

Economies of Scope and Local Government Expenditure: Evidence from Creation of Specially Authorized Cities in Japan

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Abstract

This study aims to estimate the impact on expenditure of the designation of cities as either core cities or special case cities, thereby giving them the authority to undertake a wider range of activities, and identify the magnitude of the economies of scope in local governments using panel data for Japanese municipalities. The findings of this research are summarized as follows.

First, in the provision of public services by general-purpose local governments, economies of scope do not occur in the short term, but do occur in the mid- to long term. After being designated, core cities see an immediate increase of 2.8% in expenditure per capita, but then a 0.6% decrease annually. Second, the wider the range of extra activities delegated, the greater the economies of scope.

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1. Introduction

Since the pioneering studies by Baumol et al. (1982) and Panzar and Willig (1981), the importance of economies of scope has been widely argued, in particular in the context of the industrial organization literature on assessing the costs of specialization. Economies of scope exist if the cost of providing a diversified set of products is less than the cost of specialized production of these products. Much attention has been paid to economies of scope in multiproduct manufacturing firms, as these firms have considerable opportunities to increase their productivity by broadening their range of activities, enabling them to fully exploit underused resources such as employee expertise, information from various divisions, and production facilities. This results in joint production in which costs are shared by the various activities and overall organizational outcomes are jointly generated.

There is also potential for economies of scope in public sector activities. A notable example of economies of scope in the provision of public services involves the *co-location* of organizations (Bovaird, 2014; OECD, 2010), which makes it possible to not only share facilities, thereby saving on overheads such as electricity, security, and cleaning, but also reduce users' travel costs by providing one-stop access to a range of different services. In addition, different sections can approach the same users more easily at lower cost. However, co-location alone does not provide an organization with a competitive advantage because it is merely a means of facilitating joint administrative operations.

Moreover, the need for professional staffs who have expertise in various specific public services is related to the prevalence of economies of scale in the public sector. When economies of scope arise from intangible resources, such as managerial ability, dominant logic, routines and repertoires, and technologies, they can result in a sustainable competitive advantage (Nayyar, 1993). For example, third sector organizations operating residential care homes tend to be more diversified than private sector providers, providing both residential and other forms of care, and thus are able to benefit from economies of scope (Kendall and Knapp, 2000). Generally, skilled administrators are viewed as a capital resource capable of performing more than one activity.

Related to administrative expertise, *relationship-oriented* activities are another source of economies of scope. Relationship-oriented activities involve the utilization of consumer knowledge, teamwork, and commitment to partnerships with local providers to develop strong relationships with consumers enabling the economical delivery of a range of services (Bovaird, 2014). Local governments have an advantage in this regard because they can access information about their residents and acquire more trust from their residents than other organizations. For instance, fire departments can use information provided by police departments to locate and rescue residents in a timely manner.

Overall, there is considerable potential for economies of scope in local government activities because they provide a range of services. A strand of relevant literature has been

accumulated. For example, in the case of local public transport, Viton (1992, 1993) and Colburn and Talley (1992) investigated the long-term costs of urban transit companies in the US during the period from the late 1970s through the 1980s. Viton (1992) found that there were potential economies of scope, dependent on the post-consolidation wage level, whereas Colburn and Talley (1992) found that there was potential for cost complementarity depending on the combination of transit modes. Farsi et al. (2007) studied the cost structure of Swiss urban transport and found evidence of economies of scope, supporting the view that multi-mode transportation companies may benefit in comparison to unbundled franchise monopolies. The cost structures of municipal solid waste (MSW) services have also been studied, albeit to a limited degree, given the rising levels of waste generation in society. Callan and Thomas (2001) modeled the multi-product nature of MSW services and found that offering joint disposal and recycling services reduced costs by approximately 5% as a result of economies of scope. Third sector organizations have drawn attention to the presence of economies of scope, as much of their work is undertaken by professionals and they have closer access to and more significant relationships with service users than other providers (Bovaird, 2014). Bovaird (2014) found that the benefits obtained by third sector organizations from economies of scale, for example through their consolidation, were overemphasized, while economies of scope and learning should be given more weight from a policy-making viewpoint. However, to date, little evidence of economies of scope in third sector organizations has been reported, while some studies of

UK fundraising charities (Hyndman and McKillop, 1999) and US charities (Hager et al., 2001) have found evidence of economies of scale.

Nevertheless, there is little evidence of either the existence or absence of economies of scope in public services provided by general-purpose local governments. Grosskopf and Yaisawarng (1990) conducted a pioneering study on efficiency in the provision of local public services through economies of scope, and proposed a framework for modeling municipal costs as a means of measuring economies of scope. It is found that potential economies of scope exist in the provision of municipal services. Duncombe and Yinger (1993) also conducted an influential study involving cost function analysis of local government service provision with a focus on firefighting services using data on municipal fire departments in New York, and found evidence of economies of scale in the quality, economies of scope, and constant returns to population scale. The relationships among local government size, structure, and administrative overheads in local authorities in England have also been studied, and it is suggested that the finding that administrative overheads are higher for councils in the lower tier of their two-tier system indicates the presence of diseconomies of scope associated with administrative duplication in these units (Andrews and Boyne, 2009). Overall, it seems that economies of scope are present in the supply of local services provided by general local governments, as these local governments are naturally more multiproduct and multifunctional entities than specialized public service providers, and employ professional staff whose knowledge enables

them to achieve greater efficacy across a range of services. However, it should be noted that little evidence has been accumulated in this field. Thus, this study sheds more light on the assessment of economies of scope in the activities of general local governments.

In this study, I use difference-in-differences (DID) analysis and the event study method to estimate the impact on expenditure of the designation of cities as either core cities or special case cities, thereby giving them the authority to undertake a wider range of activities, and identify the magnitude of the economies of scope in local governments using panel data for Japanese municipalities during the period 1996–2015. As mentioned above, previous empirical studies on economies of scope in the provision of public services have measured the size of scope economies by estimating the cost function of the public organization concerned and calculating fitted values of the cost function in the case of specialized production by extrapolating the value zeros into the amounts of outcomes out of interest (e.g., Callan and Thomas, 2001; Farsi et al, 2007). However, previous studies have raised concerns about the validity of the extrapolations and the specifications regarding the cost functions (e.g., Adams et al., 2004). To avoid problems associated with the cost function approach, in this study, I analyze the economies of scope by building on the program evaluation framework using the DID and event study approaches. To the best of my knowledge, no previous empirical studies have used the program evaluation methodology to detect the presence of economies of scope in general public service provision.

A key to the identification of the impact of designation is the system of specially authorized cities, that is, core cities and special case cities in Japan. The central government launched the core city designation in 1996 and the special case city designation in 2000 to delegate some of the activities the prefectures normally handled and give the designated cities the authority to handle a wider range of activities than ordinary cities. To ensure their fiscal capacity to handle a wider range of responsibilities, population requirements were set for both designations, and cities that met the population requirements were able to apply for specially authorized city status. As the population requirement was higher for core city status, a wider range of duties was delegated to core cities. Figure 1 shows the numbers of core and special case cities that have been designated since 1996 and 2000, respectively. It can be seen that the number of core cities has steadily increased since the introduction of the core city designation, while the number of special case cities peaked in 2010, and has been falling since then. Also, the designation of cities as specially authorized cities has occurred every year since the scheme commenced. These authorized cities are used as the treatment group in this study, and the variations in the timing of designation are used to identify the impact on expenditure of changes in the scope of activities as a result of a transition to special city status, that is, the size of the economies of scope that were generated.

Insert Figure 1 around here

The remainder of this paper is organized as follows. Section 2 presents the institutional background, specifically the Japanese local government system and the designations to core cities and special case cities. Sections 3 and 4 discuss econometric specification and data, respectively. The main and extended results are presented in Sections 5. Section 6 is the conclusion.

2 Institutional background

2.1 Local government system in Japan

Japan is a unitary state and has a two tier system of local governments: 47 prefectures and about 1,700 municipalities as of 2020.¹ Prefectures constitute regional governments spread across wider areas; municipalities are composed of cities, towns, and villages, and are subordinate governments of prefectures. The responsibilities of prefectures comprise police force, the operation of high schools, prefectural hospitals, prefectural roads, regional urban planning, and duties delegated from the central government such as the maintenance of national roads. Municipalities handle basic concerns associated with 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

¹ See, for example, MIC (2020) for details of Japanese local public finance.

sewerage systems, collection and disposal of garbage, and fire protection. In 2018, public welfare expenditure accounted for the largest share, around 26%, while expenditure on education, debt repayments, and civil engineering works each accounted for more than 10% of total expenditure. The responsibilities of local governments in Japan are similar to those in many developed countries

Total public spending in Japan was about 25% of GDP in 2018, while the central and local governments accounted for 4.1% and 11%, respectively. Prefectures and municipalities accounted for approximately 46% and 54% of the local government budget, respectively. Fiscal autonomy of the municipalities is small, relying on funds from the central government. Intergovernmental transfers occupy about 29% of their budget in 2018, and 13.3% comes from general grants (*Local Allocation Tax*) and 15.3% comes from conditional grants (*National Treasury Disbursements*). Among the remaining municipal revenues, local taxes and bonds take up, respectively, 34% and 8.5%. Municipal taxes mainly comprise income tax (47% of total tax revenues) and property tax (40.5%), and specifically, municipal income taxes comprise individual income tax (36.1%) and corporate tax (10.8%).

2.2 Specially authorized cities in Japan: designated cities, core cities, and special case cities

Japan has long had two tiers of cities, authorized (ordinary) cities, and government ordinance

designated cities (or designated cities).² Designated cities were officially authorized as a second tier of cities in April 1956 by the central government, as it was recognized that very large cities, that is, those with a population of more than one million, should be provided with a wide range of authorizations beyond those that applied to ordinary cities. To be designated, officially a city had to have a population of at least 500,000 and a density of more than 2,000 people per km², but eventually, the central government had long viewed a population of at least one million as a requirement for designation. Designated cities have been delegated many tasks, most of which are normally undertaken by the prefectures, including almost all functions related to city planning and urban transport, and their territories have been divided into wards, which undertake basic functions such as resident registration, trash pickup, and local tax collection. Figure 2 depicts the relationship between all categories of cities and the numbers of extra duties delegated to specially authorized cities. As shown the figure, the number of extra duties delegated to designated cities is about 1,300. Initially, there were five designated cities, but by April 2020 there were 20 designated cities.

Insert Figure 2 around here

Core cities are included in a specially authorized tier of cities in the Japanese

² See, for example, Jacobs (2011) and Ohsugi (2011) for explanation for the city system in Japan.

municipal hierarchy that was introduced in 1996. Initially, to be considered as a core city, a city had to have a population of at least 300,000 and an area of more than 100 km², and a daytime/nighttime population ratio of 1 or more in the case of a city with a population of 500,000 or less. A candidate city applied for designation following approval by its city council and prefectural assembly. The qualification terms were eased with the abolition of the daytime/nighttime population ratio requirement in 1999, further eased by limiting the area requirement to cities with a population of 500,000 or less in 2002, and then simplified to just the population requirement in 2006. In 2014, the category of special case cities was abolished and the population requirement was amended to a population of at least 200,000. Core cities are delegated a wider range of administrative and service authorities than ordinary cities, but provide a smaller range of services than designated cities. As shown in Table 1 and Figure 2, the number of extra duties for core cities is around 2,200, and the extra costs in the first year of the designation are on average around 1,280 million JPY (approximately 12.8 million USD). The contents of extra duties are listed in Table A1 in Appendix A. Initially, there were 12 core cities, but this number had increased to 60 by 2020, as shown in Figure 1.

Insert Table 1 around here

In July 1999, the Omnibus Law for Decentralization (*Chiho Bunken Ikkatsu Ho*) was

enacted, and one of the most important items it contained related to the introduction of special case cities as a fourth tier of specialized cities. The requirement to be considered a special case city was a population of at least 200,000, and the process for designation was similar to that for core cities. Because the financial capacity to accept new responsibilities was crucial, not all of the cities meeting the population requirement applied for designation as a special case city. Functions devolved to special case cities are much more limited than those devolved to core cities. The number of delegated duties is about 700, as shown in Figure 2, and a list of delegated functions is presented in Table A1 in Appendix A. Following the easing of the population qualification for core city status in 2014, special case city was abolished and was designated as “special case cities for the enforcement period,” which retain the same administrative responsibilities as before. Another reason of the abolition of special case cities is that, while many of the duties operated by prefectures were recently being delegated to ordinary cities, the duties handled by special case cities were similar those for ordinary cities. The number of special case cities had risen to 44 by 2010, but declined to 25 following the changes in 2014, as illustrated in Figure 1.

3. Empirical strategy

3.1 Econometric specification

In this study, I used two-way fixed-effects regressions to estimate difference-in-differences

(DID) treatment and event study effects. The data used in this study are yearly panel for Japanese municipalities from 1996 to 2015. To assess the impacts of designation as either a core city or a special case city on expenditure, I used the following empirical equation:

$$y_{it} = \delta^{core} D_{it}^{core} + \delta^{spec} D_{it}^{spec} + X_{it} \beta + c_i + time_t + \epsilon_{it}, \quad (1)$$

where y_{it} represents the log of per capita total expenditure (in the baseline estimation) and i and t represent the municipality and year, respectively. D_{it}^{core} is a dummy variable that takes a value of 1 for cities that are designated as a core city, and 0 otherwise, and D_{it}^{spec} is a dummy variable that takes a value of 1 for cities designated as a special case city, and 0 otherwise. Therefore, δ^{core} and δ^{spec} are DID treatment estimators for core city status and special case city status, respectively. If δ^{core} takes a negative value, this means that the city reduces its total expenditure after transition to core city status, indicating that economies of scale emerge when duties are delegated from the prefectures. X_{it} represents a vector of control variables and β represents its coefficient vector. c_i represents municipality time-invariant dummies and $time_t$ represents yearly time dummies. ϵ_{it} represents the error term.

Control variables are selected based on those used to explain various types of expenditure in the literature on local government mergers (e.g., Blesse and Baskaran, 2016; Lima and Silveira-Neto, 2017; Miyazaki, 2017; Reingewertz, 2012). Controls include the log of population size to represent government expenditure, log of population density to capture geographical characteristics, and log of per capita taxable income to represent wealth, the

shares of population aged 14 or under and 65 or over to represent demographic composition, the share of foreigners to represent the degree of ethnic heterogeneity, the unemployment rate to reflect economic conditions, and a merger dummy and trend, or the elapsed years from the merger, to represent the dynamic impacts of mergers on expenditure. See Table B in Appendix B for detailed explanation of the controls.

Empirical research on municipal mergers has demonstrated definite group-specific trends over time in local expenditure (e.g., Blesse and Baskaran, 2016; Lima and Silveira-Neto, 2017; Miyazaki, 2017; Reingewertz, 2012). In this study, I also take into account specific linear time trends, TR_{it}^{core} and TR_{it}^{spec} , which represent the number of years that have elapsed since the transition to a core city and special case city, respectively. For instance, if a city transitioned to a core city in 2002, its core city time trend takes a value of 1 in 2003, 2 in 2004, 3 in 2005, and so on. Then, the DID trend estimator for the time trends is τ^{core} for a core city and τ^{spec} for a special case city. The econometric specification is as follows:

$$y_{it} = \delta^{core} D_{it}^{core} + \tau^{core} TR_{it}^{core} + \delta^{spec} D_{it}^{spec} + \tau^{spec} TR_{it}^{spec} + X_{it}\beta + c_i + time_t + \epsilon_{it}. \quad (2)$$

Regarding core city status, if δ^{core} and τ^{core} are positive (negative), the city's expenditure increases (decreases) discontinuously immediately after designation as a core city and gradually thereafter. If δ^{core} is positive (negative) but τ^{core} is negative (positive), the city's expenditure increases (decreases) sharply immediately after designation but then decreases

(increases) gradually thereafter. This argument also holds for special city status.

Given that time trends specific to the number of years elapsed since designation explain a significant proportion of the variation in expenditure over time following designation, it is anticipated that the sizes of treatment effects vary more flexibly over time. If so, an event study approach might be more appropriate because generally, this approach presumes different treatment timings and various treatment effects. Thus, in this study, I adopted an event study framework wherein the treatment effects are allowed to differ in treatment timing, in years relative to the treatment, and in size following the treatment. Here, as explained in detail later, for the formal parallel trend test, the pre-event, or pre-designation, year dummies are also incorporated in the regression equations. The econometric specification is as follows:

$$y_{it} = \sum_{h=1}^{24} \eta_{-h}^{core} EV_{-hit}^{core} + \sum_{h=1}^{19} \eta_{-h}^{spec} EV_{-hit}^{spec} + \sum_{k=1}^{19} \eta_k^{core} EV_{kit}^{core} + \sum_{k=1}^{15} \eta_k^{spec} EV_{kit}^{spec} + X_{it}\beta + c_i + time_t + \epsilon_{it}, \quad (3)$$

where k represents the number of years since designation. EV_{kit}^{core} and EV_{kit}^{spec} are dummies that take a value of 1 k years after a city's designation as a core city and special case city, respectively. η_k^{core} and η_k^{spec} represent event study estimates of EV_{kit}^{core} and EV_{kit}^{spec} , respectively. If η_k^{core} (η_k^{spec}) is negative, the expenditure of the core city (special case city) decreases k years after designation. If most of the η_k^{core} estimates are negative, it can be said that economies of scale exist in government expenditure because, even after the responsibilities increase following the transition to core city status, total expenditure declines over the long

term (the same argument holds in relation to special case cities). The event study approach generates large numbers of estimates, and by convention, these are presented graphically by displaying the number of years prior to and following the event on the horizontal axis and the magnitudes of the coefficients on the vertical axis.

3.2 Identification strategy

To identify DID treatment estimators, the parallel trend assumption, namely, that during the pre-treatment period, the treated and control have the same time trend, should be satisfied (e.g., Angrist and Pischke, 2008; Heckman et al., 1997). Recent empirical studies applying the DID approach have tested the validity of the DID estimation approach applying graphical illustrations of the outcomes and more formal statistical tests of the existence/non-existence of pre-treatment trends. Following the conventional approach to testing the identification assumption, in this study, first I graphically compare between the evolutions of the average per capita expenditure for the “never designated” municipalities, that is, the municipalities that have never been designated as either a core city or a special case city during the sample period, and those for the designated cities in the pre-designation periods. Normally, the parallel trend assumption is tested by comparing the graphs of outcomes averaged at each period between the treated and control groups in the pre-treatment period. However, as the designation timing differs among cities, the pre-designation window is not consistent over all units, and thus the

standard testing strategy cannot be applied. Therefore, as a compromise, the graphs for the never designated municipalities and the designated cities in the pre-treatment periods are presented to enable us to check the assumption.

As can be seen from Figure 3, average per capita expenditure among the core cities in the pre-designation periods evolved in a similar manner to that of the never designated municipalities, suggesting that the parallel trend assumption appears valid. However, the average of the former is much lower than that of the latter. The difference seems to be because to become a core city, cities had to have a population of at least 300,000, which is much larger than the municipal average of 67,000 as of 2010, and hence the candidate cities' average per capita expenditure was lower given their economies of population size. Figure 3 also displays the same graph for the special case cities in the pre-delegation periods. As can be seen in the figure, there was a discontinuous jump in 2004 in per capita expenditure by the special case cities in the pre-treatment periods and have been greater variations since 2007. The jump in expenditure can be explained by the large-scale municipal merger, which reduced the number of municipalities from 3,132 in 2003 to 1,821 in 2005 and then increased the sizes of merged municipalities. The fluctuations seem to arise from the reduction in the number of newly designated special case cities since 2008, which is only four. However, those trends for the special case cities in the pre-designation periods are almost in parallel with those for the never delegated municipalities except 2004. Because the expenditure impacts of municipal mergers

are controlled in the regressions, the trends for the never designated municipalities and for the special case cities in the pre-designation periods can be viewed to some extent parallel. Thus, the parallel trend assumption seems valid, and the differences in the levels of per capita expenditure between the never designated municipalities and the core cities and special case cities are validated with reference to the fact that they arise from population differentials.

Insert Figure 3 around here

The parallel trend assumption is more formally tested by statistical methods such as a falsification test and regressions including time dummies. Recent empirical studies have tended to rely on regression-based tests wherein the interaction terms of the treatment variable with time dummies for the entire sample period are included instead of the treatment effect dummy in the standard DID framework to determine whether non-parallel trends between the treated group and the control group exist prior to treatment by checking the coefficients of the interactions during the pre-treatment periods (e.g., Benzarti and Carloni, 2019; Kearney and Levine, 2015; Lima and Silveira-Neto, 2017). This approach is valid if the time frame comprises the pre- and post-treatment window, or the treatment timing is unique, even if the sizes of the treatment effects change over time. However, in the present study, the treatment timing differs among units as cities were designated as core cities or special case cities in

different years. Hence, it is difficult to define the unique pre- and post-treatment window. As noted earlier, the changes in city status have the nature of an event study, and thus regression-based parallel trend testing can be applied because it is analogous to the framework used in event study estimation, as in Eq. (3). Then, analogous to the interaction terms of the treatment dummy and pre-treatment year dummies in the standard parallel trend test, the year dummies representing the years prior to the year of designation are incorporated into Eq. (3) to check whether there is a difference in the expenditure trend between the never designated municipalities and the designated cities in the pre-designation periods.

In Eq. (3), EV_{-hit}^{core} (EV_{-hit}^{spec}), where h represents an index for the years prior to the designation, represents an pre-event year dummy that takes a value of 1 for core (special case) cities in h years prior to the designation to core (special case) city status in year t . η_{-h}^{core} (η_{-h}^{spec}) represents the coefficient of EV_{-hit}^{core} (EV_{-hit}^{spec}), and thus is a pre-designation event study estimate. If the majority of η_{-h}^{core} (η_{-h}^{spec}) are statistically insignificant, the trends for the core (special case) cities in the pre-designation periods and for the never designated municipalities are the same, thereby validating the parallel trend assumption.

Figure 4 shows a plot of the event study estimates for the designation to core city status in the pre- and post-designation periods, along with the corresponding 95% confidence intervals. As can be seen from Figure 4, none of the event study estimates in the pre-event periods are significant at the 5% level, indicating no designation year-specific trends and

suggesting the validity of the parallel trend assumption regarding core city status. Figure 5 shows the corresponding graph for the designation to special case city. As shown in the figure, with wider confidence intervals there is a larger variation in the point estimates, and the pre-designation estimates for 12–14 years prior to the year of designation are positively significant. However, the pre-designation event study estimates are not significant in the years of less than 10 relative to the designation year, and thus it seems that the parallel trend assumption remains valid. Overall, the graphical illustration of expenditure by the never designated municipalities and the designated cities in the pre- and post-treatment periods and the results of the event study analyses suggest that the parallel trend assumption seems valid for both core cities and special case cities.

Insert Figures 4 and 5 around here

4. Data

In this study, I used panel data for Japanese municipalities during the period 1996–2015. A large number of mergers in the early 2000s saw some municipalities disappear and other new municipalities emerge, and thus the panel is unbalanced. As a result of these mergers, the number of municipalities fell from around 3200 in 1999 to around 1700 in 2015. Most of the variables employed in this study are collected annually, although data on the population aged

14 or under, the population aged 65 or over, foreigners, unemployment, and the labor force are collected every five years during the Census, and thus the gaps are filled using linear interpolation between the survey years. Designated cities are excluded from the sample because they are granted great authority different from the other cities. See Table B1 in Appendix B for definitions of the variables and data sources.

Table 2 shows summary statistics and units for all of the variables used in the estimations, classified by city and designation status. Per capita expenditure is clearly greater for ordinary cities, followed by core and special case cities. The average for the core cities declines over time, but that for special case cities increases, thereby reversing their relative expenditure positions in the post-designation period. As for the other fiscal items, per capita amounts are greatest for ordinary cities, but the relative levels of the core and special cities are ambiguous. Population is lowest in ordinary cities, followed by special case cities and core cities, and this order remains the same both before and after the designation. This seems appropriate because the population level required to be designated a core city is higher than that required to be designated a special case city, and both of these levels are much higher than the average city population over the entire country.

Insert Table 2 around here

5. Results

5.1 Baseline results

Table 3 shows DID estimates of the impacts of the designation to core and special case cities during the period 1996–2015. As can be seen from column (1), which presents the regression results using Eq. (1), the impact of the designation as a core city is not significant, but that of the designation as a special case city is significantly positive, meaning that, given that the designation impacts are constant over time, designation as a special case city increases costs, possibly reflecting diseconomies of scope. However, as shown in column (2), which presents the regression results using Eq. (2), when group-specific trends after the event are included, the constant and trend effects of designation as either a core city or a special case city are significantly positive and significantly negative, respectively. This indicates that if a city transitions to core city status, its per capita total expenditure increases sharply by 2.8% immediately after designation, but then decreases by 0.6% annually, and in the case of transitioning to special case city status, per capita expenditure increases by 4.9% immediately after designation, but then decreases by 0.45% year-by-year. Thus, it can be seen that the transition to core city or special case city status does not facilitate economies of scope in the short run, but does so in the long run. Turning to the control variables, population, population density, share of the population aged 14 or under, and the unemployment rate are all negatively correlated with expenditure, indicating that large, urbanized, and young municipalities

experiencing challenging economic conditions are likely to exhibit a lower level of expenditure per capita. In addition, merged municipalities tend to temporarily increase their expenditure immediately following the merger, but then reduce it annually. Column (3) presents the estimation results from the same regression presented in column (2) using cities as a sample, and provides evidence supporting the existence of economies of scope in the long run, with almost the same point estimates for the trend impacts, that is, 0.64% and 0.42% annual decreases for core cities and special case cities, respectively.

Insert Table 3 around here

Columns (4)–(6) present the estimates of the effects of core city and special case city designation on current expenditure per capita. It can be seen that the cost-reduction effects of delegations are greater on per capita current expenditure than on per capita expenditure. As can be seen from column (4), the constant impacts are all significantly negative. Further, as in column (5), the group-specific trend impacts are all significantly negative, with greater point estimates in absolute value than the corresponding estimates presented in column (2), and there are no temporary cost increases for either status. It can be inferred from these results that in terms of cost reduction, economies of scope are more effective in current expenditure than in overall expenditure. The trend estimates presented in column (6) are similar to those presented

in column (3), once again supporting the existence of long-term economies of scope.

The above regressions assume constant or linear treatment impacts of the designations, but the treatment effects may vary over time. Next, assume the econometric specification that allows flexible event study effects over time relative to the designation, as shown in Eq. (3). Event study impacts of the designation to either core city or special case city are plotted, along with the corresponding 95% confidence intervals, in Figure 4 and Figure 5, respectively. As can be seen in Figure 4, the event study impacts of the designation to core city status are significantly positive until 17 years after the delegation, but have a negative trend four years after the designation. In line with the results of the analysis of the constant and trend effects on expenditure presented in column (2) in Table 3, a gradual decrease in expenditure subsequent to an instantaneous increase is observed by the event study approach. Regarding special case city status, as can be seen in Figure 5, there is an immediate increase in expenditure followed by a gradual decrease about eight years after designation, but in most of the event years, the estimates are not significant. Consequently, the event study approach also provides evidence that designation to core city or special case city status has an immediate positive impact on expenditure, followed by a gradual negative impact in the long run.

5.2 Robustness checks and extensions

The abovementioned regression analyses ignore the extra costs that would be incurred if the

additional functions that core or special case cities were required to undertake were handled separately by specialized governments. This is explained as follows. As noted in the literature (e.g., Baumol et al., 1982; Grosskopf and Yaisawarng, 1990), economies of scope exist if

$$C(Y, Y_{extra}) < C(Y, 0) + C(0, Y_{extra}),$$

where $C(\cdot)$ represents costs, Y represents a vector of the public services an ordinary city provides, and Y_{extra} represents a vector of the extra services a specialized city (either a core city or a special case city) provides. In the present analysis, $C(Y, Y_{extra})$ represents expenditure by delegated cities and $C(Y, 0)$ represents expenditure by ordinary cities, holding population constant. $C(0, Y_{extra})$ represents the extra expenditure that is incurred when a city is designated as a specially authorized city. In principle, $C(Y, Y_{extra})$ should be compared with $C(Y, 0) + C(0, Y_{extra})$ to determine whether there are economies of scope in the local governments' activities. However, because in many cases the extra costs associated with the designation are probably not calculated formally by the delegated city, I compared $C(Y, Y_{extra})$ with $C(Y, 0)$ in the abovementioned regression analyses.

Thus, as a robustness check, I perform a DID regression in which expenditure by specially authorized cities in the years prior to designation is replaced with the sum of expenditure by ordinary cities, $C(Y, 0)$, and the extra costs associated with the designation, $C(0, Y_{extra})$. As a result of limited data availability, I employ the average per capita extra cost in Table 2, 4,653 JPY, as the extra cost for core cities. The regression results are presented in

column (1) in Table 4. It can be seen that in contrast to the 2.8% increase in expenditure immediately following designation, as shown in column (2) in Table 3, expenditure by the core cities remained unchanged immediately following designation and then decreased by 5.8% year-by-year. Conversely, the constant and trend effects of designation as a special case city were almost the same as those in column (2) in Table 3.

Insert Table 4 around here

The impact on expenditure of municipal mergers is controlled for by including a dummy for merged municipalities and an event trend term that covers several years after the merger, but thus far, potential endogeneity, that is, reverse causality whereby the level of expenditure leads to a decision to merge, has not been taken into account in the regressions. To address possible endogeneity, I use the instrumental variable (IV) estimation approach as a robustness check. Following Miyazaki (2017), who proposed the use of the IV approach in assessing the cost-reduction effects of mergers, dummy variables regarding population thresholds—specifically a dummy for municipalities with a population of less than 1,000 after 2002, a dummy for municipalities with a population of 1,000–3,999 after 2002, and a dummy for municipalities with a population of 4,000–7,999 after 2002—were used as instruments because after the national government tightened its general-purpose fiscal transfers to

municipalities with a population of less than 8,000 in 2002, small municipalities were urged to merge to retain their fiscal autonomy by satisfying the new population requirement (e.g., Japan Times, 2002). The estimation results are presented in column (2) in Table 4. It can be seen that the impact of the specific designation trend is an annual 10.1% decrease in expenditure following designation as a core city, although the other constant and trend impacts are not significant. The IV estimation casts doubt on the effect of a reduction in expenditure following designation as a special case city, but supports evidence of the long-term economies of scale for core cities status.

By way of a further examination of the impact on expenditure of the designation to specially authorized cities, the DID approach with group-specific trends was used to analyze the influence on investment expenses and intergovernmental fiscal transfers per capita. As can be seen from columns (3) and (4) in Table 4, transition to core cities and special case cities had no effect on investment expenses but a temporary positive effect on intergovernmental fiscal transfers. In the case of core cities, intergovernmental fiscal transfers increased by around 1% annually. It follows that specially authorized city status does not seem to affect investment expenses and intergovernmental fiscal transfers, contrary to the effects on total expenditure and current expenditure.

5.3 Size of economies of scope

Looking at the results of the regression analyses, it can be questioned how much a designation as either a core city or a special case city either reduces or increases expenditure over the long term. As is the case in the regressions used in this study, if the trend impact of special city status on expenditure is negative, even if the constant treatment impact is positive, a long-term reduction in expenditure through economies of scope would be expected. Then, based on the DID constant and trend estimates of the impacts of core city and special case city status presented in column (2) in Table 3, the long-term changes in expenditure since the delegation are calculated. As in Table 5, a designation of core city status results in an immediate increase in expenditure of 2.8%, but expenditure is reduced by 3.1% relative to initial expenditure 10 years after designation as a core city and by 9.1% 20 years after designation. Regarding special case cities, expenditure increases by 4.9% immediately following designation, but is reduced by 4.1% 20 years after designation. Thus, it is evident that while both core cities and special case cities enjoy economies of scope in terms of total expenditure, the effect is more than twice as great for core cities than for special case cities in the long term.

Insert Table 5 around here

6. Conclusions

The aim of this study is to determine the existence/non-existence of the economies of scope in

general government expenditure using panel data for Japanese municipalities during the period 1996–2015. I used two-way fixed-effects regressions to estimate the DID treatment and trend impacts and event study effects on per capita expenditure of designation as a core city or special case city. Core and special case cities were authorized to undertake a broader range of activities than ordinary cities, and cities that met the population requirements were able to apply for designation at any time. Designations to these city statuses, which are labeled treatment events in this study, have occurred annually since their introduction, enabling a comparison of levels of expenditure between ordinary cities and these specially authorized cities.

A key requirement for the identification of the DID treatment and event study impacts is the parallel trend assumption. In this framework, per capita expenditure in the “never designated” municipalities, which comprises municipalities that have never transitioned to core cities or special case cities, should have the same trend as the specially authorized cities in the pre-designation period. Graphical illustrations and formal regression-based tests confirm that the parallel trend assumption holds for both core cities and special case cities. Two-way fixed-effects regressions are used to estimate the impact of designation as a core city or special case city on expenditure trends. The results show that first, in the provision of public services by general-purpose local governments, economies of scope do not occur in the short term, but do occur in the mid- to long term. After being designated, core cities see an immediate increase of 2.8% in expenditure per capita, but then a 0.6% decrease annually. Special case cities see an

immediate increase of 4.9% in expenditure per capita followed by a 0.45% decrease annually.

The results show that for core cities, economies of scope appear five years after designation and reach a peak of 9.1% 20 years after the transition, while for special case cities economies of scope are first seen 11 years after designation and reach a peak of 4.1% 20 years after the transition. However, note that the results for special case cities are not robust to empirical specifications. Second, the wider the range of extra activities delegated, the greater the economies of scope. This is inferred from the first result, as a greater variety of activities is delegated to core cities than to special case cities. Thus, economies of scope are observed in public services provided by general local governments, and these findings are robust to changes in econometric specifications and the sample used.

These findings have several implications in terms of policy-making. First, this study provides robust empirical evidence of potential economies of scale in public services provided by general local governments. It has been argued that the public sector, including general local governments, has a great opportunity to benefit from economies of scope in the provision of public services through organizational reforms such as co-location of various divisions, application of professional knowledge to services provided by other sectors, and utilization of their competitive advantage in terms of relationship-oriented activities (Bovaird, 2014). However, little evidence has been accumulated in previous studies, except for that of Grosskopf and Yaisawarng (1990), as to what potential economies of scale are available in the provision

of municipal services. Empirical studies have focused on determining whether economies of scope exist in the provision of specific public services such as MSW services (Callan and Thomas 2001), care services (Kendall and Knapp, 2000), and public transportation (Colburn and Talley, 1992; Farsi and Etal 2007; Viton, 1992, 1993). In this study, I not only present empirical evidence of economies of scale for general government activities, building on the program evaluation framework using DID and event study approaches, but also demonstrate how economies of scope in terms of government expenditure emerge over time. This provides practitioners and public administrators with useful information on practical ways to achieve cost reductions in the public sector.

Second, from a local government sustainability perspective, the findings of this study suggest potential new policy strategies aimed at reducing general-purpose local government expenditure. In many countries, particularly developed countries, both urban and rural governments are facing fiscal challenges related to aging and declining populations, placing pressure on social security budgets and leading to reductions in healthcare and other public services (OECD, 2019, p. 117). Given these pessimistic predictions regarding local government finances, cost savings are urgently required if local governments are to retain their fiscal autonomy. The findings of this study indicate that economies of scope, for example, through joint provision of multiple public services, can be a key driver of ongoing cost reductions in public service provision, resulting in improved sustainability of local governments.

Third, fiscal decentralization through the delegation of services that are currently provided by higher levels of government is clearly beneficial. Given the potential economies of scale, municipal consolidation is favored by practitioners as a means of reducing administrative costs and increasing efficiency in the provision of public services. In many cases, economies of scope have not been considered in determining whether municipal consolidation is worthwhile (e.g., Grosskopf and Yaisawarng, 1990), but creation of a large-sized local government by a merger that can have fiscal capacity to operate a wider range of functions also could be an advantage of municipal consolidation. In this regard, this study makes a significant contribution to the fiscal federalism literature, with a focus on economies of scope in public services as a new channel for cost reduction, and to the policy debate regarding the validity of municipal consolidations from a cost-saving viewpoint.

There is, however, a caveat in this research. The economies of scope literature has built on the cost function analysis and a calculation of production costs predicted if each product were produced separately, to measure the degrees of scope economies. Yet the present study employs the program evaluation framework, where the cost impacts of a wider range of responsibilities assigned to specially authorized cities are more directly assessed by comparing expenditure between the designated cities and non-designated municipalities. Indeed, comparison between the sizes of scope economies estimated from the cost function approach and those from the program evaluation methodology may yield further insight into the literature.

This issue is left for future research.

Appendix A. List of Duties Handled by Core and Special Case Cities

Insert Table A1 around here

Appendix B. Variable Definition, Sources, and, Units

Insert Table B1 around here

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Table 1. Extra Duties and Costs for Core Cities

Cities	No. of extra duties	Extra costs in the first year, 1,000 JPY	Population	Per capita extra costs, JPY	Designation date
Hachinohe	2,003	924,000	238,000	3,882	January 1, 2017
Morioka	1,900	1,310,000	300,746	4,356	April 1, 2008
Yamagata	2,426	1,352,476	253,832	5,328	April 1, 2019
Fukushima	2,000	934,988	294,378	3,176	April 1, 2018
Mito	2,640	2,070,000	270,783	7,644	April 1, 2020
Takasaki	2,386	2,413,829	364,919	6,615	April 1, 2011
Koshigaya	2024	1,241,090	326,313	3,803	April 1, 2015
Kofu	2,398	998,460	193,123	5,170	April 1, 2019
Yao	2,000	1,098,000	268,562	4,088	April 1, 2018
Suita	2491	1,188,911	374,526	3,174	April 1, 2020
Akashi	1,856	926,599	293,509	3,157	April 1, 2018
Tottori	2211	930,000	193,766	4,800	April 1, 2018
Matsue	1,980	1,264,044	206,407	6,124	April 1, 2018
<u>Average</u>	2,178	1,280,954	275,297	4,653 -	

Notes: The author sampled the core cities that open on their homepages their extra duties and costs borne to be core cities; the extra duties and costs come from their open resources such as the leaflets. Population is collected from the latest *Census* as of the designation date. The average of per capita extra costs are calculated as a population-weighted average.

Table 2. Descriptive statistics

	<i>A. Core cities</i>				<i>B. Special case cities</i>				<i>C. Ordinary cities</i>	
	Pre-designation periods		Post-designation periods		Pre-designation periods		Post-designation periods			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
Per capita expenditure (1,000 JPY)	325.59	62.72	355.70	51.60	332.42	66.52	327.17	61.56	408.23	203.47
Per capita current expenditure (1,000 JPY)	288.72	56.39	312.88	45.72	295.30	56.43	291.20	53.36	330.15	140.70
Per capita investment cost (1,000 JPY)	1.22	5.85	0.63	2.41	1.21	5.54	0.33	1.14	30.67	78.20
Per capita fiscal transfers (1,000 JPY)	61.39	42.50	65.69	27.22	49.13	19.07	60.97	19.33	71.61	87.63
Core city dummy	0	0	1	0	0	0	0	0	0	0
Core city-specific trend	0	0	7.62	5.15	0	0	0	0	0	0
Special case city dummy	0	0	0	0	0	0	1	0	0	0
Special case city-specific trend	0	0	0	0	0	0	6.10	4.21	0	0
Population, unit	378,587	98,864	441,739	111,084	232,220	70,263	270,435	69,593	30,827	42,519
Population density (unit/km ²)	1378.41	1663.73	1008.51	964.66	1216.11	1589.68	1325.15	1811.962	201.12	547.42
Income per taxpayer (1,000 JPY)	3554.7	983.3	2672.3	1418.7	3662.8	597.3	2565.3	1560	2617.5	1424.1
Share of population aged 14 or under (%)	15.01	1.44	14.35	1.37	15.42	1.21	13.99	1.085882	14.13	2.15
Share of population aged 65 or over (%)	15.90	3.64	20.08	3.78	15.49	3.97	20.69	3.79	21.83	6.35
Share of foreigners (%)	0.99	0.77	0.98	0.77	1.09	0.81	1.27	0.76	0.89	0.84
Unemployment rate (%)	5.44	1.59	5.43	1.22	4.88	0.92	5.68	1.15	5.12	1.65
Merged municipality dummy	0.13	0.33	0.41	0.49	0.15	0.36	0.36	0.48	0.14	0.35
Merged municipality-specific trend	0.51	1.76	2.05	3.28	0.44	1.47	1.93	3.29	0.77	2.26
Observations	198		586		339		575		41033 [40907]	

Notes: The sample is the same as that used for the baseline regression, in column (2) in Table 3. Per capita statistics are a weighted average of population. Definition and sources of the variables are listed in Table B1. The bracket refers to the number of observations of per capita investment cost and per capita fiscal transfers.

Table 3. Difference-in-Differences Estimates of Designation to Core City and Special Case City

Dependent variables	Log of per capita expenditure			Log of per capita current expenditure		
	(1)	(2), baseline	(3)	(4)	(5)	(6)
Core city dummy	-0.0016 (0.0161)	0.0281* (0.0162)	0.0092 (0.0141)	-0.0635*** (0.0154)	-0.0123 (0.0161)	0.0128 (0.0150)
Core city-specific trend		-0.0060*** (0.0019)	-0.0064*** (0.0019)		-0.0104*** (0.0019)	-0.00674*** (0.00198)
Special case city dummy	0.0260*** (0.0097)	0.0491*** (0.0108)	0.0149 (0.0109)	-0.0292*** (0.0112)	0.0067 (0.0121)	0.0209* (0.0124)
Special case city-specific trend		-0.0045*** (0.0015)	-0.0042*** (0.0015)		-0.0071*** (0.0016)	-0.00424** (0.00167)
Log of population	-0.1294*** (0.0349)	-0.1337*** (0.0350)	-0.0262 (0.0384)	-0.2435*** (0.0318)	-0.2508*** (0.0317)	-0.0368 (0.0399)
Log of population density	-0.1507*** (0.0186)	-0.1481*** (0.0184)	-0.1054*** (0.0164)	-0.1385*** (0.0193)	-0.1341*** (0.0190)	-0.0913*** (0.0166)
Log of income per taxpayer	0.0249* (0.0132)	0.0255* (0.0134)	0.0150 (0.0092)	0.0295** (0.0141)	0.0305** (0.0144)	0.0163 (0.0100)
Share of population aged 14 or under	-0.0110*** (0.0026)	-0.0106*** (0.0026)	-0.0203*** (0.0043)	-0.0149*** (0.0025)	-0.0143*** (0.0025)	-0.0194*** (0.00457)
Share of population aged 65 or over	0.0004 (0.0014)	0.0004 (0.0015)	0.0077*** (0.0020)	-0.0048*** (0.0015)	-0.0048*** (0.0015)	0.00771*** (0.00215)
Share of foreigners	0.0004 (0.0040)	0.0002 (0.0040)	0.0130* (0.0079)	0.0001 (0.0030)	-0.0002 (0.0030)	0.0153* (0.00901)
Unemployment rate	-0.0134*** (0.0028)	-0.0138*** (0.0028)	-0.0196*** (0.0049)	-0.0090*** (0.0025)	-0.0097*** (0.0025)	-0.0202*** (0.00522)
Merged municipality dummy	0.1120*** (0.0131)	0.1173*** (0.0131)	0.0425*** (0.0133)	0.0530*** (0.0139)	0.0620*** (0.0140)	0.0466*** (0.0140)
Merged municipality-specific trend	-0.0062*** (0.0014)	-0.0060*** (0.0014)	0.0015 (0.0020)	-0.0065*** (0.0014)	-0.0062*** (0.0014)	-5.03e-05 (0.00212)
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sample	All	All	Cities	All	All	Cities
Adjusted R squared	0.265	0.266	0.351	0.399	0.401	0.351
Observations	42802	42802	14323	42676	42676	14197

Notes: In "Sample," "All" indicates all municipalities; "Cities" is all cities. Standard errors cluster robust with regard to municipality are in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. Constants are abbreviated.

Table 4. Estimates of Designation to Core City and Special Case City, Robustness Checks and Extensions

Models	Impacts on extra cost-adjusted expenditure	IV estimation for municipal mergers	Impacts on per capita investment expenses	Impacts on per capita fiscal transfers
	(1)	(2)	(3)	(4)
Core city dummy	0.0141 (0.0159)	-0.1479 (0.2168)	0.0535 (0.6536)	0.0692** (0.0288)
Core city-specific trend	-0.0058*** (0.0019)	-0.1013** (0.0464)	0.0529 (0.0598)	0.0085*** (0.0033)
Special case city dummy	0.0488*** (0.0107)	-0.0760 (0.1556)	-0.2078 (0.5574)	0.1681*** (0.0223)
Special case city-specific trend	-0.0045*** (0.0015)	-0.0475 (0.0361)	0.0401 (0.0733)	0.0010 (0.0028)
Log of population	-0.1339*** (0.0348)	-3.4261* (1.8100)	3.3899*** (0.5241)	0.3053*** (0.0862)
Log of population density	-0.1469*** (0.0183)	1.8427* (1.0559)	-1.8070*** (0.3642)	-0.0487 (0.0350)
Log of income per taxpayer	0.0253* (0.0133)	-0.0643 (0.0408)	-0.1063 (0.1343)	0.0424** (0.0204)
Share of population aged 14 or under	-0.0105*** (0.0026)	0.0063 (0.0281)	0.0038 (0.0279)	-0.0070 (0.0058)
Share of population aged 65 or over	0.0003 (0.0014)	-0.0285** (0.0125)	0.0616*** (0.0148)	0.0099*** (0.0034)
Share of foreigners	0.0002 (0.0040)	0.0398* (0.0231)	0.0290 (0.0531)	-0.0028 (0.0086)
Unemployment rate	-0.0137*** (0.0028)	-0.0470*** (0.0149)	-0.0111 (0.0289)	-0.0263*** (0.0063)
Merged municipality dummy	0.1164*** (0.0130)	1.1904 (1.4894)	-0.3553 (0.3187)	0.1233*** (0.0294)
Merged municipality-specific trend	-0.0059*** (0.0014)	0.3705** (0.1477)	-0.0214 (0.0244)	-0.0254*** (0.0027)
Individual FE	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Hausman test		3124		
Hausman test: P-value		0.000		
Adjusted R squared	0.261	-	0.045	0.379
Observations	42802	42802	42676	42676

Notes: The samples are panels for all municipalities. 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. Sizes of Economies of Scope

Years after the designation	Per capita expenditure for core cities, %	Per capita expenditure for special case cities, %
0	2.81%	4.91%
1	2.21%	4.46%
2	1.62%	4.01%
3	1.02%	3.55%
4	0.43%	3.10%
5	-0.17%	2.65%
6	-0.76%	2.19%
7	-1.36%	1.74%
8	-1.95%	1.29%
9	-2.55%	0.84%
10	-3.14%	0.38%
11	-3.74%	-0.07%
12	-4.33%	-0.52%
13	-4.93%	-0.97%
14	-5.52%	-1.43%
15	-6.12%	-1.88%
16	-6.71%	-2.33%
17	-7.31%	-2.79%
18	-7.90%	-3.24%
19	-8.50%	-3.69%
20	-9.09%	-4.14%

Notes: The figures are estimated from the coefficients of the treatment and trend impacts of designation to core city and special case city, in column 2 in Table 3.

Table A1. List of Extra Duties Handled by Core Cities and Special Case Cities

Extra duties handled by core cities

Duties pertaining to welfare administration

- Issue of physically handicapped person's handbook
- Authorization for the foundation of nursing homes for the aged and supervision of them
- Loan of welfare loan funds for mothers, children and widows

Duties pertaining to public health (duties handled by cities authorized to establish public health centers)

- Implementation of projects for the preservation and improvement of the health of local residents
- Permission of restaurant businesses
- Notification of septic tank installation
- Permission for use of hot springs

Duties pertaining to environmental protection

- Notification of installation of soot and smoke emitting facilities
- Measure order for industrial waste collectors and transporters, and industrial waste disposal operators

Duties pertaining to town planning, etc.

- Restrictions on outdoor advertisements in accordance with bylaws

Duties relating to education

- Training of teaching staffs paid by the prefectural government

Extra duties handled by special case cities (for the enforcement period)

Duties pertaining to environmental protection

- Acceptance of the application for installation of general particulate discharging facilities
- Acceptance of the application for installation of facilities emitting pollutants or waste liquid
- Permission for contaminated solid processing licensees

Duties pertaining to town planning, etc.

- Permission for the foundation of Land Readjustment Associations
- Permission for housing estate development projects within restrictive areas for housing land development
- Permission for development activities within urbanization areas or urbanization-controlled areas

Other duties

- Recommendations on the Measurement Act and regular inspections

Notes: As of 1 November, 2020.

Sources: Ohsugi (2001) and MIC (Retrieved on 1 November, 2020 <https://www.soumu.go.jp/cyukaku/>)

Table B1. Variable Definition and Sources

Variable	Definition	Sources
Per capita expenditure	Total expenditure divided by population	1, 2
Per capita current expenditure	Current expenditure divided by population	1, 2
Per capita investment cost	Construction Work Expenses divided by population	1, 2
Per capita fiscal transfers	General grants (<i>Local Allocation Tax</i>) plus conditional grants (<i>National treasury Disbursements</i>) divided by population	1, 2
Population	Population	2
Population density	Geographical area divided by population	1, 2
Income per taxpayer	Taxable income of local income tax per taxpayer	3
Share of population aged 14 or under	Share of population aged 14 or under to total population	4
Share of population aged 65 or over (%)	Share of population aged 65 or over to total population	4
Share of foreigners (%)	Share of foreigners (non-Japanese) to total population	4
Unemployment rate (%)	Percentage of unemployed people to labor force, 2010	4
Merged municipality dummy	Dummy that takes one for merged municipalities during the Heisei great merger by 2010	5
Merged municipality-specific trend	Trend that takes the years after the merger	5

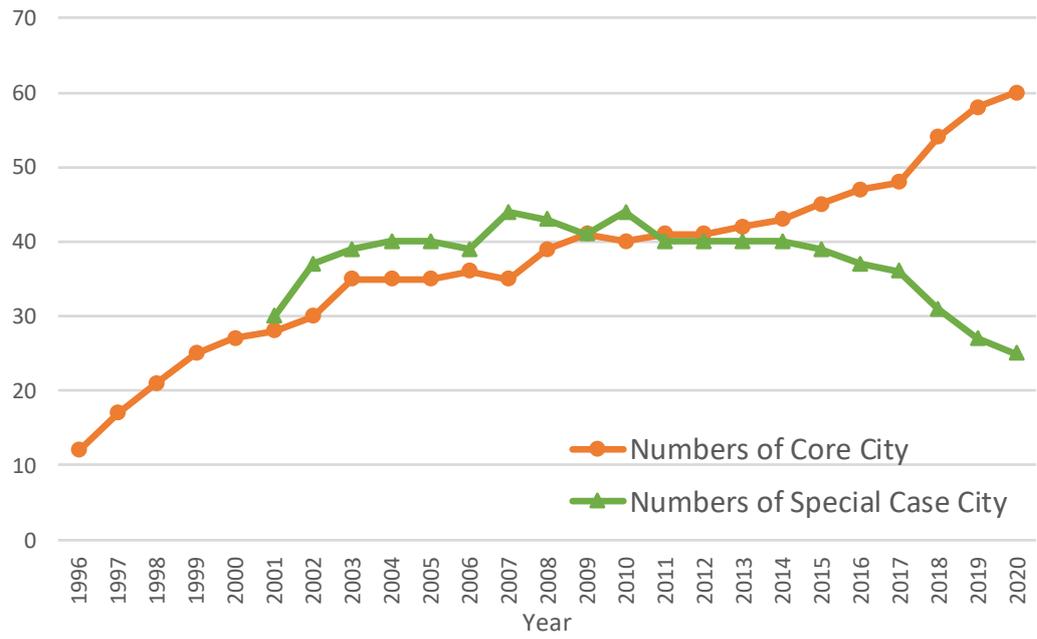
Notes: 1=Ministry of Internal Affairs and Communications (MIC) (1996-2015) *Survey on Municipal Financial Settlement*

(https://www+A1.soumu.go.jp/iken/kessan_jokyo_2.html); 2=MIC (1996-2015) *Basic Resident Register* (<https://www.e-stat.go.jp/stat-search/files?page=1&toukei=00200241&tstat=000001039591>); 3=MIC (1996-2015) *Survey on Municipal Taxation*

(https://www.soumu.go.jp/main_sosiki/jichi_zeisei/czaisei/czaisei_seido/ichiran09.html); 4=MIC, Statistics Bureau (1995, 2000, 2005, 2010, 2015) *Census*

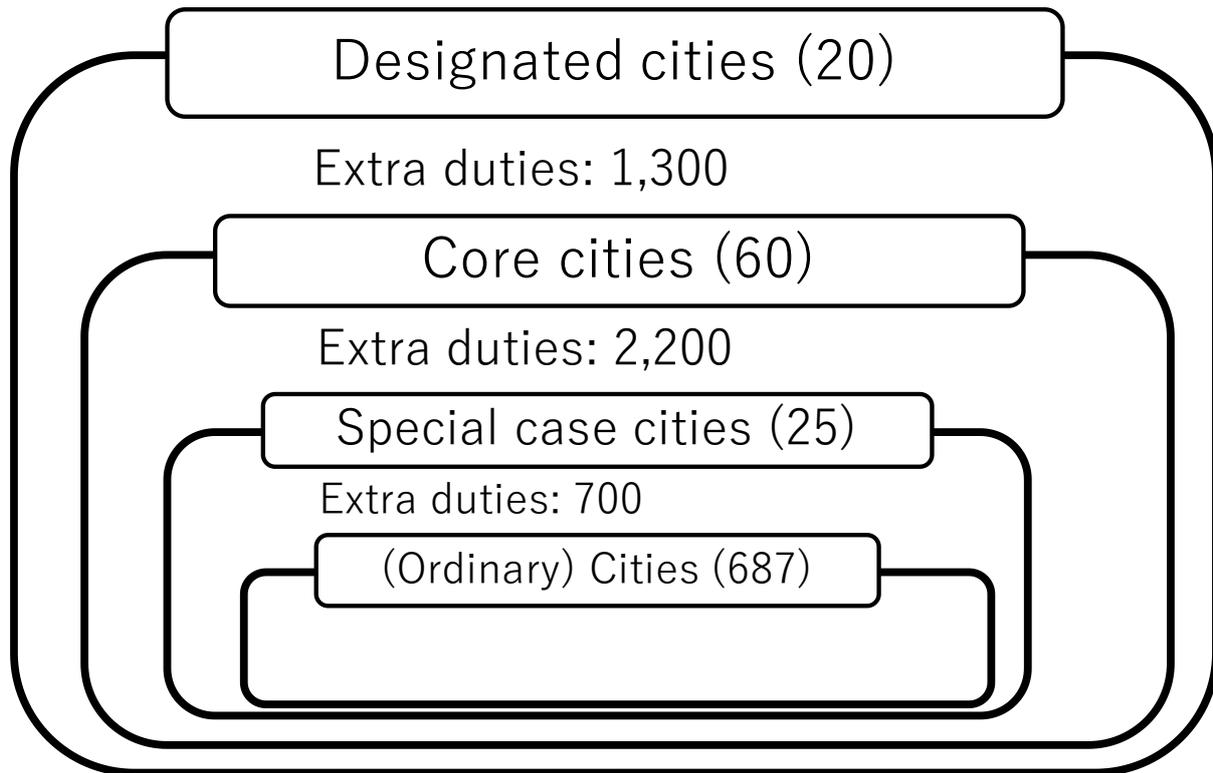
(<https://www.e-stat.go.jp/stat-search/files?page=1&toukei=00200521&tstat=000001039448>); 5=MIC (<https://www.soumu.go.jp/gapei/gapei.html>). All the Web pages were retrieved on November 5, 2020.

Figure 1. Numbers of Core and Special Case Cities, 1996-2020



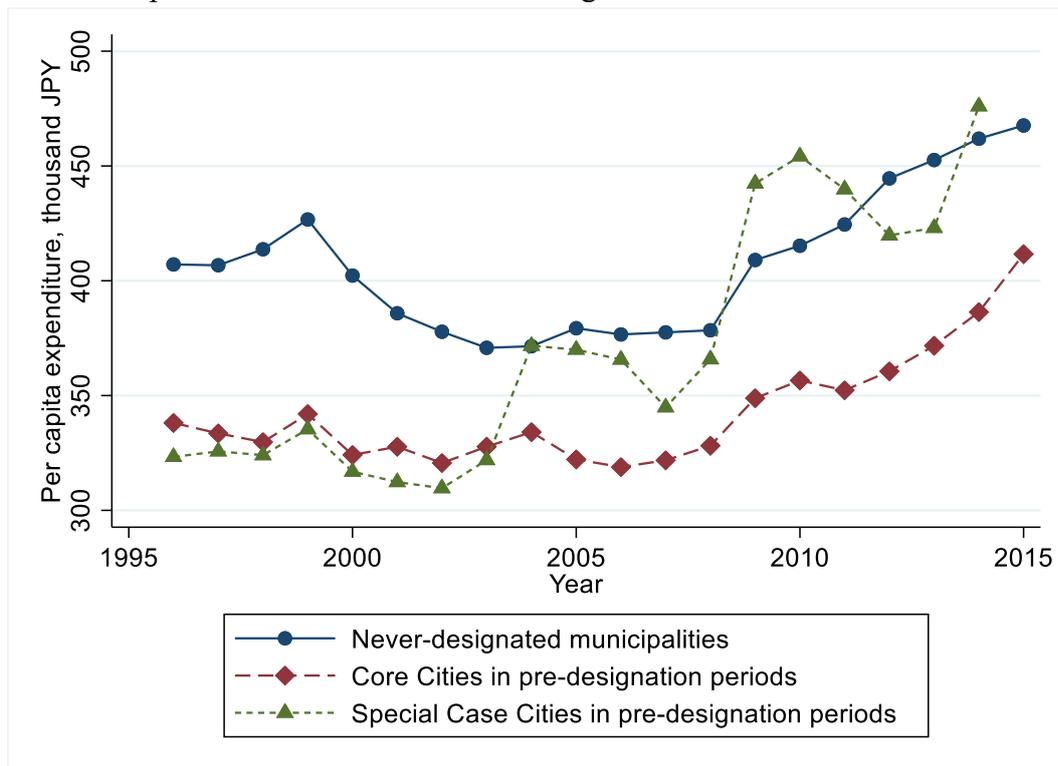
Notes: As of April 1, 2020. The numbers of Core and Special Case Cities are as of April 1 each year. Core and Special Case Cities were launched, respectively, in 1996 and in 2000.

Figure 2. Relationship between Cities and Numbers of Extra Duties Delegated to Specially Authorized Cities



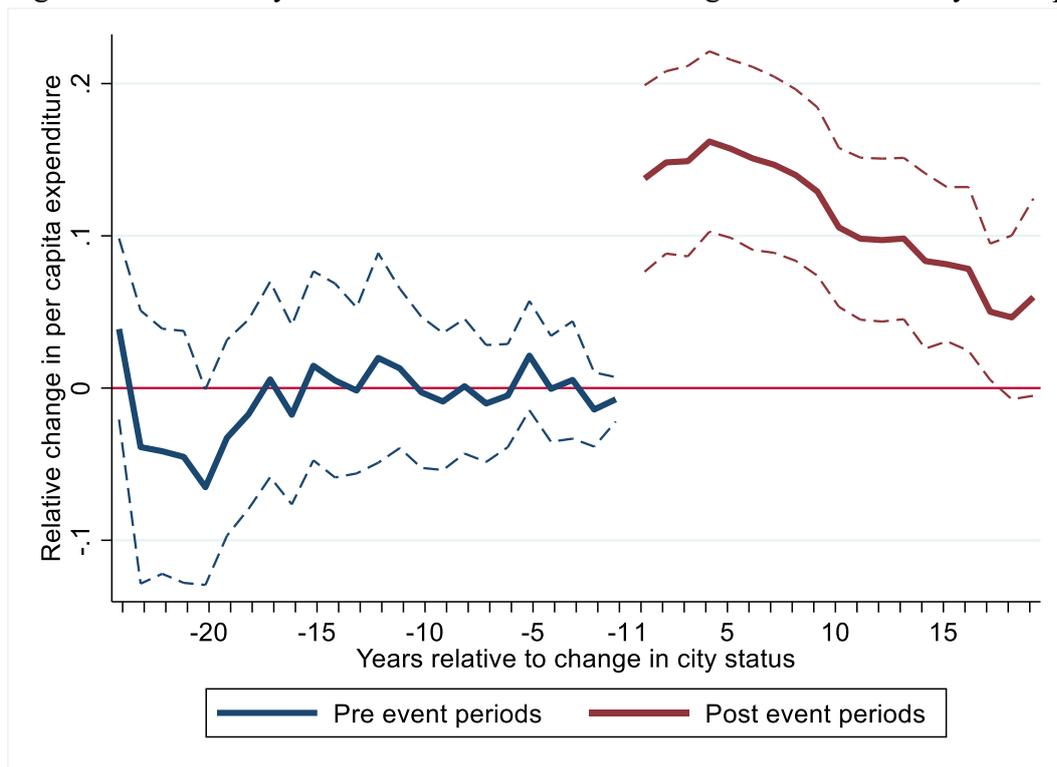
Notes: As of April 1, 2020. Parentheses indicate the numbers of cities in each category. The average of extra duties for designated cities is calculated from the estimated duties of four designated cities—Shizuoka’s estimate of 1,560, Sakai’s estimate of 1043, Hamamatsu’s estimate of 1394, and Niigata’s estimate of 1,157—reported in Shirai (2006). The average extra duty for core cities is from Table 1. The number of extra duties for special case cities is that of Matsue, because the source of the estimated extra duties delegated to special case cities is limited to Matsue.

Figure 3. Average Per Capita Expenditures for the Never Designated Municipalities and for Core and Special Case Cities in the Pre-Designation Periods



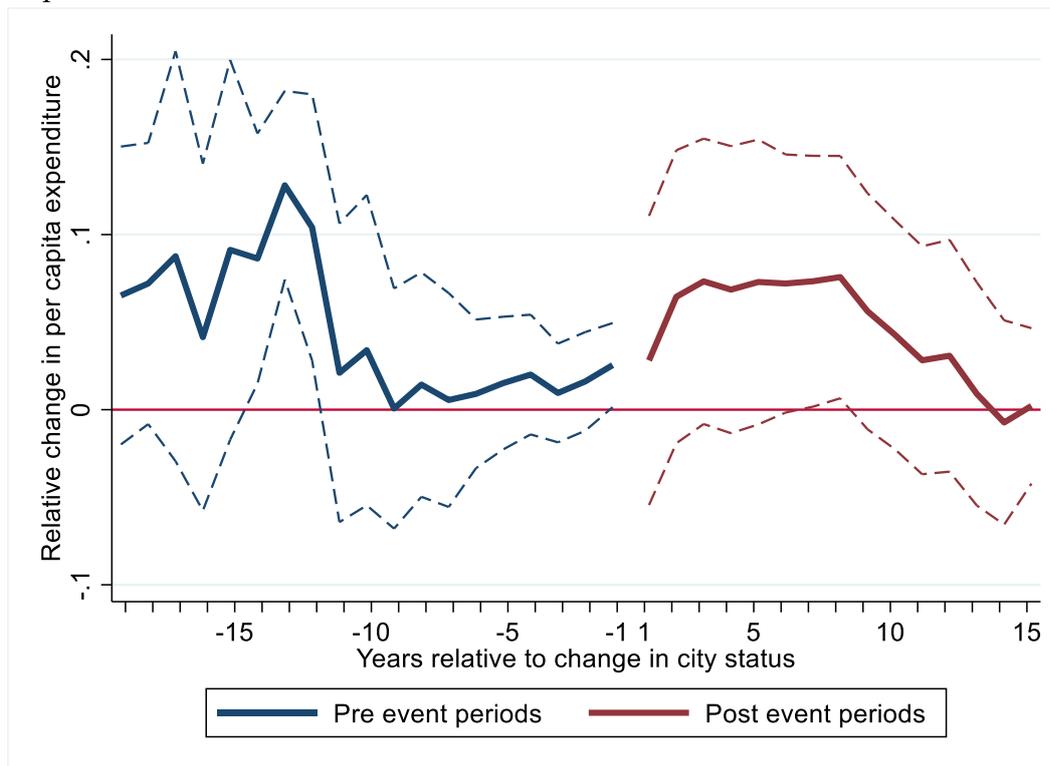
Notes: The sample is the same as that of the baseline regression, or column. (2) in Table 3.

Figure 4. Event Study Estimates of the Effects of Designation to Core City on Expenditure



Notes: The figure plots event-study estimates from the two-way fixed effects regression equation, or Eq. (3). The equation includes all the controls, individual FE, and year dummies. The (red) solid flat line indicates the y axis of zero. The dashed lines represent the 95% confidence intervals for each point estimate. Standard errors are robust to municipal clusters.

Figure 5. Event Study Estimates of the Effects of Designation to Special Case City on Expenditure



Notes: The figure plots event-study estimates from the two-way fixed effects regression equation, or Eq. (3). The equation includes all the controls, individual FE, and year dummies. The (red) solid flat line indicates the y axis of zero. The dashed lines represent the 95% confidence intervals for each point estimate. Standard errors are robust to municipal clusters.