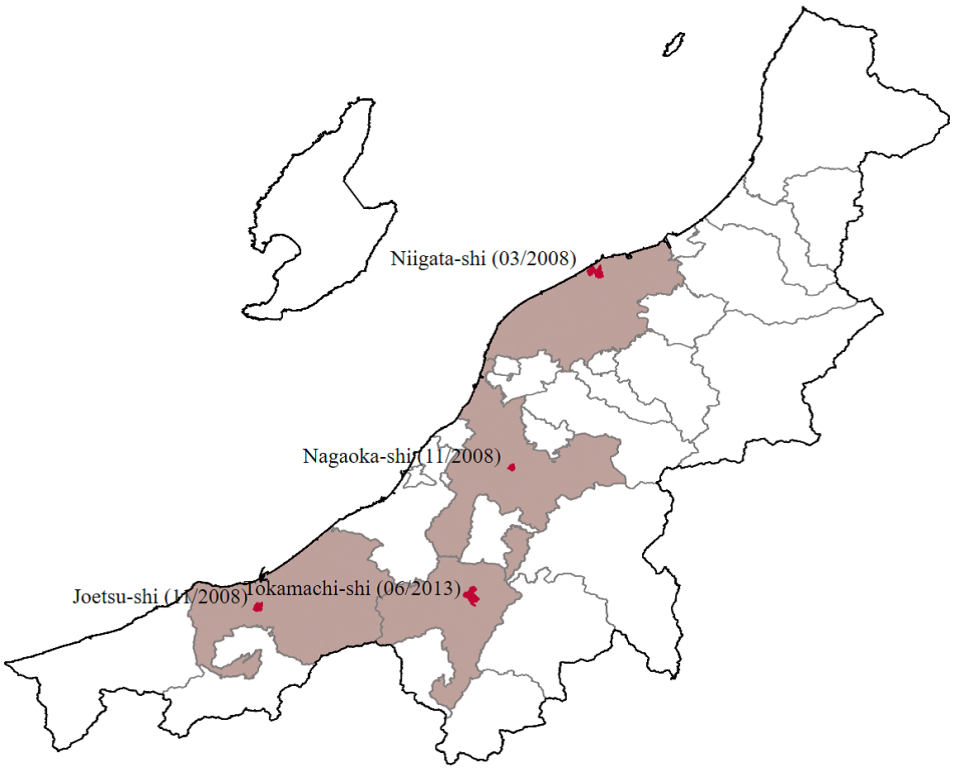

Figure OA.B. 15 Niigata

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

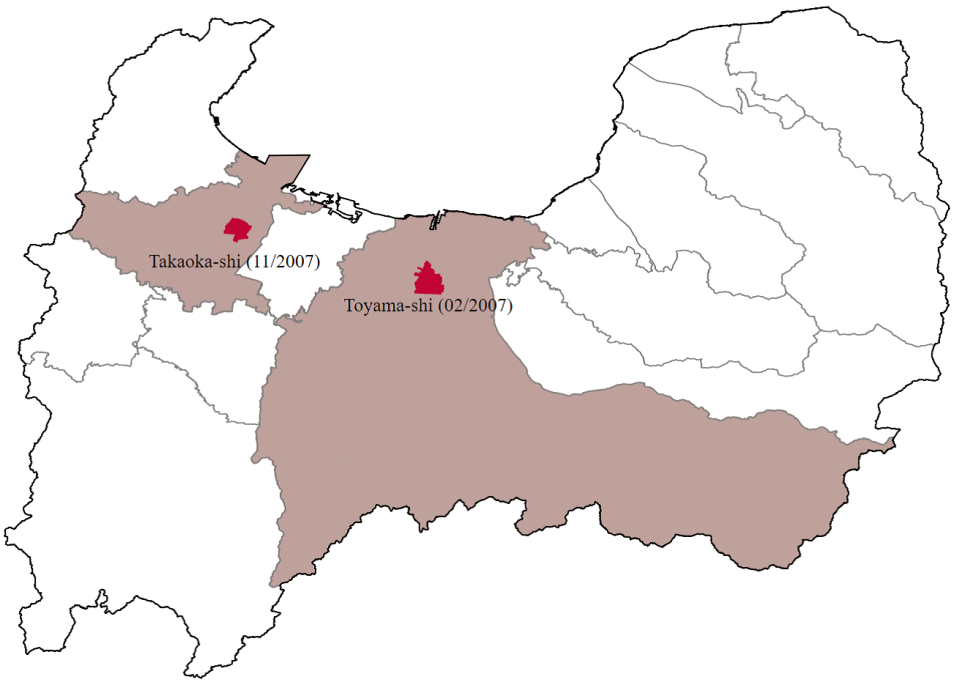

Figure OA.B. 16 Toyama

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

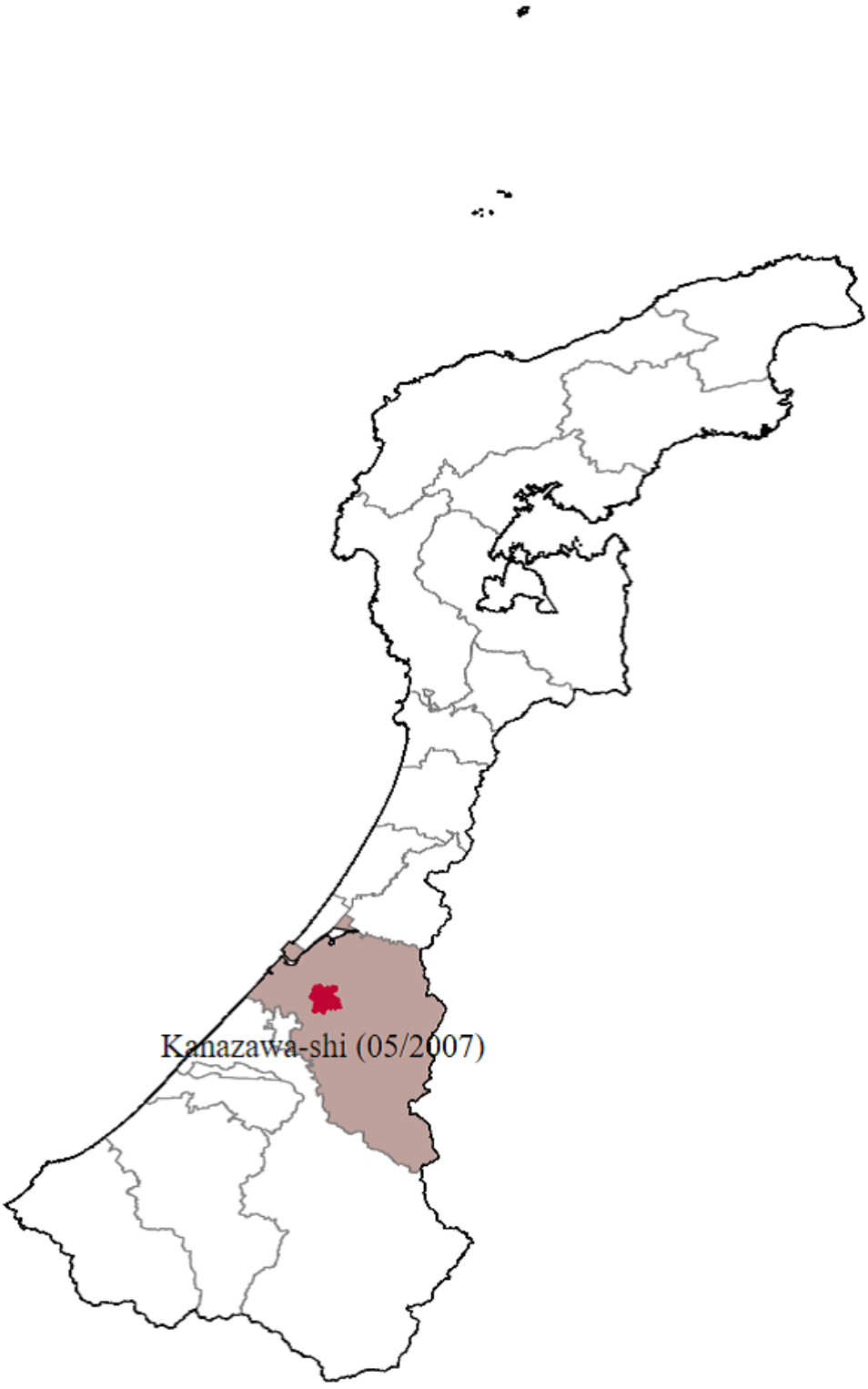

Figure OA.B. 17 Ishikawa

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

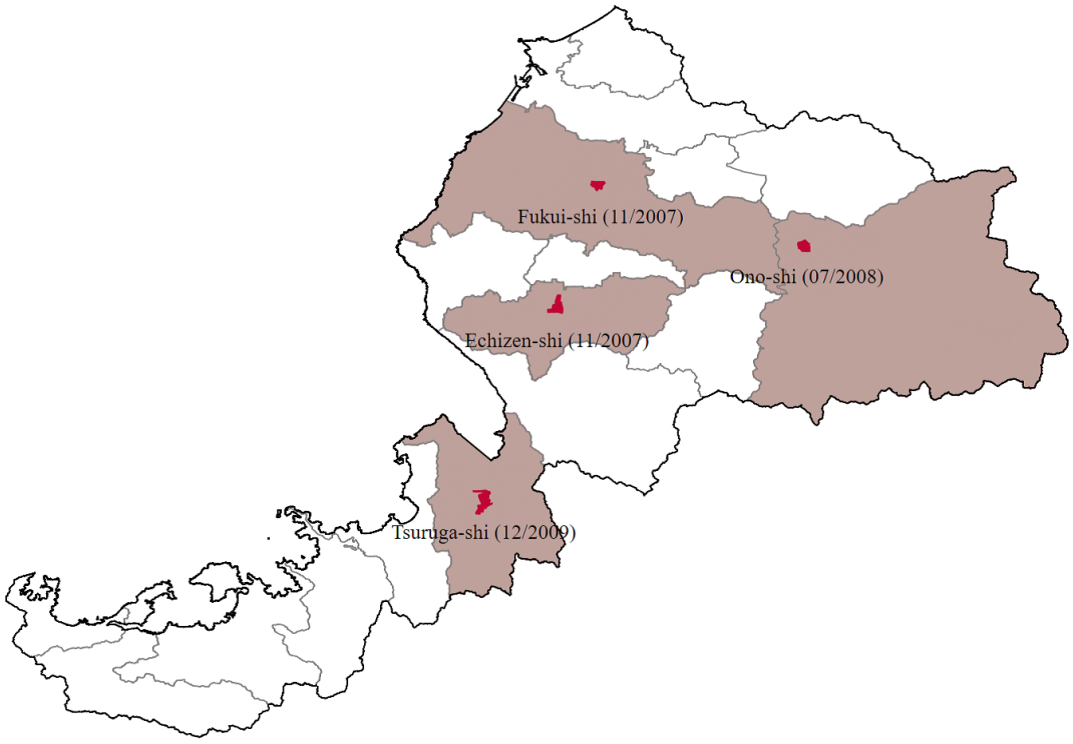

Figure OA.B. 18 Fukui

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

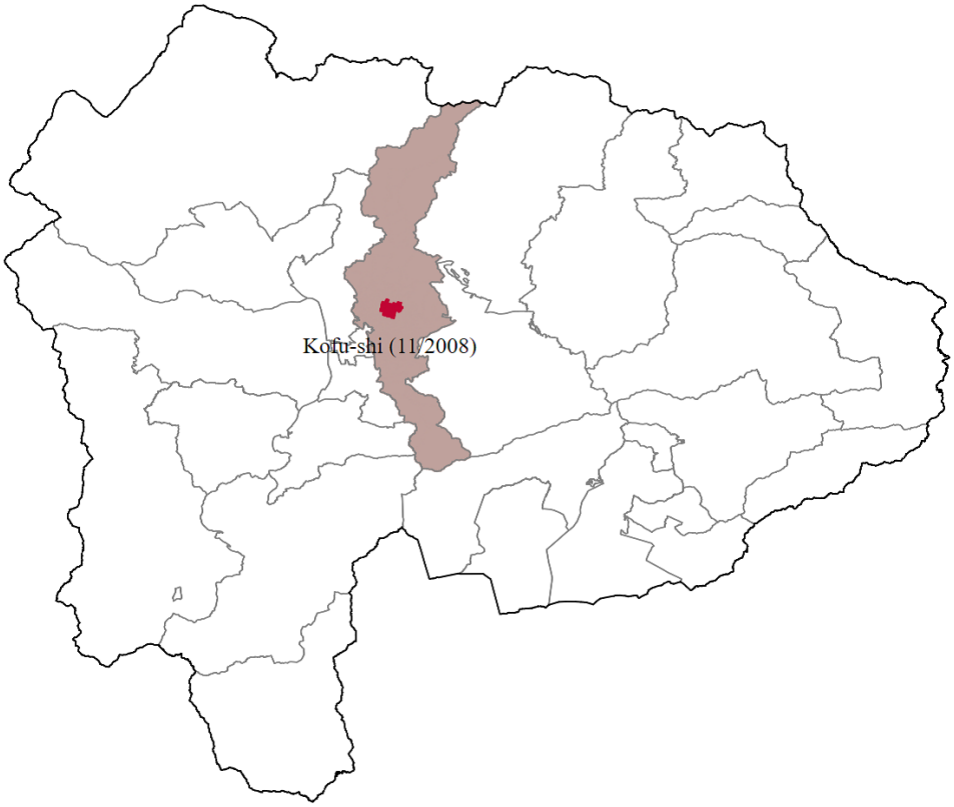

Figure OA.B. 19 Yamanashi

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

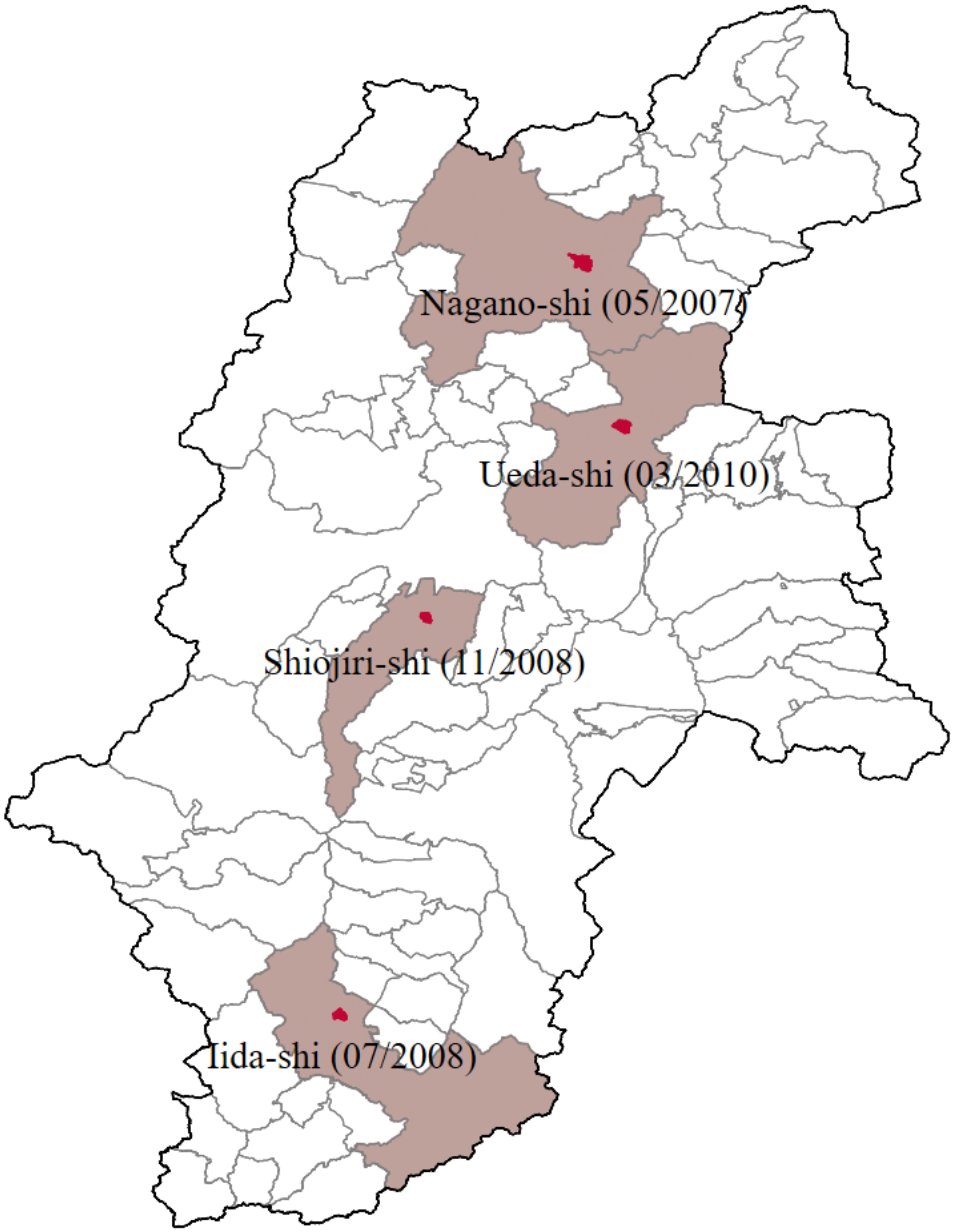

Figure OA.B. 20 Nagano

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

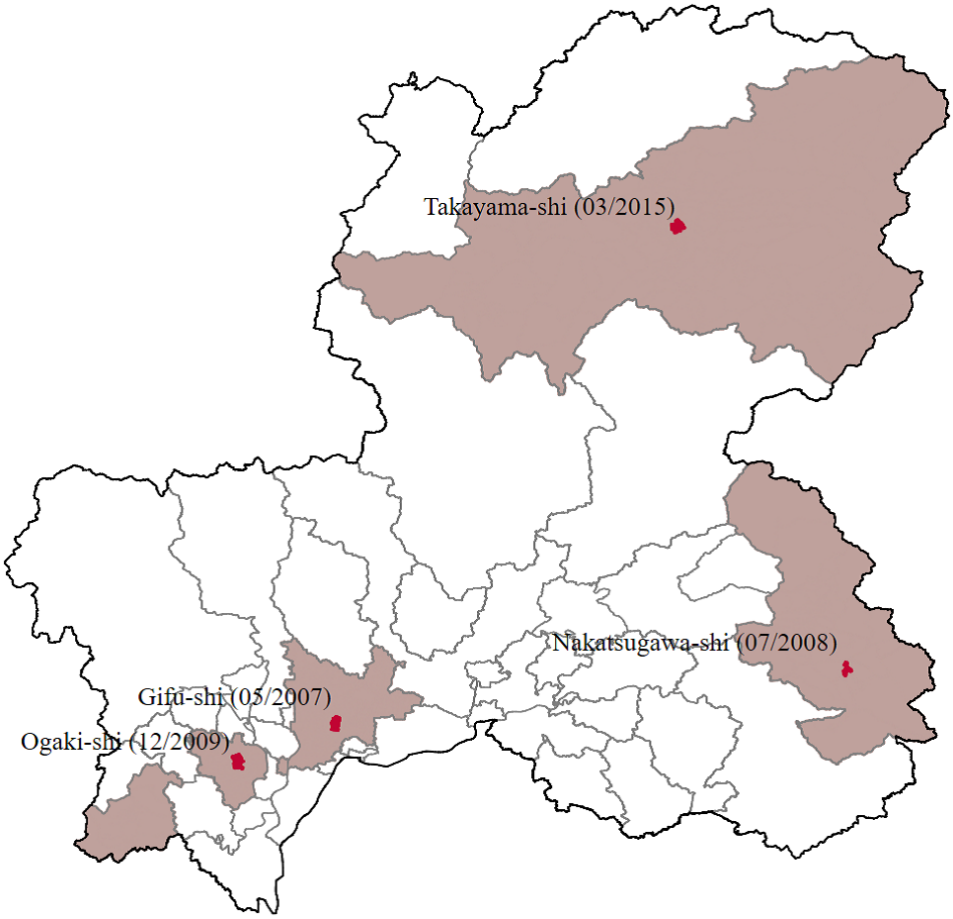

Figure OA.B. 21 Gifu

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

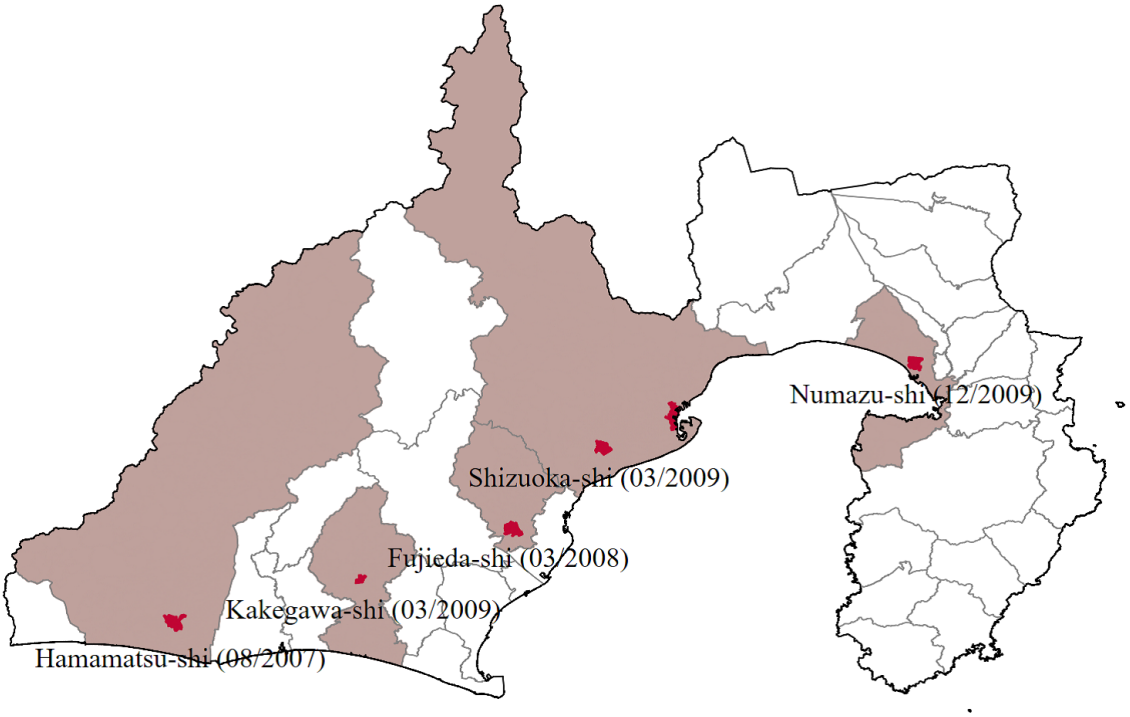

Figure OA.B. 22 Shizuoka

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

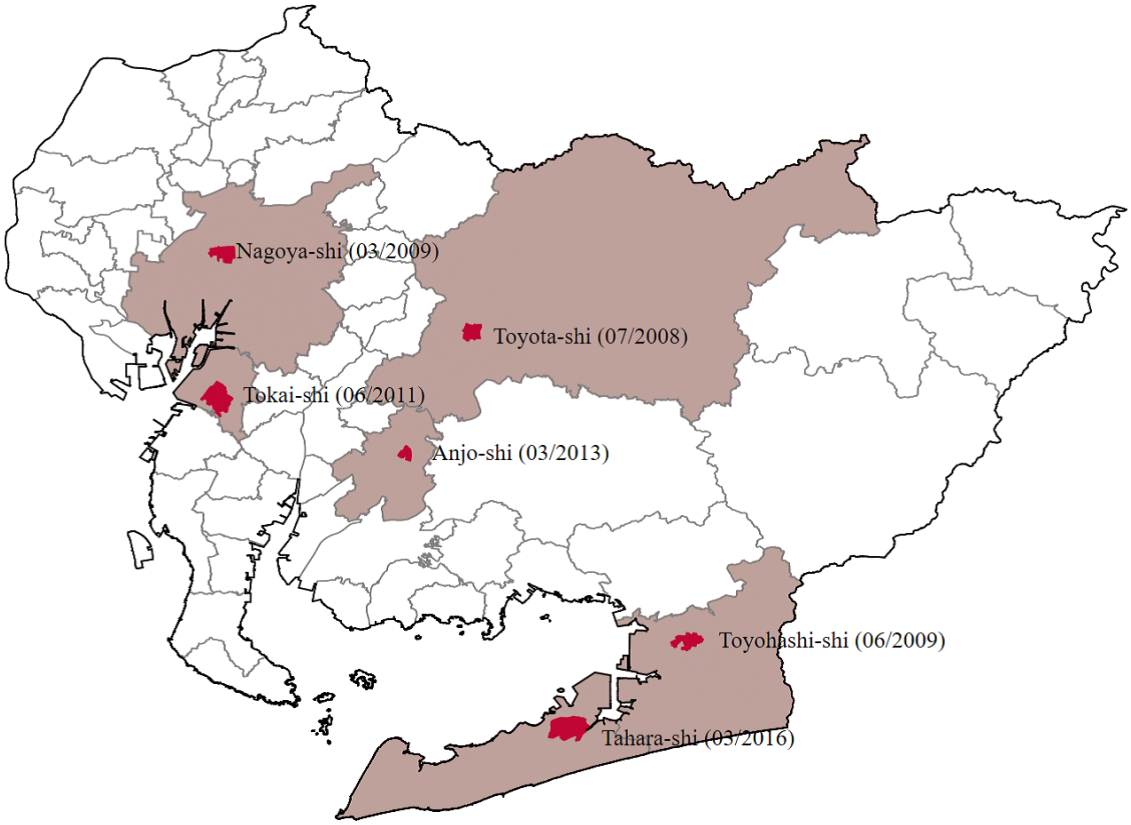

Figure OA.B. 23 Aichi

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

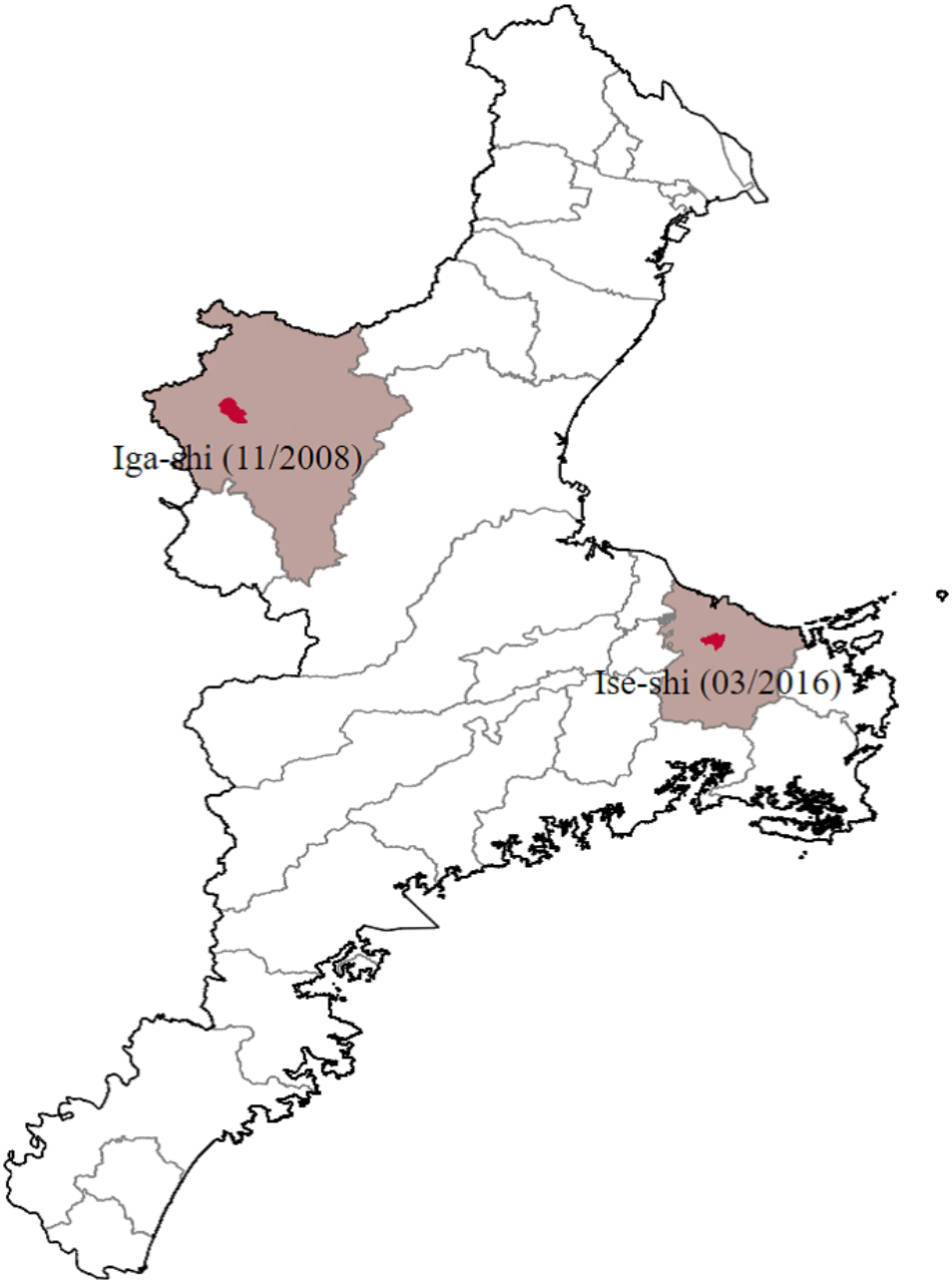

Figure OA.B. 24 Mie

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

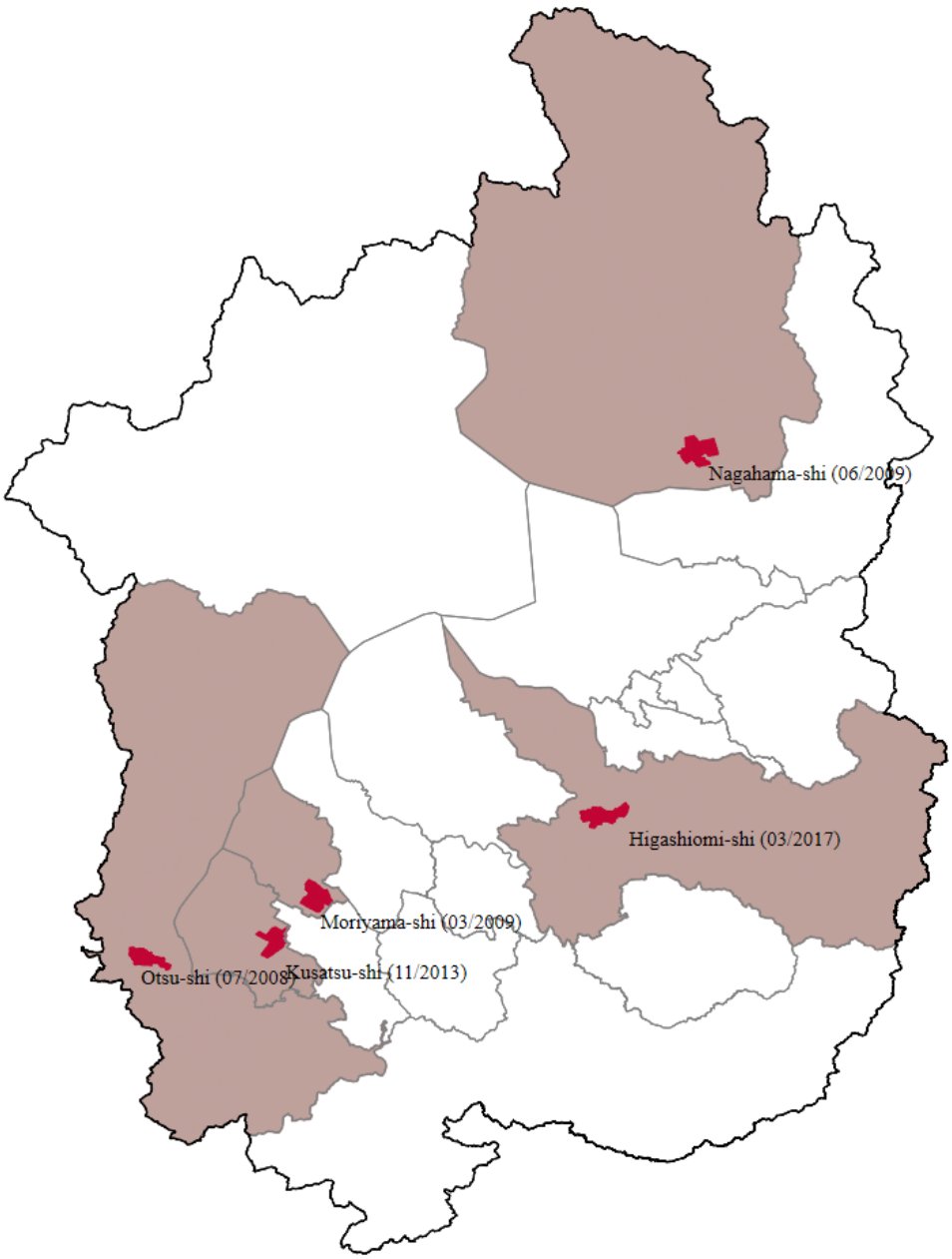

Figure OA.B. 25 Shiga

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

Figure OA.B. 26 Kyoto

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

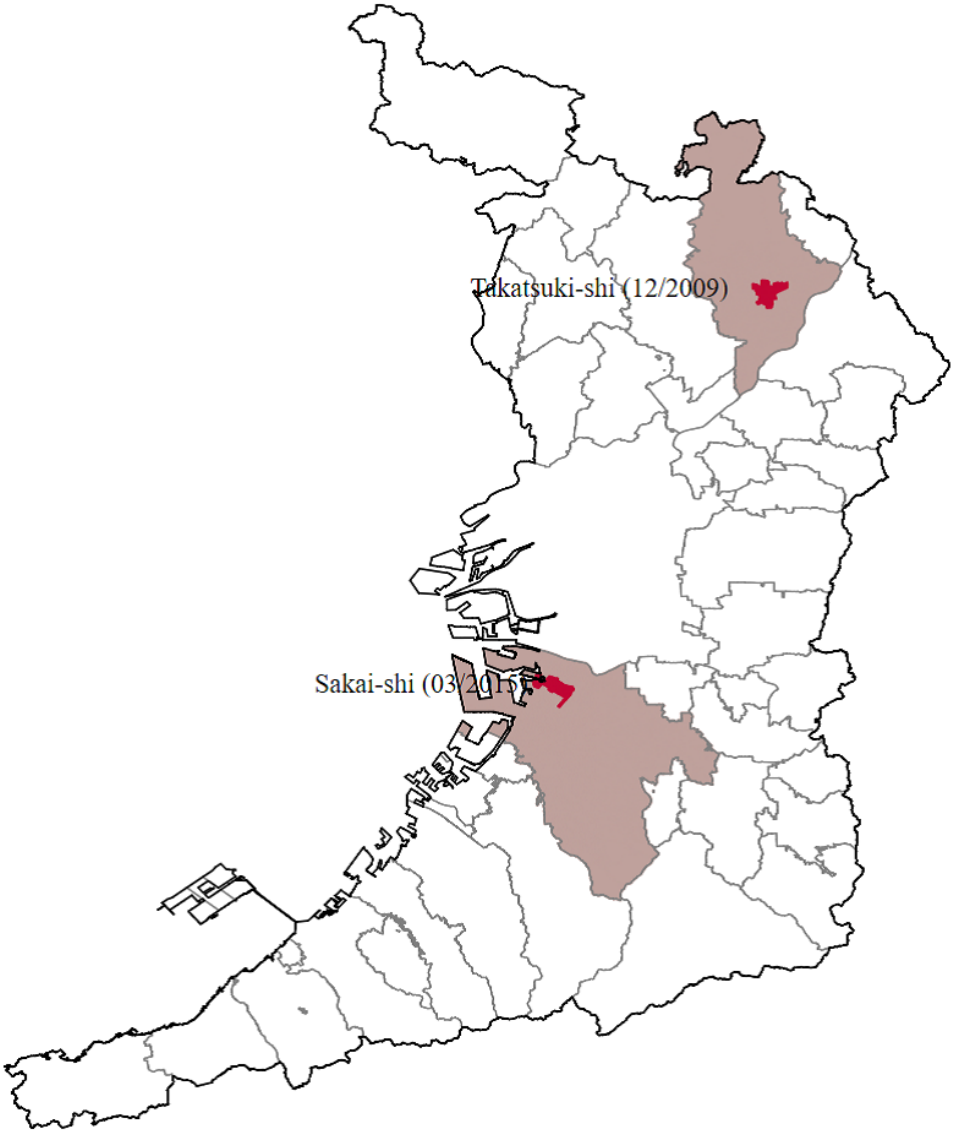

Figure OA.B. 27 Osaka

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

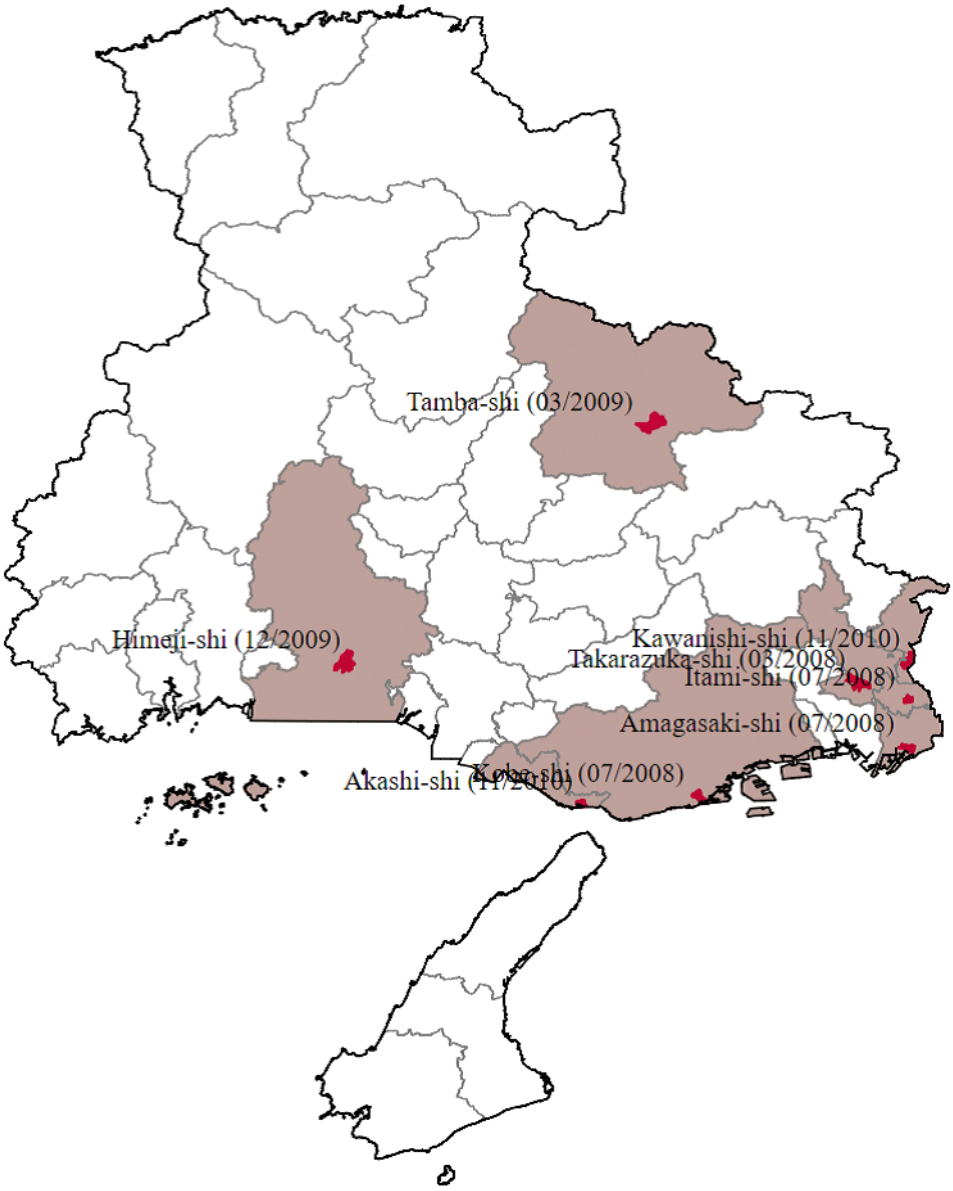

Figure OA.B. 28 Hyogo

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

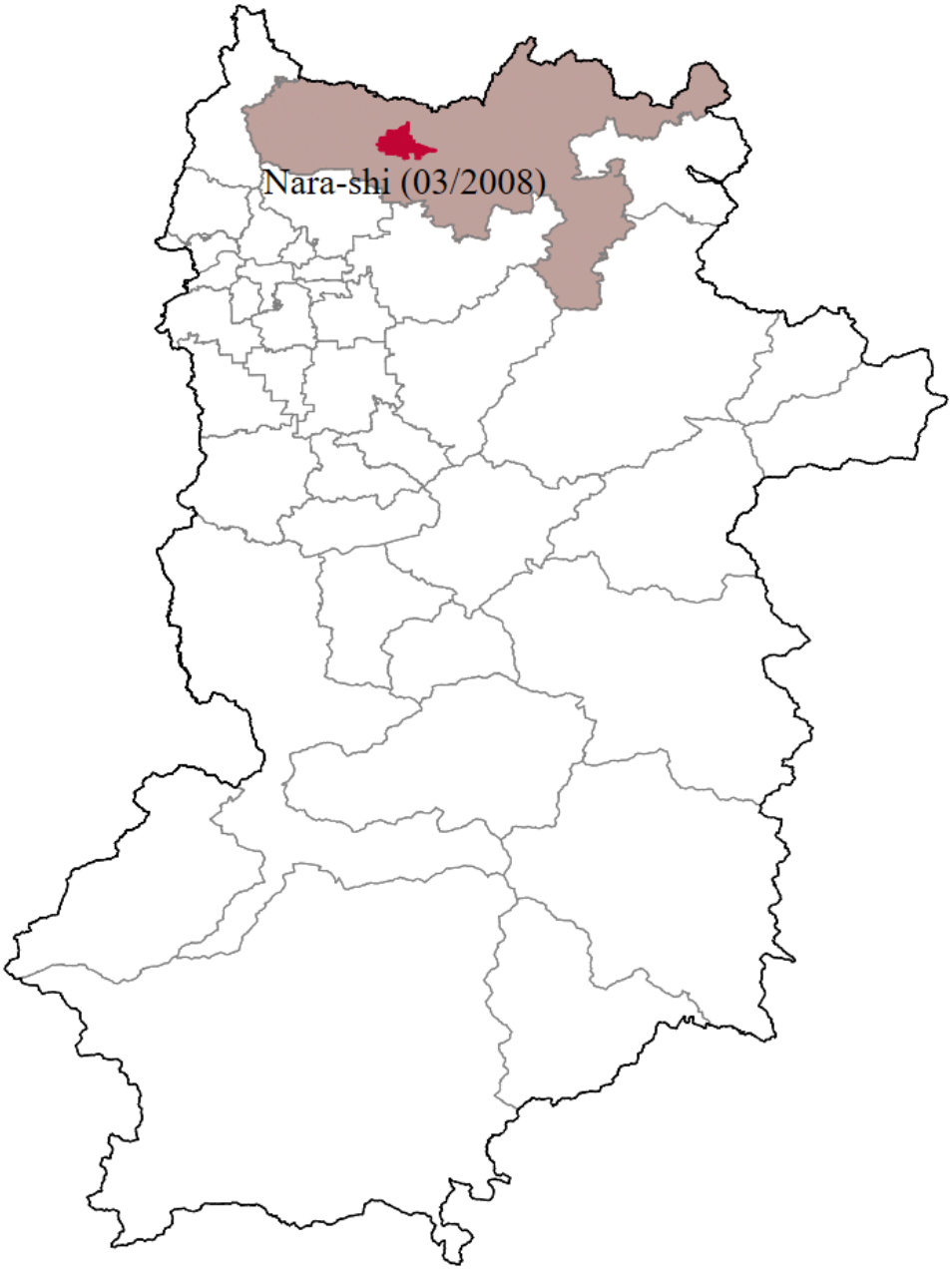

Figure OA.B. 29 Nara

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

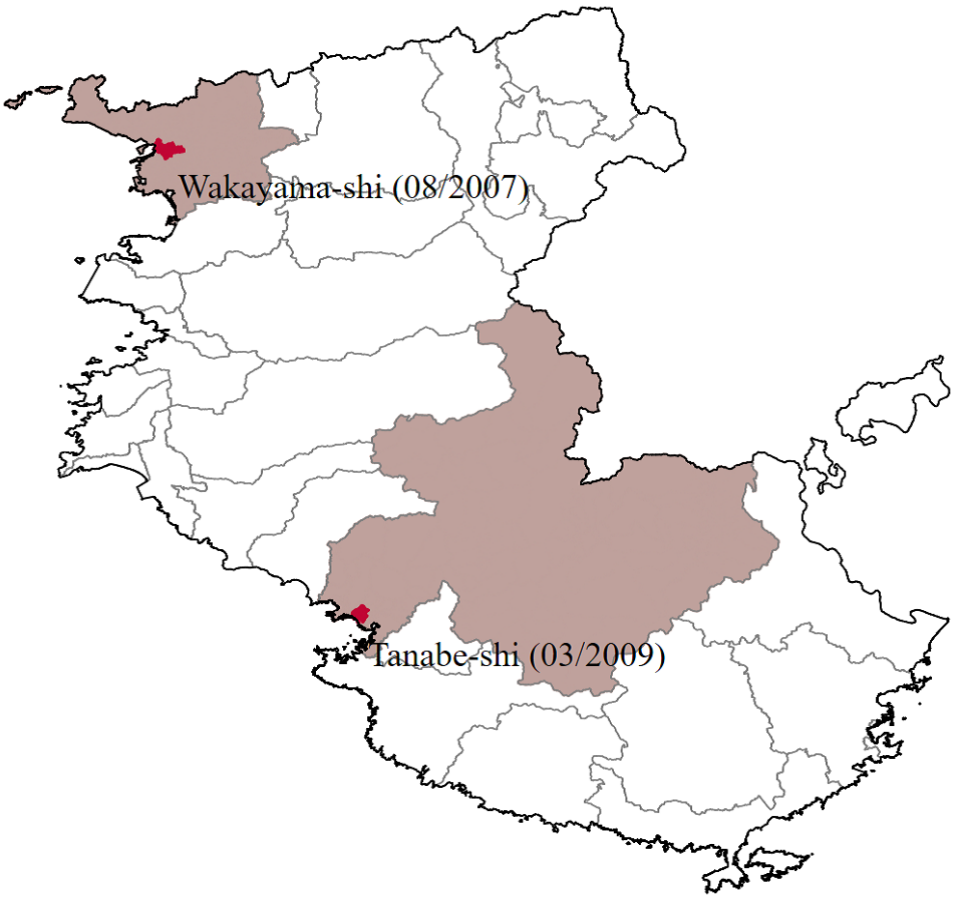

Figure OA.B. 30 Wakayama

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

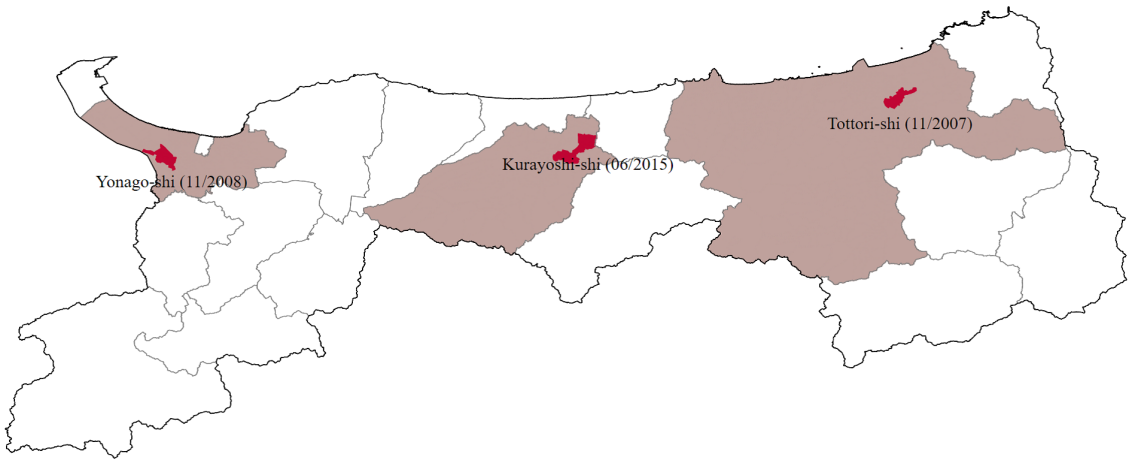

Figure OA.B. 31 Tottori

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

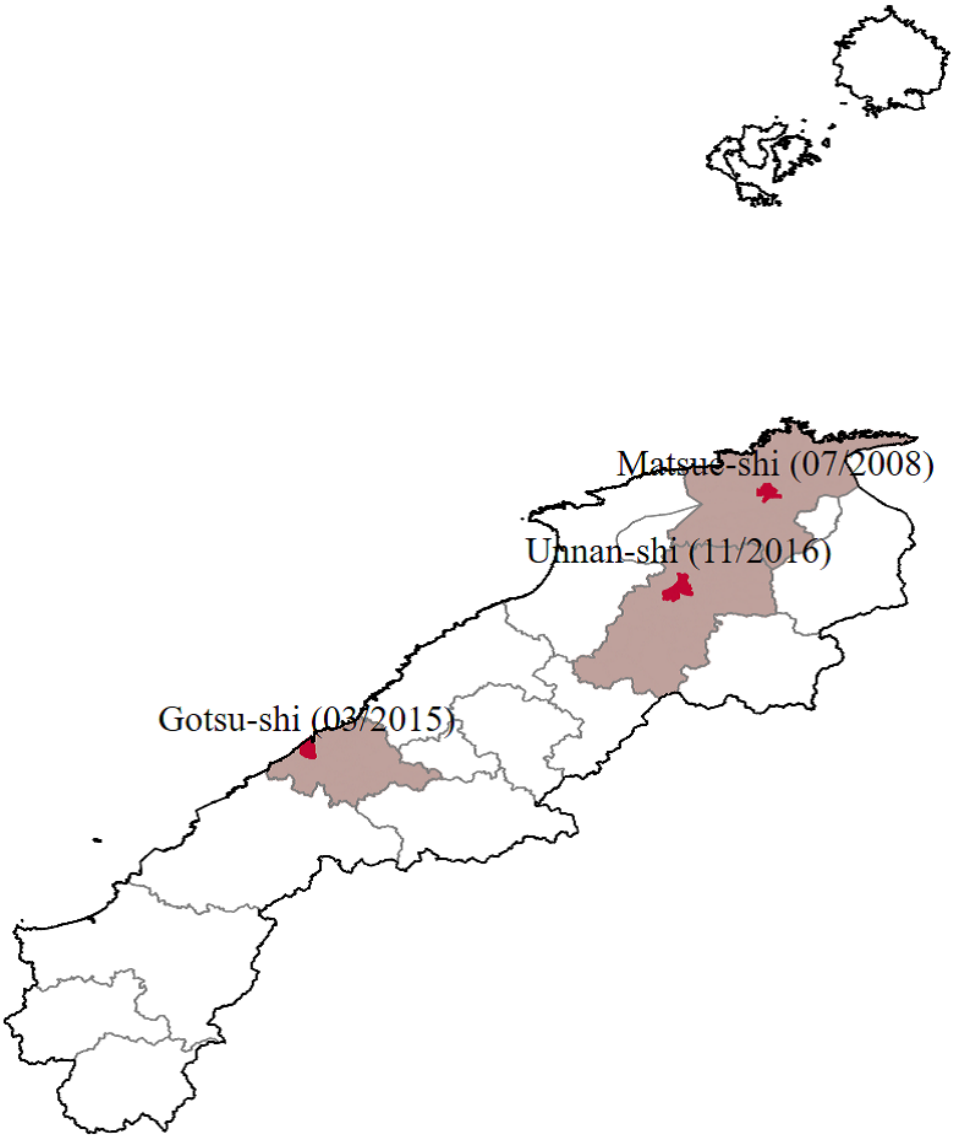

Figure OA.B. 32 Shimane

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

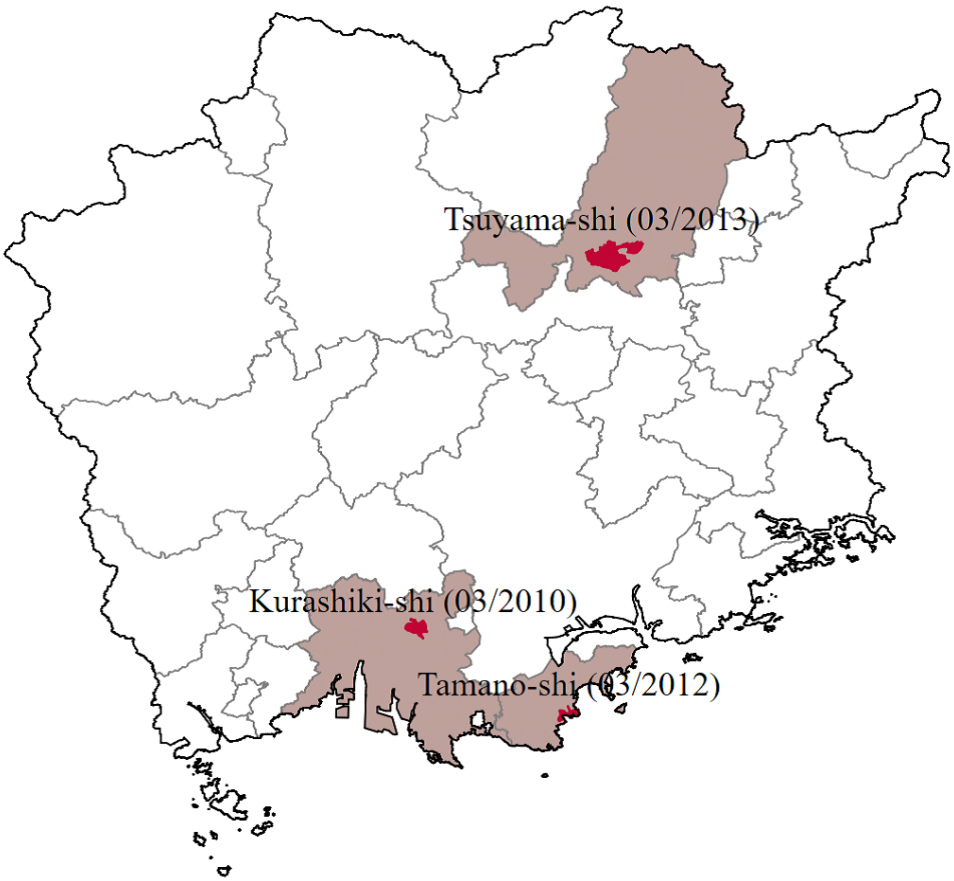

Figure OA.B. 33 Okayama

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

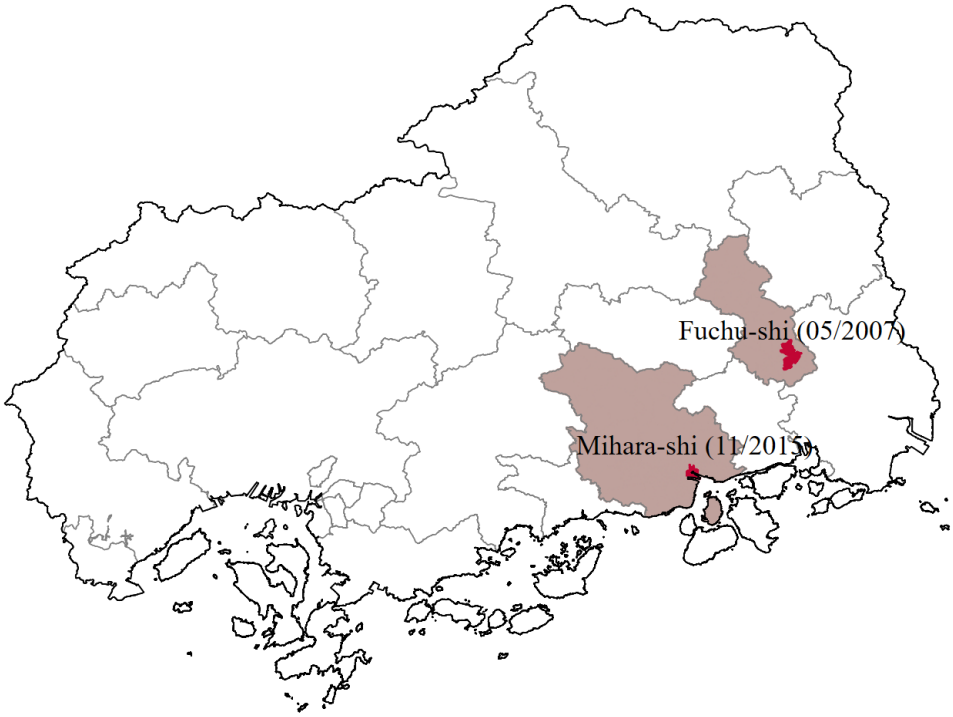

Figure OA.B. 34 Hiroshima

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

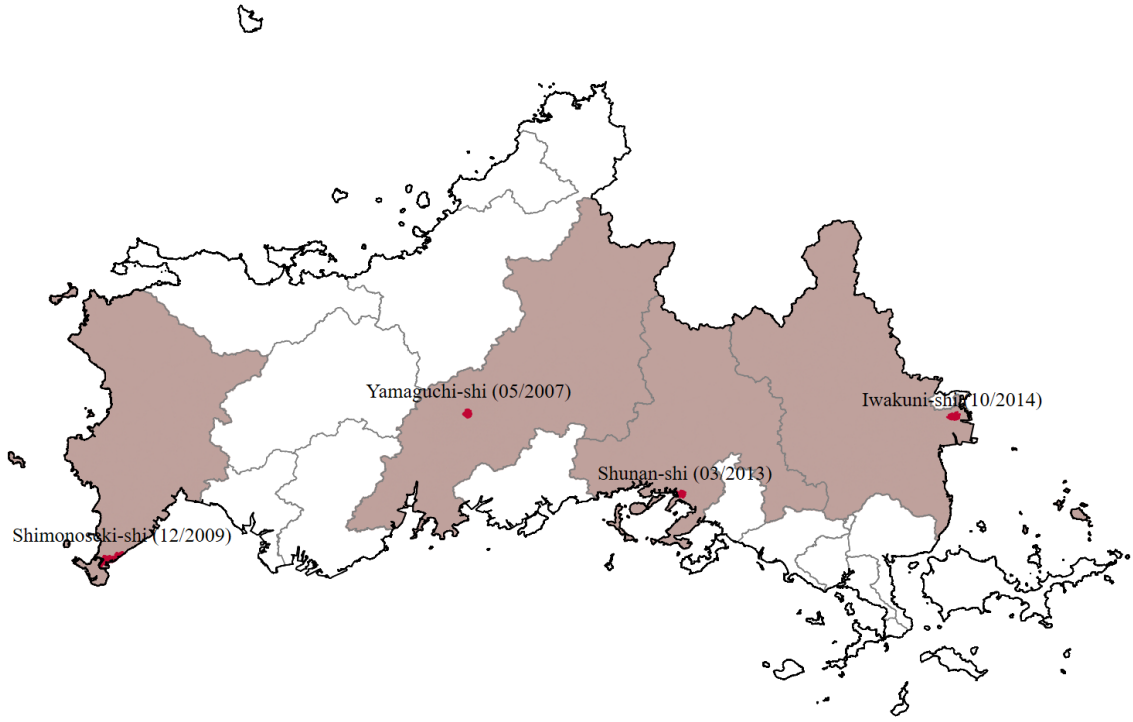

Figure OA.B. 35 Yamaguchi

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

Figure OA.B. 36 Tokushima

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

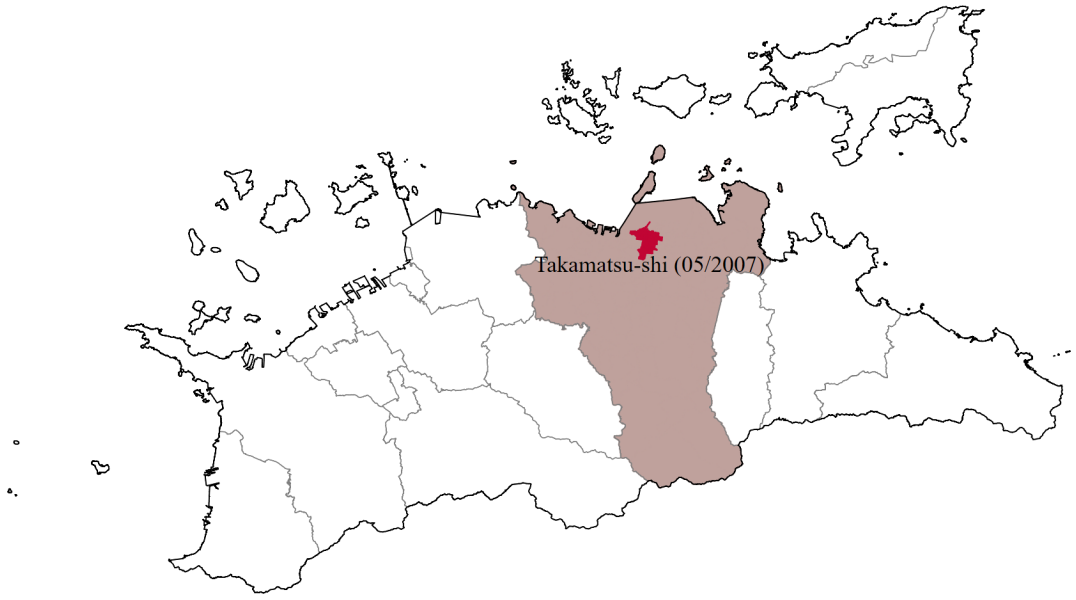

Figure OA.B. 37 Kagawa

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

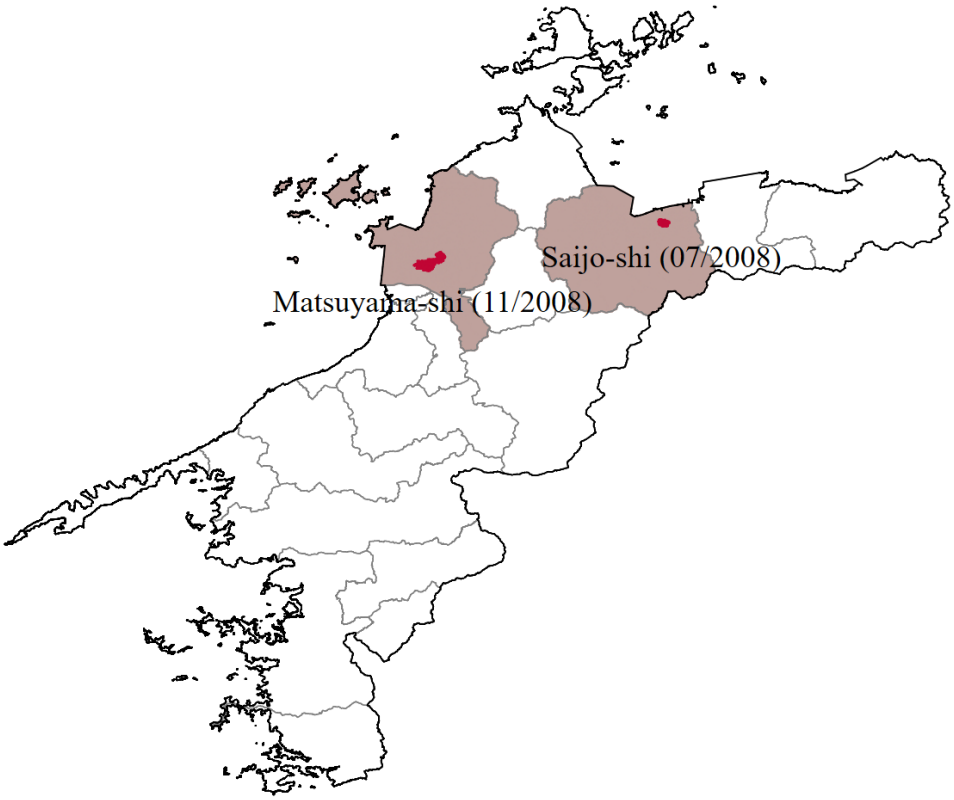

Figure OA.B. 38 Ehime

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

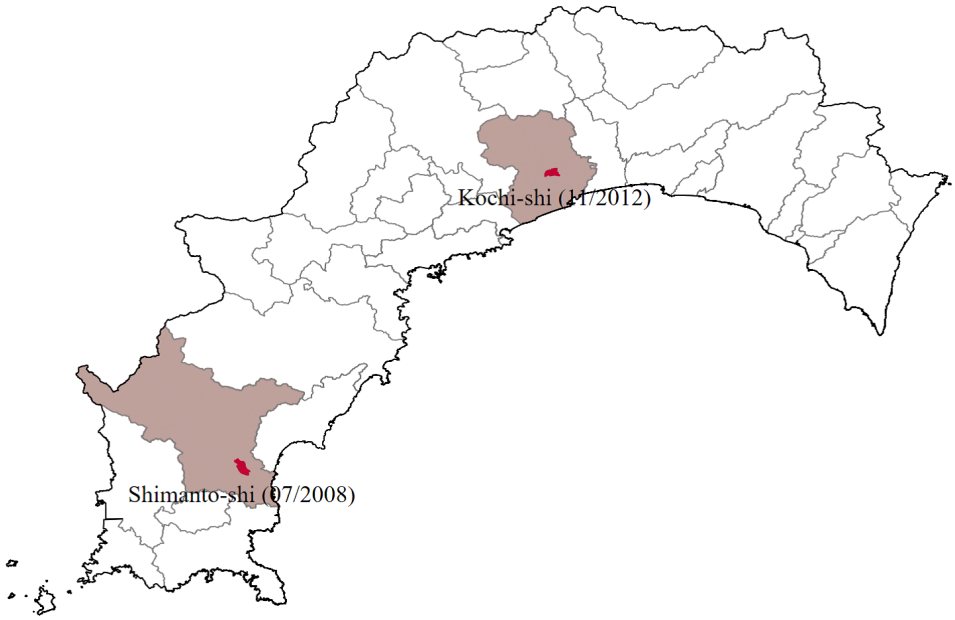

Figure OA.B. 39 Kochi

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

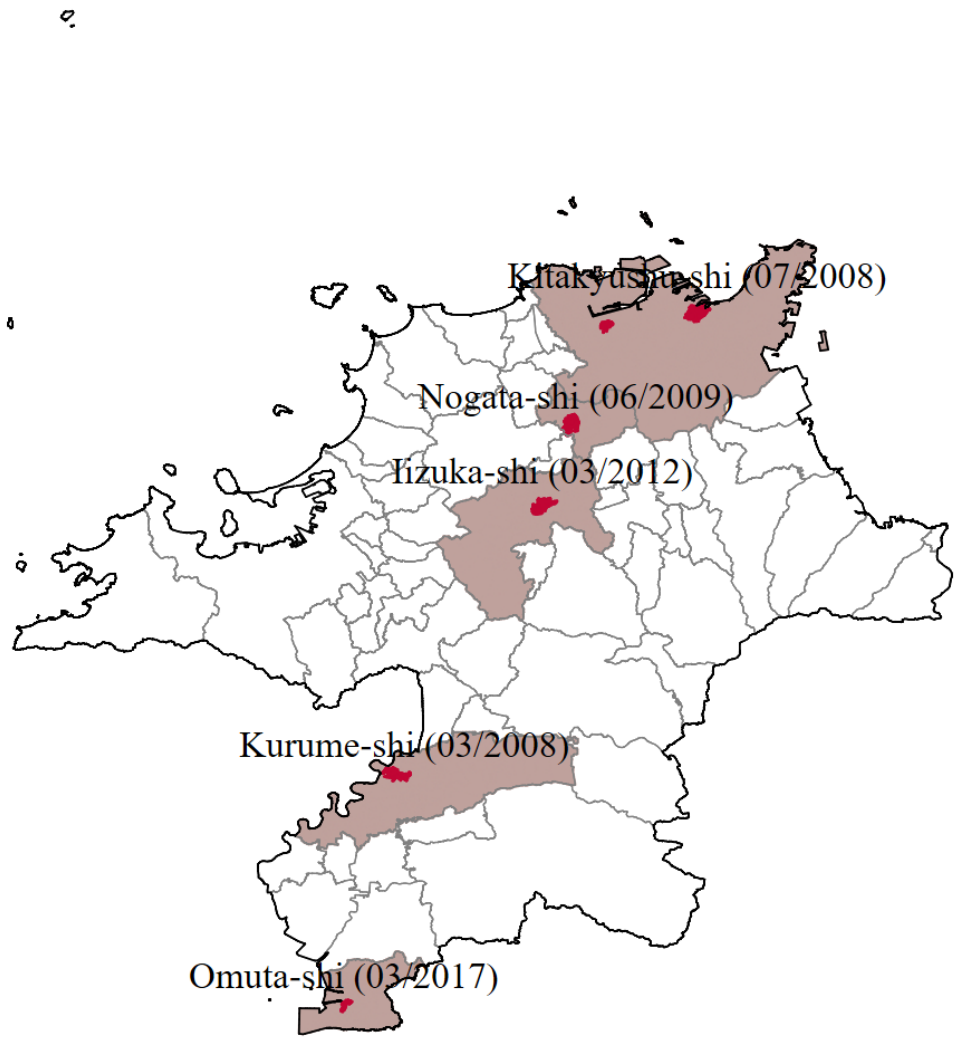

Figure OA.B. 40 Fukuoka

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

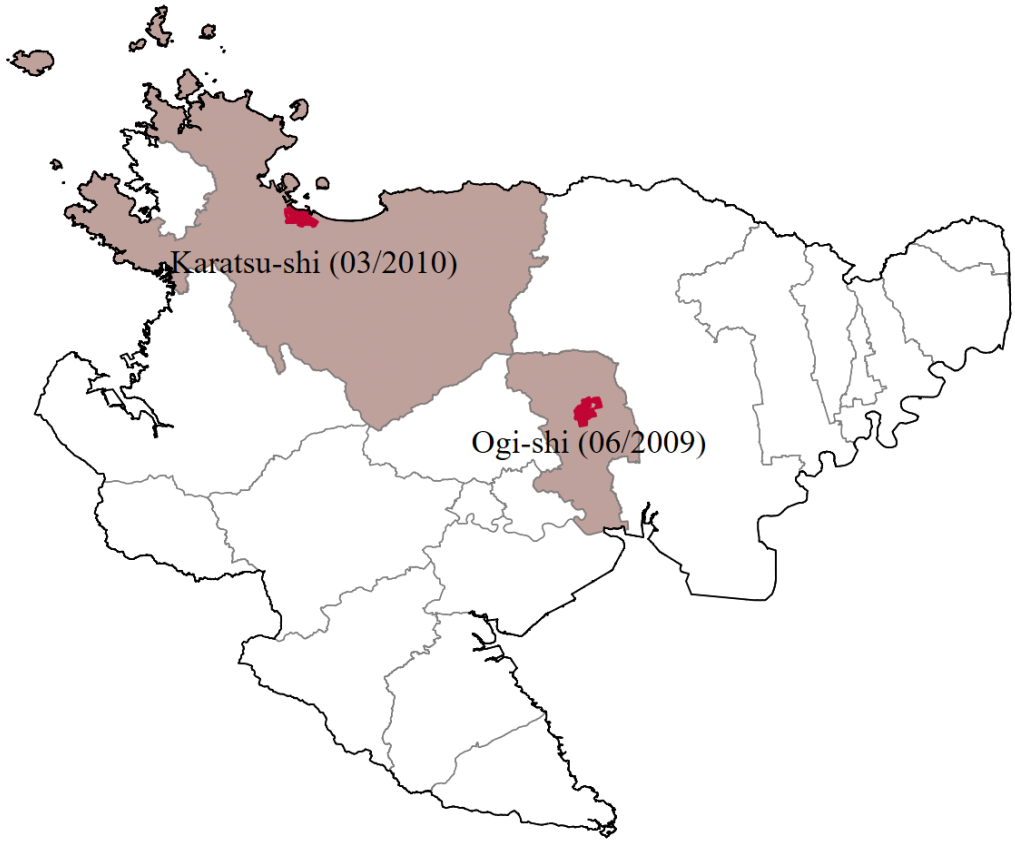

Figure OA.B. 41 Saga

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

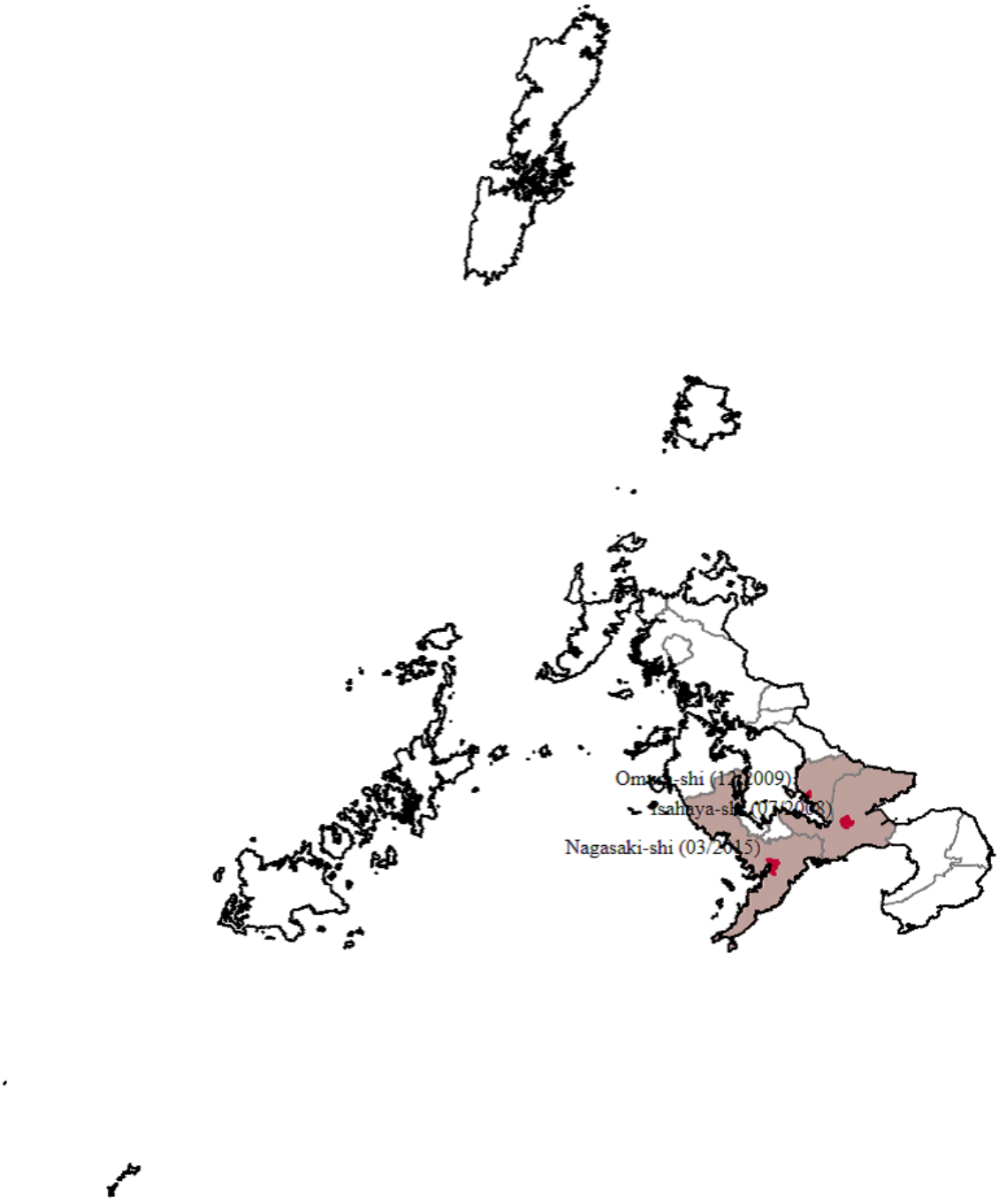

Figure OA.B. 42 Nagasaki

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

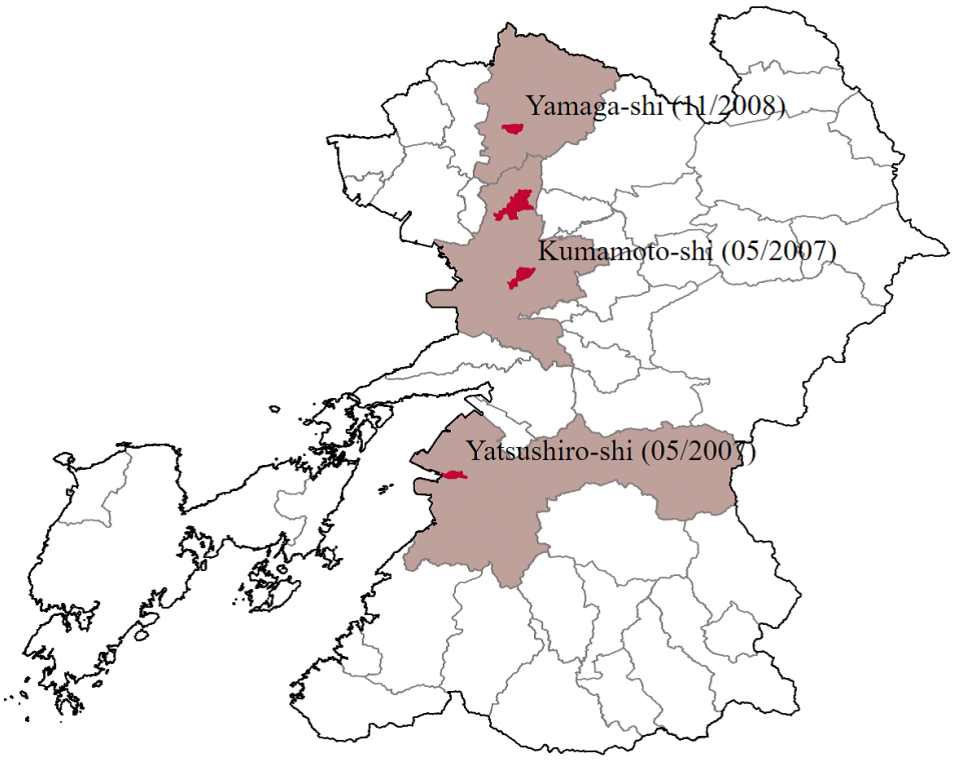

Figure OA.B. 43 Kumamoto

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

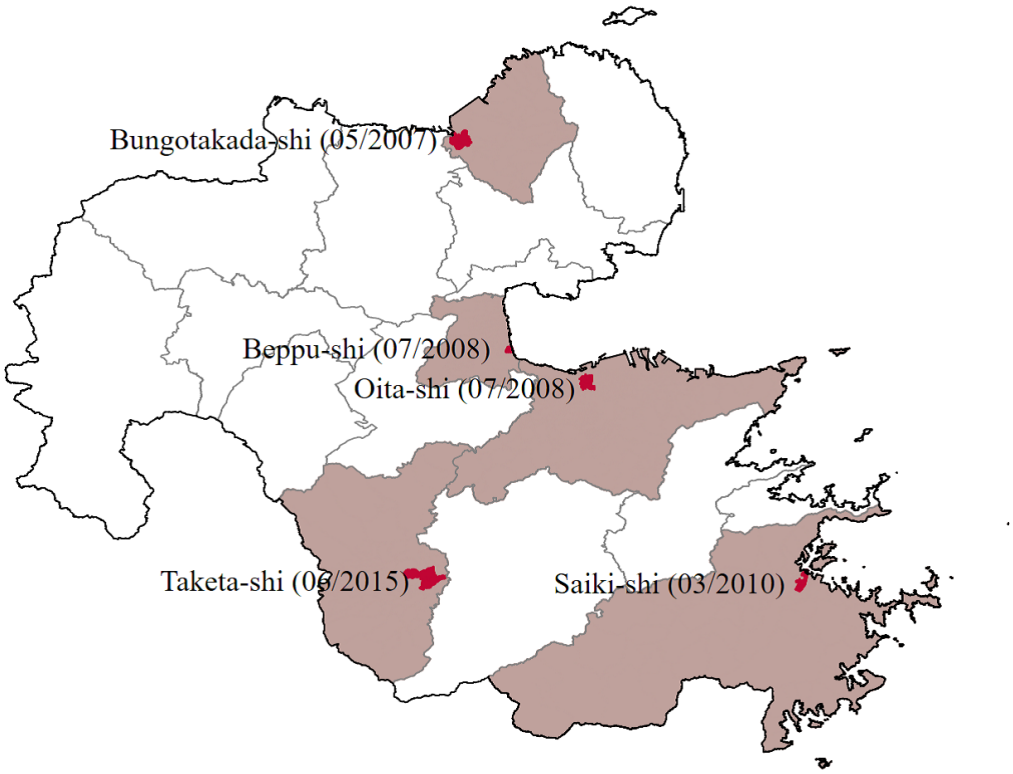

Figure OA.B. 44 Oita

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

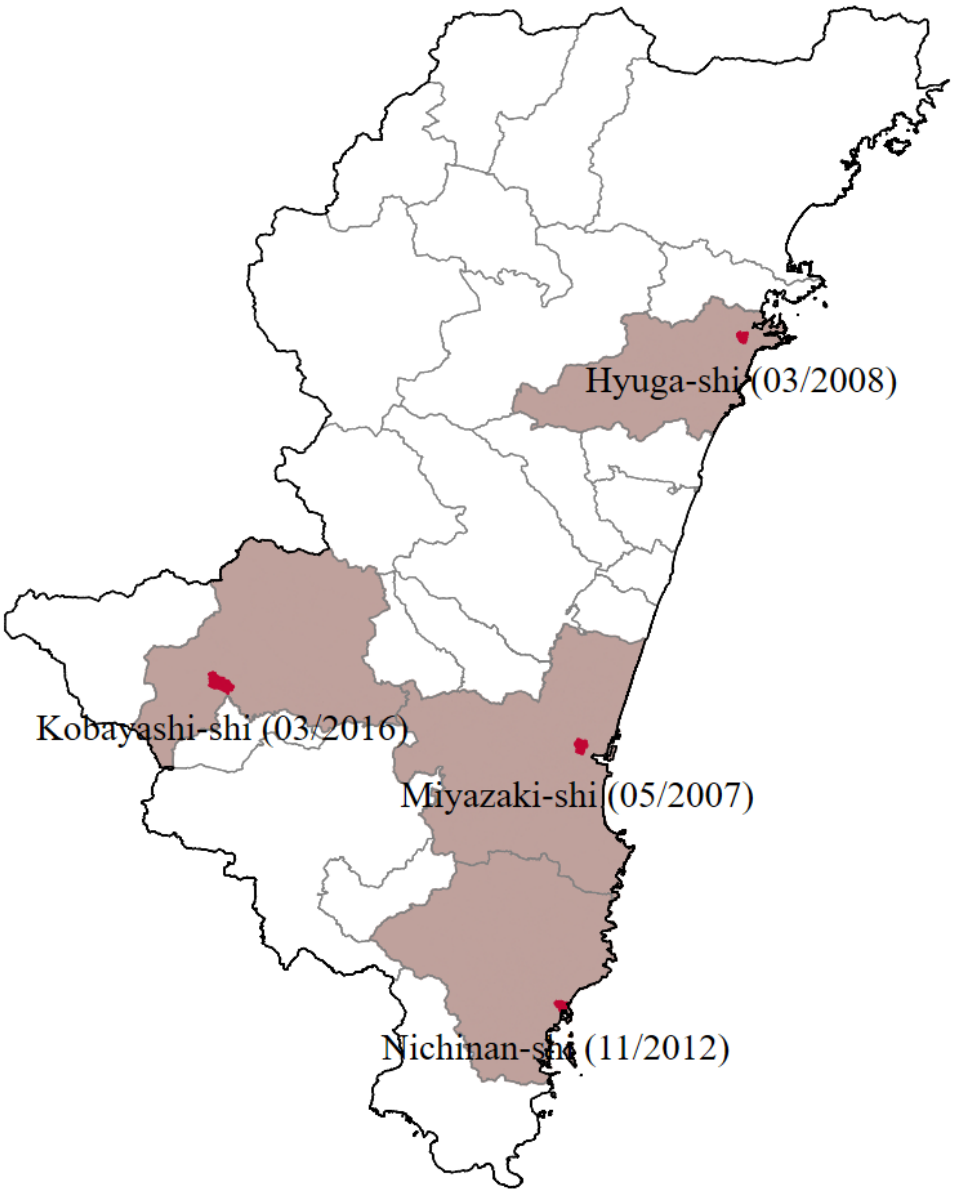

Figure OA.B. 45 Miyazaki

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

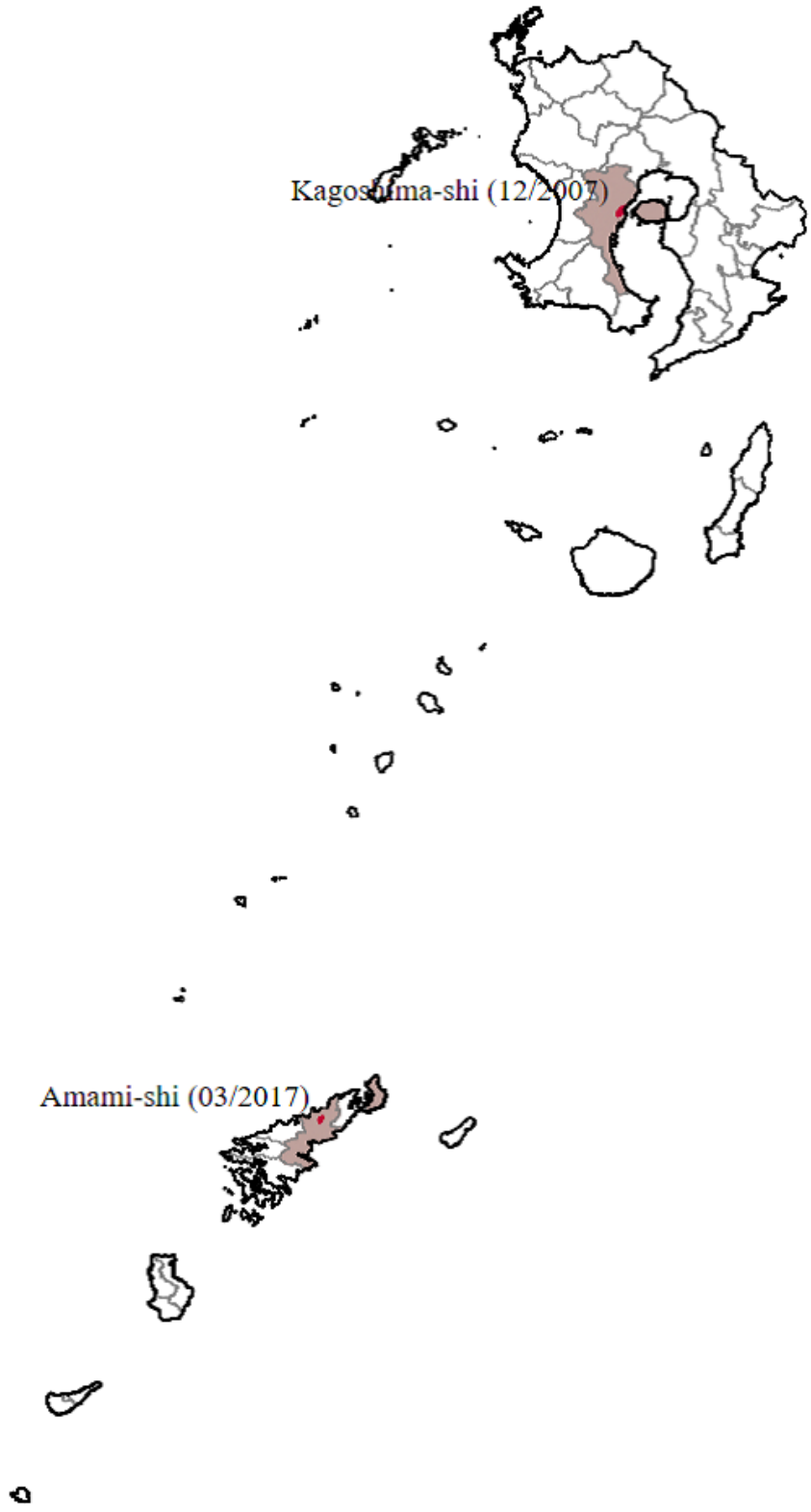

Figure OA.B. 46 Kagoshima

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.

Figure OA.B. 47 Okinawa

Note: Created by author. Geographical units of municipalities used in figure are as of October 1, 2010.