

# The Employment and Earnings of Public Assistance Recipients and the Effects of the 2013 Reform in Japan<sup>\*</sup>

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## Abstract

This study examines the employment and earnings of public assistance recipients in Japan, utilizing household-level data from the *Survey on Public Assistance Recipients* compiled by the Ministry of Health, Labour and Welfare. First, we provide basic descriptive statistics on the employment of the recipients and analyze the factors that influence their decision to work. Second, we explain incentives for work in the public assistance system, with a focus on the Basic Deduction, and examine its effect on the earnings of the recipients. In particular, we examine the effect of the August 2013 reform of the Basic Deduction using descriptive statistics as well as panel regression based on an event-study design.

Keywords: public assistance, work incentives

JEL Classification: H53, H24, I38

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## I. Introduction

A system of guaranteed income provides benefits equal to the gap of its recipient's earnings against a prescribed level of income. Due to this gap-filling formula, a reduction in benefits entirely offsets an increase in earnings, imposing a 100% marginal tax rate on their earnings. Japan's system of public assistance (PA) follows this scheme. In the PA system, the "welfare standard (WS)" constitutes the guaranteed income from which "earnings" are subtracted to yield the amount of PA benefits. However, such "earnings" are not necessarily the actual earnings that PA recipients obtain. In particular, the system deducts a certain amount from the actual earnings and regards the remaining amount as "certified earnings." Since the amount of PA benefits is given as the amount by which this certified amount exceeds the WS, the marginal tax rate on (actual) earnings is not necessarily 100%. Such deduction is called "earnings deduction" in the PA system. Currently, the PA system has the following three types of deduction.

- Basic Deduction (BD), the amount of which varies depending on earnings level.
- Deduction for New Employment, which deducts a certain amount from earnings for six

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<sup>\*</sup> This article is based on a study first published in the Financial Review No. 151, pp. 206-234, Masayoshi Hayashi, 2023, "Public Assistance and Recipients' Earnings: The Effects of the 2013 Reform in Public Assistance in Japan", written in Japanese. Some of analogous analyses with older versions of the data are also found in Hayashi (2021b, c).

months since obtaining a new job.

- Deduction for Minors, which deducts from earnings obtained by minors.

The Japanese government reformed the BD in August 2013, aiming to “provide an incentive to work from the perspective of encouraging self-reliance” (Council on Social Security, 2016).<sup>1</sup> Apparently, the way these deductions work has an impact on the work incentives of PA recipients.

The purpose of this study is to examine the effect of the 2013 reform on the earnings of PA recipients by using data at the household level from the *Survey on Public Assistance Recipients* (SPAR) which, compiled by the Ministry of Health, Labour and Welfare (MHLW), contains the observations of *all* PA recipients. The survey is conducted once a year, with stock data observed on July 31 and flow data observed during July of the year.

The Council on Social Security (2016) and Ichimura et al. (2017) examined the effects of the 2013 reform using microdata from the SPAR. Although both are handouts distributed at consulting committee meetings, they provide materials closely related to this study. The former, distributed at the 26th meeting of the Welfare Standards Subcommittee of the Social Security Council (October 28, 2016), describes changes in distributions of relevant earnings-related variables in periods before and after the reform. Meanwhile, the latter, distributed at a working-group meeting for the Council for the Promotion of Economic and Fiscal Reform, also characterizes changes in earnings distribution after the reform.<sup>2</sup> Some of our analysis is intended to improve on the analysis provided in these documents.

Several empirical studies also dealt with the employment of PA recipients. Tamada and Ohtake (2004) examined factors that affect the employment rate of PA recipients using cross-sectional data aggregated at the welfare-office level in Osaka Prefecture in 2002. Yugami et al. (2017), employing data aggregated at the municipality level, took advantage of exogenous changes in the WS to examine the effect of the changes on the employment rate among the recipients. Meanwhile, Yamada et al. (2013), with a cross-section of 177 PA households from the *Survey on Living by Social Security*, examined the effects on the employment probability of single-mother PA recipients by exploiting changes in allowances for single mothers in the PA system in December 2009. Lastly, Hayashi (2021a) estimated the wage and income elasticity of labor supply of PA recipients using the same data as those used in this study. Although Hayashi (2021a) exploited the 2013 reform to construct instruments for IV estimation, it did not intend to estimate the effect of the reform itself.

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<sup>1</sup> Meanwhile, in the same year, the special deduction was abolished. Under the special deduction, a maximum deduction of 120,000-150,000 yen per year was made. Also, in July 2014, the Allowance for Work and Independence (AWI) was introduced. It has been pointed out that if PA recipients get off welfare, they would face several taxes, including Income Tax, Inhabitant Tax, and social insurance premiums, making off-welfare disposable income smaller than disposable income for PA recipients. This would then weaken the incentive to get off welfare (Saito and Uemura 2007). To alleviate such effects, the AWI provides a benefit of up to 100,000 yen for single-person households and up to 150,000 yen for other households upon exiting public assistance, under the guise of a hypothetical accumulation of 30% of income from employment during protection.

<sup>2</sup> Ichimura et al. (2017) used a Saez-type utility function to simulate the change in the distribution of earnings of PA recipients due to the 2013 reform, but failed to approximate the observed distribution. This may be due to the restrictive form of the utility function (constant price elasticity of earnings and zero income effect) and the parameter value of the utility function (price elasticity of earnings) obtained from a study on the United States.

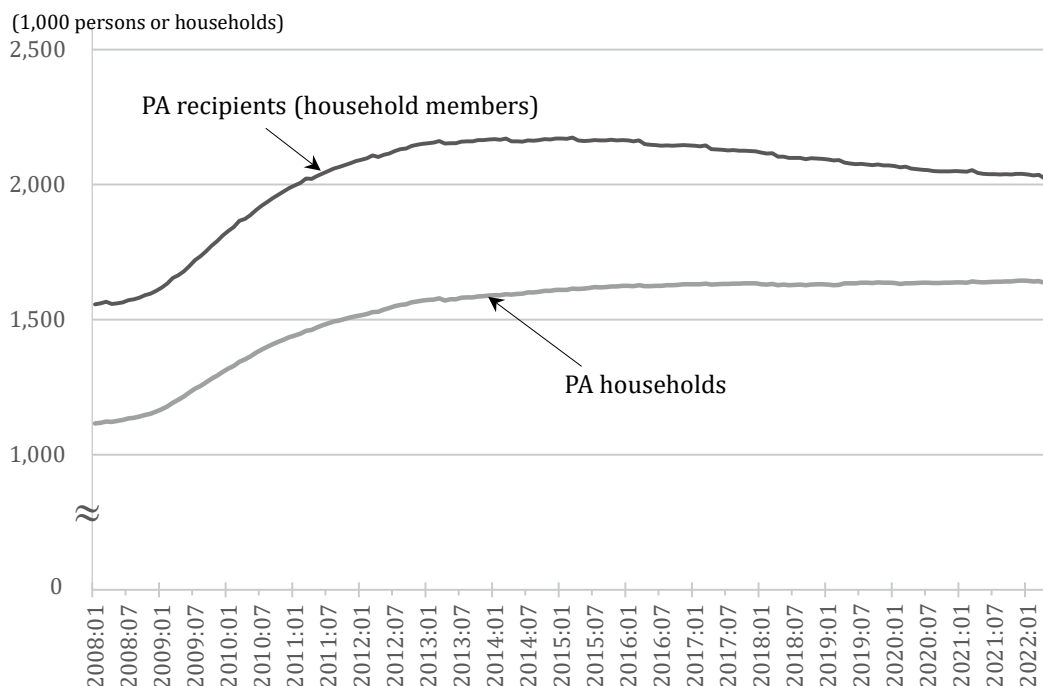
The structure of this paper is as follows. Section II provides various descriptive statistics on the employment of PA recipients. It also examines the factors that affect the probability of the employment of the recipients by conducting probit analysis with the microdata from the SPAR. Section III introduces the BD and explains how it works before and after the 2013 reform. Section IV examines the effect of the reform on the employment of PA recipients using descriptive statistics. It also attempts to estimate the effect using panel regressions based on an event study design. Section V concludes the paper.

## II. Employment of PA recipients

### II-1. The Current State

Figure 1 shows the monthly average of the size of PA caseloads in terms of recipients (i.e., household members) and recipient households since January 2008. These numbers began to increase in the early 1990s when an economic recession started. The increase then slowed down in the mid-2000s, partly due to economic recovery. However, the number accelerated again after the global financial crisis in 2008 and continued to increase until the early 2010s. Since then, the number of recipients has been gradually decreasing, while the number of households has remained almost flat. The COVID-19 outbreak after April 2020

Figure 1. The number of PA recipients and households



Source: Ministry of Health, Labour and Welfare, *Survey on Public Assistance Recipients*.

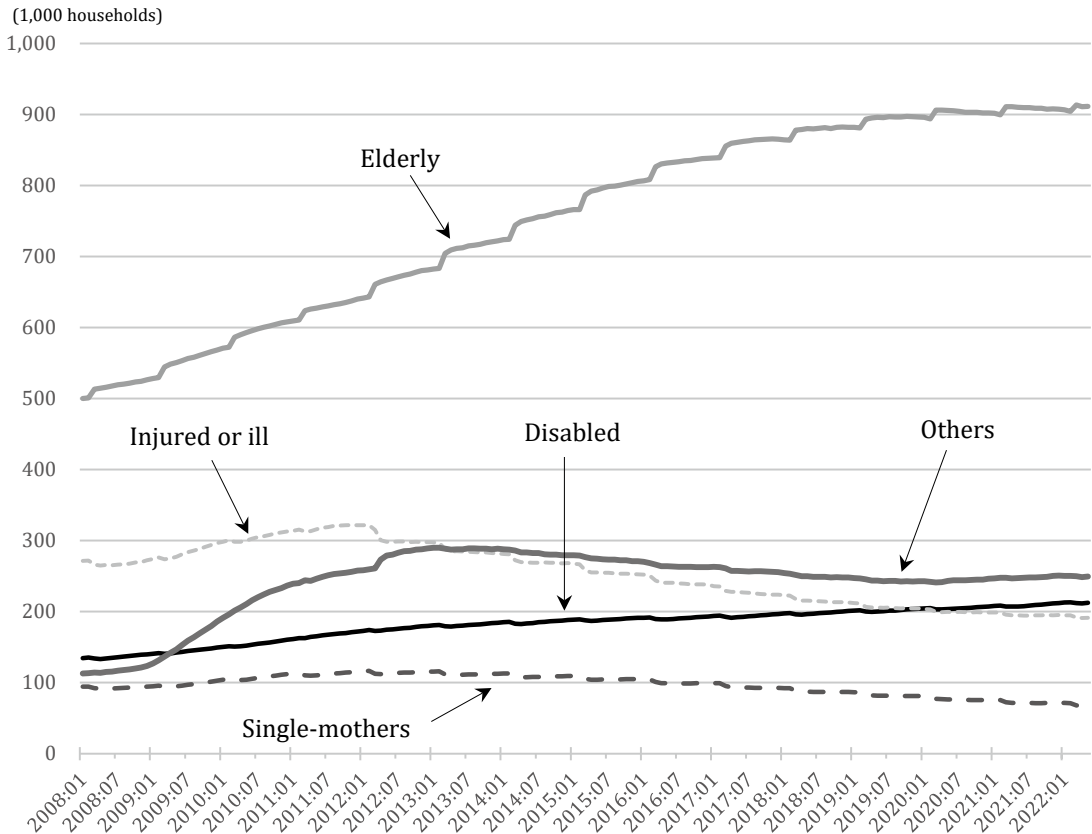
has not changed this trend.

Figure 2 shows the number of PA households by type in the same period as that in Figure 1. The Japanese PA system categorizes households into five types.

- (1) Elderly: Households consisting solely of persons 65 years of age or older, which may include persons under 18 years of age.
- (2) Single mother: Households consisting solely of a woman under 65 years of age with her children (including those adopted) under 18 years of age.
- (3) Disabled: Households whose heads are certified as persons with disabilities or unable to work due to physical, mental, or intellectual disability.
- (4) Injured or ill: Households whose heads are unable to work due to injury or illness.
- (5) Other households: Households other than those listed above (1) through (4).

These household types are defined according to the lexicographic order from (1) to (5). For example, if a household consists of an elderly person who is injured or ill, it is classified as an elderly household; if a household consists of a mother and children and the mother is ill, it is still classified as a single-mother household.

Figure 2. The number of PA households by type

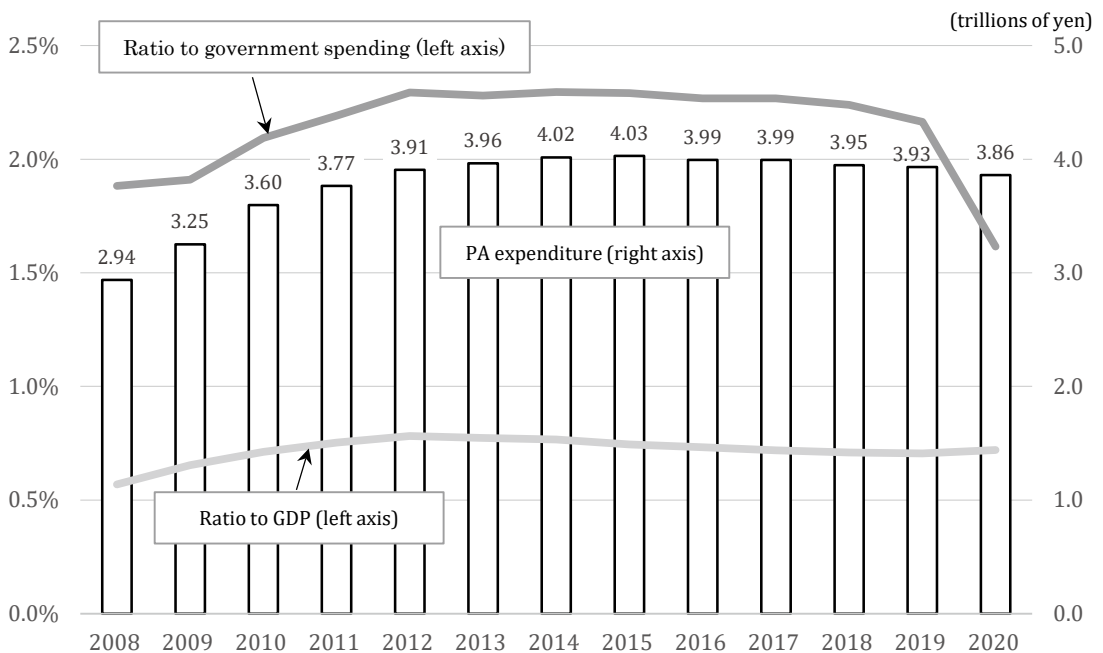


Source: Ministry of Health, Labour and Welfare, *Survey on Public Assistance Recipients*.

The most salient is a continuing increase in the number of elderly households, reflecting the aging population and an increase in the number of the old with little or no old-age pensions. In addition, the number of disabled households has been steadily increasing, but not to the same extent as the elderly households. In contrast, single-mother households and injured or ill households have been gradually decreasing since 2012. Meanwhile, the others are volatile. Their size surged after the global financial crisis, turned downward around 2013, and has remained flat recently. However, due to the COVID-19 outbreak, they started increasing since July 2020 when compared to the analogous monthly number in the previous year (which may not easily be seen in Figure 2).

Figure 3 shows the size of public expenses spent on public assistance since 2008 using total amount (right axis) and ratios to total government expenditure and GDP (left axis). In the last decade, the ratio has remained flat as has the number of PA recipients and households in Figure 2. However, 2020 witnessed a large drop in the ratio to total expenditure, reflecting a large increase in expenditures (denominator) due to measures against the COVID-19 pandemic. It should also be noted that the recent size of PA expenses (4 trillion yen) is almost twice as large as that of the early 2000s (over 2 trillion yen), the latter of which is not displayed in Figure 3.

Figure 3. Changes in Welfare Expenditures



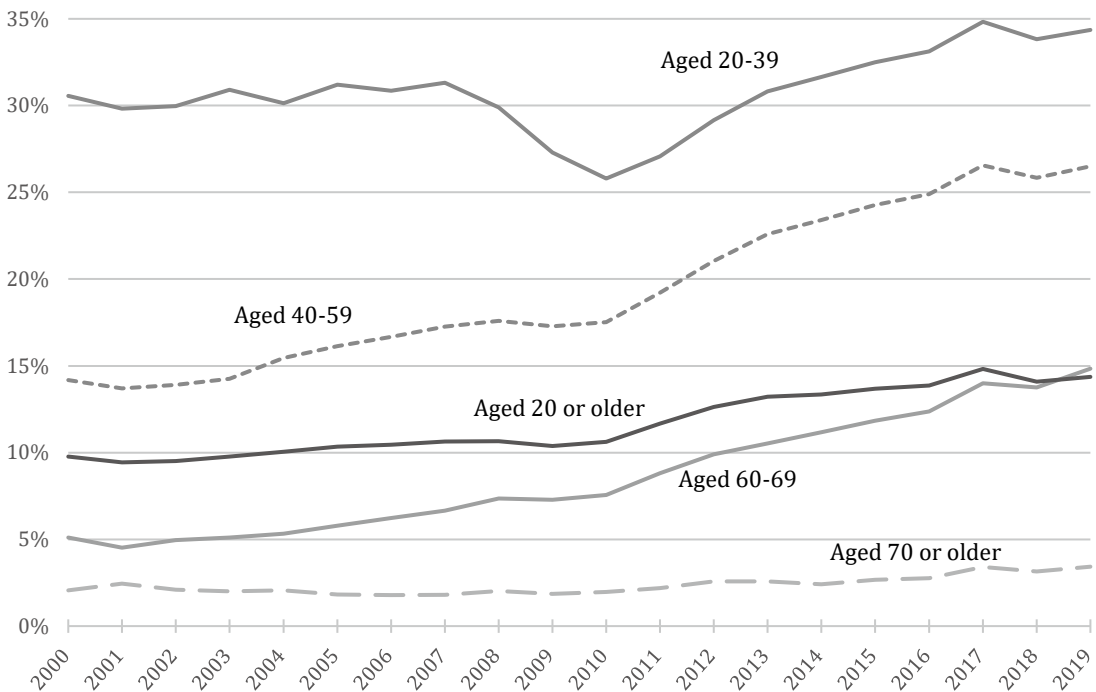
Source: Ministry of Internal Affairs and Communications and Cabinet Office.

## II-2. Employment rate and monthly days worked

Figure 4 shows the annual percentage of working PA recipients (aged 20 or older) for 2000-2019. For those aged 20 years or older, the rate has increased from 10% to 15% in these 19 years. In particular, more than 30% of those aged 20-39 were employed, except from 2008 to 2013 when employment generally declined due to the 2008 financial crisis. The rates for all age groups above 40 also increased gradually. The rate for the 40-59 age group increased by 10 percentage points from 15% to 26%, and the rate for the 60-69 age group tripled from 5% to 15%.

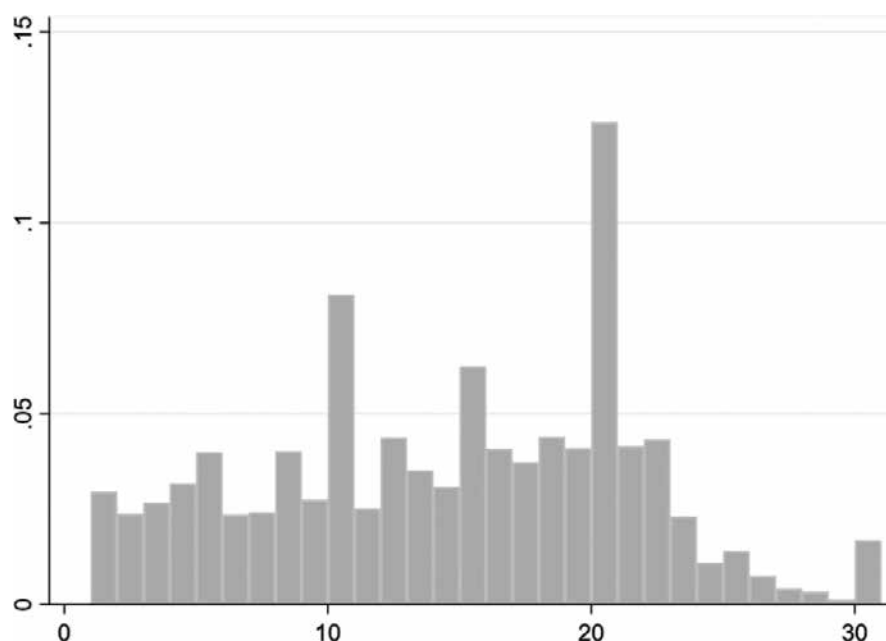
Figure 5 shows a histogram of the monthly days worked by PA recipients in July 2019. The distribution includes recipients who worked at least one day (211,881 persons) and excludes those who did not work (1,834,904 persons). Unlike Figure 4, those under 20 years of age are also included. The vertical axis indicates the percentage of PA recipients, and the horizontal axis indicates the number of working days. Assuming five workdays a week, with a mode of 20 days (12.6%), about 17% worked at least every day.

Figure 4. Employment rate among PA recipients



Source: Ministry of Health, Labour and Welfare, *Survey on Public Assistance Recipients*.

Figure 5. The distribution of days worked by PA recipients (July 2019)



Source: Ministry of Health, Labour and Welfare, *Survey on Public Assistance Recipients*.

### II-3. Recipient characteristics and employment probability

In the following, we use probit estimation to examine the impact of the recipients' characteristics on the employment probability of PA recipients. We used a sample of 1,732,644 PA recipients in July 2019 from the SPAR who were aged 25 years or older. Those from households with more than one earner are excluded. Table 1 lists the characteristics that affect employment probability. Our estimation uses the alternatives in each characteristic category expressed as dichotomous variables (1 if they apply and zero otherwise) with the alternative with an asterisk (\*) as the reference when calculating the probability change.

Figure 6 shows the results. The bars in panels (a) through (m) indicate the marginal effects (changes in the employment probability from the reference), whereas the vertical lines across the top of the bars are 95% confidence intervals. The summary below discusses only salient results.

- The marginal effect of the relapse of the assistance is  $-0.006$  with a confidence interval  $[-0.007, -0.004]$ . Those who have previously received PA benefits before the current receipt reduce the probability of employment by less than one percentage point.
- The effect of being male is  $-0.012$  with a confidence interval  $[-0.013, -0.011]$ . Again, the effect of reducing the probability itself is not very large.
- Compared with the Japanese, the earnings probability is smaller for Korean and Chinese recipients and larger for Filipino and Vietnamese recipients. The effect of being the other

Table 1. Explanatory variables

Category	Alternatives in a given category
(a) Relapsed assistance	[1] Yes, [2] No*
(b) Gender	[1] Male, [2] Female*.
(c) Nationality of household head	[1] Japan*, [2] Korea, [3] China, [4] Philippines, [5] Vietnam, [6] Cambodia, [7] United States, [8] Brazil, [9] Latin America other than Brazil, [10] Others
(d) Disability/injury or illness	[1] Disabled (mental), [2] Disabled (intellectual), [3] Disabled (physical), [4] Ill (alcoholic), [5] Ill (mental), [6] Injured or ill (others), [7] Healthy*
(e) Relation to household head	[1] household head*, [2] Spouse, [3] Child, [4] Parent, [5] Other
(f) Causes for PA receipt	[1] Injury or illness of household head, [2] Injury or illness of household member, [3] Medical allowance for urgent protection, [4] Condition requiring nursing care, [5] Death of primary earner, [6] Loss of primary earner (other than [5]), [7] Unemployment (Retirement or voluntary), [8] Unemployment (dismissal or involuntary), [9] Reduced income (due to old age), [10] Reduced income (due to business failure or bankruptcy), [11] Reduced income (other reasons), [12] Decrease/loss of pension benefits, [13] Decrease/loss of savings, [14] Decrease/loss of remittances [15] Others*.
(g) Health insurance before the start of protection	[1] National Health Insurance, [2] Employees' Insurance (Insured), [3] Employees' Insurance (Dependents), [4] Long Life Medical Care System, [5] Not Enrolled*, [6] Others
(h) Household type	[1] Elderly, [2] Single mothers (bereaved), [3] Single mothers (divorced), [4] Single mothers (other), [5] Disabled, [6] Injured or ill, [7] Others*.
(i) Housing	[1] Owner-occupied house, [2] Owner-occupied apartment, [3] Rented house or apartment (public), [4] Rented house or apartment (private), [5] Rented house or apartment (UR or public corporation), [6] Rented house or apartment (others) [7] Rented room, [8] Others*.
(j) Institutionalization	[1] Relief facilities, [2] Long-term care insurance facilities, [3] Other facilities, [4] Inpatient (mental), [5] Inpatient (others), [6] In-home*
(k) household size	Thirteen alternatives for 1 to 12 persons and 13 or more persons (one person*)
(l) Prefecture	47 alternatives for 47 prefectures (Tokyo*)
(m) Age	72 alternatives for each from 25 to 95 and 96 years old or older (25 years old*)

nationals is not significantly different from that of being Japanese.

- (d) Mental disability, injury, and illness reduce the probability of employment. Meanwhile, the probability is significantly higher for those with intellectual disabilities.
- (e) The employment probability of the household head is higher than that of the other members.
- (f) The probability decreases when the causes of receipt concern the physical status of the recipients (e.g., disability or needs for long-term care). Meanwhile, it increases when the causes are external (e.g., dismissals by employers or reduced income).
- (g) The type of public health insurance in which PA recipients had been enrolled before they started receiving their PA benefits should reflect their work history or earnings ability to some extent. In particular, the effect is highest for those who had been enrolled in an employees' insurance, which might suggest that they may have relatively larger earnings ability.



Figure 6. Marginal effects (increase or decrease in the probability of working)

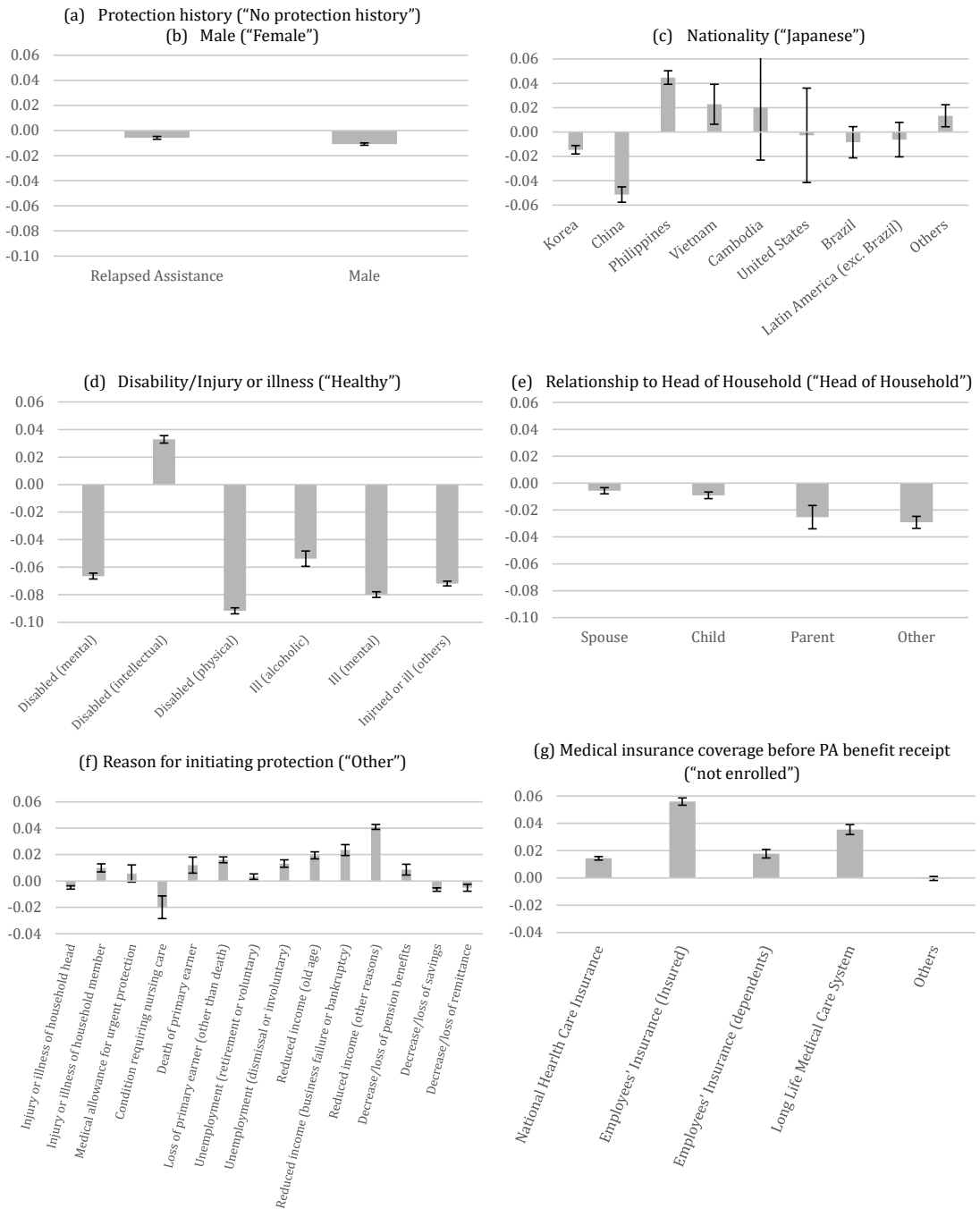


Figure 6.

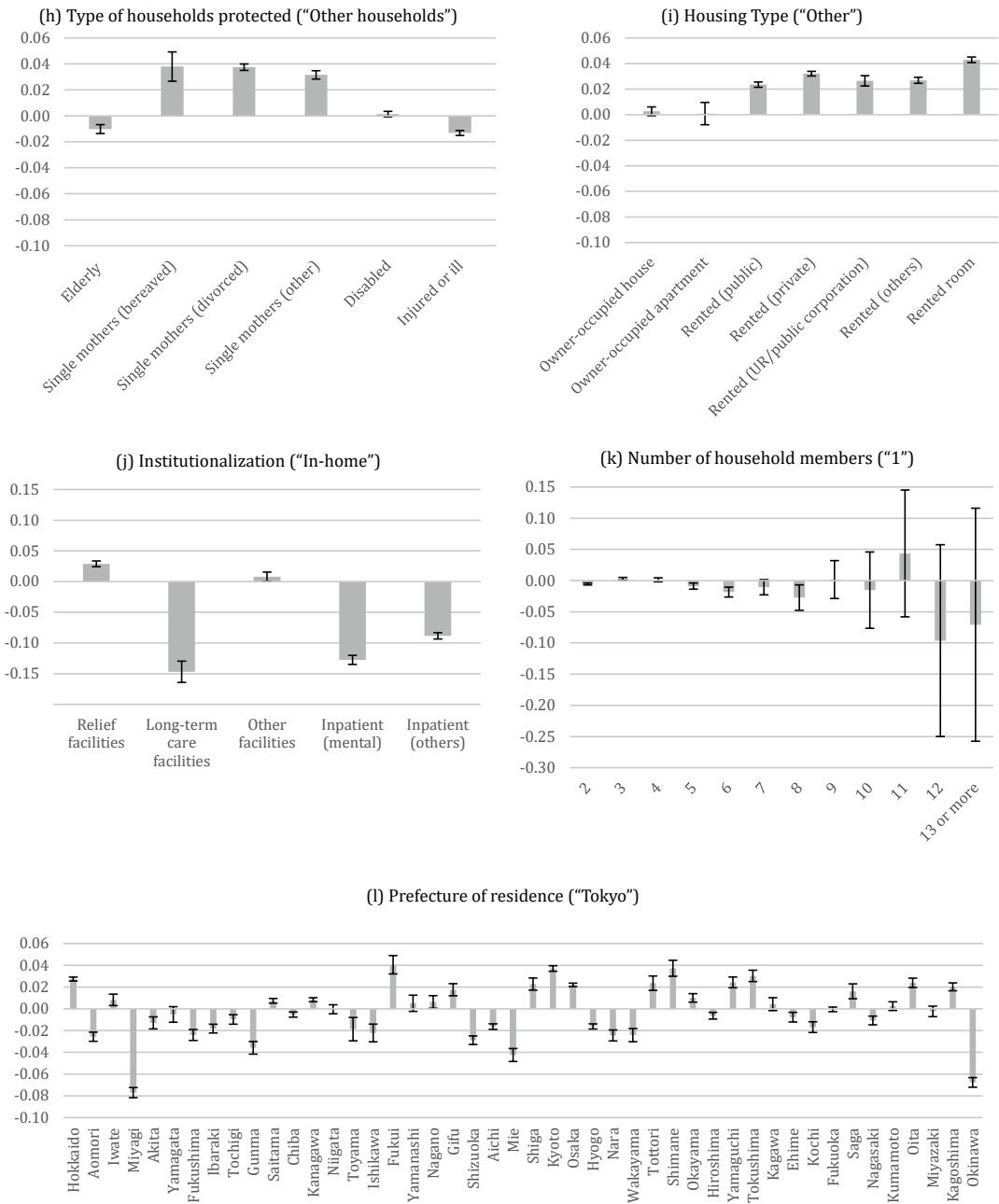
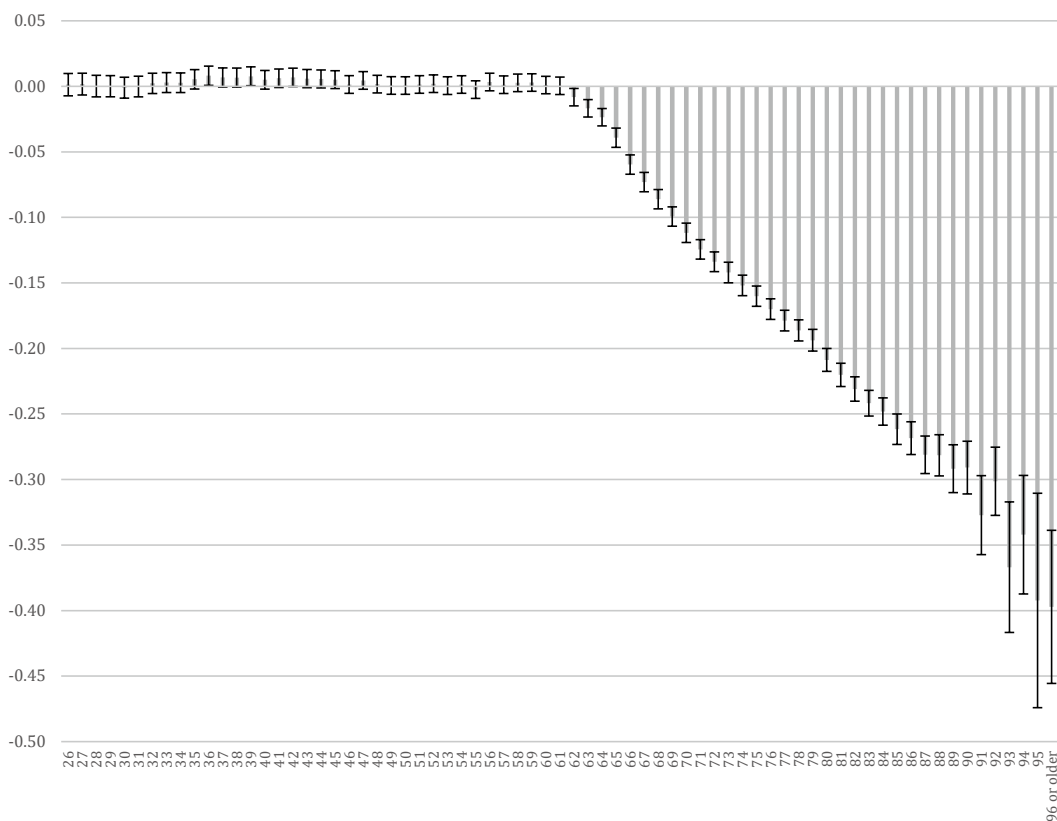


Figure 6.

(m) Age ("25")



- (h) Those in the elderly, disabled, and injured/ill households have a lower probability of employment. Meanwhile, such probability increases by 3 to 4 percentage points for single-mother households. This may reflect the fact that the employment of single mothers is generally high.
- (i) The probability is lower for those who live in owner-occupied or public housing whose provisions are more guaranteed than in the other alternatives.
- (j) The probability drops significantly (10 to 18 percentage points) after hospitalization or admission to a long-term care insurance facility. In contrast, it increases with admission to a nursing home or another institution.
- (k) The effect of household size, when it is statistically significant, is almost negligible. Estimates are large for sizes larger than 10 persons but are statistically insignificant.
- (l) No specific patterns are observed for the prefecture of residence. While one might suspect a link with the minimum wage, the prefectures with larger effects are not necessarily those with higher or lower minimum wages.
- (m) The effect of age is almost the same until the early 60s, after which the negative effect on employment probability increases rapidly.

### III. The 2013 Reform and the earnings distribution of PA recipients

#### III-1. The 2013 reform in the PA system in Japan

The relationship among disposable income  $c$ , earnings (labor income)  $Y$ , non-labor income  $O$ , and PA benefit  $B$  is given as follows:

$$c = Y + O + B. \quad (1)$$

The amount of benefit  $B$  is the non-negative difference between the Welfare Standard (WS)  $G$  and the “certified” earnings  $A$ , the latter of which is given as earnings  $Y$  minus earnings deduction  $D$  plus other income  $O$ , i.e.,  $A = Y - D + O$ . Using these symbols, we obtain

$$B = G - A = G - [(Y - D) + O] = G - Y + D - O. \quad (2)$$

Substituting (2) into (1) yields

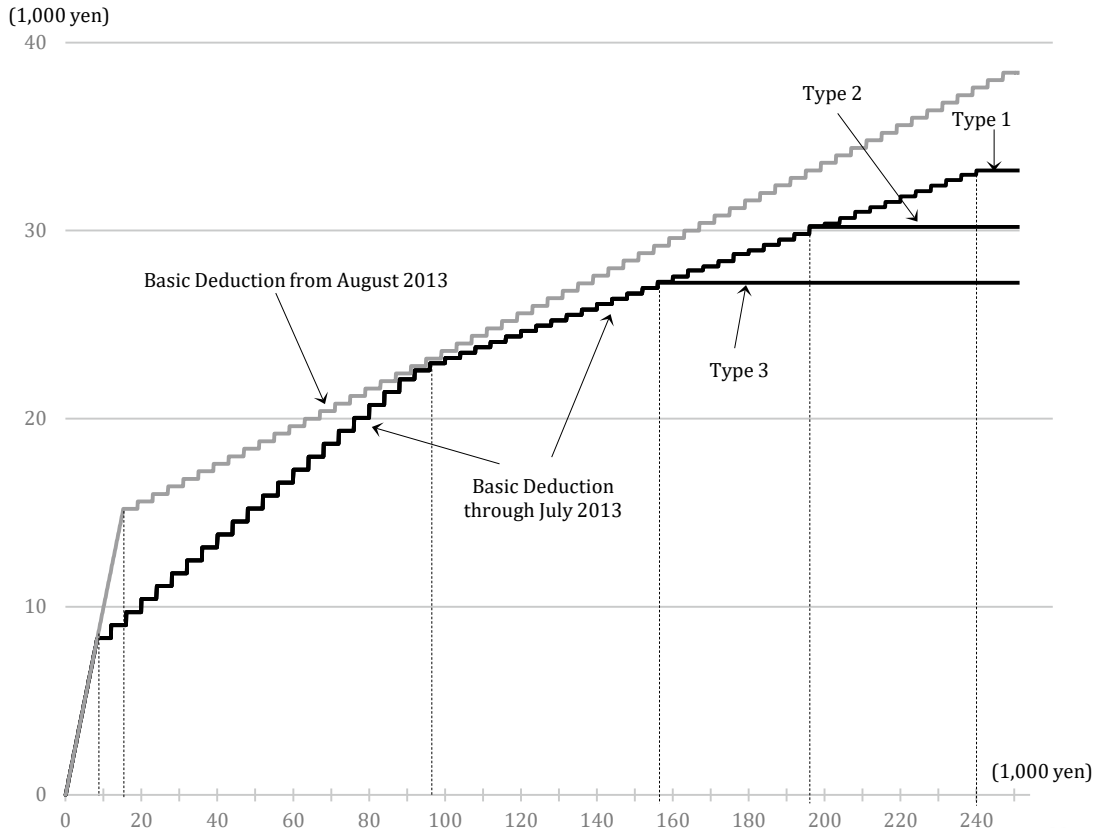
$$c = G + D, \quad (3)$$

which shows that the amount of disposable income of a PA recipient is the Welfare Standard amount plus the amount of the deduction. While there are several types of earnings deductions as described in the introduction, we only consider the Basic Deduction (BD) here. Since the BD varies with earnings, we can express  $D = D(Y)$ . From (3), we then see that the disposable income of PA recipients changes as their earnings change.

The PA reform in August 2013 revised the BD system. Figure 7 illustrates the schedules of the amount of BD, assuming that the PA household in question has a single earner before and after August 1, 2013. Before the reform (i.e., until the end of July 2013), all earnings were deducted if they were 8,339 yen or less per month, so that PA recipients obtained earnings up to that amount without reducing their benefits. In other words, the deduction rate was 100%. When earnings were 8,340 yen or more, the ratio of the rate became less than 100%, while its amount increased as earnings increased in a stair-step fashion. The slope of a line that envelops the stairsteps was reduced when earnings exceeded 92,000 yen per month. Approximating such an envelope as a straight line, the slope was 0.164 in a range between 8,340 and 92,000 yen and 0.076 in a range between 92,000 and a ceiling beyond which the deduction is zero. The ceiling differed depending on the type of municipality in which PA recipients resided.

The reform has increased the threshold for the full deduction from 8,340 to 15,200 yen. The deduction remains 15,200 yen until earnings reach 19,000 yen, beyond which it increases by 400 yen for every 4,000-yen rise in earnings. The slope of the lines that envelop these stairstep portions is 0.105 for earnings between 15,200 yen and 19,000 yen, and 0.1 for

Figure 7. Schedules of the Basic Deduction



earnings above 19,000 yen. In addition, the reform has removed the ceilings on the BD.

### III-2. The Basic Deduction and the choice of PA recipients

In the following, we use the standard simple consumer theory to examine how the reform affected the labor choices of PA recipients. We present the preferences of a PA recipient by a standard utility function with disposable income  $c$  and leisure  $l$  as its arguments,

$$U = U(c, l). \quad (4)$$

Let us denote the wage rate by  $W$  and the time endowment by  $H$ . We then express earnings as  $Y = W \cdot (H - l)$  and leisure  $l$  as

$$l = H - \frac{Y}{W}. \quad (5)$$

Thus, (4) can also be expressed as a function of disposable income  $c$  and earnings  $Y$ :

$$U = V(c, Y: W, H) \equiv U\left(c, H - \frac{Y}{W}\right) \tag{6}$$

with the wage rate  $W$  and the time endowment  $H$  as parameters. We can then draw indifference curves over  $(Y, c)$ . If (4) satisfies the standard properties, the indifference curve will be convex toward the lower right with a positive slope.

The budget line of a PA recipient is evident from the discussion over equation (3)

$$c = G + D(Y) \tag{7}$$

where the function  $D(Y)$  represents the BD schedule shown in Figure 7. In other words, the budget line drawn over  $(Y, c)$  is the BD schedule in Figure 7 shifted vertically by the amount  $G$  of the WS. The 2013 reform has changed the form of  $D(Y)$  and therefore budget line (7). Figure 8 linearly approximates the stepwise budget lines given by the BD schedule for monthly earnings below 100,000 yen. The solid black line refers to the line before the reform and the solid gray line to the line after it. Both are piecewise linear, with virtual income before and after the reform represented by intercepts  $M_1$  and  $M_2$ , respectively. While

Figure 8. Budget lines for single-earner PA households

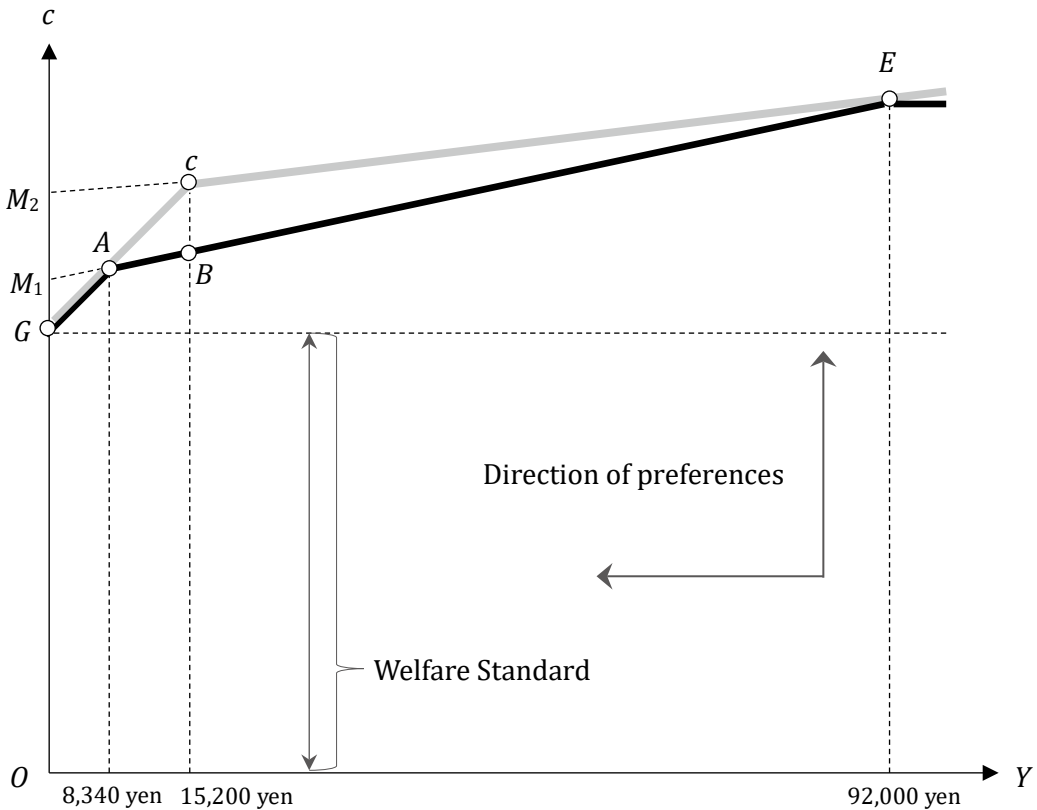


Figure 8 does not depict the indifference curves, the preference direction is set to associate an indifference curve located in the upper left direction with higher utility.

As can be seen from the change in the budget line shown in Figure 8, PA recipients cannot be worse off after the reform. In particular, PA recipients with monthly earnings of 8,340 yen or more were better off by this reform with increases in their disposable income. Of course, this conclusion only holds *if* the amount of WS, i.e.,  $G$ , is held constant. The fact is that the WS has been revised frequently in recent years, which makes it difficult for us to see if such PA recipients are in fact better off.

### III-3. Changes in earnings distribution

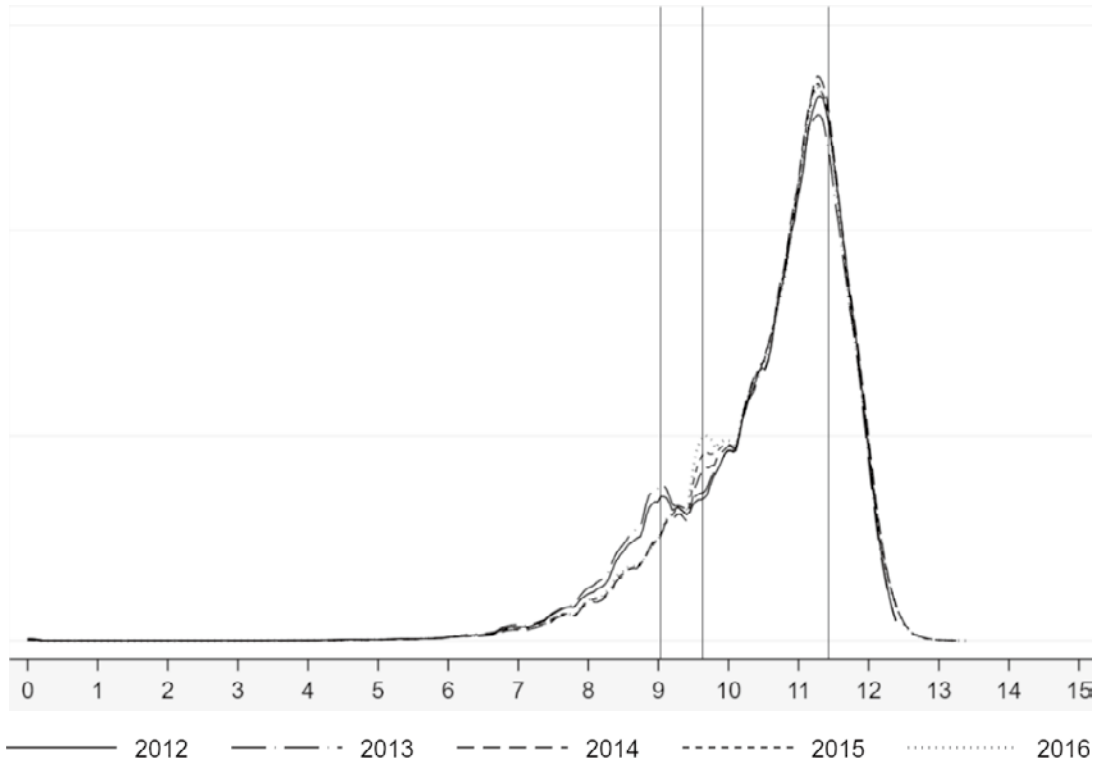
The budget line in Figure 8 had a kink at 8,340 yen (point A) before the 2013 reform and a kink at 15,200 yen (point C) after the reform. The marginal rates of substitution for those who choose at these kink points should be smaller than the slope of the budget line located to the left of those points and larger than the slope of the line located to the right of them. As such, more recipients tend to choose to earn around those points. In other words, the working recipients tend to “bunch” around the earnings level that causes these kink points. We then used the SPAR data to examine if we could observe such bunching in the earnings of PA recipients. To construct the distributions, we exclude those who are not working. We only consider those who are single earners in their household, are at least 25 years of age, and have only the BD applied to their earnings. Their numbers used for Figures 9 and 10a-c are listed in Table 2.

Figure 9 shows the distribution (kernel density) of earnings in the natural logarithm of

Table 2. The numbers of PA recipients used for the analysis

		2012	2013	2014	2015	2016
All		112,078	110,181	168,972	173,260	185,880
Healthy (i.e., none of the below)	all ages	84,828	82,129	126,658	127,239	135,173
	25 to 64	73,758	70,488	107,083	105,154	110,234
	65 and over	11,070	11,641	19,575	22,085	24,939
disabled	all ages	11,584	12,549	17,756	19,777	22,903
	25 to 64	10,431	11,328	16,026	17,788	20,537
	65 and over	1,153	1,221	1,730	1,989	2,366
Injured or ill	all ages	15,666	15,503	24,558	26,244	27,804
	25 to 64	13,509	13,379	21,005	22,185	23,194
	65 and over	2,157	2,124	3,553	4,059	4,610

Figure 9. Distributions of earnings: All PA recipients aged 25 or older



PA recipients from 2012 to 2016. The three vertical lines correspond to the two kink points before the reform (8,340 yen  $\rightarrow$  9.029; 92,000 yen  $\rightarrow$  11.430) and one kink point after it (15,200 yen  $\rightarrow$  9.629). The figure exhibits two sets of bunching at the earnings level corresponding to point A in Figure 8 for 2012 and 2013 and at the level corresponding to point C in Figure 8 for 2014, 2015, and 2016. The latter, in particular, gradually expands as the years go by. Meanwhile, Figure 9 also shows a peak of the distribution around the earning level that corresponds to point E in Figure 8. However, it is probably safe to think that point E was set according to this peak rather than vice versa. In fact, even after the abolition of point E after the reform, the location of the peaks has not changed much.

The distribution may vary depending on the characteristics of the recipients. Figures 10a-c then show the earnings distribution by type and age as specified in Table 2: [healthy, disabled, and injured/ill]  $\times$  [aged 25 or older, aged 25-64, and aged 65 or older]. We then have nine categories of distribution as follows.

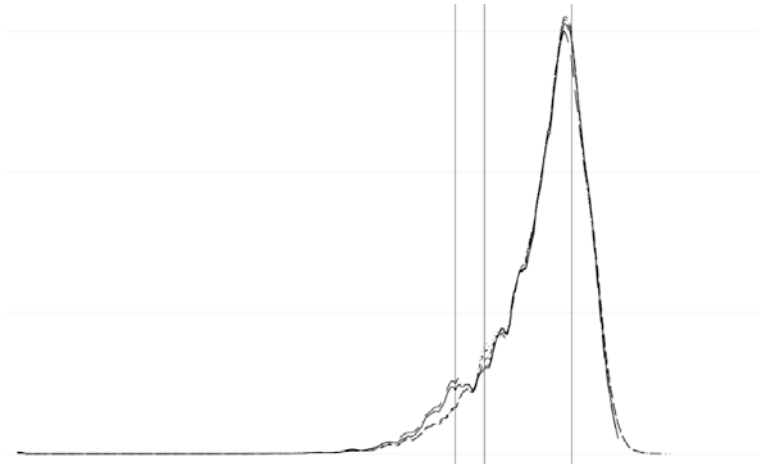
First, for the healthy aged 25 and older (Figure 10a-i), bunching is not as salient as that observed in Figure 9. Furthermore, it becomes even smaller for the age group between 25 and 64 (Figure 10a-ii). In contrast, the size of the pre-reform bunching is relatively large for those aged 65 and older (Figure 10a-iii).

Second, the cases of the injured or ill aged 25 or older (Figure 10b-i) are similar to the

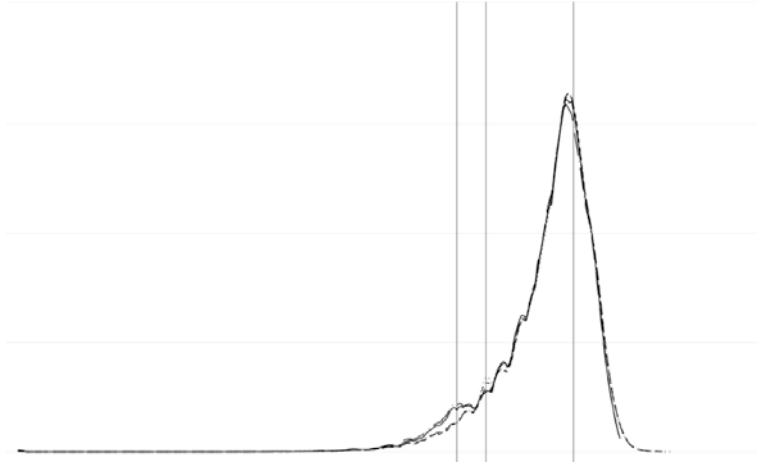


Figure 10a. Earnings distribution: Healthy and able-bodied (those excluded from Figs. 10b-c)

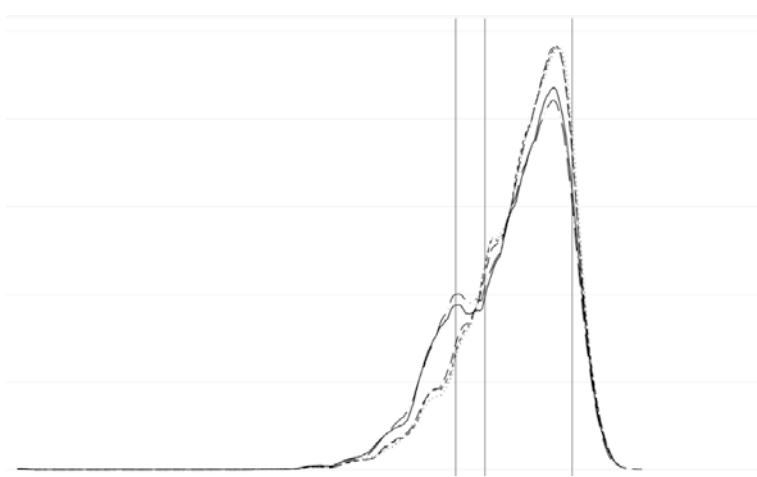
i. Aged 25 years or older



ii. Aged between 25-64 years old



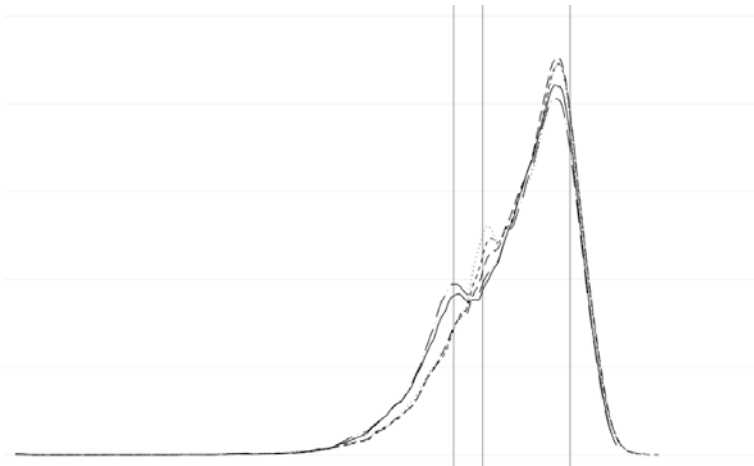
iii. Aged 65 years or older



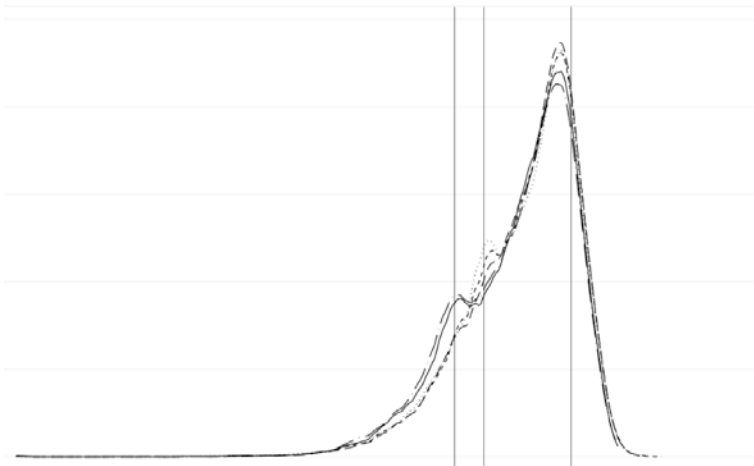
——— 2012    - - - - 2013    - - - - - 2014    - - - - - - 2015    ..... 2016

Figure 10b. Earnings distribution: Injured or ill

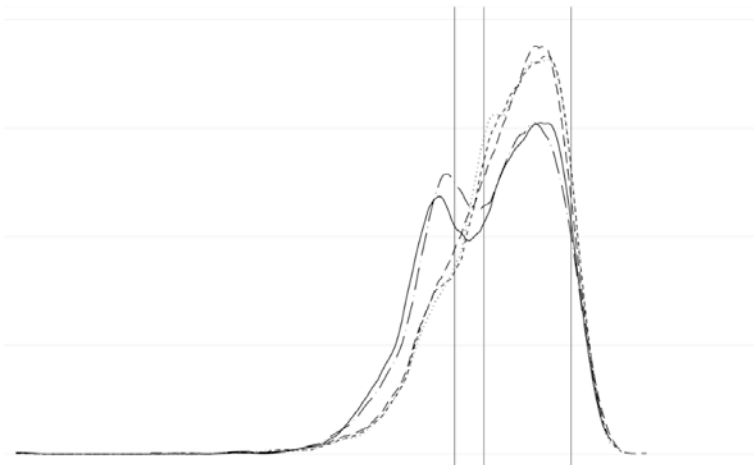
i. Aged 25 years or older



ii. Aged between 25-64 years old



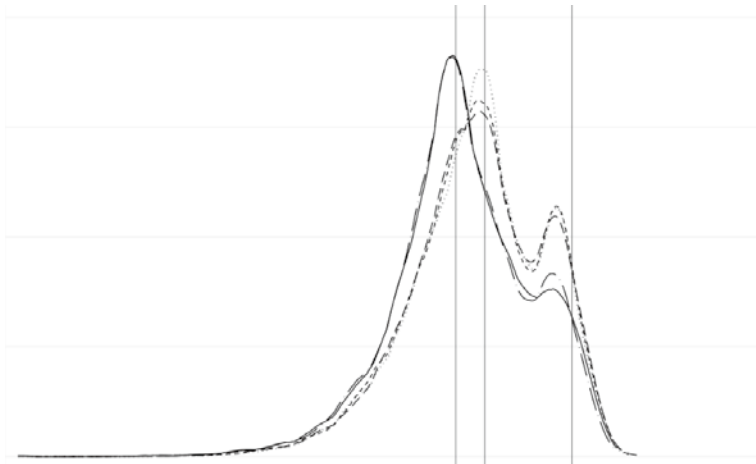
iii. Aged 65 years or older



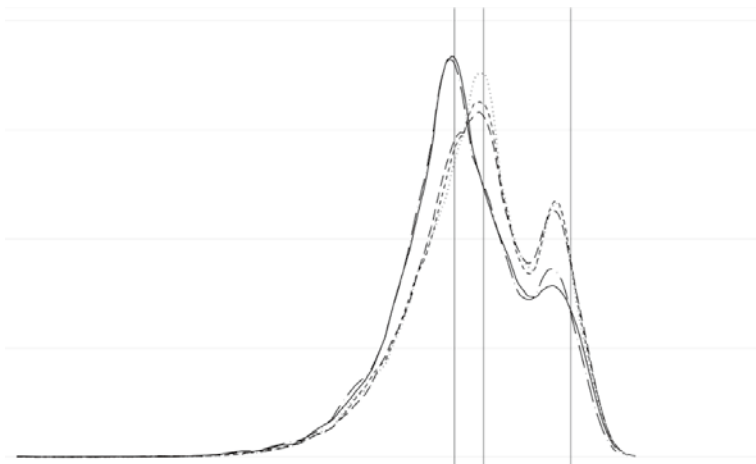
——— 2012    - - - - 2013    - - - - - 2014    - - - - - - 2015    ..... 2016

Figure 10c. Earnings distribution: Disabled

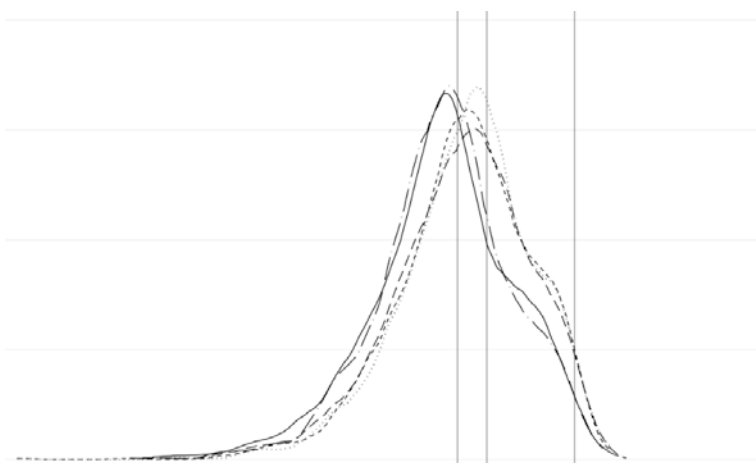
i. Aged 25 years or older



ii. Aged between 25-64 years old



iii. Aged 65 years or older



— 2012    - · - 2013    - - - 2014    - - - - 2015    ····· 2016

distribution in Figure 9. Compared to the distribution of those aged 25 to 64 (Figure 10b-ii) and those aged 65 or above (Figure 10b-iii), again, the relative size of the pre-reform bunching is larger for those aged 65 and above.

Finally, in the cases of disabled recipients (Figure 10c), we find the peaks of the distributions around earnings levels that are considered to cause bunching. Since most of the disabled recipients are thought to be working at workplaces specially designed for them, the employers there may be making them adjust their work in accordance with the upper limit of the full deduction. In addition, the distributions of the disabled aged between 25 and 64 (Figure 10c-ii) have a bimodal distribution, with their peaks corresponding to the kink points higher, while the distribution of those aged 65 or older (Figure 10c-iii) is unimodal.

#### IV. The Effect of the 2013 Reform on Earnings Choice

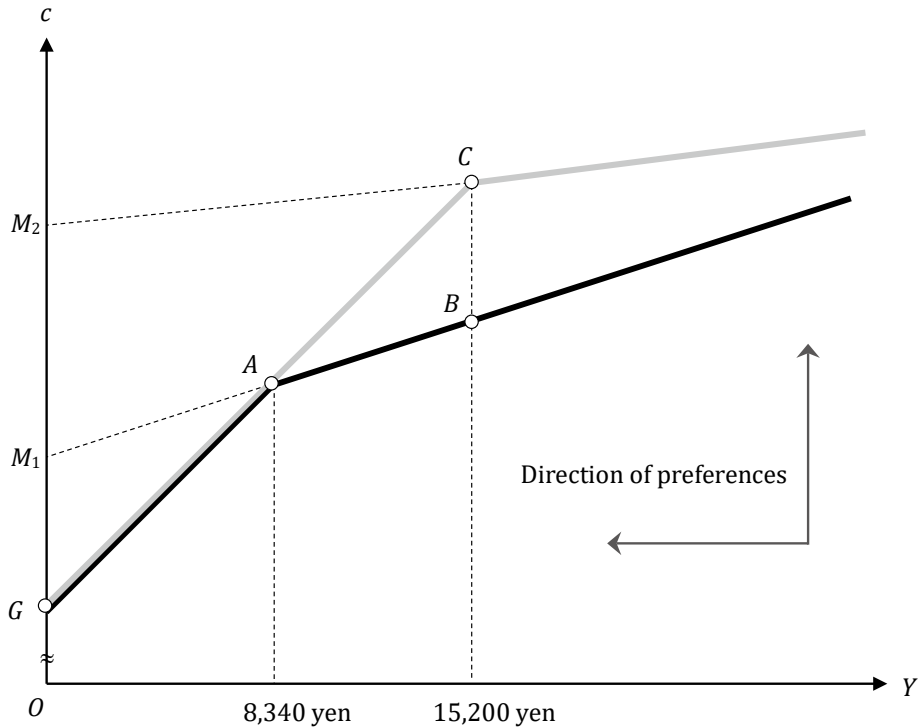
##### IV-1. Change of the BD and its effect on earnings

The changes in the earnings distribution show that the location of bunching has indeed shifted to the earning level that corresponds to the new kink point created by the reform in the BD. However, it would be premature to conclude that the reform has increased earnings among PA recipients that had been continuously enrolled in the system before and after the reform. Figure 11 enlarges Figure 8 focusing on lower earnings. Again, we represent the budget lines before and after the reform by black and gray lines, and the virtual incomes before and after the reform by intercepts  $M_1$  and  $M_2$ . While not depicted, indifference curves are upward sloping and convex to the lower right and indicate higher utility if they are located in the upper left corner.

Assuming that Welfare Standard  $G$  and wage rate  $W$  are constant before and after the reform and that leisure  $l$  is a normal good, the 2013 change in the BD is expected to have the following effects on the recipients' earnings choices. First, since the reform did not change the line segment  $GA$  (except for the kink point  $A$ ), it does not affect the choice of the recipients who had made a choice along that segment. Second, those who had chosen  $A$  and whose marginal rate of substitution was less than the slope of  $GA$  at  $A$  would increase their earnings by choosing a point on the line segment  $AC$  (excluding point  $A$ ).

Third, we consider the case for those who had made a choice on the line segment  $AB$  (excluding point  $A$ ). Since the slope of the after-reform line segment to the right of  $C$  is smaller than that of before-reform line segment  $AB$ , the recipients would not choose a point on the to-the-right-of-point  $C$  segment after the reform as (we assume) leisure is normal. Meanwhile, those who had chosen a point on segment  $AB$  would choose a point on segment  $AC$ . The reform increases the price of leisure (the real wage rate) so that the substitution effect results in an increase in working hours (a decrease in leisure demand) and therefore earnings. However, the income effect of the price change also causes an income effect that leads to an increase in leisure demand, i.e., a decrease in hours worked and earnings. Note that for those who had chosen along  $AB$ , the reform puts an additional income effect by re-

Figure 11. Budget lines for single-earner PA household (enlarged)



ducing their virtual income from  $M_1$  to  $G$ . Since this is a *decrease* in income, it increases earnings if leisure is normal. In sum, the income effect from the change in slope reduces earnings, while the income effect from the change in virtual income and the substitution effects from the change in slope increase earnings. The relative amount of these effects determines the actual increase or decrease in earnings.

Fourth, we then consider the recipients who had made a choice on a point on the line segment to the right of point  $B$  (ignoring the portion of Figure 7 with working income of 92,000 yen or more). Two possibilities exist in this case as well. One case is where they would choose a point on the line segment  $AC$  including kink point  $C$ , in which earnings decrease. The other is where they would choose on the line segment to the right of point  $C$ . Note here that the slope of the to-the-right-of- $C$  segment (after the reform) is smaller than that of the to-the-right-of- $B$  segment (before the reform). Therefore, if leisure is a normal good, as we assume here, the recipients would reduce earnings. In other words, in both possibilities, earnings will decrease.

As can be seen from the above, the only recipients who are likely to increase their earnings after the 2013 reform are those who had made a choice on segment  $AB$  before the reform. Theoretically, the only ones who are *certain* to increase their earnings are those who have chosen point  $A$  with their marginal rate of substitution being less than the slope of line segment  $AC$ . The latter are considered those that had “bunched” around the kink point be-

fore the reform.

#### IV-2. *Changes in earnings around kink points*

We then examine changes in the earnings of PA recipients who are considered to have been bunching around the kink point before the reform. Assuming that the focal point for bunching was 8,000 yen,<sup>3</sup> we regard those bunching recipients as those whose monthly earnings fell between 7,660 yen and 8,340 yen.<sup>4</sup> Furthermore, we limit our sample of the bunching recipients to those who had been in the labor market both in July 2012 and July 2013. Figures 12 through 14 show histograms of such recipients in each July from 2013 to 2016 for the healthy and able-bodied (Figure 12), the injured or ill (Figure 13), and the disabled (Figure 14). The upper set of four histograms in each figure is for (a) PA recipients aged 25 or older, while the lower is for (b) PA recipients aged 25 to 64. The vertical and horizontal axes measure the number of recipients and their monthly earnings, respectively, with the width of the bars being 2,000 yen. The right and left vertical lines indicate 8,240 and 15,400 yen, respectively.

We obtain the following observations from these Figures. First, there is no conspicuous difference among the six sets of the four histograms, except that the two sets for the disabled have the maximum level of earnings that is the lowest among the six sets. Second, while some recipients increased their earnings after the reform, many did not. Third, those who earned around the new threshold (15,200 yen) are not as numerous as the bunching in Figures 9 and 10 suggests. All figures exhibit some bunching around 15,200 yen after 2014, but its size is much smaller than those who stayed around the previous threshold. Fourth, there are a very small number of PA recipients who increased their earnings by a large amount.

#### IV-3. *Panel event analysis*

Given the discussion based on consumer theory in Section IV-1, it is no surprise if we observe both earning-increasing and decreasing recipients. Furthermore, as the discussion in Section IV-2 indicates, it is difficult to assert that the 2013 reform increased the earnings of the recipients. Indeed, multiple factors affect changes in the recipients' earnings, and the reform of the BD is only a part of them. For example, we assumed that the Welfare Standard and wage rate are held constant over time in Section IV-1. In fact, however, the former has been revised. In addition, the minimum wage rates, which are considered to have a significant impact on the wages of PA recipients, have been increasing continuously for more than 10 years. Lastly, changes in the characteristics of PA recipients and their households may impact their labor choices. Therefore, it is necessary to consider the impact of the 2013 re-

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<sup>3</sup> In fact, Council on Social Security (2016) imprecisely explained that the upper threshold for the full deduction was 8,000 yen instead of 8,340 yen.

<sup>4</sup> To ensure that the difference between this upper threshold (8,340 yen) and the focal point (8,000 yen) is symmetrical, we set the lower bound at 7,660 yen.

Figure 12a. Changes in earnings (healthy and able-bodied: 25 years or older)

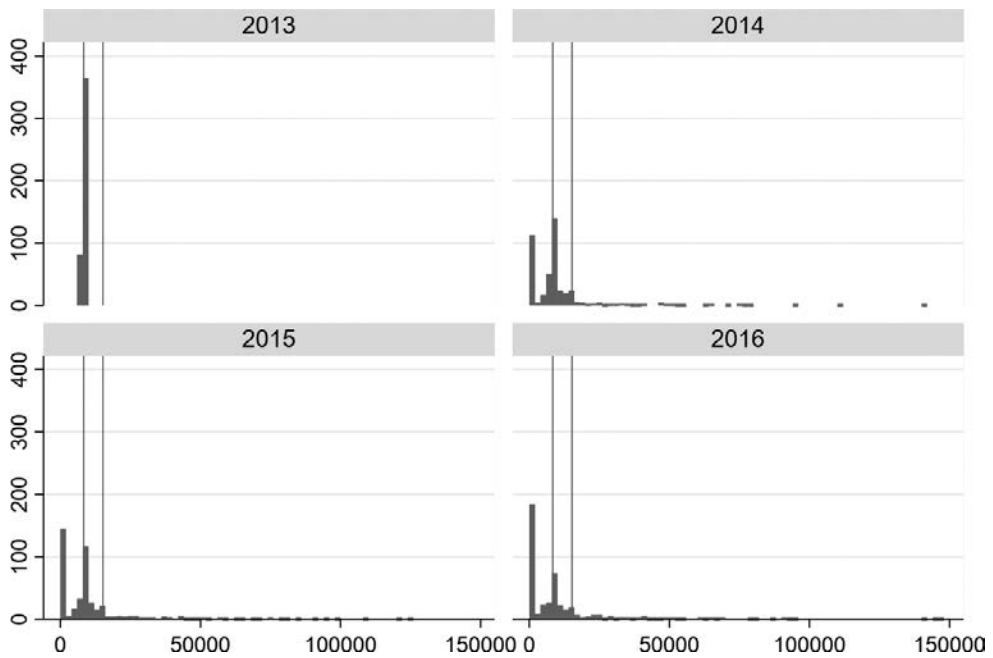
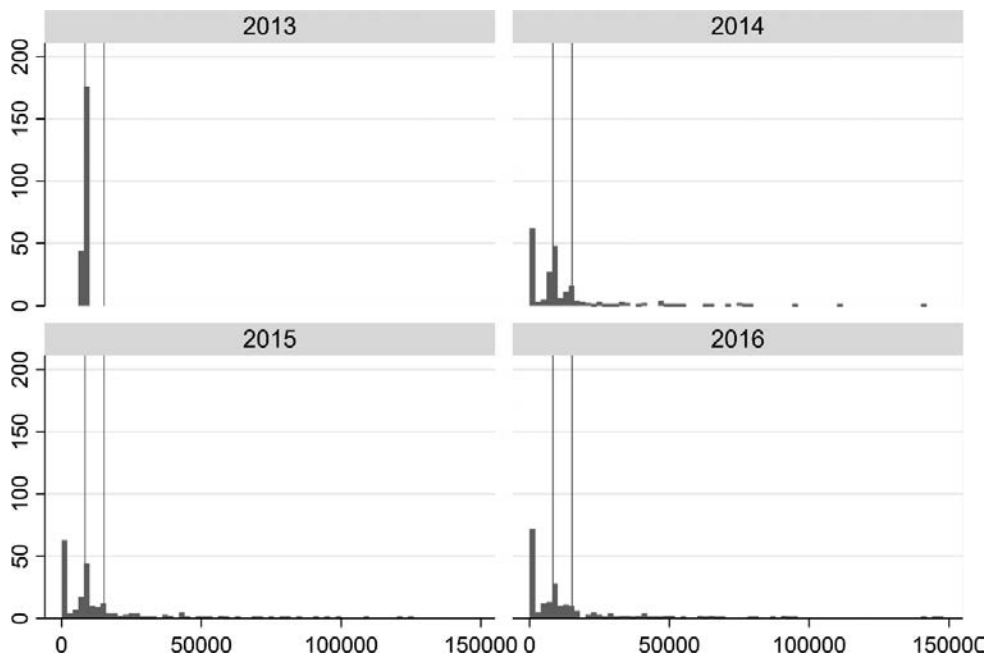


Figure 12b. Changes in earnings (healthy and able-bodied: 25 to 64 years old)



Note: The unit of the vertical axis is persons. The unit of the horizontal axis is yen. The vertical lines show earnings thresholds for full deduction, with the left line corresponding to the value before the reform and the right side corresponding to the value after the reform.

Figure 13a. Changes in earnings (injured or ill: 25 years or older)

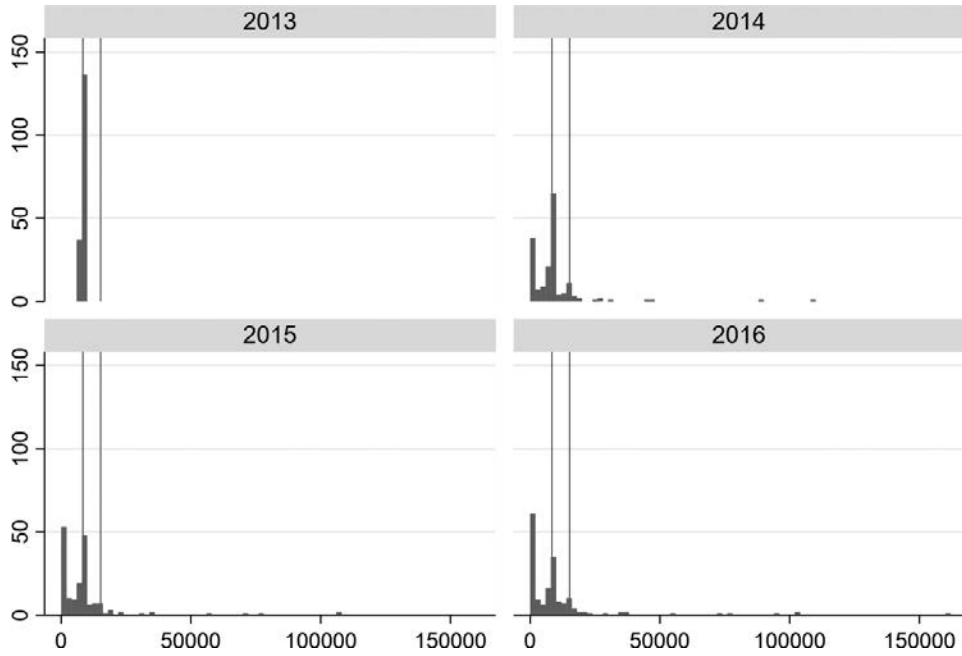
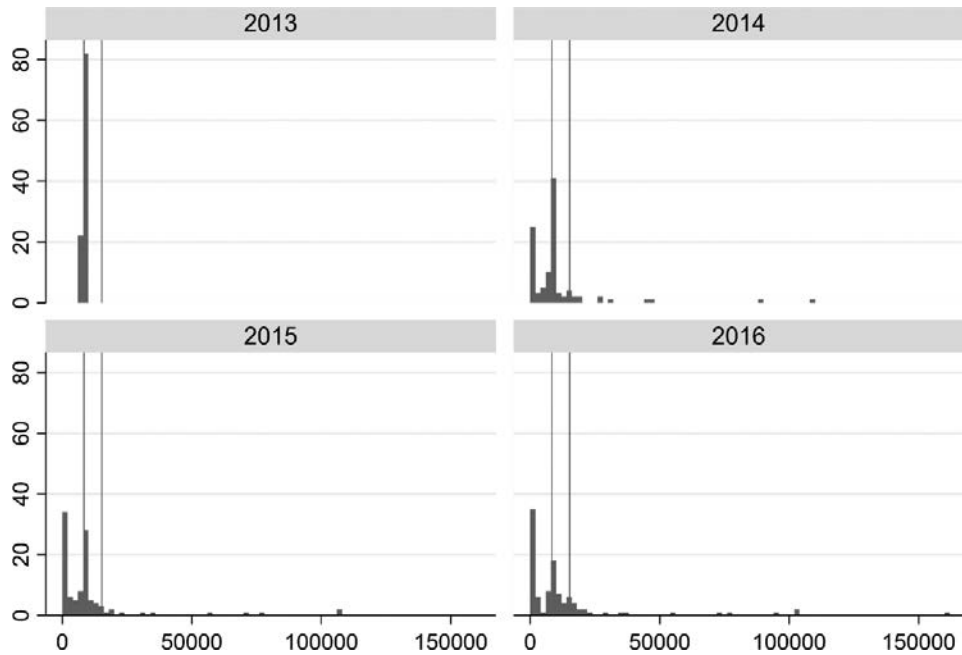


Figure 13b. Changes in earnings (injured or ill: 25 to 64 years old)



Note: The unit of the vertical axis is persons. The unit of the horizontal axis is yen. The vertical lines show earnings thresholds for full deduction, with the left line corresponding to the value before the reform and the right side corresponding to the value after the reform.



Figure 14a. Changes in earnings (disabled: 25 years or older)

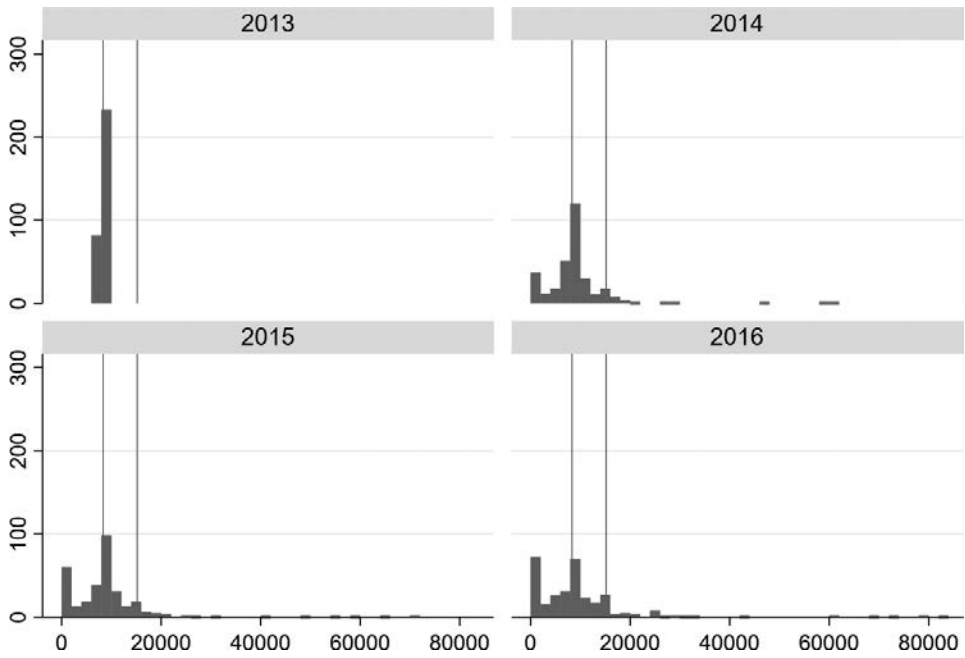
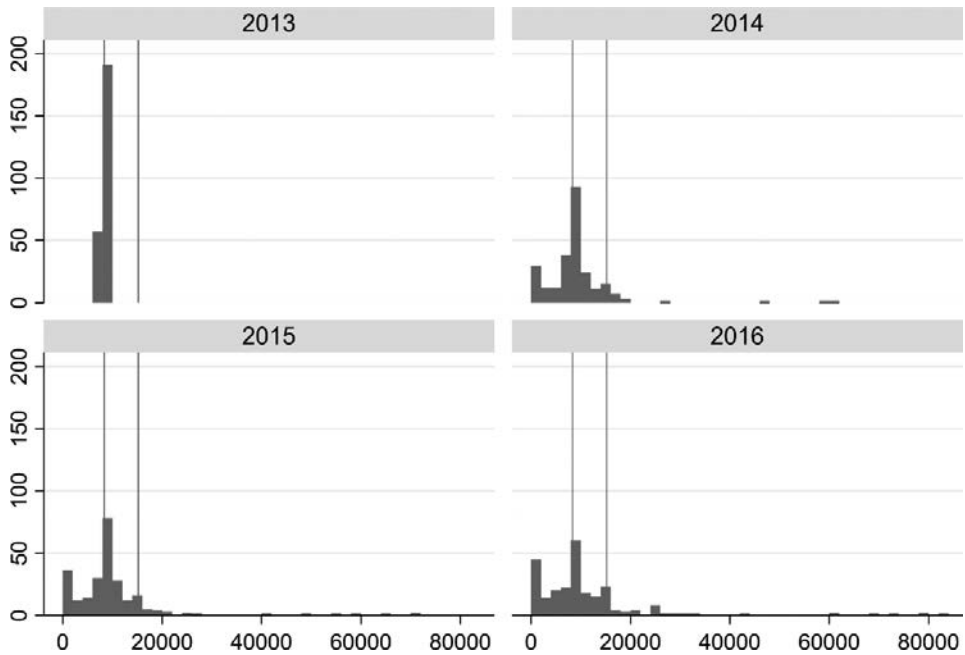


Figure 14b. Change in earnings (disabled: 25 to 64 years old)



Note: The unit of the vertical axis is persons. The unit of the horizontal axis is yen. The vertical lines show earnings thresholds for full deduction, with the left line corresponding to the value before the reform and the right side corresponding to the value after the reform.

form on earnings by allowing for such changes.

If these other factors are held constant, as we discussed with Figure 11, the 2013 reform only affected those who had earned 8,340 yen or more. Those who had earned less than 8,340 yen were unaffected. Therefore, we may regard the former recipients as the treated and the latter as the controls, again if the other factors are held constant. We thus set up the following regression model to estimate the effect of the reform on recipients' earnings:

$$y_{it} = \sum_{f=1}^2 \beta_f \cdot D_{i,t+f} + \beta_0 \cdot D_{i,t} + \sum_{l=1}^2 \beta_l \cdot D_{i,t-l} + \mathbf{X}_{i,t} \boldsymbol{\gamma} + c_i + u_{i,t} \quad (8)$$

where subscript  $i$  denotes PA recipient and  $t$  denotes July of each year from 2012 to 2016. The Greek letters are the parameters to be estimated. Dependent variable  $y_{it}$  is the earnings of PA recipient, binary treatment variables  $D_{it}$  is given as  $D_{it} = 1 \{y_{i,2013} \geq 8,340 \ \& \ t \geq 2014\}$ , and  $\mathbf{X}_{i,t}$  is a vector of covariates. Lastly,  $c_i$  and  $u_{i,t}$  are unobserved heterogeneity and idiosyncratic error, respectively. To allow for unobserved heterogeneity, we estimate the parameters in (8) using the within estimator.<sup>5</sup>

We are interested in the coefficients of the leads and lags of the treatment variable  $\{\beta_{-2}, \beta_{-1}, \beta_0, \beta_1, \beta_2\}$ . The focus is on how they change after  $t = 2013$ . As we can only identify four out of the five  $\beta$ s, we set  $\beta_{-1}$  as the reference and estimate the other four. Note that by including covariates  $\mathbf{X}_{i,t}$  in (8), we are adjusting for the factors that would affect the recipients' earnings. Conveniently, the SPAR also provides data we can use for these factors that characterize PA recipients and their households. Specifically, we have already seen in Table 1 such sets of binary variables. In addition, the SPAR offers data for the Welfare Standard that, as the discussion in Section IV-1 suggests, would also affect the recipients' earnings. We had these covariates interact with year dummies. The resulting interactions contain those between year dummies and prefectural dummies, which should adjust for all the factors that take on a common value among the recipients within a single prefecture but possibly differ over years. Such factors include the minimum wage rates, which would plausibly affect recipients' labor choice.

PA recipients in our sample are those who (1) have received PA benefits every July from 2012 to 2016, (2) earned at least 1 yen in July 2012, and (3) earned at least 1 yen but less than 15,200 yen in July 2013. Therefore, it should be noted that the population presumed here is not general PA recipients but subgroups of them conditioned on (1) to (3). From this group, we draw two subgroups of PA recipients. One consists of those (A) aged 25 years old or older in July 2012, while the other consists of those (B) aged 25 years old or older in July 2012 and 64 years old or younger in July 2016. We then construct three samples from each of (A) and (B), consisting of those who are (a) healthy and able-bodied, (b) injured or ill, and (c) disabled. We then have six samples as listed in Table 3 and use each of them to estimate (8).

The results are shown in Figure 15. Each of the six panels indexed by (A, B) and (a, b, c)

<sup>5</sup> As such, the time-invariant variables are excluded from the actual estimation.

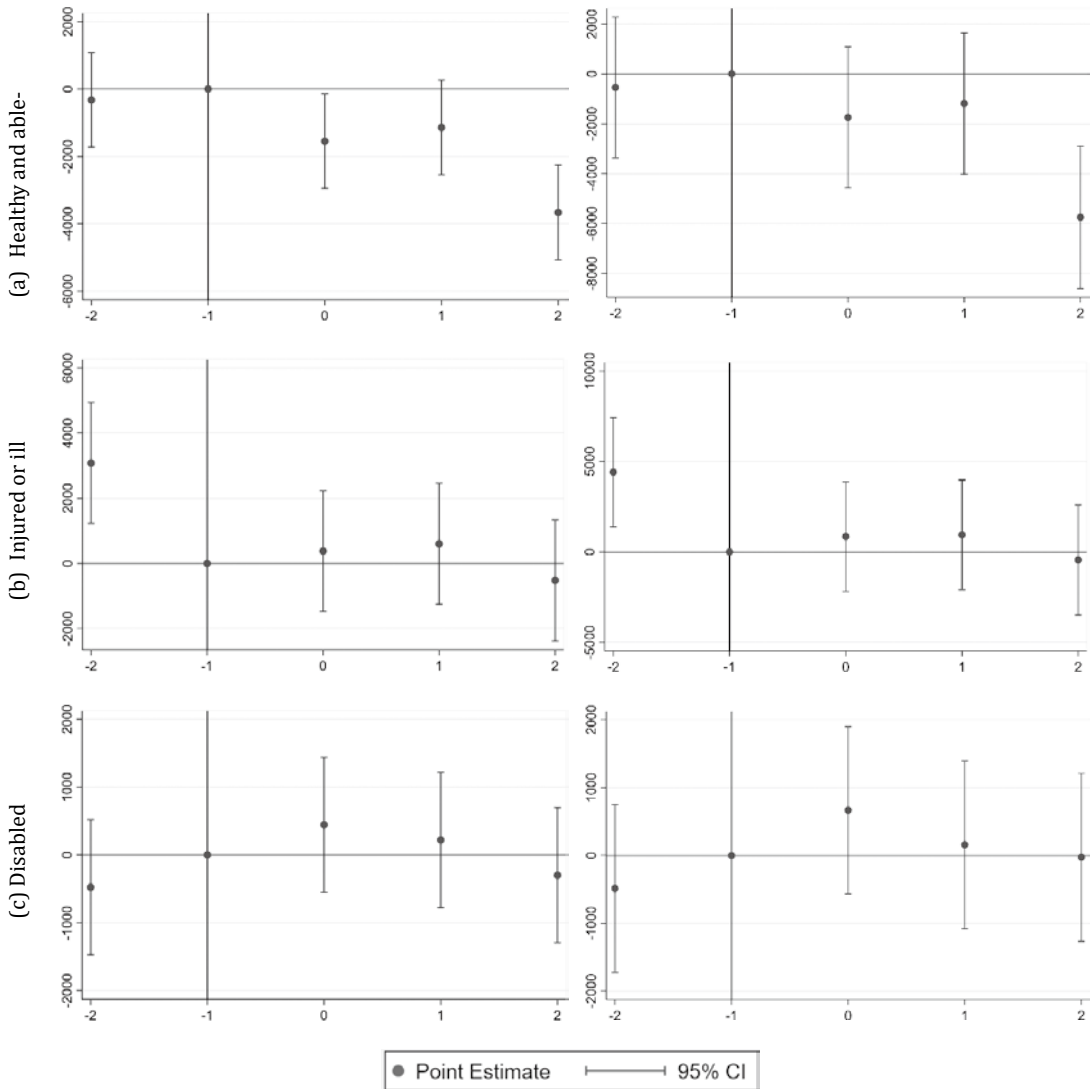
Table 3. Samples

	(A) 25 years old or older			(B) 25 years old - 64 years old		
	Sample size	treatment	control	Sample size	treatment	control
(a) Healthy and able-bodied	3,029	1,217	1,812	1,371	614	757
(c) Injured or ill	1,475	494	981	858	302	556
(c) Disabled	2,398	591	1,807	1,864	476	1,388
Total	6,902	2,302	4,600	4,093	1,392	2,701

Figure 15. Estimation results

A. 25 years old or older

B. 25 to 64 years old



in Figure 15 shows the result that uses the sample indexed analogously in Table 3. The dots in each panel in Figure 15 represent the point estimates for  $\{\beta_{-2}, \beta_0, \beta_1, \beta_2\}$ , while the straight lines extending up and down from those dots are the 95% confidence intervals.<sup>6</sup>

The results are summarized as follows. First, we do not see any noticeable differences between (A) and (B) for each category of (a), (b), and (c). Second, the point estimates after the reform are all negative for (a) the healthy and able-bodied. In particular, the effects are statistically significant (and negative) for 2016. Third, for (b) the injured or ill and (c) the disabled, the point estimates after the reform are positive for 2014 and 2015 but negative for 2016, which are all statistically insignificant. Fourth, for the period before the reform (i.e., 2012), while the estimates are statistically insignificant for (a) and (c) with values close to zero, those for (b) exhibit rather large positive values that are statistically significant. This would undermine the reliability of our estimates for (b). Nonetheless, as the estimates for (b) in years from 2014 onward show, the earnings of the injured or ill in the treatment group are not statistically different from those in the control group after the reform. These results together should point to the conclusion that the reform of the Basic Deduction in the PA system in 2013 did not increase the earnings of the PA recipients.

## V. Concluding Remarks

This study examined various aspects of the earnings of PA recipients using microdata from the SPAR. First, we provided basic descriptive statistics on the earnings of the recipients and analyzed the factors that affect the employment probability of PA recipients. Second, we have described the mechanism of the Basic Deduction in the PA system and theoretically examined its effect on the earnings of the recipients. Furthermore, we examined the effect of the August 2013 reform of the BD using descriptive statistics of their earnings, and attempted to estimate the effect of the reform using panel regressions based on an event study design.

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<sup>6</sup> We used a Stata module, “eventdd” by Clarke and Schyth (2022).

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