

The crowding-out effect of housing subsidies on parental support: evidence from Japanese mortgage tax credits*

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Abstract

Children may receive monetary transfers from their parents when they attempt to purchase a home. This raises the question of whether a homeownership-related subsidy provided by government displaces transfers received from parents. The purpose of this paper is to examine this question empirically, using a sample of Japanese home-buying households that are benefiting from a mortgage tax credit (MTC) as a model case. In the empirical analysis, we offer a test of the effect of the MTC on both the extensive and the intensive margins using the overall sample as well as subsample groups. The empirical results, which use the full sample, indicate that the MTC crowds out parental transfers on both the extensive and the intensive margins. In particular, the estimates of the latter suggest an approximately 100 percent displacement. Subsample analysis demonstrates that the crowding-out effect is strengthened when children are young, low-income, and living in the rental sector previously.

Key words: crowding out; housing subsidy; intergenerational transfer; mortgage tax credit; Japan

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1 Introduction

Previous studies have suggested that in many countries, adult children receive monetary gifts from their parents when they acquire a house (Engelhardt and Mayer, 1998; Guiso and Jappelli, 2002; Helderma and Mulder, 2007; Cirman, 2008; Luea, 2008; Spilerman and Wolff, 2012; Angelini et al., 2013; Mulder and Smits, 2013; Gulbrandsen and Sandlie, 2015).¹ Because a conventional mortgage requires a large down payment, home-buying households must build up substantial savings; therefore, down payment constraints may distort optimal housing consumption (Artle and Varaiya, 1978). Parental transfers are expected to relax this borrowing constraint. Mulder and Smits (2013) argued that the possibility of parental housing assistance is becoming increasingly important, because parents now have more assets than parents in the past. However, children can also purchase a house using a public transfer. The situation in Japan is that the government implements housing incentives such as a mortgage tax credit (MTC) to alleviate the financial pressure associated with home buying. The question is then whether parents provide additional financial assistance in this situation. When the government financially assists young and middle-aged adults to buy a home, parents are released from the funding of their children's homeownership and may therefore reduce financial transfers. This is known as the crowding-out effect of public transfers.

Inspired by the crowding-out hypothesis, this paper tests empirically how the MTC affects the receipt of transfers on both the extensive (the probability of receiving a positive transfer from parents) and the intensive (the transfer amount conditional on it being positive) margins. Our study contributes to the literature that has tested the crowding-out hypothesis. Several studies, which are unrelated to housing issues, have indicated that public transfers tend to crowd out private transfers (Rosenzweig and Wolpin, 1994; Cox and Jakubson, 1995; Schoeni, 2002; Jensen, 2004; Reil-Held, 2006; Juarez, 2009; Lai and Orsuwan, 2009; Chuang, 2012; Brandt and Deindl, 2013; Gerardi and Tsai, 2014; Orraca-Romano, 2015). Yet little is known

¹Angelini et al. (2013) found that young cohorts in European countries were more likely to become homeowners through credit thanks to the development of the mortgage industry. As a result, the number of homes received as gifts or bequests declined. However, they also showed that parental financial transfers remain an important source of home financing.

about the crowding-out effect of governmental transfers designed to encourage young and middle-aged people's homeownership on parental transfers. We use data from a customer survey from 2002 to 2009 conducted by the Japan Federation of Housing Organizations (JHO). The survey collects household-level data on purchases of detached houses in urban areas in Japan and contains information on monetary transfers from parents to their adult children, and housing loan size. We can attempt to calculate the present value of the tax credit for each household using information on loan size. The availability of the MTC has changed frequently during this period. In addition to this time-series variation, we exploit cross-sectional variation in the MTC, which potentially reflects differences in regional housing prices. The resulting combinations may generate sufficient variation in the MTC; consequently, we are able to estimate the effect of the MTC on transfers received.

The empirical results demonstrate evidence of crowding out on both the extensive and the intensive margins. That is, the estimate of the extensive margin indicates that a one million yen increase in tax credits decreases the likelihood of receiving transfers from parents by approximately 8.1 percent. The estimate of the intensive margin suggests a nearly 100 percent crowding-out effect: a one million yen increase in tax credits leads to a 1.18 million yen reduction in parental transfers. In addition, a subsample analysis indicates that the degree of crowding out is strengthened when children are relatively young, lower income, and previously living in the rental sector.

2 Background

2.1 Theory and evidence of crowding out

To understand the interaction between private and public transfers, it is useful to examine parental motives behind transfer decisions.² Altruism is one of the well-known explanations of patterns of wealth transfer from parents to their adult children (Barro, 1974; Becker, 1974). According to the parent-side altruism model, parents care about not only their consumption but also the well-being of their children, which depends on children's consumption. The model

²See Laferrère and Wolff (2006) for a comprehensive review of family transfers.

indicates positive intergenerational financial support from parents to their adult children when parental income is high enough compared with the children's. Moreover, in the case of children who experience pay cuts, parents tend to increase their transfers to compensate for their children's reduction in pay. An increase in parental transfers is able to keep the well-being of their children at a certain level, by raising the children's consumption, as well as their own well-being. In our context, altruistic parents tend to support their children's homeownership when their children face difficulties in acquiring a home. In fact, Engelhardt and Mayer (1994) demonstrated that prospective home buyers who face high house prices or households with delinquent credit are more likely to receive parental transfers for home purchases, because these households are more likely to be financially constrained. Cirman (2008) found that parental transfers for acquiring a residential property increase when both housing prices and interest rates are relatively high. She concluded that transfers can act as an informal source of housing finance and play a cushioning role in terms of harsh market conditions. These results suggest that parents have altruistic preferences. However, Barro (1974) and Becker (1974) suggested that altruistic parents are less likely to increase transfers when children's income is raised by public transfers. Laferrère and Wolff (2006) provided an example of an increase in a government housing subsidy to adult children causing the altruistic parent to reduce transfers earmarked for rental payments to his child. In our context, the MTC has a similar impact on increasing children's income and benefits the altruistic parents if they attempt to assist their children's home purchase by transfers. Therefore, governmental transfers via tax credits have a tendency to displace parental transfers earmarked for home purchases.

Exchange is an additional motivator (Bernheim et al., 1985; Cox, 1987). That is, parents tend to enter into an agreement with their adult children whereby the children agree to provide a service in exchange for receiving gifts. According to Cox (1987), under the exchange motive, parents should increase their transfers to increase the level of attention that they receive from their children, especially wealthy children whose opportunity costs are relatively high, if the parents' demand for their children's attention is inelastic with respect to the implicit price of attention. The exchange model then predicts that parents increase the amounts that they

transfer when the MTC, which increases the disposable income of children, is available. This suggests that the exchange motive behind transfers does not cause the crowding-out effect. However, if parents can rely on substitutes for their children's care, the parents' demand for their children's attention becomes elastic, and they can reduce their transfers accordingly. This again suggests that the MTC may crowd out parental transfers, even under the exchange motive.³

When the crowding-out effect is present, determining which motivation dominates is difficult. Cox and Jakubson (1995) suggested that if the demand for child services were slightly elastic, the exchange model would produce small negative coefficients that could be quite different from the large negative coefficients implied by the altruism model. However, as mentioned by Schoeni (2002), parents generally make transfers based on both motivations. Therefore, this paper does not attempt to identify the parental motive for the transfer. Instead, we only focus on the extent to which the MTC crowds out parental transfers. Using subsample analysis, however, we can examine the motivations for transfers to some extent. For example, Cox (1987) predicted that parents are motivated by a relatively strong altruistic motive among poorer recipients, whereas they are motivated by a relatively strong exchange motive among richer recipients.

Several empirical studies have supported the presence of the crowding-out effect. For instance, using US data, Rosenzweig and Wolpin (1994) found that an increase in government aid reduces the proportion of young daughters who receive parental aid; however, this relationship was weak. Schoeni (2002) demonstrated a substantial crowding-out effect of unemployment benefits for adult children on parental transfers in the US. The empirical evidence of Brandt and Deindl (2013), who used data for 13 European countries, showed that adult children are more likely to receive parental transfers, but the amounts were lower, when social expenditure was higher. This mixed evidence may reflect the fact that parents engage more in small financial gifts because intensive support is covered by public providers. Some papers have focused on

³Schoeni (2002) and Lai and Orsuwan (2009) introduced a warm-glow motive for transfers, where parents derive some utility from the act of making transfers regardless of the level of children's income (Andreoni, 1989). Under the warm-glow motive, parents do not alter the amount of transfers, even when children receive transfers from the public sector, implying no crowding-out effect.

intergenerational private transfers from the younger generations to their elderly parents. Using German data, Reil-Held (2006) demonstrated that older households that receive more public transfers, which consist mainly of public pensions, are less likely to receive private transfers on both the extensive and the intensive margins.⁴ Juarez (2009) estimated that an increase in the income of older people, caused by the nutrition transfer program in Mexico City, is related negatively to the amount of private transfers that they receive. Gerardi and Tsai (2014) found that an increase in government transfer payments, caused by the introduction of social programs in Taiwan, decreased both the likelihood of older parents receiving monetary support and the amount of the transfers from their children. However, research on the crowding out of housing subsidies on parental transfers is scarce, even though a growing number of studies have focused on parental gift-giving toward homeownership.

2.2 Homeownership and financial assets

According to the 2008 Housing and Land Survey (Statistics Bureau), over the past four decades, the Japanese homeownership rate has been stable at around 60 percent.⁵ Prior to the 1990s, the homeownership rate was approximately 50 percent for households with heads aged in their 30s, which is approximately 25 percentage points higher than for heads aged in their 20s. Home ownership rates for households with heads aged in their 30s or younger, however, have declined substantially since 1998. In fact, this rate experienced more than a 10 percentage point decline from 1988 to 2008. The recent decrease in homeownership rates for young people may reflect the fact that the two decades of economic stagnation in Japan has deteriorated the employment situation among young people in particular.⁶ The homeownership rate of households with heads aged in their 40s has also declined from 69 percent in 1988 to 62 percent in 2008, suggesting that homeownership has been delayed among this cohort.

⁴Kohli (1999) and Reil-Held (2006) found that public pension transfers to seniors are channeled back to younger generations through family transfers. In Norway, Gulbrandsen and Sandlie (2015) suggested that when parents' housing wealth increases, which is a substitute for the public pension, parental transfers to children that are earmarked for home purchases also increase.

⁵This section follows Hirayama (2010) closely. See this article for details of the housing system in Japan.

⁶Furthermore, younger people in Japan are delaying the point at which they marry and have children, and consequently, there is not the same urgency toward homeownership compared with the past.

The 2009 National Survey of Family Income and Expenditure (Statistics Bureau) reported that the majority of financial assets are held by senior citizens in Japan; 54 percent of assets are owned by households with heads aged 60 years or older. Therefore, facilitating the transfer of financial assets from parents to their children is one way for young and middle-aged cohort households to access the owner-occupied sector.

2.3 Mortgage tax credit program

A public transfer program aimed at prospective home buyers is designed to alleviate their initial financial burden and to encourage homeownership.⁷ In Japan, such a program was introduced in 1972. At that time, the size of the tax cut depended on the size of the floor space, regardless of the amount of mortgage debt. The tax credit was very small: it was only available for three years after the purchase of the house, and the maximum credit was capped at 60,000 yen. In 1978, a tax credit program for mortgage holders was introduced. The size of the tax cut for households depended not only on floor space but also on their mortgage balance. Although the deduction period was still three years, the maximum tax credit was raised to 180,000 yen. Since 1986, the program has only allowed home-buying households with a mortgage to have access to the tax credit. The tax credit is based on the balance of the household's mortgage at the end of the financial year. In 1986, the maximum credit was raised to 600,000 yen. Because Japan experienced a banking crisis in the late 1990s and the early 2000s, the tax credit has been expanded substantially since 1999 to stimulate domestic demand. That is, in 1999, the deduction period was extended to 15 years, and the maximum tax credit was raised to 5.875 million yen.

Table 1 shows the MTC rules in the 2000s. For example, any household that purchased a home in 2002 to live in can reduce one percent of their mortgage balance from their income tax. However, there are four limitations: only the first 50 million yen of a mortgage balance can be used as a tax offset, the tax credit can only be claimed for the first 10 years after acquisition (therefore the maximum annual credit was five million yen), the floor space of the

⁷This section follows Kanemoto (1997) and Sato et al. (2009, 2010) closely. See these articles for further details about the MTC.

housing unit must be at least 50 square meters, and annual income must be 30 million yen or less.

As shown in Table 1, the MTC was revised several times in the 2000s. From 2002 to 2004, the size of the MTC remained the same. The MTC was supposed to expire at the end of 2003, because the government had limited financial resources because of a large budget deficit. However, the housing industry insisted that the MTC should be continued in 2004. The government eventually decided to maintain the size of the MTC in 2004 in an attempt to revitalize the stagnant economy. Although both the maximum limit and the credit rate were lowered, the government decided to extend the MTC for a further four years from 2005 to 2008. During this period, the Japanese economy entered a recovery phase; however, the government still attempted to encourage homeownership among the middle-income earners of the second generation of baby-boomers.

Prior to 2009, the MTC had been declining in Japan; however, the global financial crisis had a large negative effect on economic activity, and in response, the government raised the MTC in 2009 to the same level as that in the years 2002 to 2004. The credit rate increased to 1.2 percent for a certified housing unit approved as long-lasting high-quality housing or low-carbon housing. As a result, the maximum tax credit was five million yen for general housing and six million yen for certified housing.

These frequent revisions in the 2000s mean that the availability of the MTC changed over time. Table 2 presents time-series summary statistics for the present value of the tax credits (in nominal terms), calculated from the JHO customer survey. The details of the calculations are shown in the following section. Regarding the tax reform in relation to the MTC, the average credit increased gradually from 2002 to 2004, then fell until 2008, and then increased sharply in 2009. The standard deviation of the credit in each year probably reflects the cross-sectional differences in regional housing prices. The standard deviation also tends to reflect yearly variation of the tax reform: lowering of the maximum credit decreases the standard deviation of the credit. Overall, the time-series and cross-sectional variations will ensure that sufficient variation exists, and accordingly we can create a variable that captures household-

level differences in the tax credits.

3 Data and empirical model

As mentioned, the data come from the customer survey conducted by the JHO. Its members consist of various housing suppliers in Japan.⁸ The JHO distributes a questionnaire to home builders whose customers bought a newly custom-built detached house in the three major metropolitan areas of Tokyo, Nagoya, and Osaka, and the four provincial cities of Sapporo, Sendai, Hiroshima, and Fukuoka. The Tokyo metropolitan area includes Saitama, Tokyo, Chiba, and Kanagawa prefectures; the Nagoya metropolitan area includes Gifu, Aichi, and Mie prefectures; and the Osaka metropolitan area includes Kyoto, Osaka, Hyogo, and Nara prefectures. Although the observations are limited to the above areas, according to the Housing Starts (2001–2009) issued by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), the number of newly built owner-occupied houses accounts for approximately 51 percent of such houses in Japan. Home builders ask their customers to report transfers received (these are treated as parental gifts in this paper), total earned income of household members, and mortgage size. The JHO conducts this survey annually and collects micro-level cross-sectional data on approximately 3,000 home-buying households. We pooled the data from 2002 to 2009. The number of observations in the full sample is 3,000 in 2002, 3,047 in 2003, 2,794 in 2004, 3,634 in 2005, 3,540 in 2006, 3,241 in 2007, 3,206 in 2008, and 3,750 in 2009, resulting in a total of 26,212 observations. According to the 2009 customer survey report of the JHO, the percentage of the sample applying for the MTC was 77.4% in 2005, 72.5% in 2006, 92.4% in 2007, 94.3% in 2008, and 85.9% in 2009. The report also demonstrated that the percentage decreased with age in 2009. This provides strong evidence that a substantial number of younger households received a governmental subsidy for homeownership. The sample used in this analysis is as follows. Of the 26,212 observations, we restricted the sample to only those households where all necessary information on the selected variables is available. This

⁸Enterprises of various sizes are members of the JHO; that is, not only large enterprises but also medium and small enterprises. Various kinds of construction methods for housing suppliers are represented; e.g., prefabricated construction suppliers, wooden home suppliers, two-by-four home builders, and foreign-designed homes. Details about the JHO are available at <http://www.judanren.or.jp/english/index.html> (accessed on 18 August, 2015).

reduced the number of observations to 24,674. We also restricted our analysis to households that purchased land themselves in order to focus on transfers of financial assets rather than real assets. This further reduced the number of observations to 20,799. Of the 3,875 removed observations, however, we add the 2,373 observations concerning land transfers from parents in Section 5. Finally, restricting our analysis to only those households that are eligible for the MTC further reduced the number of observations to 16,077.

Using mortgage size, we can attempt to calculate the present value of the tax credit for household i that purchased a house in region j in year y , TC_{ijy} .⁹ First, let us define the original loan amount of the household as L_{ijy} . Suppose that all households make a constant interest payment on the mortgage at a rate of ι_y percent over a 30-year term. The 2011 Survey of the Housing Market issued by the MLIT of Japan reported that the average mortgage term is approximately 30 years. Then, the relation between the monthly payment, MP_{ijy} , and the present value of L_{ijy} can be written as follows:

$$L_{ijy} = MP_{ijy} \sum_{k=1}^{360} \frac{1}{(1+r_y)^k},$$

where $r_y = \iota_y/12$ and there are 360 months outstanding on the loan. For ι_y , we use the average of the 10-year fixed mortgage rate in year y , which is offered by Japanese city banks.¹⁰

The monthly payment can be rewritten as follows:

$$MP_{ijy} = \frac{r_y \times (1+r_y)^{12 \times 30} \times L_{ijy}}{(1+r_y)^{12 \times 30} - 1}.$$

Then, the mortgage balance after n years, $B_{ijy,n}$, can be described as:

$$B_{ijy,n} = MP_{ijy} \frac{(1+r_y)^{12 \times (30-n)} - 1}{r_y \times (1+r_y)^{12 \times (30-n)}}.$$

Note that the tax credit is not applied to both the whole mortgage balance and the whole borrowing period from Table 1. That is, there is an upper limit for the mortgage balance in the n -th year, $\bar{B}_{y,n}$, and the deduction period is the first 10 years. Eventually, we assume that

⁹For details of the calculation method, see Brueggeman and Fisher (2006).

¹⁰The data are from Pocket Housing Statistics 2010 published by Jutaku Kinyu Fukyu Kyokai.

the tax credit, TC_{ijy} , can be represented as:

$$TC_{ijy} = \sum_{n=1}^{10} \tau_{y,n} B_{ijy,n}^*,$$

where $\tau_{y,n}$ is the credit rate, and:

$$\begin{aligned} B_{ijy,n}^* &= B_{ijy,n}, \text{ if } B_{ijy,n} \leq \bar{B}_{y,n} \\ &= \bar{B}_{y,n}, \text{ otherwise.} \end{aligned}$$

The combination of time-series (y) and cross-sectional (j) variations should generate sufficient variation in TC_{ijy} .

In the empirical stage, we must account for the fact that transfers can only be nonnegative and that a substantial fraction of children did not receive any transfers. To address this problem, the literature has estimated both the probit and the Tobit models: the probit model is used to analyze the extensive margin (the propensity to transfer), whereas the Tobit model has been used to consider the intensive margin (the amount of the transfer received). Let us define T_{ijy}^* as an unobserved latent variable measuring transfers to households. The latent variable is assumed to have a linear form:

$$T_{ijy}^* = \alpha TC_{ijy} + X_{ijy} \beta + \varepsilon_{ijy}, \quad (1)$$

where X is a vector of explanatory variables, and α and β are coefficients to be estimated. The sign of α focuses on the main relationship examined in this paper, because the crowding-out effect tends to occur when its sign is negative. The error term ε is assumed to be normal and independently distributed with a zero mean and constant variance. Then in the probit model, the latent variable determines the outcome observed for the zero-one dummy t_{ijy} :

$$\begin{aligned} t_{ijy} &= 1, \text{ if } T_{ijy}^* > 0 \\ &= 0, \text{ otherwise.} \end{aligned}$$

On the other hand, in the Tobit model, the nonnegative value T_{ijy} is defined as follows:

$$\begin{aligned} T_{ijy} &= T_{ijy}^*, \text{ if } T_{ijy}^* > 0 \\ &= 0, \text{ otherwise.} \end{aligned}$$

Table 3 presents the descriptive statistics for the whole sample. Note that all monetary variables are converted to 2005 prices using the regional consumer price index (CPI), which is the product of the national CPI (2005 = 100) and the regional difference index of consumer prices (national average set equal to 100), expressed as percentages. It indicates that approximately 20 percent of observations received a positive transfer. On average, children received 1.95 million yen from their parents. The minimum transfer amount is zero because a considerable fraction of children did not receive any parental transfers. On the other hand, the average tax credit given to children against their mortgage balance was 2.20 million yen.

The variables included in Table 3 are all included in our set of control variables. The average household income and age of householders are relatively high, reflecting the fact that our data only include owners of detached houses in urban areas.

The substitutes for children's care will influence transfer behavior (Van Houtven and Norton, 2004). To control for this effect, we use long-term care (LTC) capacity in each prefecture, which is obtained from the Survey of Institutions and Establishments for Long-term Care (Ministry of Health, Labour and Welfare). Izuhara (2006) suggested that LTC institutions are unevenly distributed across the country, which results in a shortage of such institutions in some regions. Therefore, LTC institutions may provide sufficient variation in the data. From Table 3, the numerator (number of hospital beds) may reflect the supply side of institutional care, while the denominator (elderly population) may reflect the demand side. LTC capacity thus probably proxies the accessibility of formal care. In addition to LTC capacity, we consider professional care services in the home in each prefecture, data for which are also obtained from the above survey. We create a variable called home helper that equals the number of home helpers divided by the elderly population. Unfortunately, we cannot obtain the parents' residential location from the data. We thus assume that children and parents reside in the same region. According to the 2004 wave of the Keio Household Panel Survey, approximately 80 percent of parents and their adult children dwell in the same prefecture in Japan.¹¹ As data for LTC capacity and home helper are only observed at the prefecture level, these data are

¹¹The Keio Household Panel Survey is available at <http://www.pdrc.keio.ac.jp/en/> (accessed on March 15, 2011).

used for the provincial cities.

To control for other factors, we include four location dummies (Tokyo area (reference), Nagoya area, Osaka area, and provincial cities) and eight year dummies. If there are policies targeted at promoting parental transfers or encouraging homeownership that were implemented in the same sample periods, this may also have affected the receipt of transfers. For example, to stimulate domestic demand, the Japanese government introduced a special gift-tax abatement when children receive a monetary gift from their parents for the acquisition of a residence. Even though this tax program for transfers is very friendly to children receiving gifts from parents because of the relatively large basic exception amount, children must pay tax in some cases. Although it is beyond the scope of this paper to investigate the full set of reasons, we control these influences using year dummies.

We also check whether transfers received vary between sociodemographic characteristics. First, we divide the sample into age: householders aged less than 35 years (< 35) and those aged 35 years or older ($35 +$), because some papers have considered young adult children. For example, the data used by Engelhardt and Mayer (1998) have an average age that is approximately 10 years younger than that in our data. Mulder and Smits (1999) limited their analysis to couples up to the age of 40 to ensure some homogeneity in terms of stage of life; young couples are generally still in the process of family formation and career development. Table 4 demonstrates that younger householders are more likely to receive transfers on both the extensive and the intensive margins than older householders.

Second, we examine household income: one uses household incomes below the 25th percentile (< 25 th percentile); the other uses the 25th percentile or above (25th percentile $+$). Because our data only include new custom-built detached houses in main urban areas, the mean children's income may be much higher than average. Indeed, the mean income of households that purchase custom-built detached houses in the Housing Market Trend Survey (2002–2009) issued by the MLIT is 6.95 million yen, which is approximately 1.29 million yen lower than the mean children's income in Table 3. In addition, low-income households are more likely to face liquidity constraints (Engelhardt and Mayer, 1998). Table 4 shows that the lowest income

group has a tendency to receive transfers on both the extensive and the intensive margins.

Third, households are classified by tenure status prior to acquiring a new detached house. Mayer and Engelhardt (1996) hypothesized that repeat home buyers who acquire a house in a major metropolitan area in the US are less likely than first-time buyers to be constrained financially, because the former can use the equity from their previous home. Indeed, their descriptive statistics indicate that gifts for home purchase are substantially less frequent for repeat buyers. While we do not have information on whether or not households are first-time home buyers, we do have information on whether households dwelt in a rental dwelling previously, and we expect that a relatively high proportion of these are first-time buyers. Table 4 suggests that former renters (rent) are more likely to receive transfers on both the extensive and the intensive margins than former homeowners (own). Former renters have less household income and are younger, which are similar characteristics to first-time home buyers, according to Mayer and Engelhardt (1996).

4 Estimation results

Table 5 demonstrates the estimation results that use the full sample. In the probit model, the coefficient of the tax credit has a significant and negative sign, indicating that the government housing subsidy tends to crowd out private transfers. The estimated marginal effect, which evaluates the marginal effect of each observation and averages their effects, suggests that a one million yen increase in tax credits decreases the likelihood of receiving transfers from parents by approximately 8.1 percent.

Other explanatory variables suggest that children are statistically more likely to receive parental transfers when their household income is low and when householders are young, which is consistent with the literature (Engelhardt and Mayer, 1998; Cirman, 2008). The coefficient of LTC capacity has a significantly negative sign, indicating that children are less likely to receive transfers when access of older people to LTC institutions is improved. This may suggest that parents can rely on institutional care and consequently reduce intergenerational transfers to induce care by their children. However, the coefficient of home helper has a significantly positive

sign, which runs contrary to our expectation. An explanation for this unexpected result can be found in Abe (2009), who demonstrated that professional care services at home only serve as a minor supplement to familial care. This indicates that parents who rely on professional care at home must also rely on familial care. Accordingly, the likelihood of transfers being received by their children increases.

In the Tobit model, it appears that the amount of the tax credit has a significantly negative effect on the amount of transfers received; again, the housing subsidy tends to crowd out parental transfers earmarked for home purchase. The marginal effect, conditional on receiving a positive transfer, in the Tobit model indicates that a one million yen increase in the tax credit leads to a 1.18 million yen reduction in parental transfers, suggesting almost 100 percent displacement. The signs of the other coefficients are also the same as those in the probit model.

Table 6 presents the estimation results for the subsample. Although this paper does not attempt to identify the parental motive for the transfer, the subsample analysis may address this point to some extent. Let us start with a discussion about household head age in Table 6. In both the probit and Tobit models for children less than aged 35, the estimated effects of LTC capacity are insignificant. The estimated effects of home helper are also insignificant in the probit model and only significant at the 10 percent level in the Tobit model for children aged less than 35 years. Parents of younger adult children are less likely to have a health deterioration issue, because they are likely to be younger themselves. In this sense, they may transfer without expecting care from their children; i.e., parents' behavior could be based on a relatively weak exchange motive. The marginal effects of the tax credit on parental transfers are more pronounced in younger children on both the extensive and the intensive margins. This may reflect the following fact. As mentioned in Section 2.2, homeownership rates among younger generations have been declining substantially, potentially because economic stagnation has reduced employment opportunities for young people. Therefore, young adults have faced a severe liquidity constraint when attempting to purchase a home. Cirman (2008) suggested that altruistic parents use intergenerational transfers in such a situation. However, as mentioned in Section 2.3, the Japanese government has continued to implement the MTC.

The MTC benefits altruistic parents who attempt to support their children’s home purchases. Accordingly, younger adult children are less likely to receive parental transfers. Overall, the empirical results suggest that the parents of younger homeowners are presumably motivated by a relatively strong altruistic motive and a relatively weak exchange motive, and the crowding-out effect is strengthened in this case.

When we look at the difference in household income in Table 6, the marginal effects of the MTC for low-income households are large in absolute value on both the extensive and the intensive margins. Namely, children with low income are less likely to receive transfers and to receive a smaller transfer. Our results are consistent with previous findings that the crowding-out effect is larger for low-income recipients because of the parental altruistic motive (Cox, 1987; Juarez 2009; Chuang 2012). However, the coefficient of income for low-income households is inconsistent with our prediction: it may be negative and significant if parents behave as altruists.

Finally, let us examine the difference between former renters, who are potentially first-time home buyers, and former owners in Table 6. We find that the crowding-out effect for former renters is larger than that for former owners on both the extensive and the intensive margins. The larger coefficients of income in absolute value for previous renters suggest that renters with low income are more likely to receive transfers and to receive a larger transfer conditional on receiving a positive one because their parents tend to be more sensitive to the borrowing constraints of children. This may reflect the fact that the behavior of parents of former renters is based on relatively strong altruistic preferences. The estimated effects of LTC capacity and home helper, however, are only significant for previous renters.

5 Discussion

In this section, we discuss five ancillary items of note in the current analysis. First, we must consider the endogeneity problems of the tax credits. One form of endogeneity is reverse causality: the tax credit may increase because children attempt to incur more debt when they receive larger transfers from their parents. Because T_{ijy}^* has an impact on TC_{ijy} for

this reason, we cannot assume that TC_{ijy} and ε_{ijy} in Eq. (1) are uncorrelated. Another form of endogeneity arises from the omitted variable: information on parents of adult children is not available. For example, parental home value is not available in our dataset. Parents with high-value owner-occupied housing are more likely to draw on their housing wealth to support their children (Mulder and Smits, 1999; Gulbrandsen and Sandlie, 2015). At the same time, parental home value can measure children’s expectations concerning appropriate housing standards (Henretta, 1984). The tax credit may increase when parental home value is high, because children attempt to incur more debt to purchase a home that is as expensive as their parents’ home. If one were to neglect these concerns, the estimator would suffer from bias. We thus use the instrumental variable (IV) approach to address the endogeneity problems of the tax credits. As an instrument, we calculate the average tax credit for household i that built a house in region j in year y from the sample. On the one hand, the average tax credit is expected to have an influence on the tax credit of each household, because both follow the same structure. On the other hand, the average tax credit may have only indirect impacts on transfers received through its effect on the household-level tax credit, because children tend to care about their own tax credit rather than the average tax credit. As a result, the average tax credit seems to be a valid instrument that includes information on the MTC program. The results of the IV probit and IV Tobit models are documented in the Appendix (Table 7). Both the IV probit and IV Tobit estimates demonstrate that the estimated marginal effect of the tax credit is quantitatively similar to the benchmark models in Table 5 but are statistically insignificant. The first-stage coefficient estimates associated with the instrumental variable have a significant and positive sign. However, the Wald test statistics are sufficiently small, suggesting the nonrejection of the null hypothesis that the tax credit is an exogenous variable.¹² The probit and Tobit models thus seem appropriate compared with the IV probit and IV Tobit models.

Second, we must use the interest rates on adjustable-rate mortgages (ARMs) rather than those on fixed-rate mortgages (FRMs) to calculate the tax credits. In general, the rates on

¹²Children probably do not alter their mortgage size and use all of the transfers to increase their down payment.

ARMs were lower than those on FRMs; therefore, some households might (partially) use ARMs. We use data on the average adjustable interest rates offered by Japanese city banks. However, the calculation of the tax credit becomes complex when we consider the adjustment period. We therefore assume that households that purchase a house in year y face the five-year average of the adjustable rate, which is the average of the adjustable rate from year y to year $y + 5$. Replacing this interest rate with ι_y in the equations in Section 3, we can calculate the tax credits that are influenced by both the MTC and the ARM rates. The empirical results shown in the Appendix (Table 7) yield quantitatively similar findings to those of the benchmark model in Table 5.

Third, the MTC may crowd out a gift of housing or housing inheritance from parents to their adult children. Unfortunately, we cannot examine this issue, because the JHO survey only collects data on households that acquired a new house through the housing market. The JHO survey, however, asked households to report whether they built a new house on their parents' land or inherited land. Using this information, we can test how the MTC affects the receipt of land transfers on the extensive margin. The empirical results (the last column of Table 7 in the Appendix) suggest that the MTC also crowds out real estate transfers received in our data.

Fourth, we examine selectivity bias. Because our data only include new custom-built detached houses, ready-built detached houses, condominium units, and existing houses are not included. In general, these types of housing are reasonable in price compared with the house type in our data. If home buyers who are relatively low-income prefer such homes, then the MTC may have a substantial negative impact on parental transfers. This suggests that our conclusion, which used all observations, suffers from a positive selection bias and underestimates the crowding-out effect. Nevertheless, we believe that our data are meaningful because the empirical evidence suggests the presence of the crowding-out effect.

Fifth, as suggested by Reil-Held (2006), the Tobit model is too restrictive because the latent variable determines both the probability of receiving transfers and their amount. Reil-Held (2006) suggested a Heckman two-equation model—a model for the decision to receive a

transfer in the first stage and for the transfer amount in the second stage—to address this concern. However, she admitted that it is difficult to find appropriate IVs to identify the first- and second-stage equations. We faced the same problem; thus, this remains an issue for future research.

6 Conclusion

This paper hypothesized that children tend to lose the opportunity to receive monetary transfers earmarked for home purchases from their parents when a housing subsidy is provided by the government. To confirm this hypothesis, we empirically tested whether a tax credit, which is derived from the MTC program, has a negative impact on transfers, using a sample of home buyers in urban areas of Japan in the 2000s. To the best of our knowledge, research on the crowding-out effect of public transfers, which target prospective home buyers, on intergenerational transfers is scarce. Our findings support the existence of a crowding-out effect stemming from the MTC in Japan on both the extensive and the intensive margins. In particular, the estimates of the intensive margin suggested almost 100 percent displacement. Crowding out suggests that the impact of a housing subsidy is smaller than that perceived by the government.

Although we do not provide a theoretical model that captures children’s welfare, we suggest the following implications. On the one hand, children’s welfare may be unaffected by the MTC if their parents’ behavior is based on a relatively strong altruistic motive. This is because the housing subsidy, which tends to induce large reductions in both the extensive and the intensive margins associated with the MTC, only works as a substitute for parental support. However, children’s welfare may be increased by the MTC if their parents’ behavior is based on a relatively strong exchange motive. Because children’s home purchases are likely to rely on public transfers, the MTC allows children to provide less care for their parents, which is generally a heavy burden.

We also examined the subsamples that categorize children into two groups: children’s age (whether householders are below 35 years of age or not), children’s income (whether household

income is less than the 25th percentile or not), and previous tenure (whether children dwelt in a rental house before owning a house or not). The empirical results suggested that the crowding-out effect is larger for children who are young, low-income, and previously lived in a rental house. This appears to indicate that an expansion of the MTC program may have no or negative impacts on home purchases for these subgroups.

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Conflict of interest

The authors declare that they have no conflict of interest.

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Table 1: Mortgage tax credit rules in the 2000s

| Year | Max. mortgage balance (million yen) | Tax credit rate (%) | Period (years) | Max. tax credit (million yen) |
|------|--|------------------------|-------------------|----------------------------------|
| 2002 | 50 | 1.0 | 10 | 5.00 |
| 2003 | 50 | 1.0 | 10 | 5.00 |
| 2004 | 50 | 1.0 | 10 | 5.00 |
| 2005 | 40 | 1.0 | First 8 | 3.60 |
| | | 0.5 | Last 2 | |
| 2006 | 30 | 1.0 | First 7 | 2.55 |
| | | 0.5 | Last 3 | |
| 2007 | 25 | 1.0 | First 6 | 2.00 |
| | | 0.5 | Last 4 | |
| 2008 | 20 | 1.0 | First 6 | 1.60 |
| | | 0.5 | Last 4 | |
| 2009 | 50 | 1.0 | 10 | 5.00 |
| | (60) | (1.2) | | (6.00) |

The numbers in parentheses are applied to a certified housing unit.

Table 2: Descriptive statistics of the tax credit in the 2000s (nominal values)

| Year | Observations | Mean | Std. dev. | Min. | Max. |
|------|--------------|------|-----------|------|------|
| 2002 | 1,741 | 2.31 | 1.01 | 0.12 | 5.00 |
| 2003 | 1,914 | 2.55 | 1.02 | 0.18 | 5.00 |
| 2004 | 1,787 | 2.59 | 1.03 | 0.27 | 5.00 |
| 2005 | 2,366 | 2.27 | 0.81 | 0.08 | 3.60 |
| 2006 | 2,085 | 2.00 | 0.58 | 0.02 | 2.55 |
| 2007 | 1,928 | 1.78 | 0.37 | 0.14 | 2.00 |
| 2008 | 1,965 | 1.52 | 0.21 | 0.29 | 1.60 |
| 2009 | 2,291 | 3.27 | 1.21 | 0.18 | 6.00 |

Table 3: Descriptive statistics of the full sample

| Variable | Mean | Std. dev. | Min. | Max. |
|--|--------|-----------|-------|--------|
| Children receive transfer (dummy) | 0.20 | 0.40 | 0.00 | 1.00 |
| Transfer (million yen) | 1.95 | 6.02 | 0.00 | 294.62 |
| Tax credit (million yen) | 2.20 | 0.95 | 0.02 | 5.99 |
| Income (million yen) | 8.24 | 4.19 | 0.00 | 79.13 |
| Age (years) | 40.24 | 9.33 | 21.00 | 89.00 |
| LTC capacity (1,000 beds/100,000 elderly) | 2.37 | 0.34 | 1.70 | 3.26 |
| Home helper (1,000 person/100,000 elderly) | 1.56 | 0.41 | 0.81 | 2.67 |
| Tokyo area (dummy, reference) | 0.33 | 0.47 | 0.00 | 1.00 |
| Nagoya area (dummy) | 0.18 | 0.39 | 0.00 | 1.00 |
| Osaka area (dummy) | 0.23 | 0.42 | 0.00 | 1.00 |
| Provincial city (dummy) | 0.26 | 0.44 | 0.00 | 1.00 |
| 2002 (dummy, reference) | 0.11 | 0.31 | 0.00 | 1.00 |
| 2003 (dummy) | 0.12 | 0.32 | 0.00 | 1.00 |
| 2004 (dummy) | 0.11 | 0.31 | 0.00 | 1.00 |
| 2005 (dummy) | 0.15 | 0.35 | 0.00 | 1.00 |
| 2006 (dummy) | 0.13 | 0.34 | 0.00 | 1.00 |
| 2007 (dummy) | 0.12 | 0.32 | 0.00 | 1.00 |
| 2008 (dummy) | 0.12 | 0.33 | 0.00 | 1.00 |
| 2009 (dummy) | 0.14 | 0.35 | 0.00 | 1.00 |
| Observations | 16,077 | | | |

Table 4: Mean values of the subsample by age, income, and previous tenure

| Variable | Age | | Income | | Previous tenure | |
|--|-------|--------|-------------|-------------|-----------------|-------|
| | < 35 | 35 + | < 25th %ile | 25th %ile + | Rent | Own |
| Children receive transfer [†] | 0.28 | 0.17 | 0.28 | 0.18 | 0.25 | 0.14 |
| Transfer (million yen) | 2.57 | 1.68 | 2.32 | 1.83 | 2.42 | 1.33 |
| Tax credit (million yen) | 2.29 | 2.16 | 1.96 | 2.28 | 2.33 | 2.02 |
| Income (million yen) | 6.67 | 8.94 | 4.71 | 9.42 | 7.61 | 9.10 |
| Age (years) | 31.08 | 44.29 | 36.33 | 41.54 | 36.26 | 45.61 |
| LTC capacity | 2.37 | 2.37 | 2.36 | 2.37 | 2.39 | 2.34 |
| Home helper | 1.51 | 1.59 | 1.55 | 1.57 | 1.53 | 1.61 |
| Observations | 4,931 | 11,146 | 4,017 | 12,060 | 9,235 | 6,842 |

[†] indicates a dummy variable.

LTC capacity is measured by 1,000 beds/100,000 elderly.

Home helper is measured by 1,000 person/100,000 elderly.

Table 5: Empirical results of the full sample

| | Probit (Children receive transfer) | | Tobit (Transfer) | |
|------------------------|------------------------------------|------------------|------------------|------------------|
| | Coeff. | Robust std. err. | Coeff. | Robust std. err. |
| Tax credit | -0.307*** | 0.017 | -5.477*** | 0.380 |
| Income | -0.020*** | 0.004 | -0.198*** | 0.065 |
| Age | -0.034*** | 0.002 | -0.580*** | 0.034 |
| LTC capacity | -0.187*** | 0.047 | -2.483*** | 0.791 |
| Home helper | 0.120*** | 0.043 | 2.649*** | 0.718 |
| Tokyo area | Ref. | Ref. | Ref. | Ref. |
| Nagoya area | -0.038 | 0.037 | -0.316 | 0.631 |
| Osaka area | -0.101*** | 0.035 | -1.400** | 0.602 |
| Provincial city | -0.136*** | 0.034 | -2.339*** | 0.565 |
| 2002 | Ref. | Ref. | Ref. | Ref. |
| 2003 | -0.149** | 0.049 | -1.074 | 0.790 |
| 2004 | -0.204*** | 0.051 | -2.005** | 0.842 |
| 2005 | -0.149*** | 0.051 | -1.861** | 0.813 |
| 2006 | -0.216*** | 0.052 | -3.033*** | 0.833 |
| 2007 | -0.407*** | 0.053 | -5.271*** | 0.861 |
| 2008 | -0.511*** | 0.054 | -8.005*** | 0.991 |
| 2009 | 0.059 | 0.051 | 2.598*** | 0.833 |
| Constant | 1.642*** | 0.132 | 25.788*** | 2.222 |
| Marginal effect | -0.081*** | (0.005) | -1.181*** | (0.078) |
| Pseudo R^2 | 0.071 | | 0.028 | |

Number of observations is 16,077.

Standard errors in parentheses.

Marginal effect calculates marginal effect of the tax credit conditional on it being positive.

***, ** indicate significance at 1%, 5%, respectively.

Table 6: Empirical results of the subsample

| Variable | Age | | Income | | Previous tenure | |
|--|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| | < 35 | 35 + | < 25th %ile | 25th %ile + | Rent | Own |
| Panel A: Probit (Children receive transfer) | | | | | | |
| Tax credit | -0.377*** (0.033) | -0.286*** (0.021) | -0.393*** (0.038) | -0.297*** (0.019) | -0.406*** (0.024) | -0.246*** (0.028) |
| Income | -0.016** (0.007) | -0.021*** (0.005) | 0.028 (0.031) | -0.021*** (0.004) | -0.029*** (0.005) | -0.010* (0.005) |
| Age | -0.012 (0.008) | -0.037*** (0.002) | -0.034*** (0.003) | -0.035*** (0.002) | -0.018*** (0.003) | -0.033*** (0.002) |
| LTC capacity | -0.123 (0.079) | -0.215*** (0.059) | -0.275*** (0.092) | -0.153*** (0.056) | -0.253*** (0.058) | -0.128 (0.083) |
| Home helper | 0.132* (0.075) | 0.109** (0.052) | 0.083 (0.082) | 0.127** (0.051) | 0.279*** (0.055) | -0.070 (0.069) |
| Location | Yes | Yes | Yes | Yes | Yes | Yes |
| Year | Yes | Yes | Yes | Yes | Yes | Yes |
| Marginal effect | -0.121*** [0.010] | -0.068*** [0.005] | -0.124*** [0.013] | -0.073*** [0.005] | -0.121*** [0.007] | -0.051*** [0.006] |
| Pseudo R^2 | 0.044 | 0.069 | 0.054 | 0.068 | 0.064 | 0.074 |
| Panel B: Tobit (Transfer) | | | | | | |
| Tax credit | -6.068*** (0.494) | -5.460*** (0.525) | -5.828*** (0.472) | -5.765*** (0.359) | -6.707*** (0.376) | -4.782*** (0.799) |
| Income | -0.044 (0.098) | -0.282*** (0.089) | 0.476 (0.383) | -0.315*** (0.080) | -0.234*** (0.075) | -0.143 (0.113) |
| Age | -0.113 (0.112) | -0.700*** (0.058) | -0.442*** (0.038) | -0.656*** (0.036) | -0.298*** (0.037) | -0.646*** (0.084) |
| LTC capacity | -1.636 (1.116) | -2.997*** (1.098) | -2.145* (1.165) | -2.529** (1.065) | -3.036*** (0.854) | -2.022 (1.704) |
| Home helper | 2.504** (1.069) | 2.657*** (0.962) | 0.952 (1.019) | 3.377*** (0.956) | 4.948*** (0.828) | -0.982 (1.371) |
| Location | Yes | Yes | Yes | Yes | Yes | Yes |
| Year | Yes | Yes | Yes | Yes | Yes | Yes |
| Marginal effect | -1.539*** [0.125] | -1.089*** [0.099] | -1.472*** [0.136] | -1.178*** [0.095] | -1.617*** [0.090] | -0.873*** [0.140] |
| Pseudo R^2 | 0.019 | 0.028 | 0.024 | 0.027 | 0.027 | 0.028 |
| Observations | 4,931 | 11,146 | 4,017 | 12,060 | 9,235 | 6,842 |

Robust standard errors in parentheses and standard errors in brackets.

Constant term is included in all models, but result is not shown.

Marginal effect calculates marginal effect of the tax credit conditional on it being positive.

***, **, * indicate significance at 1%, 5%, 10%, respectively.

Appendix

Table 7: Empirical results considering endogeneity/using ARMs/land transfers

| | Endogeneity of the tax credit | | ARMs | | Probit (Children receive land) |
|------------------------|-------------------------------|----------------------|----------------------|----------------------|--------------------------------|
| | IV probit | IV Tobit | Probit | Tobit | |
| Tax credit | -0.118 (0.332) | -1.851 (5.486) | -0.312*** (0.018) | -5.574*** (0.387) | -0.520*** (0.021) |
| Income | -0.030 (0.019) | -0.414 (0.338) | -0.019*** (0.003) | -0.193*** (0.065) | -0.021*** (0.006) |
| Age | -0.029*** (0.009) | -0.490*** (0.091) | -0.034*** (0.002) | -0.580*** (0.034) | -0.035 (0.002) |
| LTC capacity | -0.201*** (0.050) | -2.792*** (0.723) | -0.188*** (0.047) | -2.485*** (0.791) | 0.004 (0.052) |
| Home helper | 0.120*** (0.042) | 2.671*** (0.723) | 0.121*** (0.043) | 2.661*** (0.718) | 0.084* (0.047) |
| Location | Yes | Yes | Yes | Yes | Yes |
| Year | Yes | Yes | Yes | Yes | Yes |
| Marginal effect | -0.081 [0.086] | -1.183 [1.212] | -0.082*** [0.004] | -1.202*** [0.079] | -0.098*** [0.003] |
| Log likelihood | -25,680.054 | -36,578.545 | | | |
| Pseudo R^2 | | | 0.070 | 0.028 | 0.111 |
| IV | | | | | |
| Average deduction | 0.313*** (0.058) | 0.313*** (0.058) | | | |
| Wald statics | 0.327 {0.567} | 0.434 {0.510} | | | |
| Observations | 16,077 | 16,077 | 16,077 | 16,077 | 18,450 |

Dependent variables in columns 1 (IV probit) and 3 (probit) are Children receive transfer.

Dependent variables in columns 2 (IV Tobit) and 4 (Tobit) are Transfer.

Robust standard errors in parentheses, standard errors in brackets, and p -values in braces.

Constant term is included in all models, but result is not shown.

Marginal effect calculates marginal effect of the tax credit conditional on it being positive.

***, * indicate significance at 1%, 10%, respectively.