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Welfare Benefits and Labor Supply: Evidence from a natural experiment in Japan*

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Abstract

We use municipal amalgamations in Japan to identify the impact of welfare benefits on labor supply. In municipal amalgamations, under Japan's Public Assistance (PA) program, municipalities with the highest class-areas become the new municipality and the basis for calculating welfare benefit levels. We use a difference-in-differences approach to identify the effect of the increase in PA benefits in Japan after municipal amalgamations on the labor supply. We found that an increase in PA benefit levels has little impact on the employment rate of prime-age populations but decreases that of bereaved or divorced women by 1.2% to 1.8%.

Keywords: Public assistance, Labor supply, Natural experiment, Difference in differences
JEL classification: H53; J22

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1. Introduction

In this study, we use municipal amalgamations implemented in Japan in the mid-2000s as a natural experiment to identify the impact of welfare benefits on labor supply. In Japan, the maximum benefit level of the Public Assistance (PA) program for a person with zero income depends on the recipient's municipality and on individual attributes such as age and family type. Each municipality is assigned to one of the six class-areas, each with different benefit levels. When municipalities with different class-areas amalgamate, the highest class-area must be applied to the new municipality, as per governmental notification. While Japan strongly promoted municipal amalgamations to reduce the number of municipalities in the early 2000s, the PA program itself did not change, and the guaranteed amount of PA benefits in each class-area remained constant during the same period. Therefore, only municipal amalgamations caused exogenous increase in the guaranteed amount of PA benefits for residents of an amalgamation of different benefit levels.

Historically, analyses of PA programs have focused on the effects of benefit levels and benefit reduction rates. The canonical static model of labor supply predicts that an increase in the maximum benefit level available to non-workers inevitably undermines work incentives because of the income effect and/or substitution effect. In the empirical literature, the first wave of studies mostly consist of structural or quasi-structural models and find almost universally that PA programs negatively affect the labor supply (Moffitt, 1992, 2002). Since the late 1990s, most developed countries have conducted welfare reforms that intensify their activation strategies. Among others, welfare reform legislation in the United States and the EU (Personal Responsibility and Work Opportunity Reconciliation Act of 1996 and Luxembourg Employment Guidelines adopted of 1997, respectively) were key to defining the vision of active labor market policy based on activation principles (OECD, 2005). Particularly, in the United States, states are given considerable discretion in setting eligibility rules and benefit levels for many assistance programs, generating a further wave of studies utilizing cross-state variations of PA programs (Moffitt, 2002).

However, evaluating the effects of the welfare reforms on work incentives comes with some difficulties (Blank, 2002), such as the coincidence and interaction of the historic economic boom, the implementation of welfare reforms, and the simultaneous implementation of multiple policy changes. For example, the new public assistance program, the Temporary Assistance for Needy Families, was implemented simultaneously in all states, and there were no cross-state variations after the introduction of the new program. Hence, Lemieux and Milligan (2008) exploit an age-based policy adopted by Quebec, Canada, and use a regression discontinuity design to identify the impact of welfare payments on various labor market outcomes.[1] Bargain and Doorley (2011) employ a similar empirical strategy to identify the effects of a French social assistance program called RMI, and find that it reduces the employment of less-

[1]Fortin et al. (2004) utilize the same policy change to estimate the effect of social assistance on the duration of social assistance using the difference-in-differences approach.

educated single men by 7%–10%. Bergolo and Cruces (2021) examine the impact of social assistance programs in Uruguay on the employment of adults in beneficiary households with high informality. Using sharp discontinuity around the poverty score threshold introduced by the program eligibility rules, they find a reduction in the formal labor force of about 6 percent for all beneficiaries and 8.7 percent for single mothers.

The natural experiment employed in this study can also overcome evaluation difficulties. First, we evaluate the impact of the *unintended* increase in PA benefits that occurred after the municipal amalgamations. Generally, the central and/or local government conducts welfare reforms to manage changes in the economic environment. Hence, the implementation of welfare reforms is not necessarily random and cannot be considered a natural experiment. The Japanese welfare system is characterized by nationwide implementation, and no policy variation exists among regions. The PA system was reformed to intensify the activation strategy by introducing a job search requirement and in-work benefits in the mid-2010s. However, no change was observed in the policy during the 2000s (the observation period of this study). Therefore, an increase in the guaranteed amount of PA benefits after amalgamation of municipalities with different benefit levels can be considered a natural experiment, without any welfare reform. Moreover, as municipal amalgamations do not always result in changes in the guaranteed amount of PA benefits, we use them as a control group to control for the effect of the municipal amalgamations *per se* on regional employment.

Second, although the recent wave of studies focusing on age-based policies utilize random assignment to treatment groups, estimated effects are restricted to a particular age group. Therefore, generalizing these results to a broader population is difficult. In contrast, the event we utilize in this study affects all low-income households living in the affected municipalities. Thus, we can examine not only the average effect on the subpopulation but on a broader population.

Finally, our study omits the effect of minimum wages on welfare recipients. Previous studies suggest that minimum wages positively impact PA caseloads (Page et al., 2005). Minimum wage in Japan is set mainly by prefecture level, according to the Minimum Wage Law that was officially amended in 2007, in response to inefficiency of the legal minimum wage as a safety net (Sekine, 2008). Since then, minimum wages in each region have continued to rise. However, since the regional divisions of the minimum wage are different from those of the PA system, we can exclude the effect of the minimum wage by controlling for prefecture-specific year effects.

The remainder of this paper is organized as follows: Section II explains the institutional background and discusses the main features of municipal amalgamations; Section III describes the data and the empirical model; Section IV reports the main findings; Section V provides a robustness check; and finally, Section VI concludes.

2. Institutional Background

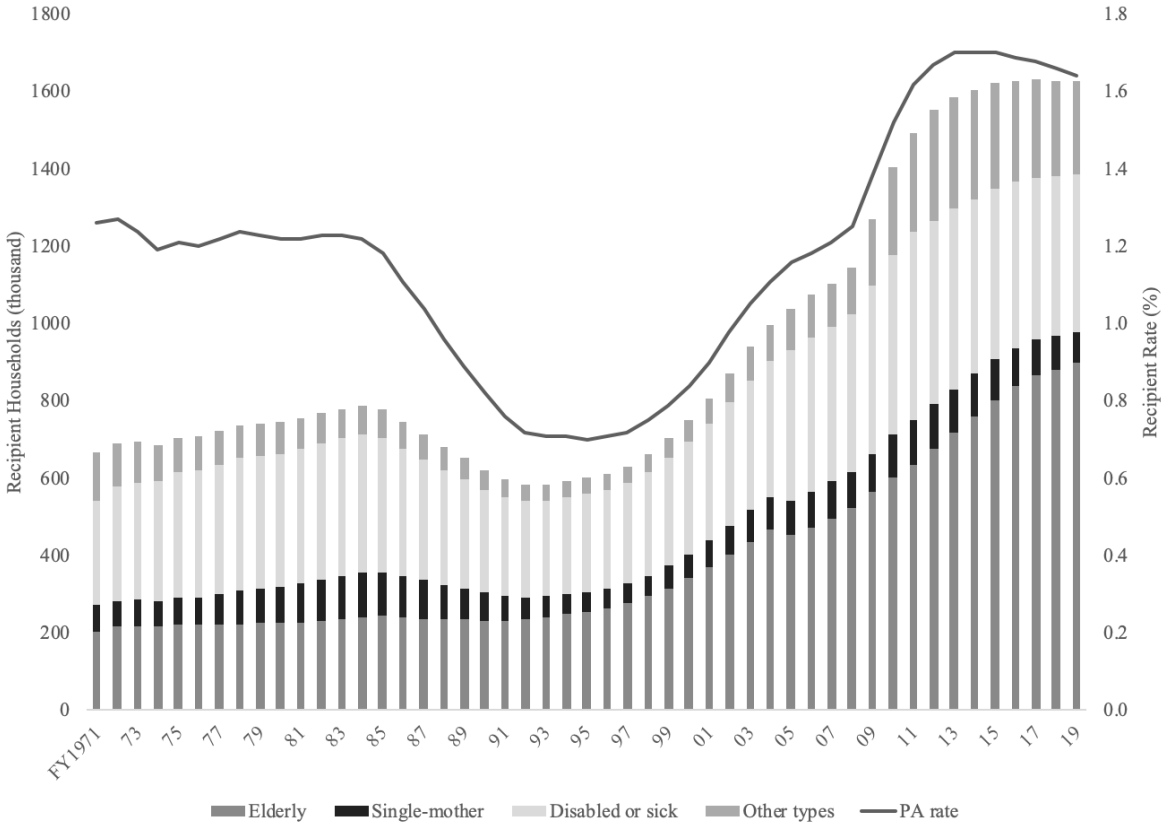
2.1 PA Program in Japan

In Japan, the PA Act of 1950[2] allows all citizens to claim PA, but aid must be supplementary to a person's best efforts and available resources. The guaranteed amount of PA benefits for those with zero income is called the "minimum cost of living" (MCL) and includes livelihood, housing, educational, medical, long-term care, maternity, occupational, and funeral expenses. When calculating MCL, the differences in ages and living costs among regions are considered, and the amount of livelihood assistance is determined by the number of children and adults, age, and residency area. Amount of assistance is calculated by subtracting final household income from MCL.[3] If MCL exceeds the final income, the difference is provided as assistance. Thus, if public assistance recipients are working, they face a marginal tax rate close to 100%.

Figure 1 shows the change in the PA recipient rate, defined as a portion of a household. Recipient rate was lowest, at 0.68%, in 1995, and considerably increased to 1.64% in 2012 (monthly average). PA recipients increased during the same period and reached a record of 1.6 million households and 2.2 million individuals in March 2015 (monthly average). Furthermore, most recipient households were households with elderly (43.7%, 2012) and disabled or sick individuals (30.6%, 2012). Other types and single-mother households, considered the working population, also increased, reaching 26.0% of recipient households in 2012. Therefore, the causal relationship between work incentives and the PA program should be examined.

[2] The description of Public Assistance program is based on the National Institute of Population and Social Security Research (IPSS; 2014).

[3] The program includes income deductions for both earners and income job finders. However, the amount of the deductions remains relatively small, and recipients face 83%–100% effective marginal tax rates in the case of employment (Iwamoto and Hamaaki, 2008).



Note: The numbers are monthly averages for each fiscal year. PA: Public Assistance

Source: Ministry of Health, Labor, and Welfare, "National Survey on Public Assistance Recipients"

Fig. 1. Changes in Public Assistance Use in Japan

Rapid aging of Japan's population and unemployment are the main determinants of variation in PA recipient rates, contributing to rapid increase in PA in Japan (Suzuki and Zhou, 2007; Zhou and Suzuki, 2012). In their empirical study, Abe and Tamada (2007) examine the effect of PA benefit levels on labor supply. They assess the extent of regional disparities in the ratio of earnings by low-wage labor (e.g., minimum wage or part-time jobs) to PA benefit levels. The study examines the relationship between the relative level of low-wage earnings to benefit levels and the employment–population ratio for men. Their findings show a positive relationship between the relative level of part-time earnings and employment ratio for less-educated men only. Although this suggests that an (relative) increase in benefit levels reduces the labor supply for the specific worker group, the causal relationship between the two remains unclear. Yamada and Komamura (2018) use microdata from the *Survey on Living by Social Security* conducted by the Ministry of Health, Labour and Welfare (MHLW) to examine the effects of the supplementary payment to single-mother PA recipients (reintroduced in December 2009). They find that an increase in the supplementary payment to a single mother negatively affects the employment rate. However, since the *Survey on Living by Social Security* collects information from about 1,100 PA recipient households nationwide, only recipients who are likely to cooperate with the survey are selected.

2.2 Municipal Amalgamation as a Natural Experiment

The PA Act (Article 8, Paragraph 2), livelihood assistance, which consists a significant part of the MCL, varies by recipient residency areas owing to differences in price levels and ways of living among regions. This "Class-Area System" was launched in 1978, when all municipalities in Japan were classified into three class-areas. In 1987, each area was then subdivided into two groups, resulting in six class-areas (Table 1).

Table 1 Classification of Class-Area

Class area	Example of municipality
1st class area-1 (Area 1-1)	Special wards of Tokyo, Yokohama City, Nagoya City, Osaka City, Kobe City, etc.
1st class area-2 (Area 1-2)	Sapporo City, Chiba City, Otsu City, Okayama City, Hiroshima City, Fukuoka City, etc.
2nd class area-1 (Area 2-1)	Morioka City, Mito City, Shizuoka City, Nara City, Matsue City, Naha City, etc.
2nd class area-2 (Area 2-2)	Hitachi City, Nagaoka City, Mishima City, Kakogawa City, Sasebo City, etc.
3rd class area-1 (Area 3-1)	Hirosaki City, Tochigi City, Hikone City, Miki City, Imabari City, etc., and some of the towns and villages are included.
3rd class area-1 (Area 3-2)	Yuki City, Sasayama City, Uwajima City and rest of the towns and villages.

Source: Ministry of Health, Labor, and Welfare, eds., The *Handbook of Public Assistance* (*Seikatsu Hogo Techo*).

Municipalities are then ranked according to population size and price levels. For example, large cities, such as special wards of Tokyo, Yokohama, and Osaka, are ranked as 1st class-area-1 (Area 1-1), and all towns and village municipalities are ranked as either 3rd class-area-1 (Area 3-1) or 3rd class-area-2 (Area 3-2). Differences in livelihood assistance among areas have been set at 4.5% since April 1992. Therefore, the difference between the highest (Area 1-1) and lowest (Area 3-2) class-areas was maintained at 22.5%. Table 2 shows examples of the standard amount of livelihood assistance (monthly) in FY 2005.

Table 2: Examples of the Standard Amount of Livelihood Assistance (Monthly) in FY 2005

	Area 1-1	Area 1-2	Area 2-1	Area 2-2	Area 3-1	Area 3-2
Three-person household (33, 29, and 4 years old)	167,170	159,870	152,580	145,270	137,980	130,680
Single-person household (68 years old)	80,820	77,190	73,540	69,910	66,260	62,640
Single-mother households (30 and 4 years old)	144,620	139,460	132,680	127,510	120,740	115,570

Note 1: Unit is yen.

Note 2: Amount of livelihood assistance includes winter supplementary payments (monthly amount in VI ward multiplied by 5/12), supplementary payment for raising children, and supplementary payment to single-mothers.

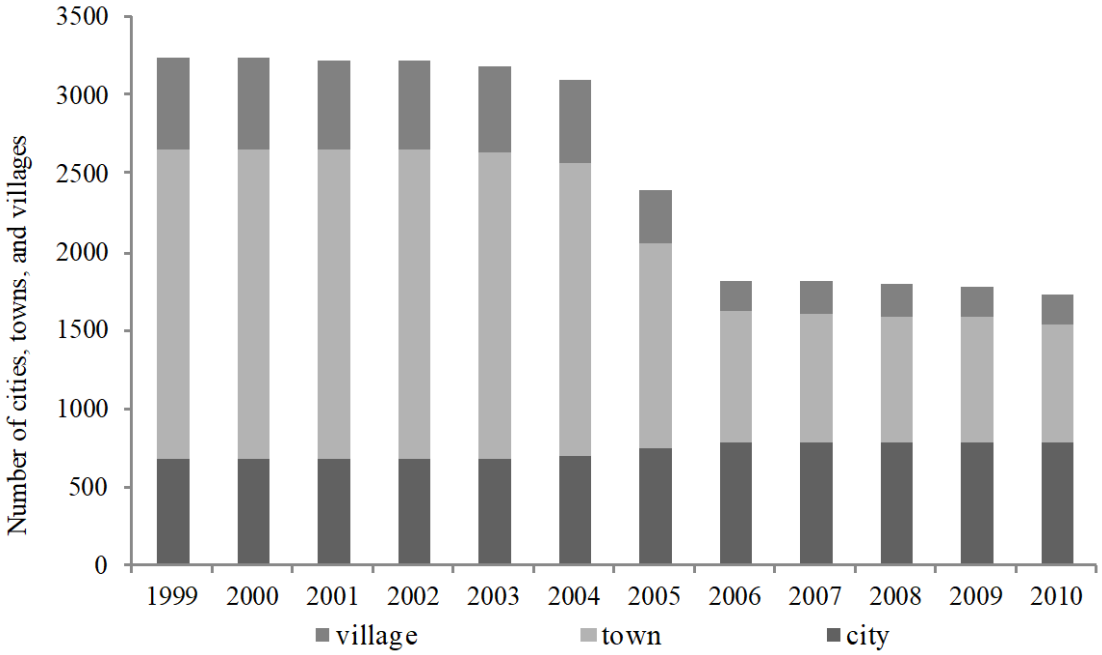
Source: Ministry of Health, Labor, and Welfare, eds., The *Handbook of Public Assistance* (*Seikatsu Hogo Techo*).

While the MCL levels are set periodically by regulations, the revision of the PA program was uniform throughout the nation and did not include regional variations in benefit levels. For residents of municipal amalgamations of different benefit levels, municipal amalgamations acted as a source of exogenous increases in the MCL for residents of municipal amalgamations of different benefit levels. A notification from the Social Welfare Bureau, MHLW to the Prefectural Governors and Mayors of Designated Cities issued in 1966[4] stated that "in case of amalgamations among municipalities ranked under different class-areas, the highest class-area among them must be applied to the new municipality." Hence, residents in lower class-areas experienced increased MCL after the municipal amalgamations.

In the early 2000s, Japan experienced large-scale municipal amalgamations. Since 1995, the Japanese government has repeatedly revised the Special Municipal Amalgamation Law to strengthen their administrative and financial foundation, for efficient and effective implementation, by consolidating municipalities (Yokomichi, 2007). Amendments to the Law were based on the Uniform Decentralization Law in July 1999, and the central government supported the amalgamations. Amendments contained several measures that provided incentives for municipal amalgamations, including extending the periods for the calculation of exceptional local allocation taxes and for establishing special amalgamation bonds. Many municipalities responded by adhering to the process of merging with neighboring municipalities when the Municipal Amalgamation Law (i.e., "the Great Heisei Amalgamation") was implemented.

[4]"Guidance of Area Classification Concerning Standards of Public Assistance Act" (Notification No. 160 dated May 18, 1966)

Therefore, the total number of municipalities in Japan declined sharply, with the total number of municipalities decreasing from 3,229 in April 1999 to 1,821 in March 2006 (Figure 2).



Source: Ministry of Internal Affairs and Communications, "Change in the Number of Municipalities"

Fig. 2. Number of Cities, Towns, and Villages in Japan

As mentioned previously, small municipalities such as towns and villages have a low class-area rank. Hence, small municipalities often face an exogenous increase in MCL when they are amalgamated with larger municipalities. We highlight the following four features of the Great Heisei Amalgamation as a natural experiment. First, it was mainly intended for strengthening the administrative and financial foundations of the municipalities through economies of scale and scope (Miyazaki, 2005). Consequently, the guaranteed amount of benefits changed automatically after amalgamation. Second, guaranteed amounts of benefit levels did not always change after amalgamation. Even when several towns and villages were consolidated and formed a new city, the standard amount of livelihood assistance did not change, except in the case of amalgamations of municipalities from different class-areas. Therefore, municipalities can be used as a control group to eliminate unobservable effects of amalgamations on outcomes such as caseloads of PA and employment. Third, as exogenous change in the guaranteed amount of benefits affects all low-income households living in the affected municipalities, we examined not only the average effect for the subpopulation but also the average treatment effect for a broader population. Finally, increased livelihood assistance in some municipalities during the Great Heisei Amalgamation constitutes a unique source of the change in regional variations during the 2000s. After 1984, the standard amount of livelihood assistance was revised regularly relative to the general public's consumption levels. Nominal amount of livelihood

assistance was also reduced by 1% from FY 2000 to FY 2005 owing to declining consumption levels, with supplementary payment to PA recipients over the age of 70 being abolished in FY 2006. Additionally, supplementary payments to single-mother recipients were abolished in April 2009 and reintroduced in December 2009. However, these revisions were uniform throughout the country. Thus, we can control for the change in the average benefit level and identify the effect of the exogenous increase in the benefit on certain outcomes. Our model predicts that adjustment of workers occurs mostly at the extensive margin (adjustment of employment) than at the intensive margin (adjustment of hours worked).

3. Data and Estimation

3.1 Data Description

On demographic attributes and labor market performance of the municipalities, we use aggregate data from the 1995–2010 *Population Census* conducted by the Statistics Bureau, Ministry of Internal Affairs and Communications (MIAC). The survey contains information about the population, the number of people employed, and the number of people unemployed per reference week every 5 years and per municipality. Additionally, data on each class-area per municipality in April of each year in the PA system were collected from the *Handbook of Public Assistance* (*Seikatsu Hogo Techo*).

Although the Great Heisei Amalgamation started in April 1999 and finished in March 2006, several amalgamations occurred from FY 2004 to FY 2005. While the annual number of amalgamations were in single digits from FY 1999 to FY 2002, these increased to 30 in FY 2003, 215 in FY 2004, and 325 in FY 2005. After the end of the Great Heisei Amalgamation, the number of amalgamations decreased sharply to 12 in FY 2006. Since we can only observe the employment outcome for municipalities every 5 years, FY 2005 and FY 2010 are candidates for the post-amalgamation period. However, we focus on FY 2010 instead of FY 2005 as the post-amalgamation period for the following two reasons. First, as FY 2005 has the highest number of amalgamations, if we focus on FY 2005 as the post-amalgamation period, we must exclude the amalgamated municipalities in that year from the sample. Second, although the second largest number of amalgamations occurred in 2004, a lag time before the effects of the amalgamations may be found. Therefore, our analysis focuses on the 2000–2010 period.

We construct municipal panel data as follows: First, when examining the impact of amalgamations occurring between FY 2004 and FY 2006, which was the middle of the analysis period and had the largest number of amalgamations, we restrict our sample to those municipalities that amalgamated between April 1, 2004 and March 31, 2007. We also construct the data for FY 2004 and FY 2005, respectively, which were the two years with the highest number of amalgamations during the era of the Great Heisei Amalgamation. Second, we set our municipality sample as of March 31, 2011, and merged all data for pre- and/or post-amalgamations at the unit level for all amalgamated municipalities.[5] Finally, we

[5] Kofu City, which divided and partially amalgamated Kamikyuishiki Village in FY 2005, and Fujikawaguchiko Town, which amalgamated the other part of the village, are omitted from the analysis. Municipalities that amalgamated in other fiscal years are

divide our municipality sample into two groups: (1) amalgamated municipalities without a change in class-area, and (2) amalgamated municipalities with a change in class-area. We regard the former as a "control group," and the latter as a "treatment group," as low-wage workers experienced an exogenous increase in the MCL after the municipal amalgamations. No municipalities ranked in the highest class-area among the "treatment group" experienced changes in their class-area. However, the Great Heisei Amalgamation promoted inter-municipality mobility, especially between amalgamated central cities and peripheral towns and villages that amalgamated with the central cities (Hatakeyama, 2013). Therefore, we regard those amalgamated municipalities, *including* municipalities that experienced a change in their class-area as a "treatment group." The final sample for FY 2004–FY 2006 comprised 501 municipalities, of which 269 amalgamated without a change in class-area, and 232 experienced a change in class-area. For FY 2004, in 197 municipalities, 113 amalgamated without a change in class-area and 84 experienced a change in class-area. For FY 2005, in 286 municipalities, 149 amalgamated without a change in class-area and 137 experienced a change in class-area.

Regarding the target of the analysis, we assume that people are likely to receive welfare benefits. This is attributable to the unevenly distributed risk of poverty and employment opportunities in the economy, which cause the impacts of the changes in PA benefit levels on the labor supply to vary across demographic groups. Particularly, according to the *National Survey on Public Assistance Recipients* conducted by MHLW in 2004, among households on PA, single-mother households have the highest labor force participation rate (50%), followed by other types of households (38%). Households with disabled or sick individuals exhibit low participation rates (Komamura, 2008). Moreover, according to the *Nationwide Survey on Single Parent Households* conducted by the MHLW in 2003, the PA rate for single-mother households was 10.2%, which is higher than the overall PA recipient rate. This means that single-mother households are more likely to participate in the labor market and to receive PA benefits. Therefore, we should examine the impact of PA benefits on employment, focusing on single-mother households. Here, we regard the bereaved or divorced (single) women as single-mother households. We focus on bereaved or divorced women between the ages of 25 and 49, since mothers aged over 50 often have children who are grown and are no longer considered single-parent households. Additionally, we also analyze prime-age groups (25–54 years), who are at low risk of poverty, to compare with bereaved or divorced groups.

Table 3 shows the weighted average employment rate among the bereaved or divorced people and the prime-age people for each fiscal year of the amalgamation. Heterogeneity exists between the two regions in terms of their labor markets: the employment rates of the amalgamated municipalities without a class-area change (control) are consistently higher than those of amalgamated municipalities with a class-area change (treatment). Focusing on bereaved or divorced women, in municipalities that amalgamated in FY 2005, the treatment group appears to bring a greater decrease in employment rates only during the era

also omitted from the analysis for each of the FYs 2004–2006, 2004, and 2005.

of the Great Heisei Amalgamation. However, the treatment group in the other cases showed a decrease in employment rates even before the amalgamations. According to the descriptive statistics, no exogenous change in guaranteed PA benefits found during the mid-2000s induced recipients to leave the labor market. Therefore, controlling for observable characteristics of municipalities affecting the employment rate and then examining the impact of the exogenous increase in PA benefits on the outcomes were necessary.

Table 3: Employment Rate by Municipality Group and Year

(a) Bereaved or Divorced Women

		1995	2000	2010	Change between 2000-1995	Change between 2010-2000	N
Municipalities that amalgamated between FY 2004 and FY 2006	Amalgamated without class-area change	0.843	0.835	0.820	-0.008	-0.015	269
		(0.045)	(0.042)	(0.046)	(0.027)	(0.036)	
	Amalgamated with class-area change	0.830	0.821	0.797	-0.009	-0.025	232
		(0.035)	(0.037)	(0.040)	(0.016)	(0.024)	
Municipalities that amalgamated in FY 2004	Amalgamated without class-area change	0.846	0.839	0.828	-0.007	-0.012	113
		(0.036)	(0.033)	(0.038)	(0.027)	(0.033)	
	Amalgamated with class-area change	0.832	0.819	0.801	-0.013	-0.019	84
		(0.031)	(0.035)	(0.037)	(0.015)	(0.020)	
Municipalities that amalgamated in FY 2005	Amalgamated without class-area change	0.840	0.831	0.815	-0.008	-0.017	149
		(0.050)	(0.048)	(0.049)	(0.027)	(0.037)	
	Amalgamated with class-area change	0.831	0.823	0.796	-0.008	-0.028	137
		(0.040)	(0.040)	(0.043)	(0.017)	(0.024)	

(b) Bereaved or Divorced Men

		1995	2000	2010	Change between 2000-1995	Change between 2010-2000	N
Municipalities that amalgamated between	Amalgamated without class-area	0.893	0.875	0.833	-0.017	-0.043	269
		(0.052)	(0.059)	(0.087)	(0.035)	(0.069)	

FY 2004 and FY 2006	change						
	Amalgamated with class-area change	0.884	0.862	0.811	-0.023	-0.053	232
		(0.042)	(0.050)	(0.057)	(0.022)	(0.045)	
Municipalities that amalgamated in FY 2004	Amalgamated without class-area change	0.894	0.872	0.822	-0.021	-0.050	113
		(0.061)	(0.069)	(0.123)	(0.036)	(0.097)	
	Amalgamated with class-area change	0.878	0.857	0.806	-0.022	-0.052	84
		(0.040)	(0.050)	(0.063)	(0.024)	(0.034)	
Municipalities that amalgamated in FY 2005	Amalgamated without class-area change	0.892	0.877	0.839	-0.015	-0.039	149
		(0.046)	(0.051)	(0.048)	(0.034)	(0.041)	
	Amalgamated with class-area change	0.888	0.863	0.815	-0.024	-0.050	137
		(0.046)	(0.053)	(0.057)	(0.021)	(0.050)	

(c) Prime-age Total

		1995	2000	2010	Change between 2000–1995	Change between 2010–2000	N
Municipalities that amalgamated between FY 2004 and FY 2006	Amalgamated without class-area change	0.832	0.824	0.812	-0.007	-0.012	269
		(0.038)	(0.036)	(0.034)	(0.008)	(0.017)	
	Amalgamated with class-area change	0.792	0.784	0.775	-0.008	-0.008	232
		(0.040)	(0.041)	(0.037)	(0.007)	(0.015)	
Municipalities that amalgamated in FY 2004	Amalgamated without class-area change	0.834	0.828	0.816	-0.006	-0.012	113
		(0.038)	(0.036)	(0.035)	(0.008)	(0.018)	
	Amalgamated with class-area change	0.790	0.784	0.776	-0.007	-0.007	84
		(0.044)	(0.044)	(0.041)	(0.006)	(0.012)	
Municipalities that amalgamated in FY 2005	Amalgamated without class-area change	0.831	0.822	0.810	-0.008	-0.012	149
		(0.038)	(0.036)	(0.032)	(0.008)	(0.016)	

	Amalgamated with class-area change	0.795	0.787	0.778	-0.008	-0.008	137
		(0.040)	(0.040)	(0.034)	(0.007)	(0.015)	

(d) Prime-age Women

		1995	2000	2010	Change between 2000–1995	Change between 2010–2000	N
Municipalities that amalgamated between FY 2004 and FY 2006	Amalgamated without class-area change	0.712	0.718	0.738	0.006	0.022	269
		(0.068)	(0.061)	(0.051)	(0.014)	(0.023)	
	Amalgamated with class-area change	0.639	0.650	0.680	0.011	0.032	232
		(0.069)	(0.063)	(0.050)	(0.010)	(0.020)	
Municipalities that amalgamated in FY 2004	Amalgamated without class-area change	0.718	0.724	0.745	0.007	0.021	113
		(0.066)	(0.059)	(0.048)	(0.014)	(0.023)	
	Amalgamated with class-area change	0.638	0.649	0.682	0.012	0.035	84
		(0.076)	(0.070)	(0.057)	(0.011)	(0.017)	
Municipalities that amalgamated in FY 2005	Amalgamated without class-area change	0.710	0.715	0.735	0.006	0.022	149
		(0.067)	(0.060)	(0.050)	(0.014)	(0.023)	
	Amalgamated with class-area change	0.644	0.654	0.683	0.011	0.031	137
		(0.068)	(0.061)	(0.047)	(0.011)	(0.022)	

(e) Prime-Age Men

		1995	2000	2010	Change between 2000–1995	Change between 2010–2000	N
Municipalities that amalgamated between FY 2004 and FY 2006	Amalgamated without class-area change	0.951	0.929	0.885	-0.022	-0.045	269
		(0.020)	(0.022)	(0.029)	(0.008)	(0.017)	
	Amalgamated with class-area change	0.947	0.919	0.870	-0.028	-0.049	232
		(0.016)	(0.022)	(0.031)	(0.010)	(0.017)	

Municipalities that amalgamated in FY 2004	Amalgamated without class-area change	0.950	0.930	0.886	-0.020	-0.044	113
		(0.020)	(0.023)	(0.033)	(0.007)	(0.020)	
	Amalgamated with class-area change	0.947	0.920	0.870	-0.027	-0.049	84
		(0.014)	(0.021)	(0.030)	(0.010)	(0.016)	
Municipalities that amalgamated in FY 2005	Amalgamated without class-area change	0.950	0.928	0.883	-0.022	-0.045	149
		(0.020)	(0.022)	(0.026)	(0.008)	(0.014)	
	Amalgamated with class-area change	0.948	0.921	0.873	-0.027	-0.047	137
		(0.018)	(0.024)	(0.030)	(0.009)	(0.015)	

Notes: Standard deviations are shown in parentheses. The employment rate is defined as the number of jobs divided by the respective population.

3.2 Estimation Model

First, we use a difference-in-differences (DID) model for the municipalities that amalgamated between FY 2004 and FY 2006, with the group that experienced a change in class-area during this period as the treatment group and the never-treated group as the control group[6]. Specifically, we estimate the following first-difference regression model (FD-DID):

$$\Delta emp_{ij2010} = \beta_0 + \beta_1 r_{ij} + \Delta x_{ij2010}\gamma + \delta p_{ij2000} + \phi_{c2010} + c_{j2010} + \mu_{ij2010}, \quad (1)$$

$$\Delta emp_{ij2000} = \beta_0 + \beta_1 r_{ij} + \Delta x_{ij2000}\gamma + \delta p_{ij1995} + \phi_{c2000} + c_{j2000} + \mu_{ij2000}, \quad (1)'.$$

Here, Δemp_{ij2010} in equation (1) is the change in the employment rate for municipality *i* of prefecture *j* from year 2000 to year 2010, and Δemp_{ij2000} in equation (1)' is the change in the employment rate from 1995 to 2000, the period of the placebo test. r_{ij} is a dummy variable indicating whether the amalgamated municipalities include municipalities that experienced a change in their class-area. Δx_{ij2010} and Δx_{ij2000} denote changes in control variables from 2000 to 2010 and from 1995 to 2000 as a placebo test, including the bereaved or divorced people as a share of the working-age population (or prime-age people as a share of the working age population) and the unemployment rate of prime-age (25–54) men. p_{ij2000} and p_{ij1995}

[6]Employment rates in the absence of treatment (during FY 1995–FY 2000) are different (Table 3). Therefore, we could use a propensity score matching method using the pre-treatment covariates. However, as candidates for covariates, we used the industry ratio, local allocation tax grants, specific grants, bonds, area, and so on. However, these values could not be appropriate as they are averages of municipalities before the amalgamation. Additionally, after many attempts, covariates were hardly balanced, so this study uses a DID approach.

denote the public employment share in municipality i in 2000 (1995 for the placebo test), which controls for the effect of the consolidation of municipal offices on local employment. ϕ_{c2010} and ϕ_{c2000} denote a region-specific effect for the lowest class-area in 2000, capturing heterogeneous trends in the regional labor markets. c_{j2010} and c_{j2000} denote prefecture-specific trends, which capture differences in labor market conditions by prefecture, including the prefectural minimum wages, industrial structure, economic growth rate, and so on. Finally, u_{ij2010} and u_{ij2000} are error terms. As we eliminate the unobservable effect of amalgamations on employment, and of other determinants, the DID estimator β_1 can be regarded as an average treatment effect on the treated (ATT) of the increase in the guaranteed amount of benefits caused by the Great Heisei Amalgamation. Note that all estimations in this study use weights based on the size of the population in the year 2000 (1995 for the placebo test) for a corresponding group and calculates robust standard errors clustered at the prefecture level, of which 47 can be found.

It should be noted that equations (1) and (1)' assume that the treatment effect is homogeneous regardless of the timing of treatment, that is, it is not a dynamic treatment effect. However, recent literature revealed the problem of heterogeneity of treatment effects in staggered DID with different treatment timing (Baker et al., 2022). To address this issue, some studies have proposed the estimation of dynamic treatment effect by timing of treatment. (Cengiz et al., 2019; Callway and Sant'Anna, 2020; de Chaisemartin and D'Haultfoeuille, 2020; Sun and Abraham, 2020).

However, in this study, we only use the data for FY 2000 and FY 2010 due to data limitations. Thus, for each observation, the timing of the treatment (e.g., treatment in 2004) corresponds uniquely to the time points observed before (e.g., lead in 6 years) and after (e.g., lag in 4 years) the treatment. Therefore, it is inappropriate to use the event-study approach to identify heterogeneous treatment effects by timing of treatment.

Consequently, we create a treatment and control group dataset for each treatment timing for FY 2004 and FY 2005, the years with the highest number of amalgamations, and estimate the equations (1) and (1)'. Hence, the estimated average treatment effect reflects both differences in the timing of treatment and differences in the timing of pre- and post-treatment observations.

Although the above approach can identify the effect of an exogenous increase in PA benefits during the Great Heisei Amalgamation on the labor supply, we cannot evaluate the effect quantitatively. Ideally, we should calculate the average change in the benefits that residents face by municipality and use these estimated benefits to identify the elasticity of labor participation with respect to the marginal increase in the benefit level, among others. Unfortunately, because a guaranteed level of benefits depends on age and family structure, as well as region, we cannot estimate the benefit levels precisely owing to the lack of detailed municipality data.

We address this issue by classifying the treatment group to capture the increase in benefits in detail. Specifically, we classify the treatment group into three categories, according to the extent of changes in the lowest class-area from 2000 to 2010: (1) change by one class-area, (2) change by two

class-areas, and (3) change by three or more class-areas. Here, control groups were categorized into group (0) as they did not experience changes in terms of class-area. Table 4 shows the pattern of amalgamations between municipalities by lowest class-area in 2000. For example, 173 of 457 municipalities included were ranked as Area 3-2 in 2000, and 2 of 41 municipalities were ranked as Area 3-1 in 2000, which amalgamated with municipalities ranked as Area 3-1 and Area 2-2, respectively. Thus, residents in pre-amalgamation municipalities ranked as lower class-areas, experienced a 4.5 % increase in the amount of livelihood assistance. Similarly, 25 (1 + 7 + 17) municipalities include municipalities that amalgamated with a two-rank increase, and 32 (1 + 3 + 3 + 25) municipalities include those that amalgamated with a three-rank increase in class-area, or higher.

Table 4: Pattern of Municipal Amalgamations from 1 April 2004 to 31 March 2007

The lowest class area in 2000	Class area in 2010						
	Area 1-1	Area 1-2	Area 2-1	Area 2-2	Area 3-1	Area 3-2	Total
Area 2-1	0	0	1	0	0	0	1
Area 2-2	0	1	0	1	0	0	2
Area 3-1	1	3	7	2	28	0	41
Area 3-2	0	3	25	17	173	239	457
Total	1	7	33	20	201	239	501

Based on the above definition, we estimate the following regression model:

$$\Delta emp_{ij2010} = \theta_0 + \sum_{k=0}^{3} \theta_1 r_{ijk} + \Delta x_{ij2010}\gamma + \delta p_{ij2000} + \phi_{c2010} + c_{j2010} + \nu_{ij2010}, \quad (2)$$

$$\Delta emp_{ij2000} = \theta_0 + \sum_{k=0}^{3} \theta_1 r_{ijk} + \Delta x_{ij2000}\gamma + \delta p_{ij1995} + \phi_{c2000} + c_{j2000} + \nu_{ij2000}, \quad (2)'.$$

Here, r_{ijk} is a set of dummy variables indicating the four patterns of municipality amalgamations, and ν_{ij2010} and ν_{ij2000} are error terms. Although r_{ijk} does not show the (affected) population-adjusted increase in the guaranteed amount of benefits, we can generally consider that guaranteed benefits of municipalities amalgamated with cities of a higher class-area increased with a change in class-area.

Table 5 displays summary statistics of the independent variables, both by municipality group and year. Overall, Japanese municipalities have experienced an increase in the number of bereaved or divorced women as a share of the working-age population and an increase in the unemployment rates of prime-age men since 1995. Among municipality groups, amalgamated municipalities without a class change (control group) are characterized by relatively large size and poor labor market performance in unemployment rate.

Table 5: Summary Statistics for Independent Variables by Municipality Group and Year

		Bereaved or divorced women as a share of the working-age population		Unemployment rate for prime-age males		Public employment share	
	Year	Amaglamated without class-area change	Amaglamated with class-area change	Amaglamated without class-area change	Amaglamated with class-area change	Amaglamated without class-area change	Amaglamated with class-area change
Municipalities that amalgamated between FY 2004 and FY 2006	1995	0.013	0.015	0.028	0.027	0.048	0.044
		(0.004)	(0.004)	(0.013)	(0.011)	(0.017)	(0.021)
	2000	0.014	0.016	0.036	0.036	0.048	0.044
		(0.004)	(0.004)	(0.013)	(0.012)	(0.017)	(0.021)
	2010	0.019	0.020	0.074	0.068	0.048	0.044
		(0.004)	(0.004)	(0.024)	(0.020)	(0.017)	(0.021)
Num. of Obs.		269	232	269	232	269	232
Municipalities that amalgamated in FY 2004	1995	0.013	0.015	0.027	0.026	0.048	0.044
		(0.003)	(0.004)	(0.011)	(0.008)	(0.014)	(0.022)
	2000	0.014	0.015	0.034	0.035	0.048	0.044
		(0.003)	(0.004)	(0.011)	(0.010)	(0.014)	(0.022)
	2010	0.019	0.020	0.074	0.065	0.048	0.044
		(0.004)	(0.004)	(0.024)	(0.018)	(0.014)	(0.022)
Num. of Obs.		113	84	113	84	113	84
Municipalities that amalgamated in FY 2005	1995	0.014	0.015	0.029	0.028	0.049	0.044
		(0.004)	(0.004)	(0.014)	(0.012)	(0.020)	(0.020)
	2000	0.015	0.016	0.037	0.037	0.049	0.044
		(0.004)	(0.004)	(0.014)	(0.012)	(0.020)	(0.020)
	2010	0.020	0.020	0.074	0.070	0.049	0.044
		(0.004)	(0.005)	(0.024)	(0.021)	(0.020)	(0.020)
Num. of Obs.		149	137	149	137	149	137

Notes: Standard deviations are in parentheses.

4. Effects of an Exogenous Increase in Welfare Benefits on Labor Participation

Table 6 presents the estimation results. Panels (a) and (b), (c) and (d), and (e) and (f) present weighted FD-DID estimates for bereaved or divorced women and men for municipalities that amalgamated in FY 2004–2006, FY 2004, and, FY 2005 respectively.

Table 6: First Difference Estimates for Bereaved or Divorced People

(a) Women among municipalities amalgamated in FY 2004–2006

	1995–2000		2000–2010	
	(1)	(2)	(3)	(4)
Δ unemployment rate for working-age population	-0.966***	-0.950***	-0.632***	-0.667***
	(0.242)	(0.236)	(0.169)	(0.152)
Δ working-age population	0.120	-0.0845	-1.396	-2.275*
	(1.414)	(1.576)	(1.164)	(1.291)
Lag of public employment share	0.105*	0.107*	0.313***	0.312***
	(0.0585)	(0.0578)	(0.107)	(0.107)
Area change dummy	0.000286		-0.0140***	
	(0.00264)		(0.00340)	
Change by one class-area		0.00175		-0.0103***
		(0.00258)		(0.00370)
Change by two class-areas		-0.00268		-0.0112**
		(0.00415)		(0.00505)
Change by more than three class-areas		-0.000307		-0.0205***
		(0.00369)		(0.00471)
Num. of Obs.	501	501	501	501
Adj. R2	0.153	0.153	0.261	0.278
F statistics	2.741	2.674	4.395	4.559
p-values	1.12e-08	1.70e-08	2.48e-18	9.31e-20

(b) Men among municipalities amalgamated in FY 2004–2006

	1995–2000		2000–2010	
	(1)	(2)	(3)	(4)
Δ unemployment rate for working-age population	-1.770***	-1.835***	-0.586***	-0.696***
	(0.318)	(0.311)	(0.195)	(0.166)
Δ working-age population	-3.692	-5.147**	-17.67***	-18.04***

	(2.280)	(2.308)	(5.895)	(5.916)
Lag of public employment share	0.0102	0.0142	0.131	0.122
	(0.0889)	(0.0776)	(0.139)	(0.129)
Area change dummy	-0.00778**		-0.0124***	
	(0.00297)		(0.00457)	
Change by one class-area		-0.00279		-0.00375
		(0.00310)		(0.00638)
Change by two class-areas		-0.00614		-0.0128*
		(0.00370)		(0.00747)
Change by more than three class-areas		-0.0150***		-0.0235***
		(0.00463)		(0.00523)
Num. of Obs.	501	501	501	501
Adj. R2	0.200	0.229	0.374	0.398
F statistics	3.398	3.745	6.748	7.130
p-values	1.81e-12	7.37e-15	1.08e-31	1.63e-34

(c) Women Among Municipalities that Amalgamated in FY 2004

	1995–2000		2000–2010	
	(1)	(2)	(3)	(4)
Δ unemployment rate for working-age population	-0.563*	-0.607**	-0.482***	-0.522***
	(0.279)	(0.271)	(0.174)	(0.168)
Δ working-age population	-0.586	-1.245	-1.205	-1.670
	(1.478)	(1.378)	(1.995)	(2.211)
Lag of public employment share	0.0602	0.0939	0.464***	0.451***
	(0.0746)	(0.0713)	(0.151)	(0.143)
Area change dummy	-0.00363		-0.0175***	
	(0.00481)		(0.00591)	
Change by one class-area		-0.000682		-0.0156**
		(0.00522)		(0.00716)
Change by two class-areas		-0.00345		-0.0269***
		(0.00672)		(0.00813)
Change by more than three class-areas		-0.00948		-0.0201***
		(0.00602)		(0.00693)
Num. of Obs.	197	197	197	197

Adj. R2	0.142	0.153	0.223	0.226
F statistics	1.756	1.786	2.306	2.269
p-values	0.00693	0.00510	0.000107	0.000121

(d) Men Among Municipalities that Amalgamated in FY 2004

	1995–2000		2000–2010	
	(1)	(2)	(3)	(4)
Δ unemployment rate for working-age population	-2.069***	-2.119***	-0.257	-0.472
	(0.501)	(0.480)	(0.318)	(0.321)
Δ working-age population	-0.269	-1.259	-14.12**	-14.48**
	(4.111)	(4.041)	(5.872)	(5.754)
Lag of public employment share	-0.0271	0.0354	0.116	0.179
	(0.154)	(0.126)	(0.210)	(0.178)
Area change dummy	0.00122		-0.00869	
	(0.00595)		(0.0110)	
Change by one class-area		0.00548		-0.00117
		(0.00628)		(0.0115)
Change by two class-areas		0.00554		-0.0122
		(0.00930)		(0.0154)
Change by more than three class-areas		-0.00967		-0.0287**
		(0.00892)		(0.0112)
Num. of Obs.	197	197	197	197
Adj. R2	0.196	0.216	0.426	0.453
F statistics	2.110	2.200	4.389	4.604
p-values	0.000494	0.000210	6.94e-12	8.65e-13

(e) Women among municipalities amalgamated in FY 2005

	1995–2000		2000–2010	
	(1)	(2)	(3)	(4)
Δ unemployment rate for working-age population	-1.075***	-1.043***	-0.625***	-0.684***
	(0.376)	(0.352)	(0.199)	(0.196)
Δ working-age population	0.741	0.648	-0.836	-0.876
	(1.833)	(1.817)	(1.815)	(1.826)
Lag of public employment share	0.102	0.109	0.211	0.199
	(0.0978)	(0.0969)	(0.143)	(0.129)
Area change dummy	0.00171		-0.0121**	
	(0.00285)		(0.00525)	
Change by one class-area		0.00378		-0.0114**
		(0.00335)		(0.00536)
Change by two class-areas		-0.00228		-0.00572
		(0.00586)		(0.00858)
Change by more than three class-areas		0.00134		-0.0196***
		(0.00441)		(0.00704)
Num. of Obs.	286	286	286	286
Adj. R2	0.199	0.197	0.241	0.248
F statistics	2.418	2.348	2.806	2.803
p-values	0.00000505	0.00000806	9.05e-08	6.68e-08

(f) Men among Municipalities that Amalgamated in FY 2005

	1995–2000		2000–2010	
	(1)	(2)	(3)	(4)
Δ unemployment rate for working-age population	-2.005***	-2.095***	-0.847***	-0.903***
	(0.424)	(0.436)	(0.253)	(0.263)
Δ working-age population	-3.962	-4.198	-16.97**	-16.87**
	(2.460)	(2.513)	(8.078)	(8.158)
Lag of public employment share	0.128	0.125	0.0600	0.0496
	(0.0843)	(0.0748)	(0.160)	(0.163)
Area change dummy	-0.0124***		-0.0100	
	(0.00381)		(0.00604)	
Change by one class-area		-0.00920**		-0.00573

		(0.00444)		(0.00691)
Change by two class-areas		-0.0119*		-0.00897
		(0.00655)		(0.00982)
Change by more than three class-areas		-0.0192***		-0.0195***
		(0.00490)		(0.00667)
Num. of Obs.	286	286	286	286
Adj. R2	0.323	0.334	0.433	0.437
F statistics	3.723	3.746	5.347	5.261
p-values	5.91e-12	2.77e-12	4.68e-19	5.05e-19

Note: Standard errors in parentheses are clustered by prefecture. In municipalities amalgamated between FY 2004 and FY 2006 (i.e., (a), (b)), the number of observations is 501, of which 269 pertain to the control group and 232 for the treatment group; in the case of municipalities amalgamated in FY 2004 (i.e., (c), (d)), the number of observations is 197, of which 113 pertains to the control group and 117 relate to the treatment group; in the case of municipalities amalgamated in FY 2005 (i.e., (e), (f)), the number of observations is 286, of which 149 pertains to the control group and 137 relate to the treatment group. The dependent variables are changes in the employment rate for each sub-group. Independent variables are change in unemployment rate for prime-age men, change in population share of each sub-group to total working-age population, lag of public employment share, the lowest class-area dummies in 2000, prefecture dummy variables, and constant. * p<0.10, ** p<0.05, *** p<0.01.

Coefficients of changes in regional labor market conditions (i.e., unemployment rate for prime-age men) have expected signs and are statistically significant in most models. As we focus on 2004–2006 municipality amalgamations, provided that both control and treatment groups have parallel trends, we observe treatment effects only during the period of the Great Heisei Amalgamation. Therefore, the negative effects for bereaved or divorced women are large (-1.2 % to -1.8 %) and statistically significant only after the treatment period (when evaluating the results with the area change dummy). Considering the difference in the magnitude of changes in class-area, most results were negative and statistically significant only after the treatment period, showing a 2.7 % reduction in employment rates. These groups are regarded as single-mother households, with recipient rates being higher than the population average. Conversely, in the placebo period, results are not significant for bereaved or divorced women, but negative and statistically significant for men in many cases.

Table 7 shows the weighted FD-DID estimates for the prime-age population at low risk of poverty by amalgamation year. The total, including women and men in Panel (a), is mostly statistically insignificant. However, some of the results are positive and statistically significant. In Panels (b) and (c), which separate women and men, statistically significant results are found for the placebo period (1995–2000) and for 2000–2010. Although Panels (b) and (c) must be interpreted carefully, adopting the results

in Panel (a) shows that the impact of changes in the level of PA benefits on the labor supply appears to be almost irrelevant for prime age.

Table 7: First Difference Estimates for Prime-Age Groups (25-54 years)

(a) Total

	Amalgamation in FY2004-2006		Amalgamation in FY2004		Amalgamation in FY2005	
	1995–2000	2000–2010	1995–2000	2000–2010	1995–2000	2000–2010
	(1)	(2)	(1)	(2)	(1)	(2)
Area change dummy	0.0000536	0.00239	-0.000778	0.00438	0.000795	-0.000156
	(0.00082)	(0.00196)	(0.00143)	(0.00305)	(0.00094)	(0.00257)
Change by one class-area	0.000282	0.000769	-0.0000189	0.00413	0.000396	-0.00204
	(0.00070)	(0.00207)	(0.00125)	(0.00320)	(0.00086)	(0.00229)
Change by two class-areas	0.00165	0.0042	-0.00138	0.0117*	0.0027	0.0014
	(0.00131)	(0.00319)	(0.00165)	(0.00683)	(0.00166)	(0.00390)
Change by more than three	-0.000834	0.00622**	-0.00217	0.00458	-0.000219	0.00548
class-areas	(0.00127)	(0.00244)	(0.00260)	(0.00506)	(0.00161)	(0.00413)

(b) Women

	Amalgamation in FY2004-2006		Amalgamation in FY2004		Amalgamation in FY2005	
	1995–2000	2000–2010	1995–2000	2000–2010	1995–2000	2000–2010
	(1)	(2)	(1)	(2)	(1)	(2)
Area change dummy	0.00517***	0.00736***	0.00252	0.00735*	0.00565***	0.00453
	(0.00127)	(0.00240)	(0.00191)	(0.00390)	(0.00181)	(0.00360)
Change by one class-area	0.00301**	0.00319	0.00252	0.0051	0.00301*	0.000497
	(0.00113)	(0.00265)	(0.00200)	(0.00427)	(0.00162)	(0.00332)
Change by two class-areas	0.00547***	0.0118***	0.00246	0.0221***	0.00720**	0.00772
	(0.00203)	(0.00375)	(0.00359)	(0.00679)	(0.00324)	(0.00512)
Change by more than three class-areas	0.00724***	0.0164***	0.00254	0.0153**	0.00916***	0.0156**
	(0.00177)	(0.00303)	(0.00333)	(0.00625)	(0.00223)	(0.00585)

(c) Men

	Amalgamation in FY2004-2006		Amalgamation in FY2004		Amalgamation in FY2005	
	1995–2000	2000–2010	1995–2000	2000–2010	1995–2000	2000–2010

	(1)	(2)	(1)	(2)	(1)	(2)
Area change dummy	-0.00497***	-0.00272	-0.00408**	0.00106	-0.00384***	-0.00482**
	(0.00100)	(0.00217)	(0.00185)	(0.00354)	(0.00126)	(0.00224)
Change by one class-area	-0.00232***	-0.00185	-0.00234*	0.00274	-0.00145	-0.00484**
	(0.00072)	(0.00198)	(0.00136)	(0.00323)	(0.00104)	(0.00206)
Change by two class-areas	-0.00341***	-0.00356	-0.00429***	0.00165	-0.00368**	-0.00521
	(0.00106)	(0.00349)	(0.00120)	(0.00931)	(0.00155)	(0.00376)
Change by more than three class-areas	-0.00877***	-0.00419	-0.00764***	-0.00668	-0.00882***	-0.00415
	(0.00151)	(0.00330)	(0.00275)	(0.00699)	(0.00240)	(0.00363)

Note: Standard errors in parentheses are clustered by prefecture. In the case of municipalities amalgamated between FY 2004 and FY 2006, the number of observations is 501, of which 269 pertain to the control group and 232 relate to the treatment group; in the case of municipalities amalgamated in FY 2004, the number of observations is 197, of which 113 pertain to the control group and 117 relate to the treatment group; in the case of municipalities amalgamated in FY 2005, the number of observations is 286, of which 149 pertain to the control group and 137 relate to the treatment group. The dependent variables are changes in the employment rate for each sub-group. Independent variables are change in unemployment rate for prime-age men, change in population share of each sub-group to total working-age population, lag of public employment share, the lowest class-area dummies in 2000, prefecture dummy variables, and constant. * p<0.10, ** p<0.05, *** p<0.01.

Our results show that increase in benefit levels lower the employment rate of bereaved or divorced women from 1.2 to 1.8 % points in the mid-2000s. The magnitude of the estimated effects is substantial compared to the sample mean change in the employment rate for these groups during the same period (-1.7 to -2.5% points). Conversely, the employment of the prime-age population, who were less likely to receive benefits, was unaffected.

5. Robustness Checks

Exogenous increase in the MCL in some cases of municipal amalgamations were assumed to have affected low-wage workers whose final income fell below the new standards of minimum living costs, inducing them to leave the labor market. Therefore, we evaluate the impact on the PA recipient rate by estimating the first-difference model, similar to equations (1), (1)', (2), and (2)'.

Data on the number of PA recipients are aggregated from the *Case Reports of Social Welfare Administration* reported by the MHLW. The data contain (monthly) averages of the number of PA recipients within each fiscal year, grouped by municipality. As data on the number of PA recipients under the age of 65 by town or village are only available for 14 prefectures (Miyagi, Ibaraki, Chiba, Gifu, Shizuoka, Aichi, Mie, Tottori, Shimane, Okayama, Tokushima, Kagawa, Fukuoka, and Nagasaki) for the

analysis period, municipalities other than these prefectures are omitted from the sample.[7] Additionally, we regard 2009 as 2010 in the analysis as data on the number of recipients were reported only until 2009.

Table 8 shows the results of the FD-DID estimates, where dependent variables are the change in the recipient rate among the population under the age of 65 in the late 1990s [Columns (1), (2), (5), (6), (9), and (10)] for the same group and in the 2000s [Columns (3), (4), (7), (8), (11), and (12)].[8] As expected, results indicate that an exogenous increase caused by municipal amalgamations raised the recipient rate during the treatment period; average recipient rate in the affected municipalities rose by 0.10 to 0.13% points more than that in non-affected municipalities. The magnitude of the estimated effects is non-negligible compared to the sample mean change in the recipient rate in the 2000s (+ 0.26 to 0.30% points). However, note that some results (e.g., those based on the extent of changes in the lowest class-area) also show an increase in the recipient rate in the placebo period. The sample for this study was limited by the unavailability of detailed data on PA in many municipalities; therefore, we need to analyze the results with more complete data in the future.

[7]Nakatsugawa City in Gifu Prefecture is not included in the data because it amalgamated with Yamaguchi Village in Nagano Prefecture.

[8]When calculating recipient rate, that is, the number of recipients of public assistance divided by the total population, we use data on the population under the age of 65 at of the end of March in each year from the *Basic Resident Registration* by MIAC.

Table 8: First Difference Estimates of the Exogenous Increase in Public Assistance Benefits on the Recipient Rate for Persons Under the Age of 65

	Amalgamation in FY2004-2006				Amalgamation in FY2004				Amalgamation in FY2005			
	1995–2000		2000–2010		1995–2000		2000–2010		1995–2000		2000–2010	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Δ unemployment rate for	0.00836	0.00416	0.0223	0.0236	-0.0112	-0.0108	-0.00661	0.00917	0.00445	0.0153	0.0477	0.0532
working-age population	(0.026)	(0.023)	(0.034)	(0.034)	(0.019)	(0.014)	(0.023)	(0.013)	(0.036)	(0.031)	(0.038)	(0.037)
Δ working-age population	0.000874	0.00092	-0.00123	-0.00125	0.000332	-0.000818	0.00536	-0.00263	0.000145	0.000522	0.00233	0.000404
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.006)	(0.004)	(0.003)	(0.003)	(0.005)	(0.005)
Lag of public employment	-0.00255	-0.00217	0.00907	0.00805	-0.000636	-0.00552	0.0269	-0.0281	0.00689	0.00527	0.0262	0.0208
share	(0.004)	(0.004)	(0.013)	(0.015)	(0.008)	(0.007)	(0.018)	(0.016)	(0.005)	(0.005)	(0.016)	(0.017)
Area change dummy	0.000249*		0.00105***		0.0003		0.000984**		0.000816		0.00125**	
	(0.00012)		(0.00024)		(0.00025)		(0.00037)		(0.00063)		(0.00050)	
Change by one class-area		0.000276		0.000969**		0.000158		0.0000811		0.00055		0.000749
		(0.00026)		(0.00041)		(0.00017)		(0.00037)		(0.00043)		(0.00048)
Change by two class-areas		0.000665		0.00172***		0.000491**		0.000762		0.00102		0.00111
		(0.00045)		(0.00050)		(0.00019)		(0.00046)		(0.00108)		(0.00077)
Change by more than three		0.000724*		0.00318***		0.000558		0.00410***		0.001000**		0.00268***
class-areas		(0.00037)		(0.00081)		(0.00053)		(0.00044)		(0.00046)		(0.00082)
Num. of Obs.	171	171	171	171	76	76	76	76	91	91	91	91
Adj. R2	0.196	0.188	0.544	0.54	0.23	0.254	0.295	0.648	0.141	0.137	0.449	0.526
F statistics	3.18	2.879	11.68	10.52	2.4	2.418	2.963	8.675	1.774	1.682	4.863	5.756
p-values	0.0000384	0.000104	3.89E-21	3.18E-20	0.00771	0.00599	0.00123	1.49E-10	0.0434	0.0556	0.000000485	1.48E-08

Note: Standard errors in parentheses are clustered by prefecture. Change in population denotes the change in the log of the working-age population. Constant, the lowest class-area dummy variables in 2000, and prefecture dummy variables are included in all estimations. * $p<0.10$, ** $p<0.05$, *** $p<0.01$

6. Conclusion

In this study, we examined the impact of welfare benefits on labor supply by utilizing the exogenous increase in PA benefits in the case of municipal amalgamations. As the Japanese welfare system is characterized by nationwide implementation, the municipal amalgamation implemented in the early 2000s is the only source of changes in regional variations to the guaranteed amounts of benefit levels, the event provides an ideal natural experiment to identify the impacts. Moreover, as the event utilized in this study affected all low-wage workers living in the affected municipalities, we could examine the impact for a broader population than those in previous studies. We found that municipal amalgamations with an increase in PA benefits had decreased employment rate (1.2% to 1.8%) for bereaved or divorced women (who are likely to receive welfare benefits), and raised recipient rate (0.10% to 0.13%). However, it did not affect the employment of the prime-age population, who were less likely to receive benefits. Given that bereaved or divorced women form low-income households and are more likely to receive PA benefits, the results adhere to the idea that labor participation responses may be strongest for those who have the lowest potential earnings (Bargain and Doorley, 2011; Eissa and Liebman, 1996).

Our findings are limited owing to several reasons. Although we examined the impact of amalgamations with increases in welfare benefits, we could not identify the elasticity of labor participation relative to the marginal increase in the benefit level, owing to the lack of detailed municipality data. Furthermore, previous authors have suggested that low-wage workers do not necessarily receive PA, and that the coverage rate of PA among working-poor households under the age of 65 is extremely low in Japan (Komamura, 2008). Therefore, we should further examine labor participation response to changes in welfare benefit levels at the individual level. Furthermore, this study did not use microdata from PA recipients. We suggest that future studies examine the impact on the extensive and intensive margins based on large-scale micro data of PA recipients.

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