Tiebout Sorting and Local Boundary Reforms: Theory and Evidence from Japan

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<<Very preliminary; please do not cite>>

Abstract

This study attempts to explore whether local public services induce internal migration. This study developed a theoretical model of residential choice following jurisdictional boundary reforms of jurisdictions, and empirically tested theoretical predictions using Japanese municipal-level data. The following results are obtained. First, population and per capita income have a positive impact on net migration, whereas, with a focus on merger impacts, only per capita income positively affects inter-municipal net migration. It is found, however, that in merged municipalities, non-workers, who are considered as being more responsive to provision

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of local public services, respond positively to larger population as well as income, consistent with the theoretical prediction. Second, for merged municipalities, larger amount of spending on welfare and public assistance decreases net migration, whereas spending on youth education increases migration. These findings are consistent with the theoretical prediction that welfare and public assistance are a kind of "patronage" public goods and do not benefit the majority, while youth education is a kind of "productive" goods from a future productivity of labor viewpoint. In line with the theoretical analysis, spending on welfare and public assistance has negative effect on net migration of workers but no impact on that of non-workers, and spending on youth education does not affect net migration of workers but increases that of non-workers. Third, for merged municipalities, young people positively respond to spending on youth education but do not respond to spending on welfare and public assistance and productive public goods. Likewise, older people do not respond to youth education expenses but adversely respond to expenses for productive goods. To summarize, residents are likely to respond to provision of local public goods in line with the context of Tiebout sorting.

Keywords: Boundary reform; migration; Tiebout sorting

JEL classification codes: H70; H73; R23

1. Introduction

Since the pioneering work of Tiebout (1956), the importance of people "voting with their feet" has been widely argued, in particular in the context of the local public finance and urban economics literature. Tiebout stated that the ability of citizens to vote with their feet leads to efficient provision of public goods if government activities generate no externalities, individuals are completely mobile, people have perfect information about their community's public services and taxes, there are no economies of scale, public services are financed by a proportional property tax, and communities can enact exclusionary zoning laws. Inspired by Tiebout's assertion, numerous researchers have studied whether a quasi-market process can solve the problem of public good provision.

A vast body of research has tested the existence or otherwise of Tiebout sorting. Day (1992) examined whether interprovincial migration flows were influenced by government tax and public expenditures, and found that migration was affected by governmental policies, but their effects differed among expenditure items. Rhode and Strumpf (2003) developed an extension of the Tiebout model incorporating decaying mobility costs, and demonstrated using long-term local government data that heterogeneity in policies and proxies for people's preferences decreased from 1850 to 1990. Banzhaf and Walsh (2008) tested whether people "vote with their feet" using a locational equilibrium model, and found that people migrated between communities as the local air quality changed, concluding that households appear to

vote with their feet in response to changes in public goods. Calabrese et al. (2012) developed a location choice model involving mobile, heterogenous households and a flexible housing supply, and empirically demonstrated that inefficiencies in relation to decentralization and property taxation arise because of externalities involving community choices. As for welfare-induced migration, McKinnish (2007) undertook a comprehensive analysis of welfare migration, and found that welfare migration effects were present and that short-distance moves in welfare-induced migration could be the determinant of migration. Following a surge in migration to European countries, Bertolia et al. (2016) considered the possibility of the sequential nature of migration decisions, and found that future expectations regarding economic conditions in the country of origin significantly affected migration flows to Germany. In the context of migration of high-skilled workers, Ariu et al. (2016) developed a random utility model of migration and found that governance quality was positively correlated with in-migration of highly skilled migrants. This confirmed the findings of previous studies that local public goods and governance were key determinants of people's migration decisions.

This study investigates whether local public services induce internal migration. On the basis of a simple model, a theoretical model of residential choice following jurisdictional boundary reforms was developed and the theoretical predictions were empirically tested using Japanese municipal-level data. The data used in this study were obtained from the 2015 Japanese census, which surveyed municipal-level in- and out-migration between 2010 and

2015. Net migration data were obtained by aggregating in- and out-migration, and were used as the dependent variable in the regression analysis. Following the theoretical model and adopting a conventional approach to the empirical analysis of local government expenditure, the control variables consist of a set of variables on sociodemographic characteristics, economic conditions, and geographical distance. From a policy impact perspective, primary focus of research is on municipalities that merged during the period 2011 – 2015 and changes in pattern of migration following municipal mergers. A merger dummy denoting a merger during the period 2011 and 2015 and its cross term with independent variables are a key in empirical investigation.

The results of this study contribute to the literature in two ways. First, a large collection of municipality-level data was used to test local public goods-induced migration. Previous empirical studies on local policy-related migration have used either province-level data or household-level microdata. Microdata are becoming increasingly popular, but are not sufficiently comprehensive in terms of internal migration. Migration data at the municipal level cover all internal movements, and thus the database is very large, specifically around 1.8 million items annually, making it possible to accurately determine migration patterns in response to local attributes and public policies.

Second, the empirical strategy used in this study is based on the significant and mostly exogenous changes in government policies as a result of local boundary reforms. Previous

studies on the effects of local public goods on migration have used a Tiebout sorting mechanism, not exploiting discontinuous changes in local public policies, but rather developing a theoretical location choice model or simply estimating a migration equation with the differences in local attributes being used as controls. This study disentangles the migration effect of governmental policies by analyzing changes in local policies following reforms to local government boundaries.

The rest of this paper is organized as follows. Section 2 presents background information regarding the Japanese local government system and migration flows in Japan. Section 3 presents a theoretical model of residential choice following a municipal merger. Details regarding the data used in the study are presented in Section 4, and the results of the regression analyses are presented in Section 5. Section 6 concludes.

2 Background information

2.1 Local government system in Japan

Japan is a unitary state in which local governments were divided into 47 prefectures and approximately 1,700 municipalities as of 2023. Prefectures constitute regional governments spread across large areas, while municipalities are composed of cities (790 as of 2014), towns (745), and villages (183), and are subordinate to prefectures. Importantly, municipalities are the lowest level of government. In 2014, municipalities accounted for about 30% of the overall government budget, while prefectures accounted for about 28%.

Municipalities handle basic concerns related to the daily lives of residents, such as registration of present and permanent addresses, the operation of elementary and junior high schools, social welfare for infants and senior citizens, city planning, the operation of water and sewerage systems, collection and disposal of garbage, and fire protection. In 2000, public welfare expenditure accounted for the largest share of overall expenditure, totaling more than 30%, while expenditure on education, debt repayments, civil engineering works, and general administration each accounted for more than 10% of overall expenditure.

Total public spending in Japan was about 21% of GDP in 2013, with local government spending accounting for 12%. Municipalities in Japan represent a major proportion of the public sector, accounting for approximately 30% of the government budget, and are largely dependent on the central government for funds. Indeed, as much as 31% of their budget comes from intergovernmental transfers, of which 15% consists of unconditional grants and 16% consists of conditional grants. The remaining 69% of the municipalities' revenue is obtained from taxation (approximately 33%), bonds, and other independent sources. Municipal taxes mainly comprise income tax and property tax, which account for 45% and 42% of total tax revenues, respectively. Specifically, municipal income tax includes individual income tax (approximately 34% of total local income taxes) and corporate tax (approximately 11%).

2.2 Internal migration in Japan

Internal migration was characterized by large-scale movement to large cities and their suburbs in the late 1940s and 1950s, in particular to Tokyo, Osaka, and Nagoya. During this period, migration was facilitated largely by economic growth. Inter-regional, or inter-prefectural migration rates are traditionally higher during periods of high economic growth, and significantly lower during periods of recession.

Total migration decreased in 1973, when Japan experienced a recession as a result of the first oil shock. From the early 1970s, in addition to migration to high-income and high-economic-growth areas, other patterns of migration were observed, namely U-turn, J-turn, and I-turn patterns. A U-turn pattern refers to migration from a metropolitan area back to a person's place of origin, a J-turn pattern refers to migration to places other than the suburbs, and an I-turn pattern refers to migration from urban to rural areas. Therefore, unlike previous periods when economic growth was the primary facilitator of migration, it is likely that during this period, there were other factors involved in migration decisions.

From the 1960s onward, the previous trend of increasing migration from rural areas to metropolitan areas in search of employment started to reverse. One possible reason is that migration to non-suburban areas might have resulted from urban developments in areas other than the large cities, which may have been a catalyst for the increasing migration to more rural areas. For instance, increasing suburbanization and public spending in Ibaraki and Shiga in the early 1970s resulted in an increase in in-migration, followed by increased in-migration in

Saitama, Chiba, Kanagawa, Shiga, and Nara in the 1980s. In addition, older people who worked in metropolitan areas might have increasingly returned to their place of origin following their retirement. Many younger people also appeared to commence their search for employment in their place of origin, rather than in large cities.

Population movements may differ by age, and current migration trends might differ significantly from previous trends as a result of significant changes in the composition of Japan's population. In addition to economic growth, public expenditure might have a significant effect on migration. Thus, it is worthwhile examining the effect of public spending on migration, in particular the types of migrants that it attracts, as noted by Cebula (1979). In addition, whether there are any significant differences in migration based on employment is important to determine because the amounts of benefits from local public services differ by employment status.

3. Theoretical model

3.1 Local government behavior

Consider an economy consisting of three jurisdictions: large (L) and small (S) jurisdictions that will merge, and a non-merged (N) jurisdiction. Individuals within a jurisdiction have homogeneous preferences regarding publicly provided goods and identical initial incomes, while tastes and incomes differ across jurisdictions. Suppose that a public good has no

externalities. The budget constraint of individual i is given by $x_i = (1 - \tau_i)y_i$ for $i \in \{L, S, N\}$, where x_i represents private good consumption, τ_i represents the income tax rate, and y_{i} represents the individual's income. The population of jurisdiction i is denoted by n_i. Assume that jurisdiction L has a larger population than jurisdiction S, that is, $n_L > n_S$. Following the framework presented by Besley and Coate (2003), it is assumed that individual i has the log linear utility function

$$U_i = (1 - \tau_i)y_i + \theta_i \ln g_i, \qquad (1)$$

where θ_i is a preference parameter for public good g_i, supplied by jurisdiction i. Individuals in each municipality are characterized by their taste for public goods and initial income levels.

This study defines and compares two types of government structures. One is *separation (non-merger)*, under which each municipality autonomously determines the level of public goods and the income tax rate, with the provision of public goods financed by income taxes paid by the inhabitants of each municipality. The other is *merger*, under which two governments merge and the newly merged government determines the level of public good provision and the income tax rate across the two jurisdictions. As per political process, the median voter is supposed to be the decisive voter in each jurisdiction whose utility is maximized by political decisions. It is assumed that prior to the merger, individuals do not move across jurisdictions, but after the merger, they can move in search of greater utility. Then, the timing of their decision-making is as follows. At the first stage, given the present

distribution of the population, a government maximizes the median voter's utility under either governmental structure. At the second stage, individuals decide whether to move to another jurisdiction and, if so, to which jurisdiction.

The total cost of providing g_i is denoted as $c(n_i) \times g_i$, where $c(n_i)$ represents the unit cost of providing the public good. $c(n_i)$ is dependent only on the number of individuals in the jurisdiction and, considering a form of economies of scale with regard to population, is supposed to be decreasing with population size, that is, $c'(n_i) < 0$. Under *separation*, the local government's budget constraint is given by $c(n_i)g_i = \tau_i n_i y_i$. Under *merger*, the government's budget constraint is given by $2\,c(n)\,g = \tau\,y$, where $n = n_L + n_S$ and $y = n_L y_L + n_S y_S$.

First, we consider *separation*. Government i maximizes Eq. (1) with respect to τ_i and g_i subject to the government's budget constraint. The following equilibrium outcomes are obtained from the first-order condition:

$$g_i = \frac{\theta_i n_i}{c(n_i)}. \qquad (2)$$

Next, we consider *merger*. If jurisdictions L and S merge and jointly provide the public good, the inhabitants of jurisdiction L constitute the median voter in the newly merged jurisdiction. The merged government chooses income tax rate τ and level of public good provision g, with the aim of maximizing individual L's utility subject to the budget constraint of the merged government. This maximization problem yields, at equilibrium,

$$g = \frac{\theta_L \bar{n} \bar{y}}{c(n) y_L}, \qquad (3)$$

where $\bar{n} = n/2$, and $\bar{y} = y/n$, which represents per capita income in the post-merger jurisdiction.

3.2 Migration decisions

Turning to migration decisions, we compare individuals' utilities in the three jurisdictions. If individuals live in jurisdiction L and their perceived utilities if they lived in jurisdiction N are greater than those in jurisdiction L, they will move to jurisdiction N, and vice versa. The same logic holds for the comparisons between jurisdictions L and S and jurisdictions S and N. Assume that there is an extra cost d that individuals residing in jurisdiction S incur following a merger (e.g., the cost of commuting to the center of the merged municipality).

Using Eqs (2) and (3), the utilities for individuals who live in jurisdictions L, S, and N are given by

$$U_i = \theta_i \ln \frac{\theta_i \bar{n} \bar{y}}{c(n) y_i} + \left(1 - \frac{\theta_i}{y_i}\right) y_i \quad \text{for } i \in \{L, N\}; \qquad (4)$$

$$U_S = \theta_S \ln \frac{\theta_L \bar{n} \bar{y}}{c(n) y_L} + \left(1 - \frac{\theta_L}{y_L}\right) y_S - d. \qquad (5)$$

To compare the difference in utility between an original jurisdiction and a new jurisdiction, we define individual i's utility when moving to jurisdiction j as U_i^j for $i \neq j$. Furthermore, the utility gained by moving from jurisdiction i to jurisdiction j is defined as follows:

$$\Delta U_i^j \equiv U_i^j - U_i \quad \text{for } i \neq j \qquad (6)$$

Suppose that the net utility gain from residing in jurisdiction i is measured by the utilities gained by individuals j and k (for $i \neq j \neq k$) from moving to jurisdiction i minus the utilities gained by individual i from moving to jurisdiction j and k:

$$\Delta U^i \equiv \Delta U_j^i + \Delta U_k^i - \Delta U_i^j - \Delta U_i^k \quad \text{for } i \neq j \neq k. \qquad (7)$$

The net utility gain from residing in jurisdiction N is then calculated as, using Eqs. (4) – (7),

$$\Delta U^N = -(\theta_L + \theta_S + 2\theta_N)\left[\ln\frac{c(n_N)}{c(n)} + \ln\frac{\bar{n}}{n_N} + \ln\frac{\bar{y}}{y_N} + \ln\frac{y_N}{y_L}\frac{\theta_L}{\theta_N}\right] - \frac{\theta_N}{y_N}\left(1 - \frac{y_N}{y_L}\frac{\theta_L}{\theta_N}\right)(y_L + y_S + 2y_N) + 2d \qquad (8)$$

Eq. (8) indicates that the net utility gained by migrating to jurisdiction N depends on the relative sizes between $\bar{n}$ and n_N, $\bar{y}$ and y_N, and θ_L and θ_N, and the cost of residing in jurisdiction S. By approximating $\frac{y_N}{y_L}\frac{\theta_L}{\theta_N}$ in the second parenthesis with $\frac{y_N}{y_L} + \frac{\theta_L}{\theta_N}$, Eq. (8) is rewritten as

$$\Delta U^N = -(\theta_L + \theta_S + 2\theta_N)\left[\ln\frac{c(n_N)}{c(n)} + \ln\frac{\bar{n}}{n_N} + \ln\frac{\bar{y}}{y_N} + \ln\frac{y_N}{y_L} + \ln\frac{\theta_L}{\theta_N}\right] - \frac{\theta_N}{y_N}\left(1 - \frac{y_N}{y_L} - \frac{\theta_L}{\theta_N}\right)(y_L + y_S + 2y_N) + 2d \qquad (9)$$

The following proposition follows from the result.

Proposition 1.

(1) The greater the population in the merged jurisdiction than that in the non-merged jurisdiction, the smaller the net utility gain from residing in the non-merged jurisdiction following the merger.

(2) The greater the average income in the merged jurisdiction than that in the non-merged jurisdiction, the smaller the net utility gain from residing in the non-merged jurisdiction following merger.

(3) The greater the difference between preferences for public goods in the larger merging jurisdiction and those in the non-merged jurisdiction, the larger the net utility gain from residing in the non-merged jurisdiction following merger.

(4) The greater the difference in income between the larger merging jurisdiction and the non-merged jurisdiction, the larger the net utility gain from residing in the non-merged jurisdiction following merger.

Proposition 1 (1) indicates that due to economies of scale in public good production and the law of "n", a larger population in a merged jurisdiction results in a lower net benefit from residing in a non-merged jurisdiction. Tax base effect, or benefit with high income population being in the jurisdiction, explains the statement of Proposition 1 (2). Proposition 1 (3) and (4) is explained by the fact that a larger heterogeneity in preference alleviates the net utility gain.

From the theoretical predictions, I derive hypotheses for empirical examination.

Hypotheses

(1) *The larger the population in the merged jurisdiction than that in the non-merged, the larger*

the net migration to the merged jurisdiction.

(2) *The larger the average income in the larger merging jurisdiction than income in the non-merged, the larger the net migration to the merged jurisdiction.*

(3) *The larger the difference in preference for public good between the larger merging jurisdiction and the non-merged, the smaller the net migration to the merged jurisdiction.*

(4) *The larger the difference in income between the larger merging jurisdiction and the non-merged, the smaller net migration to the merged jurisdiction.*

3.3 Effects of expenditure and spending items on migration

It is expected that "productive" public goods, which are public goods that improve regional productivity and welfare and then benefit all the residents equally, and "non-productive"/patronage public goods, whose benefits are limited to specific groups and do not benefit the others, could provide the residents with different degrees of the benefits. As an extreme case, non-productive public goods are supposed to cost the resident. Then the utility, Eq. (1), is rewritten as

$$U_i = T_i + \theta_i(\ln G_i - \ln P_i),$$

where G_i is productive public goods, P_i is non-productive public goods, and T_i is local tax revenue, per capita.

The net utility gain from residing in jurisdiction N is, then, expressed as

$$\Delta U^N = -(\theta_L + \theta_S + 2\theta_N)\left[\ln\frac{\bar{G}}{G_N} - \ln\frac{\bar{P}}{P_N} + \ln\frac{\bar{T}}{T_N} + \ln\frac{T_N}{T_L} + \ln\frac{\theta_L}{\theta_N}\right]$$
$$-\frac{\theta_N}{T_N}\left(1 - \frac{T_N}{T_L} - \frac{\theta_L}{\theta_N}\right)(T_L + T_S + 2T_N) + 2d \qquad (10)$$

where $\bar{X} \equiv X_L + X_S$. As shown in Eq. (10), the difference in productive public goods and that in non-productive goods between the average of merged jurisdictions and jurisdiction N affect migration to jurisdiction N negatively and positively, respectively. The difference in local tax revenues between the average of merged jurisdictions and jurisdiction N reduces migration to jurisdiction N. Consequently, the following hypotheses for empirical investigation are obtained.

Hypotheses

(5) *The larger the amount of productive public goods in the merged jurisdiction than that in the non-merged, the larger the net migration to the merged jurisdiction.*

(6) *The larger the amount of non-productive public goods in the merged jurisdiction than that in the non-merged, the smaller the net migration to the merged jurisdiction.*

(7) *The larger the amount of local tax revenues in the merged jurisdiction than that in the non-merged, the larger the net migration to the merged jurisdiction.*

3. Econometric model

The theoretical predictions indicate that the net utility gain from residing in merged or non-merged jurisdictions varies with differences between the merged and non-merged jurisdictions

in terms of population, income, and public good preferences. Migration flows between jurisdictions following a merger can also be explained by the relative sizes of the net utility gains.

The theoretical predictions regarding internal migration flows were tested using Japanese municipal-level data. The empirical model for econometric analysis, which is mainly based on differences in the key explanatory variables, is as follows:

$$
\begin{aligned}
M_{ij,2015} - M_{ij,2010} &= \alpha + \delta\, TREAT_i + \rho_0(POP_i - POP_j) + \rho_1(POP_i - POP_j) \times TREAT_i \\
&+ \eta_0(INC_i - INC_j) + \eta_1(INC_i - INC_j) \times TREAT_i + \boldsymbol{X_{ij}\beta_0} \\
&+ \boldsymbol{X_{ij}\beta_1} \times TREAT_i + c_i + \epsilon_{ij} \quad \text{for } i \neq j, \quad (11)
\end{aligned}
$$

where $M_{ij,year}$ denotes the net migration flow to municipality i from municipality j in the year. TREAT is a treatment dummy that takes a value of one if the municipality merged between 2010 and 2015. TREAT is not only included as a constant, but also is multiplied with all the covariates because it is supposed that municipal mergers affect individuals' incentives to move and then the migration effects of socioeconomic and demographic characteristics. POP and INC denote population and per taxpayer taxable income, respectively, in which the differences are included as controls based on the theoretical predictions mentioned above. As predicted in the theoretical analysis, the differences in population and per capita income are the key factors to explaining individuals' migration decisions.

$\boldsymbol{X_{ij}}$ is the vector of control variables for municipality i, which consist of the absolute values of the difference in per taxpayer income and the differences in shares of population aged at 14 or under and population aged 65 or over, the difference in unemployment rate, the difference in share of employees working in the manufacturing industry, the difference in share of employees working in the service industry, the difference in average housing land price, the difference in population density, geographical distance, and the same prefecture dummy. The differences are taken between municipalities i and j. Heterogeneity in preference among municipalities are represented by the absolute difference in per taxpayer income and the shares of young and older people. Economic conditions are explained by unemployment rate, the shares of employees working in the manufacturing industry and in the service industry. The literature in urban economics states that housing price or land price as its proxy can be an essential element to trace migration flows, and then the average price of land for housing is incorporated into the controls. Population density is used to capture migration effects of urbanization.

As easily imagined, migration pattern to a large extent relies on geographical distance. In other words, people are more likely to choose a closer location when they decide to move. Therefore, distance between municipality i and j is included. Also, a dummy that take the value one when municipalities i and j exist in the same prefecture is employed. ϵ_{ij} is a conventional error term.

As regards the empirical specification, as the amounts of productive and non-productive public goods and local tax revenues are given, Eq (11) is redefined as

$$M_{ij,2015} - M_{ij,2010}$$

$$= \alpha + \delta\, TREAT_i + \rho_0(EXP_i - EXP_j) + \rho_1(EXP_i - EXP_j) \times TREAT_i$$

$$+ \eta_0(TAX_i - TAX_j) + \eta_1(TAX_i - TAX_j) \times TREAT_i + \boldsymbol{X_{ij}\beta_0}$$

$$+ \boldsymbol{X_{ij}\beta_1} \times TREAT_i + c_i + \epsilon_{ij} \quad \text{for } i \neq j, \quad (12)$$

where EXP_i denotes the log of per capita total expenditure or spending item for municipality i, and TAX_i is the log of per capita local tax revenues for municipality i.

It is also interesting to see whether patterns of migration are different between workers and non-workers because employment status is expected to influence migration incentives: Workers are likely to move to seek more attractive job opportunities and not to pay attention to public services, whereas non-workers are more concerned with public services, specifically welfare services. When the maximum of five years of time span since a merger seems to be short, to assess the longer migration effects, ten years, 2010 – 2020, of net migration flow is also used as a dependent variable. Finally, populations classified by age are also adopted as dependent variables as different age groups may draw different attention to public services: young people can benefit from government expenses for youth education, whereas older adults enjoy public services related to elderly welfare, and perhaps most benefit from public assistance since in Japan, a large share of public assistance recipients is made up by older adults.

4. Data

This study used Japanese municipal-level data between 2010 and 2015. The numbers of in-migrants and out-migrants from one municipality to another between 2010 and 2015 were recorded in Japan's census in 2015, and thus that database was used. Municipality-to-municipality migration data comprise not only the total number of migrants but also the numbers of employed and non-employed migrants and migrants by age. These data are also used for regression analysis in an effort to identify different migration patterns based on sex and employment.

Geographical distance is clearly the most significant factor determining a person's choice of residence. Thus, the distance between government buildings was used as a measure of distance between municipalities. Furthermore, because people are likely to remain within the prefecture where they currently reside, a dummy denoting whether the pair of municipalities were located within the same prefecture was included as a control variable.

Descriptive statistics for all the dependent and control variables are provided in Table 1. The statistics are categorized into the merged municipalities and the non-merged municipalities. The numbers of observations for the merged and non-merged municipalities are about 1,876,000 and 8200, respectively, and thus are sufficient to estimation the policy impact of municipal mergers. A total of about 1,700 municipalities are matched one-to-one, and then

the total number of observations is enormous. Regarding migration variables (dependent variables), total net migration is negative for non-merged municipalities but is positive for merged municipalities, and the same tendency is seen for net migrations for those employed and non-employed, aged 14 or under, and aged 65 or over, and in 2000 – 2010, indicating that this tendency appears despite the way of classifying population groups. In non-merged municipalities, the negative tendency in net migration of workers is around four times as large in absolute value as that in net migration of non-workers, while in merged municipalities, the positive tendency for workers is more than four times as large as that for non-merged municipalities. The absolute values of net migration, 2010 – 2020 in merged and non-merged municipalities are larger than those between 2010 – 2015, suggesting that the negative and positive trends for non-merged and merged municipalities, respectively, get clearer as a year range of comparison is extended.

Insert Table 1 around here

As for control variables, remarkable difference is found in terms of population and the average price of land for housing between merged and non-merged municipalities, specifically the large amounts in population and average land price for merged municipalities but negative amounts for non-merged municipalities, thereby suggesting that the merged municipalities are

more urbanized with a large size of population. It is found for fiscal variables that patterns of changes in expenditure and spending items are different between merged and non-merged municipalities: Specifically, merged municipalities reduced expenditure more than non-merged municipalities for the five years, increased welfare and public assistance expenses less, and increased expenses for youth education more.

Definitions and unit of measurement are provided in Table A1 in Appendix.

5. Results

5.1 Baseline results

Table 2 presents estimates of the migration equation, Eq. (11). As in Eq. (11), the empirical equation includes merger dummy and its cross term with covariates. Nevertheless, the regression equations without merger dummy and its cross terms are also estimated to see whether estimates of covariates change after the merger dummy and cross terms are incorporated. Comparing the estimates in columns (1) and (2), it is confirmed that the coefficients of the variables common between the two specifications are almost the same, then meaning that adding the variables does not alter their estimates. As shown in the columns, differences in population and per taxpayer income are significantly positive in line with the theoretical predictions that larger population and average income lead to more migration inflows. The coefficients of absolute value of population aged 65 or over are significantly

negative, consistent with the theoretical prediction, while that of population aged 14 or under is positive and significant. As expected, difference in unemployment rate has a negative impact on net migration. Although not consistent with our intuition, the differences in average land price and in population density are positively and negatively, respectively, correlated with net migration.

Next, we turn to merger dummy and its cross terms. As in column (2), merger dummy is significantly negative, showing that municipal mergers decrease net migration by about 10 people. The cross term of difference in per taxpayer income and merger dummy has a significant positive impact on net migration, as predicted in the theoretical analysis, but the cross term of difference in population is not significant. As expected, the cross terms concerning the absolute values of population aged 65 or over and per taxpayer income have significant negative signs, indicating that people are unlikely to migrate between municipalities with different attributes for public services. However, the cross term concerning the absolute value of population aged 14 or under has a significant positive sign. One possible reason is that people under 15 move and live with their parents and then their parents determine where to live, probably taking into most account their concerns such as job opportunities and housing.

Table 2 inserted around here

Columns (3) and (4) provide estimates of net migration of workers between 2010 and 2015, and columns (5) and (6) provide estimates of non-worker migration. With a focus on cross terms with merger dummy in columns (4) and (6), per taxpayer income is significantly and positively correlated with net migration, consistent with the theoretical prediction. Cross term related to population is not significant for the net migration of workers, but is significant and positive for non-workers, in line with the theory. This result may reflect the fact that workers tend not to respond to public service provision as they reside primarily based on job places, but non-workers are strongly concerned with local public services as many of them may be the beneficiaries of welfare benefits. In columns (7) and (8), regarding long-term net migration between 2010 and 2020, the cross term of per taxpayer income and merger dummy has a significant positive impact on net migration, but the cross term relating to population not, as with the case of shorter net migration.

5.2 Effects of expenditure and spending items

Basic theoretical analysis models decisions on provision of single local public good considering local government's welfare maximization. In reality, however, a variety of public services are provided by local governments, and different population groups have different tastes for public services. To take account of such a situation, expenditure and spending items, which are categorized by their characteristics, are employed as dependent variables to address

their effects on net migration.

Table 3 provides estimates of the extended regressions in which population and per taxpayer income are replaced with expenditure and spending items and per capita local tax. As in column (1), the cross term of difference in per capita expenditure and merger dummy is significantly negative. This sign of coefficient is not consistent with the theory, but can be explained by the fact that in Japan, municipalities that spend large amount of per capita expenditure seem to be considered as being inefficient and fiscally poor, and hence are not attractive for migrants.

Table 3 inserted around here

In column (2), the cross term concerning difference in spending on welfare and public assistance per capita is negatively associated with net migration, consistent with the conventional view that welfare and public assistance are so-called “patronage” public goods, which provide only limited recipients with benefits and then for the majority, are not attractive. As in column (3), for merged municipalities, spending on productive public goods is not correlated with migration, not consistent with the view that residents can benefit from productive public goods and hence move to the municipalities that provide larger amount of productive goods. By contrast, larger amount of spending on youth education per capita

increases net migration, as in column (4), which is intuitive because generally, education for the young improves future productivity of labor and then is regarded as "productive" good.

Turning to the net migration of workers, for merged municipalities, the differences in per capita expenditure and spending on welfare and public assistance are negatively related with net migration, as in columns (5) and (6), consistent with the results for total net migration. The difference in spending on public goods is little correlated with the net migration of workers, as in the case of total net migration. In contrast to the case of total migration, difference in spending on youth education has little impact on the net migration of workers, probably suggesting that workers are not likely to migrate with reference to amount of expenses for youth education.

In turn, we address the migration effects of expenditures on non-workers. As in columns (9) – (12), similar to the case of migration of workers, the cross terms concerning expenditure and spending on productive public goods have negative and no effects on net migration, respectively. In contrast to the workers' migration, however, for merged municipalities spending on welfare and public assistance does not affect the net migration of non-workers, but expense for youth education positively affects. One possible reason is that non-workers put heavier weight on "patronage" public services provided by local governments, such as welfare and public assistance, and, thus, may concern amounts of such patronage goods when they migrate. Also, when students and pupils comprise part of non-workers, youth

education could have greater impact on the migration of non-workers than that of workers. As regards long-term migration, the migration pattern for years 2010 – 2015 appears more evidently and strongly, and especially, for merged municipalities, spending on productive goods has significantly negative effect.

To summarize, as expected from the hypothesis, for merged municipalities, spending on welfare and public assistance and youth education has negative and positive impacts on net migration of population, respectively. By contrast, total expenditure and spending on productive public goods have negative or no effects on net migration. The results are inconsistent with the hypotheses argued above, but is consistent with the fact that municipalities that spend much are regarded as inefficient and fiscally non-healthy ones and in reality, not everyone benefits from productive goods. From a work and non-worker viewpoint, spending on welfare and public assistance has negative effect on migration of workers but no impact on migration of non-workers, whereas workers do not respond to spending on youth education but non-workers positively do. These contrasts seem to arise from different attitudes towards public services between workers and non-workers, specifically workers' weak attention or adverse standpoint and non-workers' strong attention to public services, particularly patronage goods.

5.3 Effects of spending items on young and elderly migration

It is supposed that different age groups migrate in response to changes in local public services

in different ways. Next, then, it is addressed how young (aged 14 or under) and older (aged 75 or over) people decide on where to live in response to public service expenses at the municipality level.

Table 4 reports estimates of the regressions concerning the migration effects of expenditure and spending items for populations aged 14 or under and 75 or over. With a focus on the cross terms of fiscal variables and merger dummy, as expected from the conventional view, spending on welfare and public assistance and productive goods does not affect the net migration of young people, while spending on youth education increases the migration of the young significantly. Older people negatively respond to spending on productive goods but do not respond to spending on youth education, consistent with our intuition. The negative response of older adults to spending to welfare and public assistance is counterintuitive, but this can be interpreted based on the argument that older adults also do not intend to move to fiscally poor municipalities where a relatively large number of older people already live.

Table 4 inserted around here

5.4 Placebo effect tests

It is generally concerned that the estimated impacts of local public goods and expenditures on net migration arises from simple correlation between them, not from a causal inference from

discontinuous changes in public service provision to migration patterns of residents. To check such a possibility, I run the regressions in which net migration between 2005 and 2010 is adopted as the dependent variable, and see whether the cross terms of variables on public good provision and local spending items and merger dummy are insignificant.

Table 5 provides estimation results of the placebo tests. The coefficients of every cross term are not significant, implying that migration consequences of fiscal and local government variables for merged municipalities are not statistically different from those for non-merged municipalities.

6. Conclusion

This study attempts to clarify the relationship between internal migration pattern and boundary reforms of jurisdictions using Japanese municipal data. Large-scale and drastic municipal mergers since 2000 are used as quasi-natural experiment for examination of merger impacts on migration. Municipality-to-municipality migration data between 2010 and 2015 are employed as the dependent variable, and based on theoretical analysis, a set of one-to-one migrations is regressed on a merger dummy and its cross terms with control variables.

The following results are obtained. First, population and per capita income have positive impacts on net migration, whereas, with a focus on merger impact, only the cross term of per capita income and merger dummy positively affects inter-municipal net migration. It is

found, however, that in merged municipalities, non-workers, who are considered as being more responsive to provision of local public services, respond positively to population as well as income, consistent with the theoretical prediction. Even for longer-term migration of ten years, the positive migration impact of per capita income is observed.

Second, for merged municipalities, spending on welfare and public assistance decreases net migration, whereas spending on youth education increases net migration. These findings are consistent with the theoretical prediction that welfare and public assistance are a kind of “patronage” public goods, which are likely allocated to specific groups, and do not benefit the majority, while youth education is a kind of “productive” goods from a future productivity of labor viewpoint. In line with the theoretical analysis, spending on welfare and public assistance has negative effect on the net migration of workers but no impact on that of non-workers, and spending on youth education does not affect the net migration of workers but increases that of non-workers. These contrasts seem to arise from different attitudes towards public services between workers and non-workers, specifically workers' weak attention or adverse standpoint and non-workers’ strong attention to public services, particularly patronage goods.

Third, in merged municipalities, young people positively respond to spending on youth education but do not respond to spending on welfare and public assistance and productive public goods. Older people do not respond to youth education expenses but adversely respond

to expenses for productive goods. These findings also follow the theoretical prediction in the sense that people respond positively to provision of public services that benefit them but not or negatively to public goods that do not benefit them.

Appendix A.

Table A1 inserted around here

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Table 1. Descriptive Statistics

	A. Non-mergered municipalities				*B. Merged municipalities*			
	Mean	SD	Max	Min	Mean	SD	Max	Min
Dependent variables, (unit)								
Net migration, 2010 - 2015	-0.0034284	24.79222	5245	-5245	0.7810982	36.0074	1544	-2004
Net migration of workers, 2010 - 2015	-0.0027576	12.93839	2060	-2060	0.6282799	17.93556	926	-738
Net migration of non-workers, 2010 - 2015	-0.0006707	14.92242	3185	-3185	0.1528183	20.32044	618	-1266
Net migration, 2010 - 2020	-0.0047368	22.57726	4064	-4064	1.079203	48.14655	2112	-3079
Net migration of population aged 14 or under, 2010 - 2015	-0.0002314	5.631623	1567	-1567	0.0527211	8.92576	180	-661
Net migration of population aged 75 or over, 2010 - 2015	-0.0007054	5.206952	1481	-1481	0.1607143	6.964498	333	-262
Control variables								
Merger dummy	1	0	1	1	0	0	0	0
Diff in population (unit)	-0.0070869	1.693576	7.576473	-7.576473	1.614638	1.293766	5.694047	-3.363812
Diff in per taxpayer income (1,000 JPY)	0.1283691	0.2221274	1.528932	-1.528932	0.0768135	0.1815151	0.4790234	-1.351158
Abs of share of population aged 14 or under (%)	1.985682	1.626377	15.29082	0	1.712089	1.381658	9.39683	0.0001254
Abs of share of population aged 65 or over (%)	6.260152	4.874799	38.49706	0.0000109	6.0915	4.711886	28.45927	0.0001295
Diff in unemployment rate (%)	-0.0798065	2.316723	18.36034	-18.36034	-0.316682	2.225305	5.894742	-15.42182
Diff in share of manufacturing employment (%)	-5.837512	14.60612	65.86359	-65.86359	1.162765	14.41669	42.27149	-55.61278
Diff in share of service industry employment (%)	6.951377	14.80753	66.77901	-66.77901	-0.1537304	14.42665	55.93822	-42.5695
Diff in average land price (JPY)	-15.90109	134514	1857200	-1857200	3622.798	106956.9	166550	-1830600
Diff in population density (unit/km2)	-889.6721	2923.017	21877.53	-21877.53	-833.7238	2974.72	9056.984	-21779.87
Distance (km)	549.5795	398.0019	2873.756	0.8739787	483.4396	328.2309	2272.635	4.283892
Same prefecture dummy	0.0270922	0.1623521	1	0	0.0216229	0.1454577	1	0
Fiscal variables (1,000 JPY)								
Diff in expenditure, pc	-0.1432764	0.4306893	2.160612	-2.160612	-0.1841217	0.4338411	0.8263964	-1.943675
Diff in local tax revenues, pc	-0.2046476	0.5028923	2.75357	-2.75357	-0.1423441	0.4661432	1.177134	-2.24055
Diff in spending on welfare and public assistance, pc	1.200917	1.853642	6.063941	-6.063941	1.00334	1.558042	3.843974	-3.898749
Diff in spending on productive public goods, pc	-0.4629579	2.004144	9.673615	-9.673615	-0.4635533	1.698755	4.877622	-6.856278
Diff in spending on youth education, pc	0.3843587	0.8666601	4.172669	-4.172669	0.6219678	0.8106901	1.461016	-4.172669
Observations	1,875,524				8,232			

Notes: The sample is the same as that used for the regressions in Table 2. In the calculation of averages, per capita variables are weighted by population; population density weighted by area; unemployment rate weighted by labor force; shares of employees weighted by the total number of employees; local tax ratio and accumulated debt ratio weighted by total revenue. Definition and sources of the variables are listed in Table A1.

Table 2. Estimation of Migration Equation

Dependent variables	Net migration, 2010 - 2015	Net migration, 2010 - 2015, baseline	Net migration of workers, 2010 - 2015	Net migration of workers, 2010 - 2015	Net migration of non-workers, 2010 - 2015	Net migration of non-workers, 2010 - 2015	Net migration, 2010 - 2020	Net migration, 2010 - 2020
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Merger dummy		-10.13***		4.084***		-14.22***		-24.02***
		(1.280)		(0.667)		(0.769)		(2.257)
Diff in population	0.103***	0.102***	0.0414***	0.0423***	0.0614***	0.0594***	0.0759**	0.0734**
	(0.0207)	(0.0208)	(0.0108)	(0.0108)	(0.0125)	(0.0125)	(0.0366)	(0.0367)
Diff in population × Merger dummy		0.184		-0.253		0.436**		0.409
		(0.327)		(0.170)		(0.196)		(0.576)
Diff in per taxpayer income	1.958***	1.899***	0.372***	0.342***	1.586***	1.557***	3.661***	3.519***
	(0.210)	(0.210)	(0.109)	(0.110)	(0.126)	(0.126)	(0.370)	(0.371)
Diff in per taxpayer income × Merger dummy		15.44***		8.419***		7.024***		37.41***
		(3.189)		(1.662)		(1.915)		(5.624)
Abs of share of population aged 14 or under	0.0292**	0.0249*	-1.12e-05	-0.00261	0.0292***	0.0275***	0.0914***	0.0806***
	(0.0147)	(0.0147)	(0.00765)	(0.00766)	(0.00881)	(0.00883)	(0.0259)	(0.0259)
Abs of share of population aged 14 or under × Merger dummy		0.950***		0.591***		0.359**		2.384***
		(0.258)		(0.134)		(0.155)		(0.455)
Abs of share of population aged 65 or over	-0.0266***	-0.0254***	-0.0139***	-0.0130***	-0.0127***	-0.0124***	-0.0534***	-0.0507***
	(0.00533)	(0.00534)	(0.00278)	(0.00278)	(0.00320)	(0.00321)	(0.00941)	(0.00942)
Abs of share of population aged 65 or over × Merger dummy		-0.231**		-0.171***		-0.0607		-0.505***
		(0.0941)		(0.0490)		(0.0565)		(0.166)
Abs of per taxpayer income	0.0795	0.133	0.0543	0.0900	0.0252	0.0432	0.152	0.296
	(0.192)	(0.193)	(0.100)	(0.100)	(0.116)	(0.116)	(0.339)	(0.340)
Abs of per taxpayer income × Merger dummy		-12.59***		-8.041***		-4.551**		-34.10***
		(3.095)		(1.613)		(1.859)		(5.458)
Diff in unemployment rate	-0.0311***	-0.0327***	-0.0477***	-0.0483***	0.0166**	0.0155**	-0.0590***	-0.0628***
	(0.0109)	(0.0110)	(0.00570)	(0.00571)	(0.00656)	(0.00658)	(0.0193)	(0.0193)
Diff in unemployment rate × Merger dummy		0.387**		0.150*		0.237**		0.937***
		(0.168)		(0.0873)		(0.101)		(0.296)
Diff in share of manufacturing employment	0.00222	0.00165	-0.00454	-0.00496	0.00676	0.00661	0.00865	0.00735
	(0.00977)	(0.00980)	(0.00509)	(0.00511)	(0.00587)	(0.00588)	(0.0172)	(0.0173)
Diff in share of manufacturing employment × Merger dummy		0.135		0.0990		0.0359		0.299
		(0.149)		(0.0776)		(0.0895)		(0.263)
Diff in share of service industry employment	0.00987	0.00918	-0.00704	-0.00742	0.0169***	0.0166***	0.0232	0.0217
	(0.0101)	(0.0101)	(0.00524)	(0.00525)	(0.00604)	(0.00605)	(0.0177)	(0.0178)
Diff in share of service industry employment × Merger dummy		0.161		0.0920		0.0690		0.352
		(0.153)		(0.0797)		(0.0918)		(0.270)

Diff in average land price	0.189***	0.186***	0.00794	0.00562	0.181***	0.180***	0.191**	0.183**
	(0.0450)	(0.0451)	(0.0234)	(0.0235)	(0.0270)	(0.0271)	(0.0793)	(0.0795)
Diff in average land price × Merger dummy		0.722		0.495		0.227		1.669
		(0.681)		(0.355)		(0.409)		(1.201)
Diff in population density	0.000113**	0.000104**	3.33e-05***	3.84e-05***	0.000196**	0.000192**	5.33e-05**	-3.00e-05
	(1.03e-05)	(1.04e-05)	(5.38e-06)	(5.39e-06)	(6.20e-06)	(6.22e-06)	(1.82e-05)	(1.83e-05)
Diff in population density × Merger dummy		-0.00211***		-0.00116***		-0.000954***		-0.00524***
		(0.000160)		(8.32e-05)		(9.58e-05)		(0.000281)
Distance	-0.000114*	-0.000107*	-5.48e-05*	-5.21e-05*	-5.93e-05	-5.49e-05	-0.000199*	-0.000182*
	(6.02e-05)	(6.03e-05)	(3.14e-05)	(3.14e-05)	(3.62e-05)	(3.62e-05)	(0.000106)	(0.000106)
Distance × Merger dummy		-0.00157		-0.000585		-0.000980*		-0.00384**
		(0.000966)		(0.000503)		(0.000580)		(0.00170)
Same prefecture dummy	-0.129	-0.127	-0.0457	-0.0446	-0.0834	-0.0826	-0.225	-0.220
	(0.117)	(0.117)	(0.0611)	(0.0611)	(0.0704)	(0.0704)	(0.207)	(0.207)
Adjusted R squared	0.004130	0.00426	0.00598	0.00615	0.00772	0.008	0.00366	0.00393
Observations	1,883,756	1,883,756	1,883,756	1,883,756	1,883,756	1,883,756	1,883,756	1,883,756

Notes: "Diff" indicates difference; "Abs" is an abbreviation of "Absolute value." Standard errors cluster robust with regard to municipality are in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. Constants are abbreviated.

Table 3. Effects of Expenditure and Spending Items on Migration

Dependent variables	Net migration, 2010 - 2015				Net migration, workers			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Merger dummy	-11.45***	-11.50***	-11.96***	-11.34***	3.201***	3.194***	3.015***	3.211***
	(1.128)	(1.133)	(1.122)	(1.125)	(0.588)	(0.590)	(0.585)	(0.586)
Diff in expenditure, pc	-0.679***				0.0475			
	(0.0718)				(0.0374)			
Diff in expenditure, pc × Merger dummy	-3.829***				-2.112***			
	(1.141)				(0.595)			
Diff in spending on welfare and public assistance, pc		-0.0721***				-0.0383***		
		(0.0143)				(0.00746)		
Diff in spending on welfare and public assistance, pc × Merger dummy		-0.497**				-0.347***		
		(0.217)				(0.113)		
Diff in spending on productive public goods, pc			-0.0895***				0.0396***	
			(0.0163)				(0.00852)	
Diff in spending on productive public goods, pc × Merger dummy			-0.398				-0.229*	
			(0.251)				(0.131)	
Diff in spending on youth education, pc				0.101**				0.128***
				(0.0417)				(0.0217)
Diff in spending on youth education, pc × Merger dummy				2.775***				0.585*
				(0.631)				(0.329)
Adjusted R squared	0.00426	0.00422	0.00422	0.00422	0.00617	0.00618	0.00618	0.00618
Observations	1,883,756	1,883,756	1,883,756	1,883,756	1,883,756	1,883,756	1,883,756	1,883,756

Notes: "Diff" indicates difference; "pc" is an abbreviation of "per capita." Standard errors cluster robust with regard to municipality are in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. Constants are abbreviated.

Table 3. *continued*

Dependent variables	Net migration, non workers				Net migration, 2010 - 2020			
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Merger dummy	-14.65***	-14.70***	-14.97***	-14.55***	-27.29***	-27.47***	-28.50***	-27.31***
	(0.677)	(0.680)	(0.674)	(0.676)	(1.989)	(1.998)	(1.978)	(1.984)
Diff in expenditure, pc	-0.727***				-1.077***			
	(0.0431)				(0.127)			
Diff in expenditure, pc × Merger dummy	-1.717**				-9.646***			
	(0.685)				(2.012)			
Diff in spending on welfare and public assistance, pc		-0.0338***				-0.209***		
		(0.00859)				(0.0252)		
Diff in spending on welfare and public assistance, pc × Merger dummy		-0.150				-1.286***		
		(0.131)				(0.383)		
Diff in spending on productive public goods, pc			-0.129***				-0.138***	
			(0.00982)				(0.0288)	
Diff in spending on productive public goods, pc × Merger dummy			-0.169				-1.106**	
			(0.151)				(0.443)	
Diff in spending on youth education, pc				-0.0269				0.183**
				(0.0250)				(0.0736)
Diff in spending on youth education, pc × Merger dummy				2.190***				5.647***
				(0.379)				(1.112)
Adjusted R squared	0.00784	0.00770	0.00778	0.00771	0.00392	0.00391	0.00388	0.00388
Observations	1,883,756	1,883,756	1,883,756	1,883,756	1,883,756	1,883,756	1,883,756	1,883,756

Table 4. Effects of Spending Items on Young and Elderly Migration, 2010 - 2015

Dependent variables	Net migration of population aged 14 or under			Net migration of population aged 75 or over		
	(1)	(2)	(3)	(4)	(5)	(6)
Merger dummy	-2.205***	-2.313***	-2.402***	-3.696***	-3.790***	-3.660***
	(0.257)	(0.255)	(0.255)	(0.155)	(0.154)	(0.154)
Diff in spending on welfare and public assistance, pc	-0.0289***			-0.000352		
	(0.00325)			(0.00196)		
Diff in spending on welfare and public assistance, pc × Merger dummy	-0.0392			-0.0857***		
	(0.0493)			(0.0298)		
Diff in spending on productive public goods, pc		-0.0709***			-0.0169***	
		(0.00371)			(0.00224)	
Diff in spending on productive public goods, pc × Merger dummy		-0.0456			-0.0893***	
		(0.0570)			(0.0344)	
Diff in spending on youth education, pc			-0.203***			0.0645***
			(0.00947)			(0.00572)
Diff in spending on youth education, pc × Merger dummy			0.567***			0.128
			(0.143)			(0.0864)
Adjusted R squared	0.00706	0.00721	0.00726	0.00628	0.00542	0.00545
Observations	1,883,756	1,883,756	1,883,756	1,883,756	1,883,756	1,883,756

Notes: "Diff" indicates difference; "pc" is an abbreviation of "per capita." Standard errors cluster robust with regard to municipality are in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. Constants are abbreviated.

Table 5. Placebo Tests, Effects on Migration between 2005 and 2010

Dependent variable	Net migration, 2005 - 2010				
	(1)	(2)	(3)	(4)	(5)
Merger dummy	383,172***	375,861***	376,876***	376,756***	385,539***
	(2,158)	(1,907)	(1,915)	(1,897)	(1,897)
Diff in population	3,828***				
	(35.04)				
Diff in population × Merger dummy	-620.4				
	(550.5)				
Diff in per taxpayer income	-8,159***				
	(354.4)				
Diff in per taxpayer income × Merger dummy	2,689				
	(5,375)				
Diff in expenditure, pc		-781.9***			
		(121.5)			
Diff in expenditure, pc × Merger dummy		106.7			
		(1,929)			
Diff in spending on welfare and public assistance, pc			814.9***		
			(24.19)		
Diff in spending on welfare and public assistance, pc × Merger dummy			-231.2		
			(367.4)		
Diff in spending on productive public goods, pc				574.6***	
				(27.65)	
Diff in spending on productive public goods, pc × Merger dummy				-88.67	
				(424.6)	
Diff in spending on youth education, pc					7,552***
					(70.33)
Diff in spending on youth education, pc × Merger dummy					-1,238
					(1,063)
Adjusted R squared	0.506	0.502	0.502	0.502	0.505
Observations	1,883,756	1,883,756	1,883,756	1,883,756	1,883,756

Notes: "Diff" indicates difference; "pc" is an abbreviation of "per capita." Standard errors cluster robust with regard to municipality are in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. Constants are abbreviated.

Table A1. Variable Definition and Sources

Variable	Definition	Sources
Dependent variables, (unit)		
Net migration, 2010 - 2015	Net migration of total population to the municipality from the other, 2010 - 2015	1
Net migration, 2010 - 2020	Net migration of total population to the municipality from the other, 2010 - 2020	1
Net migration of employees, 2010 - 2015	Net migration of employees to the municipality from the other, 2010 - 2015	1
Net migration of non-employees, 2010 - 2015	Net migration of non-employees to the municipality from the other, 2010 - 2015	
Net migration of population aged 14 or under, 2010 - 2015	Net migration of population aged 14 or under to the municipality from the other, 2010 - 2015	1
Net migration of population aged 65 or over, 2010 - 2015	Net migration of population aged 65 or over to the municipality from the other, 2010 - 2015	1
Control variables		
Merger dummy	A dummy that takes a value of one for municipalities that merged during years between 2011 and 2015	
Diff in population (unit)	Difference in population in the municipality minus that in the other, 2010	1
Diff in per taxpayer income (1,000 JPY)	Difference in per taxpayer taxable income in the municipality minus that in the other, 2010	2
Abs of share of population aged 14 or under (%)	Absolute value of the difference in the share of population aged 14 or under between the municipality and the other, 2010	1
Abs of share of population aged 65 or over (%)	Absolute value of the difference in the share of population aged 65 or over between the municipality and the other, 2010	1
Diff in unemployment rate (%)	Difference in the percentage of unemployed people to labor force in the municipality minus that in the other, 2010	1
Diff in share of manufacturing employment (%)	Difference in the share of employees working in the manufacturing industry in the municipality minus that in the other, 2009	1
Diff in share of service industry employment (%)	Difference in the share of employees working in the service industry in the municipality minus that in the other, 2009	1
Diff in average land price (JPY)	Difference in the average housing land price in the municipality minus that in the other, 2010	4
Diff in population density (unit/km2)	Difference in population density in the municipality minus that in the other, 2010	1
Distance (km)	Geographical distance of government buildings between the municipality and the other, 2010	3
Same prefecture dummy	Dummy taking a value of the one if the two municipalities exist in the same prefecture	-
Fiscal variables (thousand yen)		
Diff in expenditure, pc	Difference in the log of total expenditure per capita in the municipality minus that in the other, 2010	1, 5
Diff in local tax revenues, pc	Difference in the log of spending on local tax revenues, per capita in the municipality minus that in the other, 2010	1, 5
Diff in spending on welfare and public assistance, pc	Difference in the log of spending on welfare and public assistance, per capita in the municipality minus that in the other, 2010	1, 5
Diff in spending on productive public goods, pc	Difference in the log of spending on roads and bridges, housing and fire protection, per capita in the municipality minus that in the other, 2010	1, 5
Diff in spending on youth education, pc	Difference in the log of spending on elementary, junior and high school, per capita in the municipality minus that in the other, 2010	1, 5

Notes: 1=MIC, Statistics Bureau (2010, 2015, 2020) *Census* (https://www.e-stat.go.jp/stat-search/files?page=1&toukei=00200521&tstat=000001039448); 2=MIC (2010) *Survey on Municipal Taxation* (https://www.soumu.go.jp/main_sosiki/jichi_zeisei/czaisei/czaisei_seido/ichiran09.html); 3=Amano (2022) *Data on Location of Local Government Buildings* ; 4=Land Information Center (2010) *Official Land Price: Average Price at the Prefectural and Municipal Level* ; 5=Ministry of Internal Affairs and Communications (MIC) (2010) *Survey on Municipal Financial Settlement* (https://www+A1.soumu.go.jp/iken/kessan_jokyo_2.html).