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Housing subsidy or parental support: Crowding-out effect of mortgage tax deduction

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Abstract

Children may receive monetary transfers from their parents to realize the dream of homeownership. This raises the question of whether transfers received decrease if governments also provide a homeownership-related subsidy. The purpose of this paper is to empirically examine this question, using a sample of the Japanese home-buying households that are subsidized by a mortgage tax deduction (MTD) as a model case. In the empirical stage, we offer a test of the effect of the MTD on both the extensive (the probability of receiving transfers) and the intensive (the amount of transfers received) margins using the overall sample as well as subsample groups. The empirical results, which use the full sample, appear to indicate that the MTD has a tendency to crowd out transfers on both the extensive and the intensive margins. Subsample analysis demonstrates that the crowding-out effect is strengthened when parents' behavior is influenced by a relatively strong altruistic motive and a relatively weak exchange motive.

JEL classification: D12, R21

Key words: Intergenerational transfer, crowding out, mortgage tax deduction

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1 Introduction

Parents tend to assist their adult children to realize the dream of homeownership. Because a conventional mortgage requires a large down payment, home-buying households usually accumulate substantial savings, and thus down payment constraints may distort optimal housing consumption. Parental transfers are likely to alleviate this borrowing constraint. Children, however, can realize a house purchase when the government implements public transfer programs earmarked toward prospective home buyers, because these also alleviate the borrowing constraint of children.¹ The question is then whether parents provided additional financial assistance under this condition.

Some recent studies have indicated that additional financial assistance is not offered frequently. Namely, these studies have suggested that public transfers tend to crowd out private transfers. However, these are unrelated to housing issues as they are from children to parents. For instance, Juarez (2009) estimated that an increase in the income of senior people, caused by the nutrition transfer program in Mexico City, is negatively related to the amount of private transfers they receive. Gerardi and Tsai (2010) found that an increase in government transfer payments, caused by the introduction of social programs in Taiwan, decreased the likelihood of senior parents receiving monetary support from their children.²

Inspired by the crowding-out hypothesis, this paper empirically tests how housing subsidy schemes designed to encourage homeownership, affect 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. To the best of our knowledge, this is the first paper that applies the idea of the crowding-out effect to the housing market. We use Japan as a case study, which is an interesting setting, because it includes a time period during

¹For instance, the home mortgage interest deduction (MID) in the US lowers the amount of tax collected from households. Thus, the US government believes that these transfers encourage homeownership. Glaeser and Shapiro (2003), however, found evidence against this claim: the subsidy created by the MID has little effect on homeownership rates. Hanson (2012) also found no relationship between the MID and homeownership. His empirical results, however, suggested that the MID increases the size of the homes purchased.

²Kohli (1999) tried to refute the crowding-out effect, because public transfers and private transfers may interact and complement each other. Kohli (1999) found that the public pension transfers to seniors are channeled back to younger generations through family transfers.

which the government provided housing incentives such as the mortgage tax deduction (MTD). This government program may have the same type of impact as public transfers because it alleviates housing financial pressures by increasing the disposable income of children. Using household-level data on purchases of detached houses in the urban areas of Japan that contains information on monetary transfers from senior parents to adult children, and household-level differences in the availability of the MTD as the parameters, we are able to estimate the effect of the MTD on transfers received. The empirical results demonstrate evidence of crowding out on both the extensive and the intensive margins. In particular, the estimates of the intensive margin suggest a strong crowding-out effect. We also divide the sample into two groups based on sociodemographic characteristics: children's income (whether household income is less than the 25th percentile or not), children's age (whether householders are below 40 years of age or not), previous tenure (whether children dwell in rental housing before owning a house or not), and living arrangements (whether children dwell with their parents or not), and conduct the same exercise. We believe that an estimation for each sample allows us to understand differences in parental transfer motives to some degree. Indeed, the empirical results for the subsample analysis appear to indicate that the degree of crowding-out may differ between subsamples.

2 Theoretical framework of crowding out

To address this question, it is useful to examine the parental motive behind transfer decisions. Engelhardt and Mayer (1994) demonstrated that prospective home buyers who face high house prices or households with delinquent credit are more likely to receive transfers for home purchases, because these households are more likely to be financially constrained. Cirman (2008) obtained a similar result. That is, parental transfers for acquiring a residential property increase when both housing prices and interest rates are relatively high. Cirman (2008) 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 an altruistic preference (Barro 1974; Becker 1974): parents care about the well-being of their

children, and therefore parents help their children when they are confronted with a deterioration in housing-related conditions. When adult children receive gifts from their parent, they may realize the dream of owning a home (Helderman and Mulder 2007). These results, however, suggest that parents are less likely to increase transfers when their children are placed in a favorable environment for acquiring a home. This appears to indicate that the MTD, which provides subsidies to increase children's income, has a tendency to crowd out parental transfers.

Many studies in relation to intergenerational transfers, however, have suggested parents are more likely to possess an exchange motive rather than an altruistic motive (e.g. Bernheim et al. 1985). That is, parents tend to enter an agreement with their children whereby their adult 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 induce children's attentions, especially from wealthy children whose opportunity costs are relatively high, if the parents' demand of children's attention is inelastic. For example, let us consider a case where a formal care market is not operating well in the parents' neighborhood. In this situation, parents can only rely on the informal care because no close market substitutes exist. Consequently, the parents' demand for children's informal care becomes inelastic. The exchange model then predicts that parents encourage transfers when their children have easier access to home ownership. This suggests that the exchange motive behind transfers does not cause or weaken the crowding-out effect problem. In the opposite case, however, parents can rely on the formal care because it tends to be a close substitute for the informal care. As the demand becomes elastic, accordingly parents can reduce their transfers. This again suggests that the MTD may crowd out parental transfers, even under the exchange motive. In sum, the exact direction of the effect of the MTD on transfers received is theoretically ambiguous, and must be determined using empirical analysis.

Indeed, it is a controversial issue whether close substitutes for the informal care exist in Japan. Family wealth goes disproportionately to the next generation of men, especially the eldest son, because patriarchy is common practice in many Asian countries (Izuhara 2008). In

exchange, the eldest son tacitly provides care to his parent in Japan. Japan, however, faces the most rapid growth in the proportion of elderly in the population in the world. Reflecting the heavy burden of care service provided by traditional families to elderly people, the long-term care insurance (LTCI) system has been introduced to promote a formal care service through a market approach as part of the socialization of care since 2001 (Abe 2009; Izuhara 2004). Izuhara (2008) suggested that the link between children's support and transfers are increasingly being broken in Japan. Abe (2009), however, claimed that the LTCI have reduced burden on families at a fairly small level. In fact, the LTCI system aims to encourage not institutional care but rather home-based care. It is intended that home-based care provide senior people with care from their family at home with some assistance from professional care service providers. Abe (2009) demonstrated that professional care services at home are utilized by households with care needs, yet, it only serves as a minor supplement to familial care.

3 Mortgage tax deduction

The MTD allows home-buying households to deduct a percentage of their mortgage balance from their income taxes. For example, any household that purchased and dwelled in a home in 2002 are eligible for a tax credit equal to 1 percent of their mortgage balance (Table 1). However, there are two limitations: only the first 50 million yen of a mortgage balance can be used as a tax offset and the tax credit can only be claimed for the first 10 years.

As shown in Table 1, the MTD has been revised several times in the 2000s. From 2002 to 2009, the applicable period of the MTD remained the same. However, from 2005 to 2008, deduction rates in the last several years were lower than the first several years. During this period, the maximum limits were also lowered. In 2009, the MTD returned to the same level as in the period 2002 to 2004.

In the following section, considering the time-series differences in the availability of the MTD, we create a variable that captures household-level differences in deductions. This will ensure sufficient variation in MTD availability.

4 Data and empirical model

The data come from the customer survey collected by the Japan Federation of Housing Organizations (JHO). Its members consist of various housing suppliers in Japan.³ The JHO distributes a questionnaire to home builders whose customers bought a newly built detached house in the three major metropolitan areas of Tokyo, Nagoya, and Osaka, and four provincial cities of Sapporo, Sendai, Hiroshima, and Fukuoka. The Tokyo metropolitan area includes Saitama, Tokyo Metropolitan, 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, the number of newly built owner-occupied houses accounts for approximately 46.6% of such houses in Japan (the 2008 Housing Starts, Ministry of Land, Infrastructure, Transport and Tourism, Japan (MLIT)). The JHO conducts this survey every year and collects micro-level cross-sectional data on approximately 3,000 home-buying households. We pooled the data for 2002 to 2009. The number of observations in the full sample is 2,747 in 2002; 2,852 in 2003; 2,658 in 2004; 3,513 in 2005; 3,403 in 2006; 3,028 in 2007; 2,811 in 2008; and 3,220 in 2009. Screening the data for complete information on the selected variables produces a sample of 24,232 observations, which represents 92.4% of the full sample.

Home builders do ask their customers to report transfers received, total earned income of household members, and mortgage size. From the amount of the loan, we can attempt to calculate the present value of the total deductions for household i who built a house in region j in year y , $D_{i,j,y}$ (hereafter we omit the subscript j and y , for simplicity).⁴ First, let us define the original loan amount of household i as L_i . Suppose that all households make a constant interest payment on the mortgage loan of ι percent for a 30-year term. The 2011 Survey of Housing Market issued by MLIT Japan reported that the average period of mortgage

³Enterprises of various sizes are members of the JHO, not only the large enterprises but also the medium and small enterprises. Various kinds of construction methodologies for housing suppliers are also included, 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 March 15, 2011).

⁴For details of the calculation method see Brueggeman and Fisher (2006).

repayment is approximately 30 years. Then, the relation between the monthly payment, MP_i , and the present value of L_i can be written as follows:

$$L_i = MP_i \sum_{k=1}^{360} \frac{1}{(1+r)^k}.$$

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

The monthly payment can be rewritten as follows:

$$MP_i = \frac{r \times (1+r)^{12 \times 30} \times L_i}{(1+r)^{12 \times 30} - 1}.$$

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

$$B_{i,n} = MP_i \frac{(1+r)^{12 \times (30-n)} - 1}{r \times (1+r)^{12 \times (30-n)}}.$$

Note that the tax credit is not applied to both the whole mortgage balance and the whole borrowing period from Table 1. Namely, there is an upper limit for the mortgage balance, \bar{B} , and the deduction period is the first 10 years. Eventually, we assume that the amount of deduction, D_i , can be represented as:

$$D_i = \sum_{n=1}^{10} \tau_n B_{i,n}^*,$$

where τ_n is the deduction rate, and

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

In the empirical stage, we must account for the fact that transfers can only be nonnegative and that a substantial fraction of children do 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_i^* as an unobserved latent variable measuring transfers to household i . The latent variable is assumed to have a linear form:

$$T_i^* = \alpha D_i + X_i \beta + \varepsilon_i, \tag{1}$$

where X_i is a vector of explanatory variables, and α and β are coefficients to be estimated. The sign of α focuses of the main relationship examined in this paper, because the crowding-out effect tends to occur when its sign is negative. The error term ε_i 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_i :

$$\begin{aligned} t_i &= 1, \text{ if } T_i^* > 0 \\ &= 0, \text{ otherwise.} \end{aligned}$$

On the other hand, in the tobit model, the nonnegative value T_i is defined as follows:

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

However, there may be a problem of potential endogeneity of D_i in Eq. (1). The estimates of α could be biased upward, when children increase their loan amount, because they expect to receive parental transfers. Upward bias may also occur when unobservable characteristics may be positively correlated with both T_i^* and D_i . For example, parental income is not available in our data. Parents with high incomes are more likely to provide assistance to their children regardless of their transfer motives (Cox 1987). At the same time, children are more likely to borrow from banks when their rich parents cosign, and are more likely to claim deductions from their income. These problems, consequently, tend to underestimate the crowding-out effect.

Similar to Juarez (2009) and Gerardi and Tsai (2010), we use the instrumental variable (IV) approach to address this concern. The first stage regression for both the IV probit and the IV tobit models, is:

$$D_i = \gamma \bar{D}_i + X_i \gamma + u_i, \tag{2}$$

where \bar{D}_i is an instrument, which is explained below. The error terms (ε_i, u_i) are zero-mean normally distributed and independent of X_i . Eqs. (1) and (2) are estimated jointly by maximum likelihood.

As instruments, we use the average deduction amount, \bar{D}_i , as follows:

$$\bar{D}_i = \frac{\sum D_{-i}}{N - 1},$$

where $\sum D_{-i}$ is the present value of the total deduction except for household i in a region in a year, and N is the number of observations in the region in the year. On the one hand, the average deduction amount is expected to have an influence on the deduction amount of each household, because both follow the same structure. On the other hand, the average deduction amount may have only indirect impacts on transfers received through their effect on the household-level deduction amount, because children tend to care about their own deduction amount, rather than the average deduction amount. As a result, \bar{D}_i seems to be a valid instrument, which includes the information on the MTD.

Table 2 presents the descriptive statistics for the whole sample. It indicates that approximately 18 percent of observations receive a positive transfer. On average, children receive 1.94 million yen from their parents. The minimum transfer amount is zero, because a considerable fraction of children do not receive any parental transfers.

The variables included in Table 2 are all included in our set of control variables to reduce the omitted variable bias. The average household income and the age of a householder are relatively high, reflecting the fact that our data only include owners of detached houses in urban areas.

If parents transfer based on the exchange motive, the substitutes for informal care will influence transfer behavior. 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, Japan). LTC capacity may proxy the accessibility to formal care, because the numerator (the number of hospital beds) may reflect the supply side of market care services, while the denominator (elderly population) may reflect the demand side for them. 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 which 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 senior parents and adult children dwell in the same prefecture in Japan.⁵

Because a detached house is built on a separate parcel of land, homeowners often acquire land when they acquire a house. Parents may consider the land price in determining the transfer. We thus control the land price using the Land Price Survey conducted by prefectural governments. We also include four location dummies, comprising: 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, it may also have affected the receipt of transfers. Although it is beyond the scope of this paper to investigate the full set of reasons, we control these influences by year dummies.

We also check whether transfers received vary between sociodemographic characteristics. These can identify the difference in parental motives to transfer to some degree. First, we examine household income. Generally, low-income households face liquidity constraints (Engelhardt and Mayer 1998). We thus consider whether parents whose children are low income behave based more on the altruistic motive than the exchange motive to realize the children's dream of homeownership. On the other hand, parents whose children earn high incomes tend to suffer from eliciting their children's service. We thus assume that parents' behavior is based more on the exchange motive in this case. To consider this difference, we estimate two equations: one uses household incomes below the 25th percentile ($< 25\text{th percentile}$); the other uses above the 25th percentile ($25\text{th percentile} +$). Table 3 shows that the lowest income group is more likely to receive transfers on both the extensive and the intensive margins.

Second, we divide the sample into age: householders aged younger than 40 years (< 40) and aged 40 years or more ($40 +$). 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,

⁵The Keio Household Panel Survey is available at <http://www.pdrc.keio.ac.jp/en/> (accessed on March 15, 2011).

they may transfer without expecting their children's informal care, i.e. they act as an altruist. While, parents of older adult children tend to need nursing care, they behave based more on the exchange motive. Table 3 demonstrates that younger householders are more likely to receive transfers on both the extensive and the intensive margins than older householders.

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 major metropolitan areas in the US are less likely than first-time buyers to be financial constrained, 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 regarding whether or not households are first-time home buyers, we do have information on whether households previously dwelled in rental dwellings, of which we expect that a relatively high proportion of them are first-time buyers. Table 3 suggests that former renters (former renter) are more likely to receive transfers on both the extensive and the intensive margins than former homeowners (former owner). Former renters have less household income and are younger, which have similar characteristics to first-time home buyers according to Mayer and Engelhardt (1996). We expect that parents may behave altruistically when their children dwelled in rental dwellings previously.

Last, we focus on living arrangements: whether the respondent lives with their parents (with parents) or not (without parents). Like Taiwan, Japanese adult children frequently live with their parents (Gerardi and Tsai 2010). The literature suggests that sharing a home arises from the exchange motive (Tomassini et al. 2003; Yamada 2006; Yin 2010). Namely, the exchange motive suggests that living together makes it possible for children to spend large amounts of time providing nursing care, and children thus expect a return from their parents in the future. Although co-residence may affect parents' transfer behavior, there are no substantial differences between the two groups in Table 3.

5 Estimation results

Table 4 demonstrates the estimation results that use the full sample. According to the probit model, children that benefit from the MTD are less likely to receive monetary transfers from their parents, indicating a housing subsidy tends to crowd out parental transfers. The estimated marginal effect, which evaluates the marginal effect of each observation and averages their effect, suggests that a 1 percent increase in the deduction amount decreases the likelihood of receiving transfers from parents by approximately 8.4 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 are consistent with the literature (Cirman 2006; Engelhardt and Mayer 1998). The coefficient of LTC capacity has a significantly negative sign, indicating children are less likely to receive transfer when access of seniors to LTC institutions is improved. This may suggest that parents can rely on formal care, and consequently reduce intergenerational transfers to induce informal care. The coefficient of home helper, however, has a significantly positive sign which runs contrary to our expectation. An explanation for this unexpected result can be found in Abe (2009). As mentioned in Section 2, Abe (2009) demonstrated that professional care services at home only serves as a minor supplement to familial care. This indicates that parents who rely on professional care at home must rely on informal care at home as well, accordingly the likelihood of transfers being received increases. Finally, tighter land markets, as indicated by regional land prices, tend to discourage the propensity of transfers received.

As expected, the IV probit estimate demonstrates the estimated value of deduction is larger in absolute terms than in the probit model, but is statistically insignificant. The first-stage coefficient estimates associated with the instrumental variable also has a significantly positive sign. The Wald test statistic, however, is sufficiently small, suggesting the nonrejection of the null hypothesis that deduction is an endogenous variable. Therefore, it seems that the probit model is valid rather than the IV probit model.

In the tobit model it appears that the deduction amount generated by the MTD has a

significantly negative effect on the amount of transfers received; again the housing subsidy tends to crowd out parental transfers. The marginal effect, conditional on receiving a positive transfer, of the tobit model indicates that a one million yen increase in deductions leads to a 95.7 million yen reduction in parental transfers, indicating that the crowding-out effect is substantially large. The signs of the other coefficients are the same in those in the probit model. Income, however, is insignificant in this case. The IV Tobit cannot reject the nonexistence of crowding-out because of large standard errors. However, the Wald test statistic of the IV tobit model is again sufficiently small. The tobit model thus seems appropriate compared with the IV tobit model.

Tables 5 and 6 present the estimation results, which use the subsample. However, we only report the probit and the tobit models because the coefficients of deduction may not suffer from serious bias, as mentioned earlier. Let us start with a discussion about household income in Table 5. The marginal effects of deduction 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. This is most likely because parents that behave based on relatively strong altruistic preferences are more likely to recognize the benefit of the MTD. However, the coefficient of income for low-income households is inconsistent with our prediction: it may be negative if parents behave as altruists.

When we look at the difference in household head age in Table 5, the marginal effects of deduction are more pronounced in younger children on both the extensive and the intensive margins. This suggests that parents who behave based on relatively strong altruistic preferences are again more sensitive to the benefit of the MTD, results in a stronger crowding-out effect. In both the probit and the tobit models, the estimated effects of LTC capacity and home helper for children aged 40 or more are large in magnitude compared with those for children aged less than 40. This appears to indicate that parents who are more likely to have health deterioration issues tend to be more responsive to formal care services.

From Table 6, we find that the crowding-out effect for previous renters is substantially stronger than former owners on both the extensive and the intensive margins. Similar to the

above cases, this may reflect the fact that their parents behave based on relatively strong altruistic preferences. 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. Increases in land prices have a different influence on transfer behavior. For previous homeowners, an increase in land prices increases their equity. Previous owners, therefore, are less likely to receive transfers and to receive a smaller transfer as indicated by significantly negative sign for land price in both the probit and the tobit models. In contrast, for previous renters, it is difficult to acquire a new dwelling when land prices are high. This may be a reason why the coefficients of land price become insignificant in both models.

The empirical results in Table 6 also demonstrate that the marginal effects of deduction on both the extensive and the intensive margins is slightly smaller in absolute value for children who live with their parents. Consistent with the above subsample analysis, parents that behave based on the relatively strong exchange motive are less likely to be sensitive to the benefit of the MTD, resulting in a weaker crowding-out effect. The coefficients of LTC capacity and home helper for children who live with parents are insignificant, suggesting parents tend not to rely on formal care presumably because their co-resident children can care for them.

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 deduction amount, which is derived from the MTD, has a negative impact on transfers, using a sample of home buyers in urban areas of Japan in the 2000s. To our best knowledge, this is the first paper that empirically examined the crowding-out effect of public transfers, which target prospective home buyers, on intergenerational transfers. Our findings supported the evidence of a crowding-out effect stemming from the MTD in Japan on both the extensive and the

intensive margins. In particular, the estimates of the intensive margin suggested a substantial crowding-out effect: a one million yen increase in children's deductions leads to 0.957 million yen reduction in parental transfers. Crowding out suggests that the impact of a housing subsidy is smaller than perceived by the government.

We also examined subsamples that categorize children into two groups: those parents with a relatively strong altruistic motive and a relatively weak exchange motive, and the second subsample includes those parents with a relatively weak altruistic motive and a relatively strong exchange motive. The empirical results suggested that the degree of crowding-out effect differed between subsamples. Namely, the crowding-out effect is strengthened when the relatively strong altruistic motive and the relatively weak exchange motive, because these parents are presumably more sensitive to the benefit of the MTD. These empirical results have the following implications. On the one hand, children's welfare may be unaffected by the MTD, if parents behave based on the relatively strong altruistic motive. This is because the housing subsidy, which tends to induce relatively large reduction in both the extensive and the intensive margins associated with, only works as a substitute for parental support. Children's welfare, however, may be increased by the MTD, if parents behave based on based on the relatively strong exchange motive. Because the crowding-out effect is relatively small, the MTD appears to alleviate the borrowing constraint of children. Moreover, because children's dream of homeownership is likely to rely on public transfers, the MTD allows children to provide fewer services to their parent.

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Table 1: Mortgage tax deduction rules in the 2000s

Year	Credit rate (%)	Maximum mortgage balance (million yen)	Deduction period (years)
2002	1	50	10
2003	1	50	10
2004	1	50	10
2005	1	40	First 8
	0.5		Last 2
2006	1	30	First 7
	0.5		Last 3
2007	1	25	First 6
	0.5		Last 4
2008	1	20	First 6
	0.5		Last 4
2009	1	50	10

Table 2: Descriptive statistics of the full sample

Variable	Mean	Std. Dev.	Min.	Max.
Children receive transfer (dummy)	0.18	0.39	0.00	1.00
Transfer (million yen)	1.94	6.30	0.00	294.62
Deduction (million yen)	1.68	1.11	0.00	4.99
Average deduction (million yen)	1.81	0.24	1.42	2.44
Income (million yen)	8.26	5.73	0.00	199.20
Age (years)	42.77	11.65	20.00	92.00
LTC capacity (1,000 beds/100,000 elderly)	2.37	0.33	1.70	3.26
Home helper (1,000person/100,000 elderly)	1.58	0.41	0.81	2.67
Land price (ten thousand yen)	13.37	7.67	3.68	36.05
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)	0.23	0.42	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)	0.14	0.35	0.00	1.00
2006 (dummy)	0.14	0.35	0.00	1.00
2007 (dummy)	0.12	0.33	0.00	1.00
2008 (dummy)	0.12	0.32	0.00	1.00
2009 (dummy)	0.13	0.34	0.00	1.00
Observations	24,232			

Table 3: Mean values of the subsample

Variable	Income		Age	
	< 25th percentile	25th percentile +	< 40	40 +
Children receive transfer (dummy)	0.23	0.17	0.26	0.11
Transfer (million yen)	2.23	1.85	2.63	1.26
Deduction (million yen)	1.39	1.82	2.06	1.36
Average deduction (million yen)	1.93	1.93	1.94	1.92
Income (million yen)	4.19	9.62	7.10	9.43
Age (years)	41.65	43.14	33.59	51.98
Observations	6,058	18,174	12,144	12,088
Variable	Former tenure		Types of living arrangement	
	Former renter	Former owner	Without parents	With parents
Children receive transfer (dummy)	0.25	0.11	0.19	0.17
Transfer (million yen)	2.54	1.22	1.91	2.09
Deduction (million yen)	2.01	1.36	1.71	1.73
Average deduction (million yen)	1.94	1.92	1.94	1.91
Income (million yen)	7.55	9.12	8.10	8.92
Age (years)	36.75	50.05	42.15	45.25
Observations	13,273	10,959	19,453	4,779

Table 4: Empirical results of the full sample

	Probit	IV Probit	Tobit	IV Tobit
Deduction	-0.201 ^{***} (0.012)	-0.301 (0.412)	-4.665 ^{***} (0.268)	-2.023 (7.886)
Income	-0.016 ^{***} (0.004)	-0.013 (0.016)	-0.150 (0.099)	-0.243 (0.298)
Age	-0.043 ^{***} (0.001)	-0.048 ^{***} (0.017)	-0.820 ^{***} (0.034)	-0.007 ^{***} (0.314)
LTC capacity	-0.181 ^{***} (0.042)	-0.174 ^{**} (0.053)	-2.406 ^{***} (0.781)	-2.579 ^{***} (0.929)
Home helper	0.164 ^{***} (0.047)	0.155 ^{***} (0.063)	3.099 ^{***} (0.898)	3.324 ^{***} (1.121)
Land price	-0.006 ^{**} (0.002)	-0.005 (0.002)	-0.062 (0.043)	-0.066 (0.044)
Location	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Marginal effect	-0.084 ^{***} [0.004]	-0.122 [0.150]	-0.957 ^{***} [0.054]	-0.415 [1.622]
IV				
Average deduction		0.200 ^{***} (0.055)		0.200 ^{***} (0.055)
Wald statics		0.06 {0.809}		0.11 {0.739}
Observations	24,232	24,232	24,232	24,232

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

Marginal effect calculates marginal effect of deduction conditional on it being positive

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

Table 5: Empirical results of the subsample (income and age)

	Income		Age	
	< 25th percentile	25th percentile +	< 40	40 +
Probit				
Deduction	-0.307 ^{***} (0.032)	-0.185 ^{***} (0.012)	-0.302 ^{***} (0.017)	-0.119 ^{***} (0.016)
Income	0.073 ^{***} (0.027)	-0.020 ^{***} (0.006)	-0.026 ^{***} (0.005)	-0.016 ^{***} (0.006)
Age	-0.048 ^{***} (0.002)	-0.041 ^{***} (0.002)	-0.023 ^{***} (0.004)	-0.049 ^{***} (0.002)
LTC capacity	-0.217 ^{**} (0.086)	-0.168 ^{***} (0.049)	-0.144 ^{***} (0.054)	-0.220 ^{***} (0.068)
Home helper	0.118 (0.095)	0.174 ^{***} (0.055)	0.153 ^{**} (0.064)	0.168 ^{**} (0.073)
Land price	-0.003 (0.004)	-0.007 ^{***} (0.003)	-0.002 (0.003)	-0.012 ^{***} (0.003)
Marginal effect	-0.131 ^{***} [0.013]	-0.078 ^{***} [0.005]	-0.181 ^{***} [0.009]	-0.029 ^{***} [0.004]
Tobit				
Deduction	-6.301 ^{***} (0.581)	-4.551 ^{***} (0.309)	-6.066 ^{***} (0.313)	-3.532 ^{***} (0.467)
Income	1.247 ^{***} (0.463)	-0.263 [*] (0.153)	-0.240 ^{***} (0.068)	-0.237 (0.196)
Age	-0.759 ^{***} (0.047)	-0.843 ^{***} (0.044)	-0.319 ^{***} (0.056)	-1.212 ^{***} (0.102)
LTC capacity	-1.953 (1.290)	-2.548 ^{***} (0.896)	-1.746 ^{**} (0.849)	-3.601 ^{**} (1.641)
Home helper	1.347 (1.454)	3.682 ^{***} (1.121)	2.604 ^{***} (1.029)	3.893 ^{**} (1.787)
Land price	-0.011 (0.070)	-0.090 [*] (0.054)	0.023 (0.051)	-0.252 ^{***} (0.084)
Marginal effect	-1.438 ^{***} [0.131]	-0.901 ^{***} [0.060]	-1.483 ^{***} [0.077]	-0.592 ^{***} [0.077]
Observations	6,058	18,174	12,144	12,088

All models are controlled by location and year dummies

Robust standard errors in parentheses and standard errors in brackets

Marginal effect calculates marginal effect of deduction conditional on it being positive

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

Table 6: Empirical results of the subsample (former tenure and types of living arrangement)

	Former tenure		Types of living arrangement	
	Former renter	Former owner	Without parents	With parents
Probit				
Deduction	-0.283 ^{***} (0.015)	-0.121 ^{***} (0.018)	-0.214 ^{***} (0.013)	-0.150 ^{***} (0.024)
Income	-0.031 ^{***} (0.004)	-0.009 [*] (0.005)	-0.020 ^{***} (0.003)	-0.010 (0.008)
Age	-0.027 ^{***} (0.002)	-0.042 ^{***} (0.002)	-0.046 ^{***} (0.001)	-0.035 ^{***} (0.002)
LTC capacity	-0.224 ^{***} (0.052)	-0.131 [*] (0.075)	-0.221 ^{***} (0.047)	-0.016 (0.097)
Home helper	0.230 ^{***} (0.062)	0.082 (0.077)	0.193 ^{**} (0.054)	0.058 (0.103)
Land price	-0.003 (0.003)	-0.010 ^{***} (0.004)	-0.007 ^{**} (0.003)	-0.003 (0.005)
Marginal Effect	-0.159 ^{***} [0.008]	-0.030 ^{***} [0.004]	-0.090 ^{***} [0.005]	-0.062 ^{***} [0.009]
Tobit				
Deduction	-5.824 ^{***} (0.288)	-3.439 ^{***} (0.505)	-4.737 ^{***} (0.273)	-4.224 ^{***} (0.644)
Income	-0.329 ^{***} (0.066)	-0.079 (0.156)	-0.217 ^{***} (0.052)	-0.023 (0.230)
Age	-0.465 ^{***} (0.033)	-0.989 ^{***} (0.087)	-0.836 ^{***} (0.028)	-0.788 ^{***} (0.093)
LTC capacity	-2.823 ^{***} (0.826)	-1.886 (1.867)	-2.746 ^{***} (0.817)	-0.031 (2.169)
Home helper	4.040 ^{***} (1.012)	1.635 (1.867)	3.141 ^{***} (0.951)	2.318 (2.382)
Land price	0.001 (0.049)	-0.223 ^{**} (0.089)	-0.052 (0.047)	-0.092 (0.106)
Marginal Effect	-1.390 ^{***} [0.069]	-0.570 ^{***} [0.083]	-0.981 ^{***} [0.056]	-0.846 ^{***} [0.126]
Observations	13,273	10,959	19,453	4,779

All models are controlled by location and year dummies

Robust standard errors in parentheses and standard errors in brackets

Marginal effect calculates marginal effect of deduction conditional on it being positive

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