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Spillover effect of Japanese long-term care insurance as an employment promotion policy for family caregivers☆

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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 nationally representative data from 1995 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 family caregivers' labor force participation and the effects vary by gender and age. In contrast, the LTCI amendment is found to have generally negative spillover effects on their labor force participation. We draw attention to these 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.

1. Introduction

Japan's population has aged much faster than that of any other country, creating an urgent issue for the government of the increasing demand for long-term care (Campbell and Ikegami, 2000; Tamiya et al., 2011). On another track, the Japanese government is also concerned about sustaining the economy with an insufficient labor force in the context of a super-aged society (Schröder et al., 2016).

In response to the former issue, the public long-term care insurance (LTCI) system was launched in 2000 in Japan (Campbell and Ikegami, 2000; Campbell et al., 2010). The LTCI is a mandatory insurance with universal coverage. Its main objective is the "socialization" of the responsibility of long-term care (LTC) of old persons,

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considering the rising life expectancy, shrinking household size, and the increasing number of working women in Japan (Ministry of Health, Labour and Welfare (MHLW), 2002). Every Japanese aged 40 and older (40+) pays an LTCI premium; everyone aged 65 and older (65+) is eligible for benefits on the basis of his/her physical and mental conditions, in six categories of need from the mildest support required level (SL) to the most severe care level 5 (CL5).[5] Premiums are approximately one percent of income for those aged 40–64 years; for those 65+, premiums are on average JPY5,500 per month (about USD54, purchasing power parities in 2016) (MHLW, 2015). Regarding the benefits, eligible recipients 65+ receive formal care services from suppliers in the LTC market and are financially supported by the government payments for the fees. Various services – both at-home and institutional – are covered: housekeeping, bathing, visiting nurse, rehabilitation, day services, short-stay service/care, medical care management counseling, welfare devices leasing/purchasing, and home renovation are included in at-home services; nursing homes as well as chronic-care hospitals are included in institutional services. Recipients pay barely 10 percent of the fees (Tamiya et al., 2011).

As formal and informal care are partial substitutes (Charles and Sevak, 2005; Stabile et al., 2006), the generous formal services covered in LTCI are expected to mitigate unpaid family caregivers' burden. Being released from some aspects of caregiving, economically active caregivers may opt to increase their labor force participation (LFP) or re-enter the labor force. This improved LFP of caregivers – a positive spillover effect of LTCI – shall be assessed to offer a more comprehensive insight into the importance of LTCI arrangements.

Various studies in Western countries explore the differences in LFP between caregivers and non-caregivers, with the findings being inconclusive (Lilly et al., 2007). Van Houtven et al. (2013) find male caregivers in US are less likely to work than non-caregivers. In addition, Skira (2015) finds female caregivers in the US are more often likely to provide intensive care for their parents, and report a less likelihood of working than non-caregivers. Lilly et al. (2010) find that caregivers in Canada have lower LFP than non-caregivers. Carmichael and Charles (2003) find that providing care more than 10 h per week results in lower LFP in the UK, regardless of gender. In contrast, Dentinger and Clarkberg (2002) find that US male caregivers postpone their retirement more than non-caregiving men; McGarry (2006) argues that US female caregivers cut back on leisure time in order to provide care. Studies using Japanese data consistently show a negative impact of care duties on LFP (Iwamoto, 2001; Sugawara and Nakamura, 2014; Yamada and Shimizutani, 2015).

In most of the literature, LFP is measured among caregivers aged 15–64 years in the light of corresponding mandatory retirement legislations. Excluding people older than 65 from analyses, under the current demographic changes, overlooks an increasing extent to which older persons enter the labor force. The latest labor force statistics in Japan and the US reveal LFP ratios at 42.7 percent and 30.8 percent for people aged 65–69 years (Bureau of labor statistics, 2016). More importantly, as over half of the caregivers in Japan are 65+ (Ministry of Health Labor and Welfare, 2013), analysis of LFP among caregivers aged 65+ will help inform family and labor policy formulations in the context of a super-aged society. Accordingly, we extend the scope of this study to include caregivers 65+.

There is potential endogeneity between LFP and caregiving activity where researchers argue that the lower LFP of caregivers stems from their caregiving activities (Lilly et al., 2007). People that have a weaker/stronger attachment to the labor force are more/less likely to self-select into caregiving (Henz, 2004; Van Houtven et al., 2013). As many studies focus exclusively on caregivers and utilize cross-sectional data, it is difficult to adjust for endogeneity (Bolin et al., 2008; Heitmueller, 2007). Recent studies tackle the issue using instrumental variable (IV) and panel data (Bolin et al., 2008; Coe and Van Houtven, 2009; Heitmueller, 2007; Leigh, 2010; Van Houtven et al., 2013). However, disagreement exists among these study methods toward the effect of preexisting labor status on the likelihood of care provision, leaving the potential endogeneity unresolved. To address endogeneity in this study, we apply a difference-in-difference propensity score matching (DID-PSM) approach (Schmitz and Westphal, 2015) to control for 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 focus exclusively on female caregivers (Sugawara and Nakamura, 2014; Oshio and Usui, 2017; Shimizutani et al., 2008). In Japan, men's caregiving is increasing. According to the Ministry of Health Labor and Welfare (2013), the rate of male caregivers has increased threefold, from 11.2 percent in 1984–31.3 percent in 2013, which might be associated with the rising unemployment rate among male workers (Takahashi, 2015). In their recent research, Fukahori et al. (2015) find that male caregivers have a lower LFP by 7–10 percent than non-caregivers. We include both male and female caregivers in our analysis and we explore the gender differences in LFP among Japanese caregivers.

As regards the spillover effect of LTCI, Coe et al. (2015) find that adult children in the US providing care to their parents report a higher likelihood of working with LTCI. Studies in Japan, meanwhile, have not reached a consensus about such spillover effect. Tamiya et al. (2011) find a higher LPF of caregivers with high household income with LTCI; Sugawara and Nakamura (2014) also find improved LFP for female caregivers. Instead, Fukahori et al. (2015) and Sakai and Sato (2007) do not find significant evidence for the spillover effect of LTCI on caregivers' LFP.

However, to the best of our knowledge, none of the preceding literature analyses a potential negative spillover effect on LFP of the LTCI amendment in 2006. As the LTCI operated as a pay-as-you-go program, an increase in demand for LTC services promoted a great fiscal challenge for the government. During its first five years, the expenditure on LTCI soared from 3.6 to 6.4 trillion yen, much faster than expected (Shimizutani and Noguchi, 2004). A crucial reason was the sharply increasing number of recipients with mild care needs (Campbell et al., 2010; Sugawara and Nakamura, 2014; Tamiya et al., 2011). Accordingly, the government amended the LTCI in April 2006 to contain the costs by reducing benefits for recipients with mild care needs – those in SL and CL1. In addition to the existing LTC services, *preventive* long-term care (PLTC) services with fewer benefits were constructed for these recipients (Tsutsui and Muramatsu, 2007).

The process of amendment is illustrated in Fig. 1. In March 2006, i.e. the month just before the amendment, about 700,000 and 1,400,000 recipients were in SL and CL1, accounting for half of the total recipients. One month later, 91.3 percent of SL recipients were moved to a temporary category, the so-called temporary support required level (TSL). Then, TSL recipients would be re-categorized into either of the newly-established support required level 1 (SL1)

[5] 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" and "CL3" recipients require more services than those in "CL2," thus needing total care. "CL4" recipients fulfill 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 2006, the amendment re-categorized "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 preventive long-term care (PLTC) services, and those in "CL1-5" are continuously eligible for LTC service.

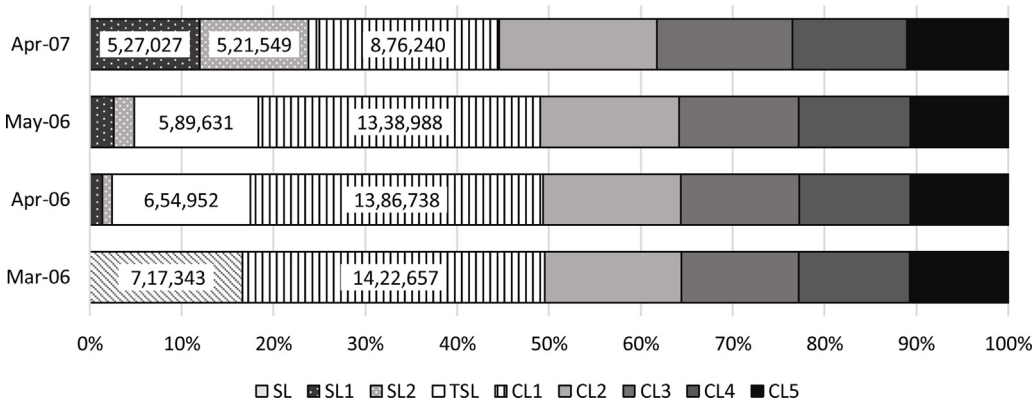

Fig. 1. Trends in Proportions of Care Level during LTCI Amendment.
Note: SL is the abbreviation for support required level, TSL for temporary support required, SL1-2 for support required level 1–2, and CL1-5 for care level 1–5.
Data
Source: Monthly report of Fact-finding Survey on Project of Long-term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

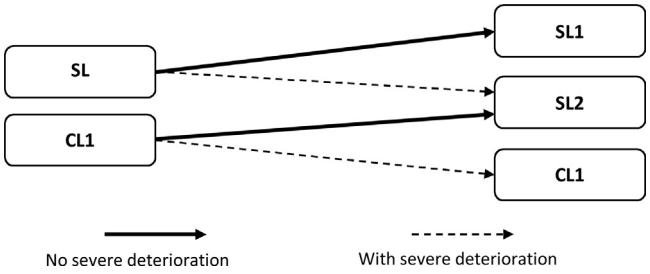

Fig. 2. Re-categorization of recipients in SL and CL1 in the Amendment.
Note: SL is the abbreviation for support required level, CL1 for care level 1.

or support required level 2 (SL2). As Fig. 2 illustrates, SL recipients were re-categorized to SL2 only if they suffer from serious health deterioration, otherwise they went to SL1 (Suzuki, 2007). No matter into which category TSL recipients were re-categorized, they became eligible for PLTC services rather than LTC services. Similarly, CL1 recipients stayed only if their health was expected to deteriorate shortly; otherwise they were re-categorized into SL2 (Fig. 2). In addition, they were no longer eligible to utilize LTC services if moved to SL2. In May 2006, more than 60,000 and 50,000 recipients in TSL and CL1 had been re-categorized into SL1 and SL2, respectively. One year after the amendment, the number of recipients in TSL was negligible and one-third of the CL1 recipients were moved to SL2.

As previously mentioned, the amendment reduces benefits for recipients using PLTC services. First, the types of services covered in PLTC are fewer compared to those in LTC. For instance, housekeeping that had been provided to SL recipients before the amendment was no longer available for SL1 recipients. Furthermore, the monthly upper limits of financial support for SL1/2 recipients were reduced (Table 1).

For recipients re-categorized from SL to SL1, the monthly upper limit was reduced from JPY61,500 (17.2 percent to that for CL5) to JPY50,030 (13.7 percent to that for CL5). Similarly, for those re-categorized from CL1 to SL2, the upper limit decreased from 46.3 percent to 29.0 percent to that for CL5. Meanwhile, the upper limits for CL2-5 recipients remained in terms of the percentage to the upper limit for CL5.

Studies show that the amendment contains the LTCI cost to a certain extent (Tamiya et al., 2011). On the other side of the coin, the caregiving burden came back to households. As of 2006, caregivers of the PLTC recipients, once again, carried on the care duties that had been shared with formal care suppliers. The reloaded burden may reduce caregivers' labor force commitment and this impact should be examined to assess the overall spillover effects.

To this end, this research analyses the spillover effect of the LTCI on caregivers' LFP corresponding to the two policy changes of the LTCI: the introduction in 2000 and the amendment in 2006. The paper is organized as follows: Section 2 introduces the data. Section 3 describes the econometric strategies. Section 4 presents the empirical results and Section 5 concludes.

2. Data and measurements

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.[6] The CSLC contains four questionnaires focusing on household, health, income/saving, and LTC.[7] The questionnaires related to household and health cover full respondents, comprising 600,000–800,000 people from approximately 300,000 households in each survey year. The questionnaires on income/saving and LTC complementarily cover a part of the full respondents, including around 100,000 and 6000 people, respectively.

We first define the outcome variable to represent LFP in this study. We confirm respondents' current work statuses by a question to respondents in the household questionnaire: "Are you currently working?" and consider respondents to be "currently working" if they self-report having full- or part-time jobs, otherwise categorize them into "currently not working." Furthermore, to analyze the influences of the LTCI introduction and amendment on LFP, we separate the respondents respectively into two groups: one includes respondents whose LFP are affected by the policy changes (i.e. treatment group), and the other includes those unaffected by the policy changes (i.e. control group).

2.1. Treatment and control groups for the LTCI introduction

To identify treated respondents whose LFP improved after the LTCI introduction in 2000, we combine the data from the questionnaires on household and health from 1995 to 2004 (i.e., the latest

[6] The CSLC is conducted every year, whereas a large-scale survey including plentiful information necessary to our analysis is conducted every three years.
[7] LTC questionnaire was newly introduced into the CSLC after the introduction of LTCI in the year of 2000.

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

Before				After			
Care Level	Service	Upper Limits[a]		Care Level	Service	Upper Limits[a]	
		JPY	%[b]			JPY	%[b]
SL	LTC	61,500	17.2	SL1	PLTC	50,030	13.9
				SL2	PLTC	104,730	29.0
CL1	LTC	165,800	46.3	CL1	LTC	166,920	46.3
CL2	LTC	194,800	54.4	CL2	LTC	196,160	54.4
CL3		267,500	74.7	CL3		269,310	74.7
CL4		306,000	85.4	CL4		308,060	85.4
CL5		358,300	100.0	CL5		360,650	100.0

[a] The upper limits for (P)LTC care utilization in JPY. Practically, the upper limits are set in terms of point, and one point corresponds to JPY10 on average. We simply show the upper limits of allowance regarding the exchange ratio as 1:10, while the ratio varies slightly among prefectures. For instance, one point corresponds to the JPY11.4 in Tokyo, and to JPY10.2 in Hokkaido.
[b] The percentages are derived in terms of the upper limits for CL5, respectively.

survey year before the amendment). The treatment group includes respondents aged 30 years and older (30+) who are *main* caregivers for co-residential care-needing old persons aged 65+; and the control group includes respondents 30+ who are not caregivers but co-resident with old persons 65+.[8] The procedure through which we find a *main* caregiver is as below. We confirm his/her household-member identification number by a question to every care-needing old person 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 old person to identify his/her main caregiver.

2.2. Treatment and control groups for LTCI amendment

To identify treated respondents whose LFP are negatively affected by the 2006 amendment, we merge three questionnaires: household, health, and LTC questionnaires, from 2001 to the latest 2013. In the LTC questionnaire, each recipient is required to report his/her current care (support) level. Based on the information, we identify recipients suffering from the reduced benefits after the amendment. Caregivers for these recipients have to resume care duties and thus reduce labor force commitment. The treatment group includes caregivers 30+ of recipients 65+ who are in SL before the amendment and in SL1 afterwards (SL-SL1), because they are eligible for LTC services before the amendment and for PLTC service afterwards. The control group includes caregivers 30+ of recipients 65+ in CL2-5 before and after the amendment. As the controlled caregivers are eligible for LTC services, they are regarded to be unaffected by the policy change.

Two points are worth mentioning. First, we exclude caregivers of recipients re-categorized into SL2 after the amendment from the treatment group. Although most of the SL2 recipients were in CL1 before the amendment (CL1-SL2), some of them were in SL (SL-SL2) (Suzuki, 2007; Tsutsui and Muramatsu, 2007). The amendment reduces benefits for the CL1-SL2 recipients, but increased the ones for the SL-SL2 (Table 1). Put differently, caregivers of the two types of recipients were motivated oppositely in terms of LFP. Due to data limitations, we could not verify precisely the proportion of CL1-SL2 caregivers; including caregivers of SL2 recipients as such would disturb the validity of our findings.

Second, we include caregivers of CL4-5 recipients into the control group in order to guarantee sufficient sample size for analyses, since CL4-5 recipients account for over 26 percent of the 6000 recipients in each survey year. Meanwhile, we are concerned about the systematical differences between CL4-5 caregivers and SL-SL1 caregivers. To address the issue, we match each of the SL-SL1 caregivers with similar CL2-5 caregivers using various factors about their demographic, socio-economic, and health statuses. We confirm that CL2-5 (including CL4-5) caregivers do not systematically differ from SL-SL1 caregivers. Details of the matching process are discussed in Section 3. We also confirm the robustness of our results by including only CL2-3 caregivers into the control group (Appendix I).

3. Empirical strategies

We apply the difference in difference (DID) approach (Rosenbaum and Rubin, 1983, 1985; Heckman et al., 1997) to examine the effects of the LTCI introduction and amendment on caregivers' LFP. The essence of the method is to compare the change in LFP Y_t^P of *treated* respondents before and after the policy changes P of the LTCI system $E(Y_{t+s}^1 - Y_t^0|P=1)$ to a counterfactual change $E(Y_{t+s}^0 - Y_t^0|P=1)$, as if they were not affected by the policy changes. The counterfactual change, in turn, is an actual change for *controlled* respondents, i.e., $E(Y_{t+s}^0 - Y_t^0|P=0)$ if a common trend assumption $E(Y_{t+s}^0 - Y_t^0|P=1) = E(Y_{t+s}^0 - Y_t^0|P=0)$ is satisfied.

The common trend assumption indicates a crucial criterion for the DID method, that is, treatment and control groups should be randomly assigned. In practice, researchers often utilize a similar criterion to determine the two groups by nature or by uncontrollable factors (Heckman et al., 1998). When we assess the influence of the LTCI introduction on LFP, ideally, the control group should be *caregivers* randomly or naturally extracted to be unaffected by the LTCI. Similarly, when we assess the influence of the LTCI amendment on LFP, the ideal control group shall be the *SL-SL1 caregivers* randomly selected to receive benefits at the pre-amendment level. In the case of such randomizations, simply comparing the LFP between treatment and control groups yields an average treatment effect on the treated (ATT); and changes in ATT after LTCI policy changes correspond to the changes in spillover effects. Unfortunately, it is impossible to do so since the Japanese LTCI is a universal coverage system. It is also unethical to select old persons randomly to receive benefits at different levels.

To make the common trend assumption more credible, alternatively, we extract the controlled respondents to match the treated ones based on their similarity in terms of propensity scores. The propensity score $p(P=1|\boldsymbol{X})$ measures the probability of being treated conditional on a set of covariates $\boldsymbol{X}$, where only controlled respondents with propensity scores overlapped within a bandwidth to those treated are extracted for DID estimations. In this study, this propensity score matching (PSM) process is conducted

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

separately for gender- or age-specific subsamples. Specifically, the sample is divided into male and female cohorts and into cohorts aged 30–49 years, aged 50–64 years, and aged 65+. Criteria for these groups consider the gaps of willingness and capability to provide care to old persons living with and to enter the labor force across the subsamples. Compared to women and older people, men and young people commonly have a stronger willingness to work and in turn are less willing to take on care duties. Furthermore, the PSM is conducted respectively for the introduction of LTCI in 2000 and its amendment in 2006. In each matching process, we first derive the propensity score using a logistic regression,

$$logit(p_{s,P}) = \alpha_0 + \boldsymbol{X_{s,P}\alpha_{s,P}} + \epsilon. \quad (1)$$

The subscript $s = s_g, s_a$ defines subsamples, where s_g and s_a represent the gender-specific and the age-specific subsamples, respectively; $P = I, A$ stands for policy changes, where I for the LTCI introduction and A for the amendment. The $\boldsymbol{X}$ is a set of covariates representing respondents' individual and household characteristics, as well as the health statuses of old persons being cared for or co-resident with the respondents. Specifically, $\boldsymbol{X_{s_g,I}}$ includes the individual characteristics which are age in years, marital status (four categories, married as reference), regular outpatient (yes=1), self-rated health (five categories, very good as reference), subjective symptoms (12 categories, none as reference); the household characteristics which are household ownership (yes=1), within a three-generation household (yes=1), number of household members, and monthly household expenditures (log scale); and the health statuses of old persons which are their self-rated health (five categories, very good as base). The $\boldsymbol{X_{s_a,I}}$ includes almost the same covariates as those in $\boldsymbol{X_{s_g,I}}$, except that the age in years is replaced by gender (male=1). In a similar fashion, $\boldsymbol{X_{s_g,A}}$ and $\boldsymbol{X_{s_a,A}}$ comprise a set of individual and household characteristics, whereas the covariates here indicating health statuses of recipients are their bedridden levels (four categories, completely bedridden as base).[9]

We include these covariates because literature suggests that factors shall be taken into consideration for PSM as long as they are related to the probability of being treated or the outcome (Austin, 2011; Brookhart et al., 2006; Garrido et al., 2014; Ho et al., 2007). According to preceding studies, people who are women, older, with children at home, with a small household and lacking caregiver substitutes are more often to be caregivers and less likely to enter the labor force. In the Japanese context, middle-aged people having ownership of residences are often found to co-reside and look after their parents (Takahashi, 2015), indicating that the health of co-resident old persons would affect people's LFP. Moreover, people with unfavorable health statuses (e.g., regular outpatient) may be selected into caregiving (Schmitz and Westphal, 2015) and stay out of the labor force.

With the propensity scores, we then match and compare the outcome of each treated respondent to a weighted set of outcomes of controlled respondents using the Gaussian kernel matching method. Specifically, the outcomes of control respondents are weighted inversely by their distance in propensity score from that of each treated respondent, within a bandwidth (i.e. 0.06) of the score (Heckman et al., 1997); outcomes of those propensity scores located outside the bandwidth are disregarded (the so-called common support constraint). The kernel PSM is a quasi-experimental design to derive ATT as if the treatment were randomly assigned. We thus can trace the changes in ATT after each policy change to obtain the DID-PSM estimators as follows,

$$DID_P = \frac{1}{N_{T_P}} \sum_{i \in T_P \cap S_P} \left[(Y^1_{i,t+s} - Y^0_{i,t}) - \sum_{j \in C_P \cap S_P} w_{ij}{}^{\circ} (Y^0_{j,t+s} - Y^0_{j,t}) \right]. \quad (2)$$

Here the subscript $P = I, A$ stands for the two policy changes; i and j denote respondents in treatment group T_P and control group C_P, respectively; S_P represents the area of common support, and w_{ij} shows the corresponding weight for kernel matching. The estimators DID_I and DID_A in Eq. (2) catch the improvement and degeneration of caregivers' LFP with the introduction and amendment of LTCI, after removing systematic differences between treated and controlled respondents.

4. Results

4.1. Kernel matching and covariates balancing test

We show the sample size, the mean and median standardized differences (SD) across all covariates (%) before and after kernel PSM (Table 2). Comparing the size of matched subsamples on common support to that of unmatched ones, we confirm that over 99 percent of the treated respondents, for both the two policy changes, have at least one controlled respondent staying within the 0.06 bandwidth of their propensity scores. Meanwhile, around 95 percent of the controlled respondents are matched to someone treated.

The mean and median SD across all covariates provide a framework to test the extent to which the post-PSM subsamples are quasi-experimentally randomized. The randomization is achieved when treated respondents are matched with highly similar controls such that the mean and median SD across all covariates shall be trivial between treatment and control groups. Although there is no generally agreed upon criterion as to what extent the SD implies significant imbalances of covariates, maximum SD at 10 percent is taken to signify negligible differences (Austin 2009, 2011; Ho et al., 2007). For LTCI introduction, the mean and median of covariates in the post-PSM subsamples are commonly balanced, as all the SD are less than ten percent; strong balances in covariates after PSM are confirmed for the LTCI amendment as well, where all the SD are less than five percent. The overall balances in *all* covariates, nonetheless, do not guarantee balance in *each* covariate involved. We further test the balance in mean SD of each covariate in the post-PSM subsamples (Tables 3 and 4).

4.1.1. Covariates balancing for the LTCI introduction

Notable differences of confounding covariates between caregivers and non-caregivers are commonly found across pre-PSM subsamples (Table 3). Generally, caregivers are overrepresented among those older, female, widowed, having regular outpatient care visits, with poor self-rated health, and having various subjective symptoms needing care. Moreover, old persons co-residing with caregivers are more likely to report poor or very poor self-rated health, compared to those living with non-caregivers. All the covariates are balanced in post-PSM subsamples, i.e. mean SD <10 percent.

Gender- and age-specific differences are found for several important covariates. Compared to non-caregivers, male caregivers are more often to be single and report very poor self-rated health, less often owning a house, having smaller family size and lower

[9] For analysis of the 2006 amendment, we exclude the subjective symptoms of caregivers in PSM due to the insufficient number of observations. As we utilize the LTC questionnaire for the second analysis, the observations shrink considerably since only about 6000 (or approximately 1 percent) out of all respondents co-residing with recipients are extracted randomly to answer the LTC questionnaire in each survey year. Accordingly, many of the subjective symptoms are lack of sufficient observations to provide statistically significant results. For instance, merely 59 treated male and 33 female caregivers report subjective symptoms concerning skin and gynecology, respectively. On the other side, the observations for self-rated health are comparatively adequate for analyses and previous studies confirm that self-rated health could be one of the most appropriate indicators to measure an individual health status (DeSalvo et al., 2006).

Table 2
Sample Size, Mean, and Median Standardized Differences across All Covariates before and after Matching

	Gender						Age								
	Male			Female			30-49			50-64			65+		
	U	M(on)	M(off)	U	M(on)	M(off)	U	M(on)	M(off)	U	M(on)	M(off)	U	M(on)	M(off)
Kernel PSM for 2000 LTCI Introduction															
Treated	7483	7447	36	25,592	25,400	192	5735	5700	35	13,888	13,766	122	4431	4378	53
Control	219,046	210,380	8666	318,453	311,803	6650	235,362	225,030	10,332	170,210	161,746	8464	69,999	65,632	4367
Mean% SD	34.7	8.3		13.6	4.9		16.8	5.1		14.4	4.3		14.1	8.7	
Median% SD	27.1	6.5		11.5	3.2		11.4	4.8		10.5	2.9		10.9	5.1	
Kernel PSM for 2006 LTCI Amendment															
Treated	561	561	0	1322	1320	2	317	314	3	893	893	0	675	674	1
Control	2432	2418	14	7448	7395	53	1214	1108	106	4503	4334	169	4436	4369	67
Mean% SD	18.9	4.7		20.7	2.0		23.1	3.4		19.4	2.5		22.9	2.9	
Median% SD	6.2	2.8		10.2	1.3		4.1	2.1		6.4	2.5		10.5	2.8	

"U" = Unmatched Sample Size; "M(on)" = Matched Sample Size on Common Support; "M(off)" = Sample Size off Common Support.
"Mean SD" = Mean Standardized Difference (%) in Covariates; "Median SD" = Median Standardized Difference (%) in Covariates.

monthly household expenditures; such imbalances are not confirmed for females. In Japan, once men are married, they tend to transfer care duties to their wives; single men usually have no choice but to take on the duties. Regardless of age, the female/male ratio of caregivers is overwhelmingly higher than that of non-caregivers. Age-specific differences reveal that caregivers aged 30–49 are overrepresented among those that are single, while those older than 50 years report the opposite.

4.1.2. Covariates balancing for the LTCI amendment

Still, treated respondents differ systematically from controls before the PSM. Specifically, the SL-SL1 caregivers are overrepresented among those who are male, younger, and have their own houses, compared to the CL2-5 caregivers (Table 4). Moreover, old persons cared by SL-SL1 caregivers report a notably higher likelihood of being independent and a lower likelihood of being severely bedridden, which indicates that the SL-SL1 caregivers have a lower care burden than CL2-5 ones.

Gender differences are confirmed as well. Male SL-SL1 caregivers are more often to be single compared to the CL2-5 ones; whereas their female counterparts are fairly balanced in terms of marital status. We verify that single males in Japan take the care duties because of having a lack of substitutes and here we further know that they are more often caring for old persons with mild care needs. All these imbalances diminish after the PSM, i.e. mean SD of each confounding covariate is less than 10 percent.

4.2. Positive spillover effect of the LTCI introduction

After PSM, we assess the effect of LTCI introduction on improving caregivers' LFP (Table 5). Compared to the matched non-caregivers, female caregivers are 10.3 percent less likely to work before the LTCI introduction in 2000; worse still, male caregivers are 25.4 percent less likely to work. The disadvantage in female caregivers' LFP is in line with preceding literature in Japan, and the lower LFP for male caregivers builds on the related research with two points: First, men in Japan do reduce their labor force commitment for caregiving activities. This potential labor force loss is not negligible regarding the fact that over one third of the Japanese caregivers are male (Ministry of Health Labor and Welfare, 2013). More importantly, men are more likely than women to quit the labor force once they take on the care duties. In our case, the reduced likelihood of working for male caregivers is double that for females.

The disadvantages in caregivers' LFP are largely mitigated with the introduction of LTCI. DID-PSM estimators find that LTCI does improve the LPF of caregivers, in particular, for males. Commonly, men have a stronger labor force attachment than women; meanwhile, men take care duties mainly because of having a lack of caregiver substitutes. This indicates that the LFP of male caregivers would be more sensitive to the formal services than females. Specifically, with the LTCI introduction, male caregivers become 15.8 percent more likely to enter the labor force, five times as much as the 3.7 percent for females.

The enhanced LFP for female caregivers is important as well. The last decades have seen an increasing number of Japanese women being highly educated and employed as full-time workers. For them, balance between work and caregiving is more stressful than that for traditional housewives (Hashizume, 2010). According to the Ministry of Internal Affairs and Communications (2013), 80.5 percent of caregivers who quit their jobs are female and merely 17.7 percent of them would re-enter the labor force. The success of LTCI on encouraging female caregivers to remain/re-enter in the labor force is a good lesson for other polices aiming to stimulate women's LFP.

Regardless of age, caregivers show lower likelihoods of working before the LTCI introduction; such disadvantage is three times greater for caregivers aged 30–49 than for those aged 65+. In fact, 82.8 percent of the non-caregivers aged 30–49 are working, indicating strong labor force attachments among this cohort. The high LFP of young people, however, is fragile with respect to the decision to provide caregiving. As previously mentioned, young caregivers are usually less wealthy and with small household sizes. Their unfavorable socio-economic statuses – being unable to pay for the formal services without LTCI and short of caregiver substitutes – give them no choice but to take on the care duties. Thereby, these young caregivers would be more sensitive than older ones to the formal services and financial support from the LTCI.

Indeed, the LTCI stimulates the LFP of caregivers in all age cohorts. As expected, young caregivers aged 30–49 report the largest improvement – 8.7 percent – in likelihood of working. Caregivers aged 50–64 and 65+ also have a better chance to work after the LTCI introduction, though the improvement in likelihood diminishes with age. It is well-known that Japanese people approaching retirement or being retired, compared to other developed countries, have a stronger willingness to remain in or re-enter the labor force (Williamson and Higo, 2007). The leading reasons for late middle-aged and older Japanese to work are to maintain favorable living standards and to achieve self-satisfaction (Cabinet Office, 2006). Regarding their physical conditions, older Japanese usually prefer to start part-time jobs in their post-retirement lives.

Older caregivers, however, may find it difficult to enter the labor force, as they often face immediate family members with intensive care needs (i.e. spouses). The formal care services release older caregivers from daily caregiving and the flexible work schedules of part-time jobs make their LFP practical. With the rapid population aging, public policies have been dedicated to motivating

Table 3
Covariates Balancing for 2000 Introduction: Mean and Mean Standardized Differences before and after Matching.

Individual Characteristics		Gender						Age								
		Male			Female			30–49			50–64			65+		
		T	C	Mean SD	T	C	Mean SD	T	C	Mean SD	T	C	Mean SD	T	C	Mean SD
Age	U	65.31	49.70	126.1[a]	59.36	56.18	25.1[a]									
	M	65.31	64.33	7.5	59.36	57.82	7.7									
Male								0.14	0.37	-73.6[a]	0.12	0.40	-66.0[a]	0.17	0.22	-33.6[a]
								0.14	0.17	-9.3	0.12	0.13	-7.8	0.17	0.18	-5.7
Marital Statuses: married as base																
single	U	0.14	0.10	12.4[a]	0.05	0.06	-3.7	0.14	0.20	-15.3[a]	0.07	0.04	14.0[a]	0.03	0.01	15.7[a]
	M	0.14	0.13	3.9	0.05	0.06	-2.9	0.14	0.16	-6.3	0.07	0.05	8.9	0.03	0.02	9.8
widowed	U	0.03	0.01	15.4[a]	0.04	0.01	13.4[a]	0.01	0.01	-3.3	0.06	0.03	18.0[a]	0.06	0.01	23.3[a]
	M	0.03	0.02	6.7	0.04	0.03	5.5	0.01	0.01	-3.1	0.06	0.05	4.4	0.06	0.04	7.8
divorced	U	0.04	0.03	5.6	0.03	0.02	5.8	0.05	0.03	9.0	0.04	0.02	11.3[a]	0.01	0.00	9.6
	M	0.04	0.03	5.7	0.03	0.02	4.7	0.05	0.03	8.5	0.04	0.03	9.0	0.01	0.01	6.4
Regular outpatient	U	0.52	0.29	48.5[a]	0.51	0.42	17.6[a]	0.28	0.20	17.9[a]	0.45	0.41	10.5[a]	0.66	0.58	16.9[a]
	M	0.52	0.51	8.7	0.51	0.49	4.1	0.28	0.26	6.8	0.45	0.42	6.8	0.66	0.63	7.6
Self-rated Health: very good as base																
good	U	0.17	0.18	-3.2	0.17	0.17	-0.5	0.18	0.18	0.5	0.17	0.17	0.9	0.15	0.16	-2.3
	M	0.17	0.17	-0.1	0.17	0.17	-0.4	0.18	0.18	0.5	0.17	0.17	0.7	0.15	0.16	-1.6
fair	U	0.43	0.43	-1.0	0.47	0.47	-0.4	0.46	0.43	5.7	0.47	0.47	-0.9	0.48	0.49	-1.9
	M	0.43	0.42	1.9	0.47	0.47	-0.2	0.46	0.43	5.4	0.47	0.47	-0.6	0.48	0.49	-1.0
poor	U	0.18	0.09	29.5[a]	0.17	0.12	13.8[a]	0.10	0.07	11.3[a]	0.15	0.11	12.5[a]	0.19	0.15	12.4[a]
	M	0.18	0.16	6.6	0.17	0.15	5.0	0.10	0.08	9.6	0.15	0.12	9.9	0.19	0.16	8.5
very poor	U	0.02	0.01	11.8[a]	0.02	0.01	5.7	0.01	0.01	4.7	0.02	0.01	5.9	0.02	0.02	2.5
	M	0.02	0.02	5.9	0.02	0.01	4.3	0.01	0.01	4.4	0.02	0.01	4.5	0.02	0.02	1.9
Subjective Symptoms: none as base																
whole body	U	0.14	0.08	19.2[a]	0.21	0.14	19.0[a]	0.16	0.08	22.0[a]	0.20	0.12	23.1[a]	0.20	0.15	14.7[a]
	M	0.14	0.12	6.5	0.21	0.19	5.2	0.16	0.15	5.7	0.20	0.17	8.4	0.20	0.18	6.7
eye or ear	U	0.20	0.07	38.0[a]	0.19	0.13	18.3[a]	0.07	0.05	11.1[a]	0.18	0.12	18.0[a]	0.25	0.17	20.7[a]
	M	0.20	0.19	6.6	0.19	0.18	4.6	0.07	0.05	9.4	0.18	0.16	7.3	0.25	0.23	8.7
chest	U	0.08	0.03	20.4[a]	0.07	0.05	11.5[a]	0.04	0.02	10.5[a]	0.07	0.04	10.1[a]	0.10	0.07	10.2[a]
	M	0.08	0.06	7.1	0.07	0.05	9.2	0.04	0.02	9.8	0.07	0.05	8.0	0.10	0.08	7.3
respirator	U	0.14	0.07	23.9[a]	0.09	0.07	7.6	0.08	0.06	10.0[a]	0.09	0.07	6.7	0.11	0.08	9.0
	M	0.14	0.13	3.1	0.09	0.07	6.0	0.08	0.06	9.4	0.09	0.07	5.1	0.11	0.09	6.8
digestive	U	0.12	0.08	15.2*	0.14	0.10	12.3[a]	0.10	0.07	11.9[a]	0.14	0.10	12.5[a]	0.15	0.12	9.7
	M	0.12	0.10	6.5	0.14	0.11	9.9	0.10	0.08	9.2	0.14	0.10	9.9	0.15	0.13	7.2
teeth	U	0.09	0.05	16.8*	0.09	0.06	11.8[a]	0.06	0.04	11.4[a]	0.09	0.06	10.9[a]	0.10	0.06	11.5[a]
	M	0.09	0.07	8.1	0.09	0.06	9.5	0.06	0.05	8.7	0.09	0.07	8.7	0.10	0.07	8.6
skin	U	0.09	0.04	18.8[a]	0.06	0.04	6.4	0.05	0.03	5.6	0.06	0.05	4.9	0.06	0.05	3.0
	M	0.09	0.07	6.4	0.06	0.05	5.1	0.05	0.03	5.3	0.06	0.05	4.0	0.06	0.05	2.0
muscle	U	0.29	0.16	32.3[a]	0.38	0.28	22.5[a]	0.24	0.14	23.8[a]	0.36	0.25	23.1[a]	0.42	0.34	16.7*
	M	0.29	0.26	6.3	0.38	0.36	8.0	0.24	0.22	9.4	0.36	0.33	8.4	0.42	0.41	2.0
urology	U	0.10	0.02	33.9[a]	0.04	0.03	7.2	0.01	0.01	5.4	0.04	0.03	5.7	0.06	0.04	8.8
	M	0.10	0.08	8.4	0.04	0.03	5.7	0.01	0.01	5.0	0.04	0.03	4.4	0.06	0.05	6.4
gynecology	U				0.01	0.01	3.4	0.04	0.01	17.7[a]	0.00	0.00	4.6	0.00	0.00	4.8
	M				0.01	0.01	2.7	0.04	0.03	6.6	0.00	0.00	3.6	0.00	0.00	3.1
trauma	U	0.02	0.01	5.8	0.02	0.01	3.2	0.02	0.01	4.6	0.02	0.01	2.8	0.02	0.02	0.1
	M	0.02	0.01	4.3	0.02	0.01	2.5	0.02	0.01	4.3	0.02	0.01	2.2	0.02	0.02	0.1
Household Characteristics																
House ownership	U	0.89	0.96	-24.4[a]	0.94	0.95	-6.5	0.93	0.96	-15.6[a]	0.94	0.95	-4.3	0.93	0.97	-16.3[a]
	M	0.89	0.91	-7.3	0.94	0.95	-5.1	0.93	0.94	-8.8	0.94	0.95	-3.3	0.93	0.94	-4.8
Three generation	U	0.31	0.62	-65.6[a]	0.51	0.52	-2.5	0.75	0.73	3.6	0.48	0.48	0.6	0.33	0.32	3.2
household	M	0.31	0.32	-4.3	0.51	0.52	-2.0	0.75	0.73	3.4	0.48	0.48	0.5	0.33	0.32	2.5
Number of household	U	3.31	4.62	-79.5[a]	4.12	4.26	-7.7	4.72	5.06	-22.0[a]	3.95	3.92	1.6	3.66	3.60	2.9
members	M	3.31	3.20	3.7	4.12	4.23	-6.1	4.72	4.84	-7.7	3.95	3.93	1.2	3.66	3.62	2.1
Monthly household	U	3.10	3.31	-35.0[a]	3.28	3.28	-1.0	3.35	3.36	-1.8	3.31	3.30	2.1	3.19	3.20	-1.5
expenditure (log)	M	3.10	3.22	-3.7	3.28	3.28	-0.8	3.35	3.36	-1.7	3.31	3.30	1.8	3.19	3.20	-0.8
Old Persons Characteristics																
Self-rated Health: very good as base																
good	U	0.06	0.15	-31.3[a]	0.10	0.16	-17.9[a]	0.10	0.16	-18.3[a]	0.08	0.15	-21.7*	0.09	0.16	-20.6[a]
	M	0.06	0.08	-2.7	0.10	0.12	-4.5	0.10	0.12	-7.3	0.08	0.10	-7.5	0.09	0.10	-4.1
fair	U	0.32	0.38	-17.5[a]	0.31	0.47	-33.3[a]	0.34	0.48	-29.6[a]	0.34	0.48	-28.1[a]	0.27	0.47	-41.1[a]
	M	0.32	0.34	-5.1	0.31	0.34	-7.0	0.34	0.37	-8.1	0.34	0.45	-8.7	0.27	0.40	-8.1
poor	U	0.36	0.19	39.7[a]	0.39	0.18	47.7[a]	0.38	0.18	47.3[a]	0.38	0.19	43.5[a]	0.39	0.17	52.1[a]
	M	0.36	0.34	7.8	0.39	0.37	9.4	0.38	0.35	8.8	0.38	0.22	6.4	0.39	0.21	9.0
very poor	U	0.21	0.12	30.8[a]	0.15	0.02	47.5[a]	0.14	0.02	45.9[a]	0.13	0.02	41.0[a]	0.20	0.02	60.0[a]
	M	0.21	0.19	9.2	0.15	0.13	6.3	0.14	0.13	6.6	0.13	0.05	8.1	0.20	0.10	7.4

"T" = Caregivers; "C" = Non-caregivers; "Mean SD" = Mean standardized difference (%)
[a] Inference: absolute value of mean standardized difference above 10%.

Table 4
Covariates Balancing for 2006 Amendment: Mean Differences before and after Matching.

Individual Characteristics		Gender						Age								
		Male			Female			30-49			50-64			65+		
		T	C	Mean SD	T	C	Mean SD	T	C	Mean SD	T	C	Mean SD	T	C	Mean SD
Age: aged 65+ as base																
30-49	U	0.14	0.11	10.8[a]	0.22	0.15	18.4[a]									
	M	0.14	0.13	2.2	0.22	0.21	3.3									
50-64	U	0.39	0.33	17.7[a]	0.52	0.47	10.2[a]									
	M	0.39	0.38	1.7	0.52	0.53	-1.3									
Male								0.19	0.16	10.2[a]	0.23	0.18	13.0[a]	0.42	0.28	28.7[a]
								0.20	0.19	2.6	0.23	0.22	2.9	0.41	0.39	4.9
Marital Statuses: married as base																
single	U	0.16	0.13	10.9[a]	0.06	0.06	1.7	0.19	0.21	-6.8	0.10	0.08	4.9	0.01	0.02	-9.0
	M	0.16	0.15	3.9	0.06	0.06	-1.2	0.20	0.20	1.0	0.09	0.07	7.0	0.01	0.01	1.3
widowed	U	0.03	0.03	-1.6	0.04	0.05	-5.6	0.02	0.06	-11.6[a]	0.05	0.05	-1.9	0.03	0.06	-11.9[a]
	M	0.03	0.03	2.7	0.04	0.04	-2.6	0.02	0.02	0.1	0.05	0.05	-0.3	0.03	0.03	0.0
divorced	U	0.07	0.06	2.9	0.03	0.03	4.2	0.08	0.06	4.1	0.05	0.04	2.6	0.01	0.01	0.2
	M	0.07	0.06	2.0	0.03	0.03	2.8	0.08	0.07	2.4	0.05	0.05	0.3	0.01	0.01	0.1
Self-rated Health: very good as base																
good	U	0.20	0.16	11.6[a]	0.16	0.15	1.3	0.18	0.19	-1.6	0.15	0.15	-0.9	0.19	0.16	7.9
	M	0.20	0.19	2.8	0.16	0.16	0.4	0.19	0.19	-1.8	0.15	0.14	2.4	0.19	0.18	2.4
fair	U	0.43	0.47	-7.7	0.50	0.48	3.8	0.40	0.47	-14.0[a]	0.53	0.50	6.2	0.46	0.46	-0.3
	M	0.43	0.46	-6.2	0.50	0.52	-2.7	0.40	0.40	-1.4	0.53	0.55	-3.6	0.46	0.48	-3.1
poor	U	0.15	0.19	-11.9[a]	0.14	0.20	-14.9[a]	0.18	0.13	12.8[a]	0.11	0.16	-16.2[a]	0.19	0.26	-17.7[a]
	M	0.15	0.15	-0.1	0.14	0.15	-0.3	0.17	0.19	-6.9	0.11	0.10	3.6	0.19	0.19	-0.1
very poor	U	0.02	0.03	-3.7	0.01	0.02	-5.0				0.01	0.01	2.7	0.02	0.03	-4.6
	M	0.02	0.02	0.3	0.01	0.01	-0.1				0.01	0.02	-2.6	0.02	0.02	-1.7
Household characteristics																
House ownership	U	0.92	0.88	12.8[a]	0.97	0.94	11.9[a]	0.96	0.93	14.0[a]	0.96	0.94	11.1[a]	0.93	0.94	-4.7
	M	0.92	0.91	2.5	0.97	0.96	0.3	0.96	0.95	3.0	0.96	0.97	-1.8	0.93	0.93	1.4
Three generation	U	0.28	0.32	-8.2	0.53	0.46	13.9[a]	0.67	0.63	7.2	0.50	0.47	6.6	0.26	0.29	-6.5
household	M	0.28	0.29	-1.6	0.53	0.49	8.0	0.66	0.65	3.1	0.51	0.50	1.1	0.26	0.26	0.4
Number of household	U	3.21	3.42	-13.1[a]	4.06	4.00	3.7	4.41	4.52	-7.0	3.96	4.01	-3.1	3.26	3.53	-15.2[a]
members	M	3.21	3.34	-8.4	4.06	4.04	1.5	4.45	4.45	-0.2	3.95	3.95	0.0	3.27	3.29	-1.3
Bedridden Statuses of Old Persons Being Cared: 100% bedridden as base																
25% bedridden	U	0.62	0.27	72.1[a]	0.58	0.26	73.4[a]	0.66	0.29	87.2[a]	0.59	0.17	74.1[a]	0.55	0.15	69.0[a]
	M	0.62	0.62	0.0	0.58	0.58	0.0	0.65	0.65	0.0	0.58	0.58	0.0	0.54	0.53	3.1
50% bedridden	U	0.34	0.34	-1.1	0.36	0.29	14.0[a]	0.32	0.31	2.3	0.33	0.30	8.0	0.40	0.31	18.9[a]
	M	0.34	0.34	0.0	0.36	0.36	0.1	0.33	0.33	0.0	0.34	0.34	0.0	0.40	0.41	-3.6
75% bedridden	U	0.03	0.27	-71.3[a]	0.06	0.31	-70.1[a]	0.01	0.31	-88.4[a]	0.06	0.30	-65.5[a]	0.06	0.31	-68.9[a]
	M	0.03	0.02	3.4	0.06	0.04	4.9	0.01	0.01	0.9	0.06	0.04	4.9	0.06	0.03	6.7

"T" = SL-SL1 caregivers; "C" = CL2-5 caregivers; "Mean SD" = Mean standardized difference (%).
"100% bedridden" = care recipients are completely bedridden such that they lie in bed all day; "75% bedridden" = care recipients are able to sit on the bed, while they often lie in bed; "50% bedridden" = care recipients can walk indoors but need help to go outside; "25% bedridden" = care recipients can go outside without help.
[a] Inference: absolute value of mean standardized difference above 10%.

Table 5
Probability of Being in Work by Gender and Age – DID-PSM Estimations for the LTCI Introduction in 2000

		Pre- LTCI Introduction				Post- LTCI Introduction				DID-PSM	
	Obs.	T	C	ATT	SE	T	C	ATT	SE	DID	SE
Male	217,827	0.501	0.755	−0.254***	0.02	0.659	0.755	−0.096***	0.03	0.158***	0.02
Female	337,203	0.353	0.456	−0.103***	0.01	0.405	0.471	−0.066***	0.01	0.037***	0.01
30–49	230,730	0.606	0.828	−0.222***	0.02	0.700	0.836	−0.135***	0.01	0.087***	0.02
50–64	175,512	0.474	0.624	−0.150***	0.01	0.563	0.650	−0.087***	0.01	0.063***	0.01
65+	70,010	0.210	0.295	−0.085***	0.02	0.279	0.313	−0.034***	0.01	0.051***	0.02

"T" = Caregivers; "C" = Non-caregivers; "ATT" = Average Treatment Effect on Treated; "SE" = Bootstrapped Standard Errors
*Inference: *** p < 0.01; ** p < 0.05; * p < 0.1.

people approaching/post retirement to remain/re-enter the labor force (Clark et al., 2015), where we verify that the LTCI is practical to stimulate caregivers' LFP during their middle and late stages.

4.3. Negative spillover effect of the LTCI amendment

We further investigate the potential negative effect of the LTCI amendment on the LFP with the PSM subsamples (Table 6). Compared to the matched counterparts supporting CL2-5 recipients, male SL-SL1 caregivers do not report a better chance to work in the years before the amendment. For men, despite the large margin in LFP between caregivers and non-caregivers, the margin is trivial regarding care intensity among the caregivers. In contrast, female SL-SL1 caregivers are 9.4 percent more likely to work than the CL2-5 counterparts, indicating that the LFP of women is sensitive not only to the care provision but also to the care intensity.

Nonetheless, this advantage in LFP vanishes completely after the amendment. The DID-PSM estimator shows a 7.7 percent decrease

Table 6
Probability of Being in Work by Gender and Age – DID-PSM Estimations for the LTCI Amendment in 2006.

		Pre- LTCI Amendment				Post- LTCI Amendment				DID-PSM	
	Obs.	T	C	ATT	SE	T	C	ATT	SE	DID	SE
Male	4590	0.606	0.578	0.028	0.05	0.529	0.519	0.010	0.04	−0.018	0.06
Female	12,811	0.520	0.426	0.094***	0.03	0.510	0.493	0.017	0.02	−0.077*	0.04
30–49	2182	0.805	0.606	0.199***	0.07	0.738	0.753	−0.015	0.05	−0.214**	0.06
50–64	7937	0.638	0.499	0.139**	0.04	0.634	0.613	0.021	0.03	−0.118*	0.04
65+	7278	0.220	0.215	0.005	0.05	0.203	0.214	−0.012	0.05	−0.017	0.05

"T" = SL-SL1 caregivers; "C" = CL2-5 caregivers; "ATT" = Average Treatment Effect on Treated; "SE" = Bootstrapped Standard Errors.
*Inference: *** p < 0.01; ** p < 0.05; * p < 0.1.

for female SL-SL1 caregivers to work. The most straightforward reason is the reduced benefits for their recipients, among which the loss of housekeeping services particularly obstructs them in joining the labor force. In fact, the provision of housekeeping accounted for the largest share of at-home services before the amendment (Tokunaga et al., 2015). The housekeeping services would free female caregivers from the predicament of balancing work, caregiving, and housekeeping, as failing to manage housework is a stigma among Japanese women (Kumagai, 2010). Accordingly, female SL-SL1 caregivers have to reallocate their time in the post-amendment years to cover housekeeping services, for which the practicable way to overcome the difficulty is to relinquish work opportunities.

Regarding the age-specific subsamples, SL-SL1 caregivers aged 30–49 are 19.9 percent more likely to work than the matched CL2-5 counterparts before the amendment; also, a higher 13.9 percent probability of working is confirmed for those aged 50–64. Like female caregivers, the LFP of young and middle-aged caregivers is sensitive to both the care provision and the care intensity. On the other side, the LFP of caregivers 65+ appears to be independent of care intensity.

The advantages disappear after the amendment, where DID-PSM estimators reveal lower probabilities at 21.4 percent and 11.8 percent of being in work for SL-SL1 caregivers aged 30–49 and 50–64, respectively. For young caregivers, the reduction in LFP overturns the original advantages. Young caregivers are less wealthy, such that the reduced upper limit of allowance in the amendment strongly discourages them from participating in the 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 these young caregivers to be outside of the labor force, as they may find themselves unable to afford formal care at the time when they became old and have care needs.

To this end, our findings reveal a hidden cost of the LTCI amendment: the work opportunities that caregivers forego when they reallocate their time to provide informal care. Including unpaid family caregivers to fulfill caregiving obligations, the amendment may curtail expenditures on LTCI in the short run. From a long run perspective, however, such a policy would significantly damage the labor forces and economies, and the adverse consequences may extend beyond the direct caregiving period. In 2014, the Japanese government announced a new amendment on LTCI to contain the costs with further restrictions on benefits for SL1 and SL2 recipients (Ministry of Health Labor and Welfare, 2014). We draw attention to adverse influences on LFP of such myopic policies, as expanding labor market supply to sustain the economy should be a priority in the coming decades.

5. Conclusion

In this research, we first show that the significant and positive spillover effects of the LTCI introduction on caregivers' LFP. Parallel family policy in Japan that aims to improve the LFP of caregivers for children (i.e., Child Care and Family Care Leave Act) is found to have little success (Asai et al., 2015). The success of LTCI on stimulating caregivers' LFP is intuitive in the context of the super-aged society, regarding the increase in caregivers for frail old persons. Our finding is in line with previous studies in Japan, but differs from that in Western countries. Geyer and Korfhage (2015) and Carmichael and Charles (2003) find negative effects of LTCI on LFP in Germany and the UK, due to the cash allowance that attributes to caregivers' nonwage income. The Japanese LTCI with benefits in kind would provide a good example to other countries where encouraging caregivers' LFP is a priority.

Furthermore, we confirm the negative spillover effects of the LTCI amendment on caregivers' LFP. This is the first evidence that verifies that caregivers' LFP would deteriorate when formal services become insufficient, which in turn underlines the importance of LTCI on improving LFP. Further research with concrete cost-benefit analyses is necessary to assess the monetary loss/gain of the amendment comprehensively.

Gender differences are found regarding the spillover effect of LTCI on LFP, which indicates that policies aiming to stimulate LFP should be formulated separately for men and women. Specifically, policies reducing risk of care provision would be effective to promote men's LFP; policies further reducing care burden would help women remain in labor force. In addition, policy makers should take age differences into consideration. Young people are highly sensitive to both the provision and the intensity of caregiving and require a comprehensive policy. For late middle-aged and old people with an intensive care provision, releasing their care burden is an urgent priority. A common part of the policies, nonetheless, would be to improve the flexibility of work schedules and to provide improved support in caregivers' workplaces.

This research suffers several limitations. The first limitation is a concern regarding the kernel propensity score matching method on addressing endogeneity. Since the matching accounts for observable covariates, unobservable influences still may remain in the model. Other researchers try to tackle the issue with the IV method using family characteristics such as number of siblings or parental health as instruments (Heitmueller, 2007; Van Houtven et al., 2013). Further analyses with Japanese data using the IV method are required for a cohesive picture of the spillover effect of LTCI. In addition, we exclusively concentrate on the extensive LFP margin (i.e. being in work) in the current study. In their recent studies, Bolin et al. (2008) and Van Houtven et al. (2013) measure the impact of caregiving on not only the extensive LFP margin, but also the intensive margin (i.e. working hours) and wages. Further research in Japan is necessary for such clarifications. The third shortcoming lies on the identification of treatment and control groups due to the universal coverage LTCI system. Public policies in the US frequently differ across states, making concrete evidence possible by comparing outcomes with adjacent states; yet, such policy setting is not practical in Japan. Finally, our findings may suffer from selection bias since we could observe only the caregivers of non-institutionalized recipients. Further studies that include recipients institutionalized and utilize more plausible randomization of treatment are necessary to clarify the spillover effect of LTCI on stimulating LFP.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.jhealeco.2017.09.011.

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