Spillover Effect of Japanese Long-Term Care Insurance as an Employment Promotion Policy for Caregivers[1]

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Abstract

We evaluate a spillover effect of the Japanese public long-term care insurance (LTCI) as a policy to stimulate family caregivers' labor force participation. Using a nationally representative repeated cross-sectional data from 1986 to 2013, we apply difference-in-difference propensity score matching to investigate the spillover effect in two periods: before and after the introduction of the LTCI in 2000, and before and after its major amendment in 2006. Our results show that the LTCI introduction has significant and positive spillover effects on caregivers' labor force participation, and the effects varies by gender and age. In contrast, the LTCI amendment is found to have generally negative spillover effects on labor force participation of caregivers. We draw attention to this spillover effects, as expanding labor market supply to sustain the economy would be a priority for Japan and other rapidly aging countries in the coming decades.

Key words: labor force participation, long-term care insurance, spillover effect, difference-in-difference, propensity score matching

JEL codes: I18, J22, I10

1. Introduction

Japan's population has aged much faster than that of any other country, leaving an urgent issue of increasing demand on long-term care with the government. On another track, Japanese government is also concerned about sustaining the economy with insufficient labor force in the context of a super-aged society.

In response to the former issue, public long-term care insurance (LTCI) system was launched in 2000 in Japan (Campbell and Ikegami, 2000; Campbell et al., 2010), which is a mandatory insurance for people aged 65 and older (65+) with universal coverage[7]. The main object of the LTCI is to "socialize" responsibility of long-term care (LTC) of old persons, considering of rising life expectancy, shrinking size of household, and increasing number of working women in Japan (Ministry of Health, Labour and Welfare (MHLW), 2002). Specifically, eligible old persons would receive formal care from suppliers in the LTC market and be financially supported by the government to pay for the fees. As formal and informal care are partial substitutes (Stabile et al., 2006), the LTCI is expected to mitigate unpaid family caregivers' (hereinafter referred to as caregivers) burden by outsourcing their duties to the society.

Being released from long hours of commitment for caregiving, economically active caregivers may opt to increase their labor force participation (LFP), both extensively and intensively. We aim to demonstrate this positive spillover effect of LTCI on caregivers' LFP to

[7] Properly speaking, all people aged 40 and older are insured and pay premium for the LTCI. The insured people are divided into category 1 (aged 65+) and Category 2 (aged 40–64); whereas in principle, only those who 65+ in Category 1 are eligible for LTC services once certified.

shed a more comprehensive insight into the importance of the LTCI, which would provide good implications for aging population facing policymakers globally.

Various studies in western countries explore the disadvantages of LFP of caregivers, whereas the findings are inconclusive (Lilly et al., 2007). Pavalko and Artis (1997) and Lilly et al. (2010) find that caregivers in the US and Canada are at lower LFP. Carmichael and Charles (2003) find that providing care more than ten hours per week results in lower LFP in UK, regardless of gender. Conversely, Dentinger and Clarkberg (2002) find that US male caregivers postpone their retirement than non-caregiving men; and McGarry (2006) argues that US female caregivers cut back on leisure time for care. On the other side, studies using Japanese data continuously show negative impact of caregiving on LFP (Fukahori et al., 2105; Iwamoto, 2001; Sugawara and Nakamura, 2014; Yamada and Shimizutani, 2015).

In most of the literature, LFP is measured among caregivers aged 16 to 64 years in the light of corresponding mandatory retirement legislations. Excluding people older than 65 from labor force, under the current demographic changes, overlooks an increasing extent to which old persons participate into labor force. The latest labor force statistics in Japan and US reveal LFP ratios at 42.7% and 30.8% for people aged 65 to 69 years (Statistics Bureau, 2016; Bureau of Labor Statistics, 2016). More importantly, as over half of the caregivers in Japan are 65+ (MHLW, 2013), investigations of LFP among caregivers aged 65+ bring concrete evidences for family and labor policy making in the case of super-aged society. Accordingly, we extend the upper age limit of LFP among Japanese caregivers to 69 years.

Besides, potential endogeneity between LFP and caregiving activity is often overlooked in existing the literature where researchers argue that lower LFP of caregivers stems from their caregiving activities (Lilly et al., 2007). In fact, people have weaker/stronger attachment to labor force are more/less likely to self-select into the caregiving (Carmichael et al., 2008; Henz, 2004; Mutschler, 1994). As many of the studies focus exclusively on caregivers and utilize cross-sectional data, it is difficult to adjust for the endogeneity and the results may be inaccurate (Heitmueller, 2007; Fukahori et al., 2015). Several recent studies tackle the issue by instrument variable (IV) method and panel data setting (Crespo and Mira, 2010; Ciani, 2012; Heitmueller, 2007; Leigh, 2010). However, disagreement exists among these IV-method studies toward the effect of preexisting labor status on the likelihood of being a caregiver, leaving the potential endogeneity uncertain. Regarding the endogeneity issue, we apply a difference-in-difference propensity score matching (DID-PSM) approach (Heckman et al., 1997) to control observable demographic and socio-economic differences between caregivers and non-caregivers.

While studies in western countries include both male and female caregivers (Lilly et al., 2007), many of those in Japan exclusively focus on female caregivers (Sugawara and Nakamura, 2014; Oshio and Usui, 2016; Shimizutani et al., 2008). In Japan, men's caregiving is not a rarity. According to the MHLW (2013), the rate of male caregivers has increased threefold, from 11.2% in 1984 to 31.3% in 2013, which is found to associate with raising unemployment rate among male workers (Takahashi, 2015). In their recent research, Fukahori et al. (2015) confirm that male caregivers have lower LFP at 7-10% than non-caregivers. In this study, LFP of male caregivers is concerned as well as that of female caregivers, and we

especially focus on the gender differences in caregivers' LFP to provide evidences for relative policies.

Several studies in Japan are conducted regarding to influence of the LTCI on LFP of caregivers. Tamiya et al. (2011) show a higher LPF of caregivers with high household income after introduction of the LTCI; Sugawara and Nakamura (2014) find improved LFP of female caregivers as well. In contrast, Fukahori et al. (2015) and Sakai and Sato (2007) do not find significant evidence for the positive spillover effect of LTCI on LFP improvement.

However, to our knowledge, none of the preceding literature in Japan investigates a potential negative spillover effect of the LTCI amendment in 2006. As the LTCI operated as a pay-as-you-go program, an increase in demand for LTC left great fiscal difficulty with the government. During its first five years, the expenditure on LTCI soared from 3.6 to 6.4 trillion yen, much faster than expected. A crucial reason for the skyrocketing cost was the sharply raising expenditure for care recipients with mild care needs (Campbell et al., 2010; Sugawara and Nakamura, 2014; Tamiya et al., 2011).

To contain the cost, the Japanese government amended the LTCI in April 2006. In addition to the existing LTC services, a new series of *preventive* long-term care (PLTC) services were constructed for recipients with mild care needs (Tsutsui and Muramatsu, 2007). Initially, care recipients were categorized into six groups from the mildest support required level (SL) to the most severe care level 5 (CL5)[8], among which the amendment targeted recipients in SL and

[8] Specifically, 'SL' referred to recipients living independently but requiring help for Instrumental Activities of Daily Living (IADL). 'CL1' recipients need more assistance in terms of IADL compared to 'SL' recipients. 'CL2' recipients have additional need with basic Activities of Daily Living (ADL) above 'CL1'. 'CL3' recipients require more services than those in 'CL2', thus needing total care. 'CL4' recipients fulfil all the above-mentioned conditions and have poor functioning in terms of ADL. 'CL5' recipients find it impossible to live without care and have stronger needs in terms of ADL than 'CL4' recipients. In

CL1. As Figure 1 illustrates, 91.3% of the SL recipients in March 2006 were moved to the temporary support required level (TSL) in April 2006, waiting for re-categorization into either of the two newly-established support required level 1 (SL1) or support required level 2 (SL2), afterwards being eligible for the PLTC services. In principle, SL recipients went to SL1 as long as no serious deterioration confirmed (Suzuki, 2007). Meanwhile, CL1 recipients would be re-categorized into SL2 if their health were not expected to deteriorate shortly. The re-categorization was rapidly conducted. In May 2006, more than 60 and 50 thousand of TSL and CL1 recipients had been moved to SL1 or SL2; in April 2007, one year after the amendment, the TSL was almost disappeared and one-third of the CL1 recipients went to SL2.

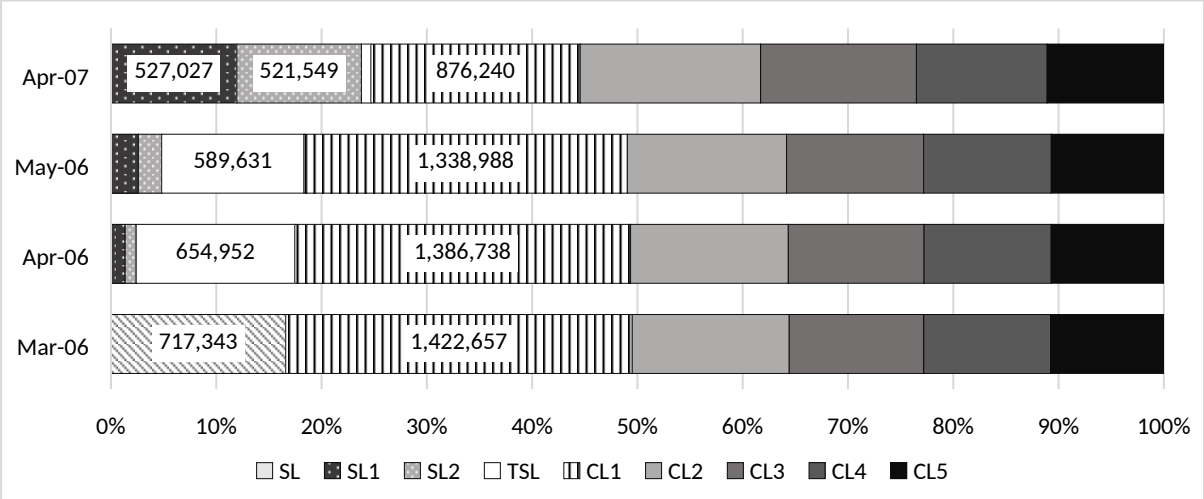

Figure 1. Trends in Proportions of Care Level during LTCI Amendment
Note: SL is the abbreviation for support required level, TSL for temporary support required, SL1-2 for support required level 1-2, and CL1-5 for care level 1-5.
Data Source: Monthly report of Fact-finding Survey on Project of Long-term Care http://www.mhlw.go.jp/topics/0103/tp0329-1.html#itiran

2006, the amendment re-categorised 'SL' and 'CL1' into 'SL1' and 'SL2', where 'SL1' applies to recipients living independently but requiring help with IADL, and 'SL2' denotes those requiring more assistance than 'SL1' recipients and might deteriorate to 'CL1'. Care recipients in 'SL1' and 'SL2' are eligible for PLTC services, and those in 'CL1-5' are continuously eligible for LTC service.

Unlike the LTC services focusing on recipients with intensive care needs, the PLTC aimed to prevent SL1(2) recipients from deteriorating. Compared to the LTC, nonetheless, types of services covered in PLTC were limited. For instance, housekeeping service that had been provided to SL recipients was no more available for SL1(2) recipients. Furthermore, the monthly upper limit of allowance payment for PLTC recipients was reduced (Table 1).

Table 1. Upper limits of allowance for (P)LTC services before and after 2006 amendment

Care Level	Service	Upper Limits[1] (2001)		2006	Care Level	Service	Upper Limits[1] (2014)	
		point	%[2]				point	%[2]
SL	LTC	6,150	17.2		SL1	PLTC	5,003	13.9
					SL2	PLTC	10,473	29.0
CL1	LTC	16,580	46.3		CL1	LTC	16,692	46.3
CL2	LTC	19,480	54.4		CL2	LTC	19,616	54.4
CL3		26,750	74.7		CL3		26,931	74.7
CL4		30,600	85.4		CL4		30,806	85.4
CL5		35,830	100.0		CL5		36,065	100.0

[1] The upper limits for (P)LTC care utilization, in terms of medical fee point. Generally, one point corresponds to around 10 yen, and this unit price varies among regions and services. For instance, one point corresponds to 10-11.4 yen in Tokyo, but to 10-10.21 in Hokkaido.
[2] The percentages are derived in terms of the points for CL5, respectively.

For caregivers re-categorized from SL to SL1, the monthly upper limit dropped from 6,150 medical fee points (17.2% of that for CL5) to 5,003 points (13.7% of that for CL5). Similarly, for those re-categorized from CL1 to SL2, the upper limit reduced from 46.3% to 29% in terms of that for CL5. On the other side, the upper limits for CL2-5 recipients and CL1 recipients remained did not change. By re-categorizing SL and CL1 recipients into SL1(2) with reduced coverage for benefits, the government mitigated the LTCI cost burden to a certain extent

(Tamiya et al., 2011). At the other side of the coin, the caregiving burden that has been transferred to social sectors came back to households. As of 2006, caregivers of the PLTC recipients, once again, carried on the responsibility of daily care that was provided by formal care suppliers and financially supported by government. The burden reloaded on caregivers may reduce their labor force commitment, and this impact should be examined to assess the overall spillover effects of the LTCI.

In sum, we examine the spillover effect of the LTCI on LFP of caregivers correspondingly before and after its 2000 introduction and 2006 amendment. Section 2 describes the econometric strategies. Section 3 introduces our data. Section 4 presents the empirical results, and section 5 concludes.

2. Empirical Strategies

2.1. LTCI Introduction in 2000

We apply the DID-PSM approach (Heckman et al, 1997) to examine the effect of the LTCI introduction and amendment on caregivers' LFP. We distinguish a treatment group ($D_{2000} = 1$) who are caregivers and a control group ($D_{2000} = 0$) who are not. Specifically, the treatment group includes respondents aged 30 years and older (30+)[9] who are main caregivers for co-residential care-needing elderly person(s) aged 65+; the control group includes respondents aged 30+ who are not caregivers but co-resident with elderly person(s) aged 65+. Two variables, $Find$ and $Lose$, stand for the LFP (i.e. outcome Y), where $Find$ indicates a transition

[9] We focus on respondents aged 30+ to balance the characteristics of non-caregivers and caregivers. Merely 0.61% of caregivers are under 30 years, while 21.7% of the non-caregivers are under 30.

in work status from being non-working in the previous year to be working currently. It allows us to measure the probability of finding jobs for non-working respondents. $Lose$, conversely, measures the probability of working respondents losing jobs.

The essence of DID method is to compare the change in LFP of the caregivers before (t) and after $(t+s)$ LTCI introduction $E(Y_{t+s}^{1} - Y_t^0 | D_{2000} = 1)$ to a counterfactual change $E($ $Y_{t+s}^{0} - Y_t^0 | D_{2000} = 1)$ if they were not influenced by the LTCI. The counterfactual change, in turn, is an actual change for non-caregivers, i.e., $E(Y_{t+s}^{0} - Y_t^0 | D_{2000} = 0)$ if a "common trend" assumption $E\left(Y_{t+s}^{0} - Y_t^0 \middle| D_{2000} = 1\right) = E(Y_{t+s}^{0} - Y_t^0 | D_{2000} = 0)$ is satisfied. This assumption indicates a crucial criterion for DID method, that is, treatment and control groups should be randomly assigned. In practise, researchers often utilize a similar criterion that the two groups should be determined by nature or by uncontrollable factors. In our case, ideally, control group shall be *caregivers* randomly or naturally extracted to experience in the absence of LTCI. Unfortunately, it is impossible to do so as the LTCI is a universal coverage program in Japan. To make the common trend assumption more creditable, alternatively, we extract the control group (i.e. non-caregivers) to match the treatment group (i.e. caregivers) basing on their similarity in terms of propensity scores. The propensity score $p(D_{2000} = 1|\boldsymbol{X})$ measures the probability of being caregiver conditional on a set of covariates, including gender, age, age squared, marital status, household ownership, within a three-generation household, number of household members, and saving levels. We consider these factors as literature confirms people who are women, without caregiver substitutes, nearing retirement age, with lower income or wealthy, with children at home are more often to be caregivers (Lilley et al., 2007). With an

additional common support constraint, only non-caregivers with propensity scores overlapped[10] with caregivers are extracted into control group. The average change in LFP of the caregivers is then compared to that of the matched non-caregivers to estimate the effect of LTCI,

$$DID - PSM = \frac{1}{N_{D_1}} \sum_{i \in D_1 \cap C} \left[\left(Y_{i,t+s}^{1} - Y_{i,t}^{0} \right) - \sum_{j \in D_0 \cap C} w_{ij} \left(Y_{j,t+s}^{0} - Y_{j,t}^{0} \right) \right], \quad (1)$$

where D_1 denotes caregivers ($D_{2000} = 1$), D_0 non-caregivers ($D_{2000} = 0$), C the area of common support, and w_{ij} the matching weight. The PSM before DID constructs pairs of caregivers and non-caregivers statistically similar to each other, making the DID more plausible. In the DID estimation, several covariates are further included, in order to adjust for factors affecting LFP other than caregiving. The added covariates are caregivers' hospital visit, self-rated health status, and survey years.

2.2. LTCI Amendment in 2006

The DID-PSM approach is also used for assessing LTCI amendment in 2006, whereas treatment group ($D_{2006} = 1$) is for caregivers 30+ taking care of recipient(s) 65+ re-categorized to be eligible for PLTC after 2006 and control group ($D_{2006} = 0$) is for caregivers 30+ taking care of recipient(s) 65+ continuously eligible for LTC.

We identify caregivers of CL2-5 recipients into control group as they are completely in absence of the amendment (recall Table 1). However, the amendment procedure makes identification of treatment group tricky. There are two sets of candidates, one is caregivers of recipients re-categorized from SL to SL1 during the amendment, another is caregivers of those

[10] We use kernel matching design.

re-categorized from CL1 to SL2. We utilize the former one as treated, because we are not able to distinguish whether the post-amendment SL2 recipients came from SL or CL1. As previously mentioned, SL recipients without serious deterioration were re-categorized into SL1, indicating possible re-categorizations of SL recipients to SL2 if they were seriously deteriorated. Hence, although the majority of post-amendment SL2 recipients had been in CL1, some of them did come from SL; and we cannot make a distinction with current data. Fortunately, we could argue that post-amendment SL1 recipients came *only* from SL, as there is hardly a case that a CL1 recipient was re-categorized into SL1 during the amendment[11].

For the outcome variable, we use $Work$ that takes unity for respondents currently working and zero otherwise. The outcomes $Find$ and $Lose$ used to measure effect of LTCI introduction are not available due to data limitation, for which we give explanation in the next section.

3. Data

We use the data of the Comprehensive Survey of Living Conditions (CSLC), which is a nationally representative repeated cross-sectional survey of the non-institutionalized population in Japan. The CSLC has been conducted once every three years from 1986 by the MHLW.[12] The CSLC contains four questionnaires focusing on household, health, income/saving, and LTC.[13] The questionnaires related to household and health cover full respondents, comprising

[11] If a CL1 recipient's health improved, probably he/she would be re-categorized into SL2.
[12] The CSLC is conducted every year, whereas a large-scale survey including plentiful information necessary to our analysis is conducted every three years.
[13] The long-term care questionnaire is available from the 2001 survey.

around 0.6-0.8 million people from approximately 0.3 million households in each survey year. The questionnaires on income/saving and LTC *complementarily* cover a part of the full respondents, including around 0.1 million and 6 thousand people, respectively.

To examine the effects of the LTCI introduction on LFP, we combine the data from the questionnaires on household, health, and income/saving from 1986 to 2004 (i.e., the latest survey year before the amendment). To identify a caregiver, we first confirm his/her household-member-identification number by a question to every care-need elderly in the household questionnaire: 'Please report the household-member-identification number of your main caregiver living with you'. We then match the number to that of all household members related to this elderly to identify the caregiver. To identify the outcomes $Find$ and $Lose$, we first confirm respondents' current work statuses in the household questionnaire. Moreover, we verify their previous-survey-year work statuses by confirming their income in the income/saving questionnaire. Specifically, if respondents report no income from employment, business, agriculture, or domestic work in the previous survey year, we denote them 'non-working' during the year. If respondents report at least one of the four types of income, we denote them 'working'.

To assess the amendment in 2006, we combine the questionnaires on household, health, and LTC from year 2001 to the latest 2013. We utilize LTC questionnaire in order to obtain information of recipients' care (support) levels accurately, so that we can identify the treatment and control groups (D_{2006}), respectively. As respondents in LTC and income/saving

questionnaire do not overlap, we cannot utilize information from the later questionnaire.[14] Hence, we simply apply respondents' current work statuses in household questionnaire to measure the LFP.

4. Results

4.1. Covariates Balancing Test

We first examine the balance of covariates after the PSM by gender (Table 2) and age (Table 3). The treated and control differ considerably in terms of important confounding factors before matching, whereas the tests confirm most of them are balanced afterwards. Besides, we formally test the common trend assumption correspondingly for treated and control before LTCI introduction and amendment, and verify the assumption is satisfied for both the analyses (see Appendix 1-3).

Assessment of the LTCI introduction. Overall, gender differences are affirmed regarding the important factors (Table 2). Compared to non-caregivers, male caregivers are overrepresented among those unmarried, without house ownerships, with less household members, and having lower savings; while female caregivers report an opposite trend. It indicates that Japanese male caregivers differ fundamentally from females. In Japan, once men got into marriage, they tend to transfer care duties to their wives; and unmarried men (probably living with their parents) have no choice but take the care duties. Moreover, female caregivers are often to be younger and live in three-generation households than non-caregivers.

[14] The Ministry does not deliver the LTC questionnaires to respondents who answer the income/saving questionnaires, as it hopes to decrease the burden on the respondents and improve the response rate by doing so.

Table 2. Covariates balancing by gender for 2000 introduction: mean differences before and after matching

	PSM Status[1]	Find						Lose					
		Male			Female			Male			Female		
		T[2]	C[2]	Test[3]	T[2]	C[2]	Test[3]	T[2]	C[2]	Test[3]	T[2]	C[2]	Test[3]
Age	U	54.52	54.86		55.05	57.19	***	54.52	54.86		55.05	57.19	***
	M	59.12	58.96		56.56	56.25		53.06	51.98		52.18	51.16	
Age squared	U	3063.4	3200.3		3117.6	3434.7	***	3063.4	3200.3		3117.6	3434.7	***
	M	3583.8	3594.6		3290.1	3265.3		2899.9	2825.6		2789.5	2692.2	*
Married	U	0.69	0.84	***	0.87	0.82	***	0.69	0.84	***	0.87	0.82	***
	M	0.60	0.61		0.90	0.89		0.73	0.71		0.81	0.77	
House ownership	U	0.87	0.92	***	0.93	0.91	**	0.87	0.92	***	0.93	0.91	**
	M	0.81	0.83		0.92	0.92		0.89	0.89		0.93	0.93	
Three generation Household	U	0.41	0.43		0.56	0.45	***	0.41	0.43		0.56	0.45	***
	M	0.23	0.24		0.55	0.59		0.47	0.48		0.59	0.62	
Number of household member	U	3.81	4.15	***	4.38	4.10	***	3.81	4.15	***	4.38	4.10	***
	M	3.26	3.42		4.40	4.49		4.02	4.12		4.34	4.41	
Saving level	U	6.39	6.75	*	6.83	6.80	*	6.39	6.75	*	6.83	6.80	*
	M	6.23	6.07		6.71	6.67		6.41	6.41		7.07	6.99	

[1] "U"=unmatched; "M"=matched

[2] "T"=treated, i.e. caregivers; "C"=control, i.e. non-caregivers

[3] Inference: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 3. Covariates balancing by age for 2000 introduction: mean differences before and after matching

	PSM Status[1]	Find									Lose								
		30-49			50-64			65-69			30-49			50-64			65-69		
		T[2]	C[2]	Test[3]	T[2]	C[2]	Test[3]	T[2]	C[2]	Test[3]	T[2]	C[2]	Test[3]	T[2]	C[2]	Test[3]	T[2]	C[2]	Test[3]
Male	U	0.14	0.54	***	0.12	0.15	***	0.14	0.48	***	0.14	0.54	***	0.12	0.15	***	0.14	0.48	***
	M	0.13	0.15	*	0.10	0.10		0.16	0.22	*	0.24	0.28	*	0.23	0.23		0.38	0.42	*
Married	U	0.83	0.74	***	0.83	0.97	***	0.89	0.84	***	0.83	0.74	***	0.83	0.97	***	0.89	0.84	***
	M	0.89	0.86		0.89	0.90		0.90	0.88		0.78	0.76		0.79	0.80		0.89	0.89	
House ownership	U	0.91	0.94	***	0.92	0.90	***	0.92	0.90		0.91	0.94	***	0.92	0.90	***	0.92	0.90	
	M	0.91	0.92		0.92	0.93		0.91	0.90		0.91	0.92		0.93	0.92		0.92	0.91	
Three generation Household	U	0.74	0.69	***	0.48	0.24	***	0.36	0.33		0.74	0.69	***	0.48	0.24	***	0.36	0.33	
	M	0.78	0.76		0.48	0.48		0.38	0.35		0.70	0.70		0.48	0.49		0.32	0.29	
Number of household member	U	4.82	5.15	***	4.10	3.43	***	3.98	3.59	***	4.82	5.15	***	4.10	3.43	***	3.98	3.59	***
	M	5.06	5.11		4.17	4.19		4.03	3.96		4.61	4.77		4.07	4.20		3.80	3.51	
Saving level	U	6.35	6.60	**	7.10	7.02		6.60	6.83		6.35	6.60	**	7.10	7.02		6.60	6.83	
	M	6.06	6.13		7.08	7.05		6.51	6.54		6.62	6.65		7.13	7.15		6.96	7.38	

[1] "U"=unmatched; "M"=matched

[2] "T"=treated, i.e. caregivers; "C"=control, i.e. non-caregivers

[3] Inference: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Among all age-specific cohorts, the female ratio of caregivers is overwhelmingly higher than that for non-caregivers (Table 3). Differences in confounding factors are frequently confirmed between caregivers aged 30-49 and 50-64. For instance, caregivers aged 50-64 are overrepresented among those unmarried, with more household members, and having own houses compared to non-caregivers, while caregivers aged 30-49 report oppositely. Although caregivers aged 65-69 are often to be married persons with more household members, they are similar to non-caregivers in terms of other factors. It appears that socio-economic characteristics of younger caregivers (aged 30-49) differ from that those of middle-aged and older caregivers (aged 50-469) in Japan. Being less wealthy, younger caregivers face higher opportunity costs to leave the labor force than their middle-aged and older counterparts. Accordingly, the LTCI would have more powerful effect on improving caregivers aged 30-49 to find jobs than preventing them from losing jobs; correspondingly, for caregivers aged 50-65, the effect on protect them against losing jobs may be stronger.

Assessment of the LTCI amendment. Treated caregivers are younger and more likely to have their own houses compared to those in the control group (Table 4). Gender differences are confirmed as previously. Compared to controlled male caregivers, those treated are less likely to be married, to live in three-generation households, and to have many household members; whereas female treated report in an opposite manner. Regardless of age, treated caregivers are overrepresented among males, those own houses, and those in three-generation households.

Table 4. Covariates balancing by gender and age for 2006 amendment: mean differences before and after matching

	PSM Status[1]	Gender						Age								
		Male			Female			30-49			50-64			65-69		
		T[2]	C[2]	Test[3]	T[2]	C[2]	Test[3]	T[2]	C[2]	Test[3]	T[2]	C[2]	Test[3]	T[2]	C[2]	Test[3]
Age	U	55.05	57.64	***	55.14	56.98	***	-	-	-	-	-	-	-	-	-
	M	55.09	55.17		55.15	55.56		-	-	-	-	-	-	-	-	-
Age squared	U	3097.3	3399.1	***	3106.3	3316.5	***	-	-	-	-	-	-	-	-	-
	M	3101.5	3110.3		3106.8	3150.5		-	-	-	-	-	-	-	-	-
Gender	U	-	-	-	-	-	-	0.21	0.18	**	0.23	0.17	***	0.25	0.21	**
	M	-	-	-	-	-	-	0.21	0.20		0.23	0.18		0.25	0.24	
Married	U	0.58	0.64	**	0.85	0.85		0.71	0.72		0.81	0.83		0.87	0.87	
	M	0.57	0.57		0.85	0.85		0.70	0.73		0.81	0.82		0.87	0.87	
House ownership	U	0.91	0.89	*	0.97	0.94	***	0.96	0.92	**	0.97	0.93	***	0.91	0.94	*
	M	0.91	0.91		0.97	0.98		0.96	0.96		0.97	0.97		0.91	0.92	
Three generation Household	U	0.29	0.32	*	0.59	0.50	***	0.66	0.64	*	0.51	0.46	*	0.33	0.30	*
	M	0.29	0.30		0.59	0.56		0.66	0.67		0.51	0.50		0.33	0.32	
Number of household member	U	3.20	3.40	*	4.31	4.13	**	4.40	4.52	**	3.99	3.95		3.76	3.61	
	M	3.20	3.25		4.31	4.30		4.41	4.43		3.99	4.02		3.76	3.67	

[1] "U"=unmatched; "M"=matched

[2] "T"=treated, i.e. caregivers of recipients with mild care needs and utilizing PLTC services after the amendment; "C"=control, i.e. caregivers of recipients with intensive care needs and continuously utilizing LTC services after the amendment

[3] Inference: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

4.2. Labor Force Participation with LTCI Introduction

After PSM, we assess the effect of LTCI introduction on LFP by gender- and age-specific groups (Table 5-6). Consistent to previous studies, we confirm that female caregivers are less likely by 4.6% to find jobs and more likely by 4.4% to lose their jobs before the LTCI introduction; also, male caregivers are found less likely by considerably 15.1% to find jobs (Table 5). The disadvantages of caregivers' LFP appear to be mitigated with introduction of the LTCI, excepted for non-working female caregivers who are willing to find jobs. The DID-PSM parameters reveal positive influences of LTCI on caregivers' LFP, while the influences differ by gender. Non-working male caregivers become more likely by 14.9% to find jobs and working female caregivers become less likely by 5.9% to lose their jobs. In contrast, neither the disadvantage for non-working female caregivers to find jobs is reduced nor it for working male caregivers is improved. Generally, men have strong labor force attachment; thereby those being outside the labor market due to caregiving are highly sensitive to formal care services provided by the LTCI. For the same reason, working men hardly reduce their labor force commitment for caregiving activities even without the LTCI, and they are to some extent be in absence of benefits of the LTCI. Recall the marriage ratios in Table 2, male caregivers are more often to be unmarried. The care burden for unmarried working male caregivers would be heaviest. On one side, they lack caregiver substitutes to provide respite from caregiving; on the other sides, they could hardly quit their jobs. The LTCI appears not to be effective to improve extensive margin of LFP for working male caregivers (i.e. losing jobs), while it may be powerful to

improve the intensive margin (i.e. working hours). Further research is needed to verify the effect.

Table 5. Probability of Finding and Losing Jobs by Gender – DID-PSM Estimates Before and After 2000 [1]

Outcome Variables	Gender	Number of Observations	Baseline Before 2000				Follow-up After 2000				DID-PSM		R-square
			Control	Treated	Diff. at Baseline Coef.[2]	S. Err.[3]	Control	Treated	Diff. at Follow-up Coef.[2]	S. Err.[3]	Coef.[2]	S. Err.[3]	
Find	Male	11,416	1.448	1.297	-0.151 ***	0.047	1.427	1.425	-0.002	0.048	0.149 **	0.066	0.20
	Female	36,257	0.674	0.628	-0.046 ***	0.012	0.704	0.677	-0.027 **	0.017	0.018	0.020	0.04
Lose	Male	47,028	-0.360	-0.329	0.031	0.020	-0.318	-0.328	-0.010	0.017	-0.041	0.027	0.11
	Female	28,994	-0.244	-0.200	0.044 ***	0.016	-0.355	-0.370	-0.015	0.013	-0.059 ***	0.021	0.10

[1] Covariates for PSM are age, age squared, married (or not), owning a house (or not), belonging to a three-generation family (or not), number of household members, and saving levels. Added covariates for further DID are: regularly visiting hospitals (or not), self-rated health status, and survey years.
[2] "Coef." = coefficients. Inference: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
[3] "S. Err." = clustered robust standard error

Table 6. Probability of Finding and Losing Jobs by Age – DID-PSM Estimates Before and After 2000 [1]

Outcome Variables	Age	Number of Observations	Baseline Before 2000				Follow-up After 2000				DID-PSM		R-square
			Control	Treated	Diff. at Baseline Coef.[2]	S. Err.[3]	Control	Treated	Diff. at Follow-up Coef.[2]	S. Err.[3]	Coef.[2]	S. Err.[3]	
Find	30-49	13,045	0.358	0.232	-0.126 ***	0.027	0.362	0.350	-0.012	0.046	0.114 ***	0.051	0.10
	50-64	14,339	1.136	1.061	-0.075 ***	0.016	1.111	1.055	-0.056 *	0.022	0.019 *	0.027	0.07
	65-69	20,100	0.881	0.841	-0.040 **	0.019	0.898	0.914	0.016 *	0.026	0.057 *	0.032	0.02
Lose	30-49	36,837	0.162	0.254	0.091 ***	0.019	0.078	0.085	0.006 **	0.013	-0.085	0.023	0.09
	50-64	20,607	-0.602	-0.524	0.079 ***	0.020	-0.640	-0.619	0.020	0.014	-0.059 **	0.024	0.09
	65-69	9,840	0.780	0.914	0.133 **	0.059	0.650	0.655	0.005	0.063	-0.128 *	0.086	0.10

[1] Covariates for PSM are gender, married (or not), owning a house (or not), belonging to a three-generation family (or not), number of household members, and saving levels. Added covariates for further DID are: regularly visiting hospitals (or not), self-rated health status, and survey years.
[2] "Coef." = coefficients. Inference: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
[3] "S. Err." = clustered robust standard error

As women have weaker attachment to labor force, the LTCI hardly improves LFP of non-working female caregivers. What important, nonetheless, is the enhanced LFP of working female caregivers. In the last several decades, an increasing number of Japanese females have been highly educated and employed as full-time workers, for whom the balance between work and caregiving is more stressful than that for traditional housewives (Hashizume, 2010). According to Ministry of internal affairs and communications (2013), 49.2% of the female caregivers in Japan are employed, almost the same to that of non-caregiving women. However, 80.5% of caregivers who quit their jobs are female, and their rate of re-participation in the workforce is only 17.7%. The success of LTCI on encouraging female caregivers to stay in the labor market is a good lesson for other family polices that aim to stimulate women's LFP.

Stratifying analyses by age-specific groups, we find significant disadvantages of LFP for caregivers in all groups before LTCI introduction (Table 6). The LTCI stimulates LFP of caregivers regardless of age, with one exception for working caregivers aged 30-49. As expected, young caregivers with strong attachment to labor force report the largest improvement in probability of finding jobs, as well as the weakest improvement in that of losing jobs after the LTCI introduction. Also, caregivers aged 50-64 and 65-69 become more likely to find jobs and less likely to lose jobs after the LTCI introduction. The magnitudes, interestingly, are larger for the older caregivers. It is well-known that retired people in Japan, compared to other developed countries, have stronger willingness to continuously participate in the labor force (Williamson and Higo, 2007). Two leading reasons for the high LFP among old persons are to maintain favourable living standards and to achieve self-satisfaction (Cabinet Office,

2006). Considering their physical conditions and relative income tax regulations, old persons in Japan usually prefer to start some part-time jobs in their post-retirement lives.

Older caregivers, however, may find themselves very difficult to participate in labor force, probably as they often face immediate family members in care needs (i.e. spouses) and lack caregiver substitutes. The increasing access to formal care releases the older caregivers from long hours of commitment to daily caregiving, and the flexible work schedules of part-time jobs make their LFP practical. With the rapid population aging, public policies have been kept on motivating people nearing/post retirement to remain/re-participate in labor force (Clark et al., 2015). The LTCI is found to be practical and effective as one entry point to stimulate people in their late middle age and older to increase LFP, as many of them would have family members being in need of long-term care.

4.3. Labor Force Participation with LTCI Amendment

As mentioned previously, caregivers taking care of the recipients using PLTC services are at risk for being outside of labor force due to the 2006 amendment (Table 7). Before the 2006 amendment, female caregivers and caregivers younger than 65 who provide care to recipients with mild care needs (i.e. eligible for SL services) are more likely to work, compared to their counterparts taking care of recipients with intensive care needs (i.e. eligible for CL2-5 services). The advantages of these treated caregivers' LFP result partially from the comparatively less intensive care required by their recipients[15], and partially from the generous

[15] One may argue that caregivers of recipients categorized into CL4 and CL5 do not suffer from heavy care burden as expected， as the recipients may be institutionalized. However, as the data we use focus on non-institutionalized people, it is reasonable to assume a heavier care burden with a higher care level.

Table 7. Probability of Working – DID-PSM Estimates Before and After 2006 [1]

Outcome variables	Gender/ Age	Number of Observations	Baseline before 2006					Follow-up after 2006					DID-PSM[4]			R-square
			Control	Treated	Diff. at baseline			Control	Treated	Diff. at follow-up						
					Coef.[2]		S. Err.[3]			Coef.[2]		S. Err.[3]	Coef.[2]		S. Err.[3]	
work	Male	1,898	1.758	1.777	0.019		0.031	1.749	1.764	0.015		0.028	-0.004		0.042	0.15
	Female	5,707	1.361	1.453	0.092	***	0.028	1.413	1.426	0.013		0.013	-0.078	**	0.034	0.10
	30-49	1,352	0.534	0.745	0.211	***	0.037	0.619	0.67	0.051		0.043	-0.160	***	0.057	0.05
	50-64	4,124	1.918	2.008	0.090	***	0.027	1.969	1.992	0.023		0.030	-0.067	*	0.040	0.09
	65-69	1,379	1.512	1.479	-0.033		0.059	1.571	1.525	-0.045		0.062	-0.012		0.077	0.03

[1] Covariates for PSM by gender: age, age squared, married (or not), owning a house (or not), belonging to a three-generation family (or not), number of household members; added covariates are: regularly visiting hospitals regularly (or not), self-rated health status, bedridden degree of care recipients, a nd survey years. Covariates for PSM by age: gender, age, age squared, married (or not), owning a house (or not), belonging to a three-generation fami ly (or not), number of household members; added covariates are the same to that for gender specific analysis

[2] "Coef." = coefficients. Inference: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

[3] "S. Err." = clustered robust standard error

services provided by the formal suppliers. Nonetheless, the advantages vanish completely after the amendment, regardless of gender or age. The DID-PSM estimators verify that treated female caregivers are less likely by 7.8% to work after the amendment; and treated caregivers aged 30-49 and 50-64 become less likely by 16% and 6.7% to work, respectively.

The findings reveal a hidden cost of the amendment, that is, the work opportunities that caregivers give up after they reallocate their time to provide informal care. Specifically, the unavailable housekeeping service due to the amendment has negative influences particularly on female caregivers' LFP. In fact, the provision of housekeeping service accounted for the largest share in at-home services before the amendment (Tokunaga, Hashimoto and Tamiya, 2015). Once the service became unavailable, many of the female caregivers have to reallocate their time to cover the vacancy. Moreover, the reduced upper limit of allowance for PLTC services may strongly discourage caregivers with economy difficulties from participating in labor force. After all, providing care by oneself is the most convenient way to avoid extra-payment for the formal services. However, it would be a vicious circle for economically difficult caregivers to be outside of the labor force, as they may find themselves unable to afford formal care some day when they are in care needs.

To this end, including unpaid family caregivers to take up care roles may curtail expenditures on LTC in a short run, but such polices would have non-negligible damages on labor forces and economies and the damages may extend beyond the direct caregiving period. In 2014, the Japanese government gave a further amendment on PLTC services to contain the corresponding costs (MHLW, 2014). We draw attention to adverse effects on LFP of such

myopic policies, as expanding labor market supply to sustain the economy would be a priority for Japan in the coming decades.

5. Conclusion

In this article, we first demonstrate significant and positive spillover effects of the LTCI introduction on caregivers' LFP. Parallel family policies in Japan to improve LFP of caregivers for children (i.e. Child Care and Family Care Leave Act) is found to be lack of effectiveness (Asai et al., 2015). The stronger power of LTCI on LFP of caregivers is intuitive in the context of super-aged society, considering the increasingly large number of caregivers for frail elderly. Our finding is in line with previous studies in Japan, but differs from that in western countries. In fact, Geyer and Korfhage (2015) and Carmichael and Charles (2003) confirm a negative effect of LTCI on LFP in Germany and U.K., because of the receipt of cash allowance that attributes to increase of caregivers' nonwage income. Japanese no-cash-allowance LTCI would provide a good experience to other countries where encourage caregivers' LFP is a priority.

Furthermore, we confirm the negative spillover effect of the LTCI amendment on LFP of caregivers. This is the first finding that verifies the negative LFP effect of the amendment, which in turn underlines the importance of LTCI on stimulating LFP. Further research with concrete cost-benefit analyses is necessary to comprehensively assess the monetary loss(gain) of the amendment.

This research suffers several limits. First, in assessment of the LTCI introduction, we do not control potential association between caregivers' living arrangement and their LFP. It is

possible that people with weaker attachment to labor force opt to live with and take care of frail family members. As our data focus exclusively on caregivers being co-residential with recipients, our results may overestimate the disadvantages of caregivers' LFP. In their recent study, however, Fukahori et al., (2015) do not find significant evidence for the association between living arrangement of caregivers and their LFP. We examine the robustness of our results by modifying the corresponding control group to be non-caregivers aged 30+, regardless of co-residence with elderly in care needs or not. The estimators in robustness check are statistically consistent to our main results (see Appendix 4-5). Second, in assessment of the LTCI amendment, we include caregivers for recipients from CL2 to CL5 in the control group for the sake of sample size. The individual heterogeneity between caregivers for recipients in SL and in CL4-5, however, might be problematic. We test the robustness by modifying the corresponding control group to include only caregivers for recipients in CL2-3. The test shows our results are robust (Appendix 6). The third shortcoming of our study lies on the identification of treatment and control groups. Even though we balance the two groups with observable covariates, unobservable individual heterogeneity still disturbs the accuracy of our findings. In U.S. and other western countries, public policies differ among states, thereby comparisons of outcome between two states using DID method often provide accurate and concrete evidences. Unfortunately, it is hard to do so in our case, as the LTCI system is universal coverage designed in Japan. Further studies with more plausible treatment and control are necessary to examine the LFP effect of the LTCI.

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Appendix 1 Test for common trend assumption before 2000: by gender [1]

Outcome Variables	Gender	1986/89 *p-value*	1989/92 *p-value*	1992/95 *p-value*	1995/98 *p-value*
Find	Male	0.945	0.487	0.324	0.221
	Female	0.254	0.227	0.368	0.270
Lose	Male	0.104	0.153	0.239	0.086
	Female	0.605	0.101	0.124	0.730

[1] p-values of the DID estimators are reported.

Appendix 2 Test for common trend assumption before 2000: by age [1]

Outcome Variables	Age	1986/89 *p-value*	1989/92 *p-value*	1992/95 *p-value*	1995/98 *p-value*
Find	30-49	0.533	0.497	0.799	0.215
	50-64	0.313	0.603	0.919	0.423
	65-69	0.351	0.718	0.711	0.245
Lose	30-49	0.140	0.867	0.100	0.370
	50-64	0.297	0.102	0.151	0.229
	65-69	0.974	0.169	0.241	0.255

[1] p-values of the DID estimators are reported.

Appendix 3 Test for common trend assumption before 2006 [1]

Outcome Variables		2001/04 *p-value*
work	Male	0.200
	Female	0.432
	30-49	0.750
	50-64	0.124
	65-69	0.419

[1] p-values of the DID estimators are reported.

Appendix 4. Probability of Losing and Finding Jobs by Gender – Robustness Check [1,2]

Outcome Variables	Group	Number of Observations	Baseline Before 2000					Follow-up After 2000				DID-PSM			R-square
			Control	Treated	Diff. at Baseline			Control	Treated	Diff. at Follow-up					
					Coef.[3]		S. Err.			Coef.[3]	S. Err.	Coef.[3]		S. Err.	
Find	Male	35,110	1.158	1.068	-0.090	***	0.026	1.163	1.166	0.003	0.024	0.093	***	0.034	0.17
	Female	116,543	0.488	0.486	-0.002		0.01	0.518	0.515	-0.003	0.012	-0.001		0.015	0.04
Lose	Male	145,102	-0.314	-0.278	0.036	*	0.019	-0.271	-0.276	-0.005	0.016	-0.041		0.027	0.11
	Female	79,597	-0.145	-0.107	0.038		0.016	-0.333	-0.330	0.003	0.012	-0.035	*	0.021	0.08

[1] Treatment group includes main caregivers 30+ for elderly 65+ in care needs; control group includes non-caregivers aged 30+.

[2] Inference: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix 5. Probability of Losing and Finding Jobs by Age – Robustness Check [1,2]

Outcome Variables	Group	Number of Observations	Baseline Before 2000					Follow-up After 2000				DID-PSM			R-square
			Control	Treated	Diff. at Baseline			Control	Treated	Diff. at Follow-up					
					Coef.[3]		S. Err.			Coef.[3]	S. Err.	Coef.[3]		S. Err.	
Find	30-49	49,393	0.164	0.149	-0.015	***	0.026	0.217	0.189	-0.028	0.045	-0.013	***	0.051	0.07
	50-64	42,140	0.871	0.840	-0.031	*	0.016	0.868	0.846	-0.022	0.021	0.009	*	0.026	0.04
	65-69	63,189	0.594	0.554	-0.040	***	0.010	0.616	0.606	-0.010	0.012	0.030	**	0.016	0.04
Lose	30-49	127,321	0.179	0.254	0.075		0.019	0.087	0.083	-0.004	0.013	-0.079		0.023	0.1
	50-64	78,747	-0.600	-0.522	0.078	***	0.020	-0.633	-0.613	0.020	0.014	-0.058	**	0.024	0.08
	65-69	18,223	-0.360	-0.292	0.067	*	0.038	-0.378	-0.417	-0.040	0.041	-0.107	*	0.056	0.08

[1] Treatment group includes main caregivers 30+ for elderly 65+ in care needs; control group includes non-caregivers aged 30+.

[2] Inference: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix 6. Probability of Working – Robustness Check[1,2]

Outcome variables	Sample Groups	Number of Observation	Baseline before 2006					Follow-up after 2006					DID-PSM			R-square
			Control	Treated	Diff. at baseline			Control	Treated	Diff. at follow-up						
					Coef.		SE			Coef.	SE		Coef.		SE	
work	Male	1,230	1.610	1.536	-0.074		0.049	1.599	1.515	-0.084	0.044		-0.011		0.046	0.14
	Female	3,991	1.411	1.496	0.085	***	0.028	1.458	1.468	0.010	0.028		-0.076	**	0.035	0.10
	30-49	939	0.484	0.616	0.132	***	0.133	0.492	0.513	0.021	0.052		-0.111	**	0.057	0.05
	50-64	2,746	1.841	1.888	0.047	**	0.033	1.895	1.861	-0.034	0.036		-0.081	*	0.044	0.09
	65-69	871	1.856	1.833	-0.023		0.060	1.916	1.833	-0.083	0.063		-0.060		0.080	0.03

[1] Treatment group includes caregivers for elderly in SL before the amendment and in SL1 after the amendment; control group includes caregivers for elderly in CL2 and CL3 before and after the amendement.

[2] Inference: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.