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Family Structure and Home Ownership: Evidence from China

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Abstract

This paper studies how individuals, particularly low-income individuals, have financed housing purchases since the housing market was privatized in urban China in the 1990s. To the surprise of many policy makers and economists, more than 80% of the households in urban China owned private housing by the end of 2010. In contrast to most developed countries, we find that male siblings are important borrowing resources to purchase housing. Conditional on the number of siblings, having more brothers instead of sisters increases the probability of owning housing among male individuals born during the baby boom (1949-1978) in urban China. However, there is no such brother effect for females. The brother effect is stronger for males with low income or low levels of education and is also stronger when brothers are wealthier. Our results are robust to different model specifications.

Keywords: housing, siblings

JEL codes: D1, J1, O1, R2

1 Introduction

In recent decades, China has been transforming from a centralized economy into a decentralized economy. One of the most prominent decentralization policies was to privatize the housing market in the 1990s (Wang, 2011, 2012; Wu, Gyourko, and Deng, 2012). While the private housing market was almost nonexistent before the 1990s, to the surprise of many policy makers and economists, more than 80% of the households in urban China owned private housing by the end of 2010.[1] In contrast to most other counties, the majority of middle- and even low-income households in China were also able to purchase housing during those two decades. As these groups of people tend to be credit constrained and have difficulty obtaining mortgages from the banking sector, many economists suspect that they encountered considerable difficulties in purchasing housing. A natural question is how they were able to finance their housing purchases.

   In the housing literature, although researchers have spent decades exploring those elements that could affect home ownership, most studies have focused on mortgage markets, housing prices, other investment decisions, and life-cycle effects.[2] For individuals in their twenties, evidence also suggest that parents are likely to support their housing purchase (Wei and Zhang, 2011). To date, however, we know little about how extended family members, such as siblings, could affect home ownership. To the best of our knowledge, this is the first paper investigating the sibling effect on home ownership. In developing countries, it is commonly observed that relatives or friends help one another to overcome financial shocks and share risks through gift exchanges and informal loans.[3] Thus far, however, little attention has been devoted to how family members could affect housing purchases–one of the most important decisions in household finance. This paper fills the gap in these two strands of literature by investigating the effect that the number of brothers an individual has on that individual's home ownership using Chinese data.

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[1]Data source: China Family Panel Studies. Home ownership in this sentence is defined as family members or relatives owning the housing currently occupied.

[2]see Chan et al. (2015); Davis and Nieuwerburgh (2014) for detailed surveys.

[3]See Cox and Fafchamps (2008); Fafchamps (2011) for detailed surveys.

The unique experiment in the Chinese housing market provides us with a rare opportunity to study how households obtain financing when they are suddenly able to purchase their own housing in urban areas. The policy change in the 1990s immediately affected the baby boom generation (1949-1978), those born after the the foundation of the People's Republic of China and before the implementation of the One Child Policy.

The reason that siblings, particularly male siblings, could affect home ownership is that siblings altruistically provide borrowing resources at low cost. Data show that, after banks, siblings are the largest borrowing resource for individuals purchasing housing in China. In addition, siblings do not typically charge interest or set a clear repayment date for the loan (see detailed evidence in Section 3.2). Using a simple theoretical model, we demonstrate that in the presence of brother(s), particularly of wealthy brother(s), an individual is more likely to be able to purchase a house because brothers provide a low-cost borrowing resource and extend an individual's borrowing limit.

The main difficulties in identifying the causal effect of brothers on home ownership arise from endogeneity, namely, that the number of brothers an individual has could be correlated with that individual's unobserved characteristics, such as the parents' wealth or preferred number of children. Following Zhou (2014), this paper explores the exogenous variation in random gender assignment of siblings. For urban residents[4] born during the baby boom, the technology of sex-selective abortion was not yet available. Conditional on the number of siblings, whether an individual has a brother or a sister could be considered a random assignment by nature. The identification strategy estimates the effect of having a brother instead of a sister on home ownership (a relative effect).

Using the approach developed by Oster (2015), we find that any unobserved factors need to be at least 4 times as important as the observables to eliminate the brother effect. We further show that our results are robust to (1) the state-owned housing reform policy and (2) the effect of inheritance from parents.

Using the identification strategy discussed above, this paper finds that for a male of the baby

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[4]Urban residents are defined as individuals who have urban resident cards (Hukou).

boom generation[5] in urban areas, conditional on the number of siblings, having one more brother instead of a sister increases the probability of owning a home by approximately 3 percentage points. Moreover, the brother effect on home ownership for males is stronger when (a) a male has a low lifetime income (he is more likely to rely on an informal financial market), and (b) the brothers of a male are relatively wealthier than he is (brothers are more likely to be able to help him). Statistical evidence suggests that sisters may also behave altruistically and affect housing ownership, although the effect is likely to be small or close to zero. For this reason, the estimated relative effect of brothers for males is likely to be the lower bound of the absolute effect (having a brother instead of not having one). In contrast to males, we do not find such a brother effect for females.

There are several potential reasons for such gender differences among siblings. First, for the baby boom generation, a married female is generally viewed as a member of her husband's family, and thus her family connection with brothers may be relatively weak compared to the connection between brothers. A sister may also have weaker bargaining power than her husband and therefore less likely to be able to help her siblings. Moreover, in Chinese culture, the male is usually considered responsible for purchasing a house; therefore, a woman has less need to rely on her kinship network to secure housing.

Finally, we explore the potential channels through which brothers matter and find that providing financial support is likely to be the main reason for the brother effect on home ownership. One may be concerned that the gender assignment of siblings may affect housing ownership through channels other than providing financial support. The main concern here is the effect of sibling gender composition on individuals' own education (Butcher and Case, 1994; Hauser and Kuo, 1998; Kaestner, 1997). We control for such potential channels by including a detailed set of individual characteristics in the regressions.

This paper contributes to several strands of the literature. First, this paper suggests that housing decisions could differ considerably between developing and developed countries. Differences in

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[5]The estimation results are robust if we exclude the cohort born during the Great Famine (1958-1961).

the borrowing resources that individuals can rely on are largely ignored in the existing literature. In addition to introducing the newly discovered factor (brothers) that could affect housing ownership in developing countries, this paper adds to the discussion on the post-reform housing market in China (Fang, Gu, Xiong, and Zhou, 2015; Wei and Zhang, 2011; Wei, Zhang, and Liu, 2012; Wu, Gyourko, and Deng, 2015). The high price-income ratio in China's housing market has attracted considerable attention, and researchers suspect there may be a tremendous financial burden for low-income individuals (Fang, Gu, Xiong, and Zhou, 2015). This paper suggests that low-income individuals are likely to receive help from kinship networks and that this may help them to afford housing. However, the results in this paper also imply that the recent One-Child-Policy generation (born after 1979) may experience additional financial stress relative to the older generation due to the former's lack of siblings.[6] This paper also contributes to the literature on gender economics. Economists have observed gender differences in a number of different domains, such as education, labor market outcomes, consumption, investment, and risk attitudes (see Blau and Kahn (2000); Croson and Gneezy (2009) for reviews). This paper contributes to that literature by suggesting that, among siblings, brothers can affect an individual's housing ownership significantly differently than can sisters.

The remainder of this paper is organized as follows. Section 2 provides background on China's housing market and the baby boom in China. Section 3 introduces our data and reports the descriptive evidence. Section 4 discusses the empirical strategy. Section 5 reports the estimation results and robustness checks. Section 6 tests the channels through which the brother effect might operate. The final section draws conclusions.

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[6]Because of the economic development after the 1990s, parents of the One-Child-Policy generation are generally wealthier than the parents of the baby boom generation. Although members of the One-Child-Policy generation cannot receive assistance from siblings, in contrast to their counterparts in the baby boom generation, they can receive more help from their parents (Wei and Zhang, 2011).

2 Background

2.1 Housing Reform

In China, before the late 1980s, the private housing market was almost nonexistent. Most individuals in urban areas lived in public housing distributed by employers and heavily subsidized by the government. The rents were merely symbolic; for example, Wang and Chern (1992) find that housing expenditure accounted for only approximately 0.87% of household expenditure between 1981 and 1987. Although the rent for public housing was low, the housing system exhibited many problems such as unfair distribution, poor management, and large imbalances between demand and supply. The per capita residential area in urban areas was as low as 6.7 square meters in 1978. To resolve these issues, the Chinese government gradually experimented with housing reform in the late 1980s, but all such experiments were conducted on a small scale and had very limited impact.

The major urban housing reform began in 1994, when the government published the document "The Decision on Deepening the Urban Housing Reform." State-owned enterprises (SOEs) allowed their employees to purchase the housing they occupied at the time for a low price. In 1998, the central government completely abolished the traditional housing allocation system and privatized residential property for all urban residents.

Housing purchases increased rapidly after the reform. The urban home ownership rate reached 80% in 2010, which was among the highest in the world (Wang, 2011). The quality of housing also improved considerably. In urban areas, the per capita residential area increased from 6.7 square meters in 1978 to 32.7 square meters in 2011 (Chen et al., 2013). Figure 1 presents the distribution of years when individuals purchased housing according to China Family Panel Studies (CFPS) data. We observe that the majority of individuals purchased housing in the late 1990s and 2000s. Many of the baby boom generation were in their 30s and 40s when the housing market was liberalized; they are the generation that was substantially affected by the housing reform.

2.2 The Baby Boom Generation and Number of Brothers

After World War II, China experienced a baby boom, as did many developed countries such as the US, Canada, and Japan. However, the population expansion in China was much more rapid and accrued at a much larger scale because the baby boom was amplified by government population policies. Following Chairman Mao's ideology of "the more population, the stronger we are," the government introduced a series of policies to encourage fertility. Females with many children were given the title "honorable mother" (Guang Rong Ma Ma in Chinese). Abortion and sterilization were strongly discouraged. This population expansion policy was only slowed after 1972 and ended with the One Child Policy in 1979. China's population had almost doubled, increasing from 540 million in 1949 to 960 million by the end of 1978 (China Statistical Year Book). Because of the population expansion policies, individuals born during the baby boom had on average 2.6 siblings, with 1.3 brothers and 1.3 sisters.

3 Data and Descriptive Evidence

3.1 Data Source

The main data set used in this paper is the China Family Panel Studies (CFPS) 2008 and 2010. The CFPS study was conducted by Peking University. It has two independent panel surveys: the first panel was surveyed in 2008 and 2009, and the second panel was surveyed in 2010 and 2012. Because both the number of brothers and home ownership do not change much within just one or two years, the panel structure of the data gives a very limited cross-year variation in both our key variable of interest (the number of brothers) and outcome variable (home ownership). For this reason, we only use data from the 2008 and 2010 waves. CFPS was collected based on a probabilistic sample and stratified design. The subsamples were obtained through three stages: the primary sampling unit was either an administrative district or a county , the

second-stage sampling unit was either a neighborhood community or an administrative village, and the third-stage sampling unit was the household.[7] The 2008 wave surveyed China's three major provinces/municipalities: Beijing, Shanghai, and Guangdong provinces. The 2010 wave surveyed 25 provinces/municipalities/autonomous regions, excluding Hong Kong, Macao, Taiwan, Xinjiang, Qinghai, Inner Mongolia, Ningxia, and Hainan.

We also use the China Household Finance Survey (CHFS) 2011 as supplemental data to investigate households' borrowing resources when purchasing housing. The CHFS is conducted by the Southwestern University of Finance and Economics. The CHFS uses a three-stage probability proportion to size (PPS) random sample design. The primary sampling units (PSU) include 2,585 counties (including county level, cities, and districts) from all provinces (including provincial cities) in China except Tibet, Xinjiang, Inner Mongolia, Hong Kong, Macau, and Taiwan.

3.2   Borrowing Resources for Purchasing Housing

We use the CHFS to investigate the borrowing resources available to those who purchased a house. Table 1 summarizes the information. Among borrowers, 23% borrowed from siblings. After banks, siblings are the second-largest source of borrowed funds for purchasing housing. The most interesting observation is that not only do siblings represent a large source of borrowing, but they also behave very altruistically when lending money to individuals. Among those borrowing from siblings, only 7.6% were asked by their siblings to set a repayment deadline, and only 3.5% said that their siblings charged interest for the money they borrowed.

A natural question is why so many siblings are able to help when siblings themselves may also face financial constraints when purchasing their own houses. In fact, unlike the current younger generation that usually relies on mortgages to purchase housing (in particular when purchasing a new house Fang et al. (2015)), many individuals of the baby boom generation purchased housing in the 1990s and 2000s with cash payments. In the CHFS 2011 data, only 36% of urban homeowners

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[7]See Xie and Hu (2014) for detailed descriptions.

ever borrowed money (from a bank or other source) to purchase a house. In the CFPS data, only 10.5% of urban homeowners currently have unpaid debt incurred from purchasing a house. When the housing market was completely liberalized in the late 1990s, many of the baby boom generation had already reached age 30 or 40. They had likely benefited from the rapid income growth experienced in China in the late 1980s and 1990s and thus were able to purchase homes with cash.[8]

3.3 Definition of Home Ownership

When a housing unit in urban China is purchased, a property statement is issued by the local Real Estate Management Bureau. Multiple names can be listed on this property statement. The CFPS asked for up to three names listed on the property statement. The majority of the property statements have only one name, with 9% having two or more names, and 3.3% having three names.[9]

We define an individual as owning a house if this individual's name is listed on the property statement. Compared to females, males are more likely to own a house: 54% of males as opposed to 20% of females own a house. The large gender difference may not be surprising: compared to females, males usually earn a higher income, and in Chinese culture, it is common for the husband to be responsible for providing a house (Wei and Zhang, 2011).

Knowing who is listed on a property statement is a substantial advantage in investigating the relationship between the number of brothers an individual has and that individual's home ownership status, as we can avoid the potential bias caused by the fact that some individuals live in a house that belongs to their relatives.[10] Even within a couple, as the statistics above suggest, a husband is more likely to own a house than is a wife, which may affect the role of brothers and brothers-in-law differently. Although this is a preferable way to define home ownership, in a robustness check

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[8]Another reason for the low borrowing rate is that the SOE housing reform between 1994 and 1997 allowed employees of SOEs to purchase the public housing they occupied at a low price.

[9]It is legally possible to register more than three names on a property statement. However, such cases are rare.

[10]There are 82% of housing properties listing respondents' names or the names of their spouses, 9% listing parents' names, 4% listing respondents' children's names, and 8% listing the names of individuals who are not immediate family members (not a spouse, parent, or child). The sample is restricted to urban residents born between 1949 and 1978 and residing in a house owned by a respondent or his/her relatives.

(Section 5.2), we nevertheless report the estimation results using a broader definition of home ownership: one is defined as a homeowner if either member of a couple is listed on the property statement.

3.4 Correlation Between Home Ownership and the Number of Brothers

We present the age profile of home ownership among urban residents in Figure 2. We first focus on males and divide them into two groups: males with zero brothers or one brother and males with two or more brothers. Figure 2a clearly shows that males with two or more brothers are more likely to own a home than are males with zero brothers or one brother, across all age groups. This suggests a strong positive correlation between the number of brothers and home ownership. We then divide males with respect to their number of sisters in Figure 2b. Males with more sisters also tend to be more likely to own housing, although the positive relationship is not as clear here as it is with the number of brothers. By contrast, for female samples, the correlation between home ownership and the number of siblings tends to be unclear and even appears to be negative (Figure 3).

4   Empirical Strategy

The number of children parents want to have is a typical source of endogeneity in economics. In estimating the effect of the number of brothers an individual has on that individual's housing ownership, similar endogeneity problems arise: the number of brothers (or siblings) of an individual could be correlated with that individual's unobserved characteristics such as parents' wealth or parents' preferred number of children.

We use a control function approach adopted in Zhou (2014) to estimate the brother effect. Zhou (2014) finds that conditional on the number of siblings an individual has, the gender of the siblings can be considered a random assignment by nature for urban residents born during the baby boom. Because of the random gender assignment by nature, the number of brothers is not correlated with

any unobserved characteristics for a given number of siblings. Thus, we can identify the effect of having a brother instead of a sister (a relative effect) by controlling for a function of the number of siblings.

This identification strategy relies on the assumption that, conditional on the number of siblings, the gender of the siblings is only determined by nature. Once parents are pregnant, parents would keep the baby regardless of its gender. Zhou (2014) suggests that the assumption is unlikely to be violated for urban residents born during the baby boom in China. One of her main reasons is that they were born before the One Child Policy and years before ultrasound technology—a technology that can identify gender before birth—was introduced in China.

One may be concerned that other unobserved factors, such as son preference of parents, may bias our results. Parents with son preference are likely to adopt a stopping rule, i.e., parents keep having babies until they reach an ideal number of boys (Ebenstein, 2010). To address this concern, we first show that unobserved factors are unlikely to bias our results (Section 5.2). Second, note that as long as parents can not control the gender of their children by abortion or infanticide, each child's gender is randomly assigned. For example, if parents have two girls, and they decide to have a third child, neither the fact that their first two babies are girls nor the decision to have a third baby, could affect the probability of having a boy as their third child. This is because the third child's gender is randomly drawn from the same distribution as the first and second babies. Because of the random gender assignment of each child, the gender distribution of the population is not biased regardless of whether the parents employ a stopping rule.

Our identification strategy is supported by both statistics in the CFPS data in this paper and statistics in the CGSS data in Zhou (2014). In the CFPS data, we also find similar evidence for urban residents born during the baby boom; the average share of male children in each family is 50.7%. The 95% confidence interval is [50.15%, 51.32%]. This covers the natural gender proportion, which is approximately 51.2%.[11] It is also much lower than the proportion of male babies

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[11] The natural gender ratio is 106 males per 100 females (Jacobsen, Moller, and Mouritsen 1999).

born in the two most recent decades, which is above 55%.

The identification strategy compares the home ownership of individuals with different numbers of brothers but with the same number of siblings. Figure 4 presents the source of variation in this identification strategy. The upper panel of the figure is for males and the lower panel for females. The upper panel suggests that for males, having more brothers is associated with a higher home ownership rate for each sibling group. However, the lower panel shows that the brother effect for females may only hold for those with 1 sibling but not for those with more than 1 sibling.

To formally evaluate the brother effect, we estimate the following equation separately for males and females:

$$Housing_i = \alpha Bro_i + \delta(Sib_i) + X_i \gamma + \varepsilon_i. \tag{1}$$

$Housing_i$ equals one if individual i's name is listed on the housing property statement, zero otherwise. Bro_i denotes the number of brothers. $\delta(Sib_i)$ is a function of the number of siblings. We use sibling dummies to represent this function.[12] X_i denotes a set of individual i's personal characteristics. α is the parameter of interest; it denotes the effect of having a brother (instead of a sister) on an individual's home ownership status.

Under this identification strategy, if sisters do not have any effect on home ownership, the identified relative effect (having a brother instead of a sister) is equal to an absolute effect (having a brother instead of not having one). If sisters also have a similar effect as brothers, the identified relative effect would be a lower bound of the absolute effect (see appendices B and C of Zhou (2014)). Figure 2 indicates that sisters are likely to have a non-negative effect on home ownership. Therefore, what we identified is likely a lower bound of the absolute effect. If this is the case, having a brother instead of not having one *at least* increases the probability of home ownership by α.

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[12]Theoretically, $\delta(Sib_i)$ can be any function of the number of siblings–linear, quadratic, or another, non-linear function of the number of siblings. Zhou (2014) simply uses the number of siblings to represent this function (assuming that the control function is linear). However, using sibling dummies is a more robust approach because even if the function is a quadratic or takes another form, sibling dummies can still approximate it.

One may want to determine the effect of sisters on housing ownership. However, we cannot simultaneously identify a sister's effect given the control function approach. First, we cannot simply add the number of sisters to Equation (1), as it causes a perfect multicollinearity problem. We can either identify the relative effect of brothers or the relative effect of sisters. Second, the coefficient of the function of siblings represents a biased sister effect. It is likely to be biased because parents usually choose how many children they want to have (see Zhou 2014 for a detailed discussion and proof).

5   Estimation Results

5.1   Baseline Results

Using CFPS data, Table 2 reports estimation results based on Equation 1. Columns 1-4 are for males and columns 5-8 for females. All estimations control for individuals' years of education, five-year age-group dummies, province fixed effects, and survey-year fixed effects. Column 1 estimates the brother effect for males without including the sibling dummies. The estimated coefficient is 0.024 and is statistically significant at the 1% level. The point estimate represents the absolute effect of brothers. However, we interpret the result with caution because it may include bias resulting from the parents' decision regarding the number of children to have.

Columns 2 to 4 report estimation results of Equation (1), where sibling dummies are included. Column 3 includes marital status and employment status. The numbers of female children and male children are also included to account for the potential children and the effect of their gender composition on housing (Wei and Zhang, 2011). Column 4 further includes personal income and household income. Estimation results in columns 2 and 4 suggest that, for males, having one more brother instead of a sister increases home ownership by approximately 3 percentage points. The results for males are all statistically significant at the 1% level.

One may be concerned that individuals with more brothers may be more likely to cohabitate

with brothers, and therefore those individuals could be more likely to own housing because brothers share the housing cost by co-owning the house. We find that it is very rare for urban residents over 30 years of age to live with their siblings in China; such cases represent less than 1% of the sample in the CFPS data. Our results remain essentially unchanged when we exclude such individuals. One may also be concerned that the Great Famine in China during the period 1958-1961 may bias our results. We assess this possibility by excluding the cohort born during the period 1958-1961. Again, our estimation results remain essentially unchanged. One important reason for the absence of an effect of the Great Famine in this context is that the famine mostly seriously affected rural areas, while we are using an urban sample.[13]

When we repeat the same specification for females in columns 5 to 8, the estimated coefficients of brothers are much smaller and are not statistically significantly different from zero in all columns. This suggests that for housing purchases, the number of brothers only affects males.

5.2   Additional Robustness Checks

SOE Housing Reform

During the SOE housing reform between 1994 and 1997, SOEs allowed their employees who were then tenants of public housing to purchase their units at below-market prices. In this subsection, we test whether our results could be biased by this policy for male samples. This policy might bias our results if individuals with more brothers (instead of sisters) are more likely to be tenants of public housing provided by SOEs, so that they could easily acquire housing at low cost. We therefore first test whether the number of brothers is correlated with SOE housing. We generate an indicator variable 'SOE Housing' that equals 1 if an individual lived in public housing provided by SOEs and 0 otherwise. In column 1 of Table 3, we regress SOE housing on the number of brothers. The coefficient of brothers is very small and is not significantly different from zero. Hence, it is

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[13]Furthermore, our results are robust if we exclude the cohort born during the period 1955-1965. Estimation results are available upon request.

unlikely that the number of brothers affected SOE housing status.

We further test the potential bias resulting from this policy by excluding all individuals who purchased housing during the period of the SOE housing reform. The coefficient of the number of brothers is 0.031 and statistically significant at the 5% level, as shown in column 2 of Table 3. The magnitude is the same as the estimation result in the baseline specification (as reported in Table 2). Therefore, we conclude that it is unlikely the SOE housing reform biased our results.

Inheritance from Parents

Another concern is that brothers may affect home ownership by inheriting their housing from parents. Traditionally, in Chinese culture, when parents grow old, they live with their male children and leave their bequest (if any) to them. If this is the case, it would cause downward bias and make our estimates a lower bound of the true estimates. This is because having brothers means individuals need to *share* the bequest with their brothers; having more brothers would make individuals less likely to inherit the bequest (or inherit less) from their parents, meaning that having more brothers would reduce the likelihood of owning housing. This is the opposite of our result that having more brothers increases home ownership.

For the urban baby boom generation, however, it is unlikely that their parents were able to leave any significant bequest or housing.[14] Most parents of the baby boom generation were the working population during Mao's era (1949-1976), when most of the population was in poverty. Those parents were not allowed to purchase a house before the 1990s, as the private housing market was nonexistent, nor were they able to accumulate sufficient wealth and retire before rapid income growth began in the 1990s. Many studies suggest that when these parents retire, they rely financially on their children to support them (Cai et al., 2006). In the third column of Table 3, we restrict the

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[14]Wei and Zhang (2011) suggest that parents of the One-Child-Policy cohort (individuals born after the 1979 One Child Policy and experienced a large gender distortion) help their male children purchase housing to increase their children's competitiveness in the marriage market. Unlike the situation of the present younger generation (the One-Child-Policy cohort), however, it is very unlikely that the baby boom generation in China were able rely on their parents to purchase housing for them, as it is unlikely that their parents had the financial ability to do so.

sample to individuals born before 1965, such that most parents of respondents in the sample are likely to have been retired before the 1990s. The estimation result remains significant at the 1% level and the size of the effect even becomes larger: 0.037. Therefore, it is unlikely that our results are biased by inheritance from parents.[15]

Alternative Definition of Home Ownership and the Effect of Brothers-In-Law

As is common practice in the housing literature, home ownership is usually defined at the household level: either a husband or a wife owns a home. In this paper, one important reason for us to distinguish between ownership by a husband and wife is that there could be a significant difference in the roles of brothers and brothers-in-law.

In this subsection, we check the robustness of our results by using a broader definition of home ownership: an individual owns a house if either the individual or his/her spouse own a house. The estimation results are reported in columns 4 and 5 of Table 3. In the male (husband) sample, only the man's brothers affect home ownership, while his brothers-in-law (wife's brothers) do not. In the female (wife) sample, a woman's brothers do not have an effect on home ownership, while her brothers-in-law (husband's brothers) do. The coefficients of brothers in the male sample and of brothers-in-law in the female sample are both statistically significant at the 1% level. We therefore conclude that our estimation results are robust to the alternative definition of home ownership.

Using Selection on Observables to Assess the Bias from Unobservables

Despite our identification strategy and the above robustness checks, one may remain concerned that some unobservable factors correlated with number of brothers (conditional on siblings) may bias our results. In this subsection, we examine to what extent the unobservables could bias our results by using a method introduced by Altonji et al. (2005) and further developed by Oster (2015). Altonji et al. (2005) suggest that observables in a model provide a guide to the amount of selection

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[15]We also conduct similar regressions for females and find that the brother effect remains insignificant.

on the unobsevables. Both of these papers rely on the assumption that the relationship between the observed covariates and the treatment is informative of the relationship between the unobserved covariates and the treatment.

Oster (2015) suggests two related ways of using selection on observables to assess the bias from unobservables. The first approach is to calculate how important the unobservables need to be to produce a treatment effect of zero. The second approach is to calculate a treatment effect under the assumption that the unobservables are as important as the observables. We assess the potential bias in the male sample. Using the first method, we find that the unobservables have to be 4.5 times as important as the observables to produce a brother effect equal to zero. The estimation result from the second method suggests that, even if we assume that the unobservables are as influential as the observables, the estimated brother effect is 0.0319, which is very close to the point estimate in Table 2.[16] We therefore conclude that it is unlikely that unobserved factors could have significantly biased our results.

6 Testing for Channels

The main reason that having more brothers could increase the likelihood of owning a home is that brothers altruistically provide financial support to individuals. In this section, we further provide empirical evidence for this suggestion. As shown in Section 3.2, siblings are the second-largest borrowing resource when purchasing housing, and they behave altruistically when providing such support. We further use two empirical tests to examine this hypothesis. Appendix A provides additional empirical evidence to support this hypothesis by comparing the role of elder brothers with that of younger brothers. Appendix B also provides the conceptual framework on brothers

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[16]We use all controls in column 4 of Table 2 to calculate Oster's estimates. Both of Oster's methods rely on the value of R_max, where R_max=πR. Following Oster (2015)'s suggestion, we set π=1.3. Oster analyzes all randomization design papers published in AER, QJE, JPE, Econometrica and AEJ: Applied during the period 2008-2013 and finds that setting π=1.3 allows 90% of these randomized results to persist. Note that our results remain econometrically significant to a wide range of π.

and housing purchases.

The Brother Effect Is Larger in Low-Income or Low-Education Group

Wealthy individuals are not typically financially constrained and may be able to purchase housing regardless of their number of brothers. By contrast, whether one has brothers may significantly affect the home ownership of individuals with low incomes because they may have to borrow from their brothers to purchase homes.

We thus divide individuals into a low-income and a high-income group to estimate the brother effect. An individual belongs to the high-income group if this individual's income is higher than the median income in the sample; otherwise, the individual falls in the low-income group. As very few people purchased their housing in the survey year, the income in the survey year may not well represent their income when they purchased their homes. For this reason, we further divide individuals into two groups based on their years of education. One substantial advantage of using education to measure income is that education is highly correlated with one's lifetime income, which is more important than current income in an individual's housing decision. An individual belongs to the high-education group if this individual has more than 9 years of education; otherwise, the individual falls in the low-education group.

Estimation results are reported in Table 4. The model specifications are the same as in column 4 of Table 2. The first two columns of Table 4 suggest that the brother effect is much stronger in the low-income/education group relative to that in the high-income/education group for the male sample. Compared to the baseline result, the estimated brother effect is much larger: 0.046 in the low-income group and 0.037 in the low-education group. By contrast, the brother effect disappears in the high-income/education group. For females, we do not observe any brother effect, regardless of current income or education level.

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The Brother Effect Is Larger if Brothers Are Wealthier

The effect of brothers on an individual's home ownership may depend on the brothers' income, particularly on the brothers' relative income compared to that of the individual in question. If brothers are relatively wealthy compared to an individual, they will be more likely to be able to help that individual. Conversely, if the individual's income is higher than that of a brother, the individual may be in a position to help his brother by lending him money instead of borrowing from him.

In the absence of brothers' income in the survey year, we use years of education as an indicator of their lifetime income. We define the variable *BroRelativeEducation* as the average of brothers' years of education minus the individual's years of education.[17]

We estimate the following equation:

$$Housing_i = \alpha Bro_i + \beta Bro_i * BroRelativeEducation_i + \delta(Sib_i) + X_i\gamma + \varepsilon_i. \tag{2}$$

In Equation (2), the brother effect equals $\alpha + \beta BroRelativeEducation$. If β is positive, then the brother effect increases when brothers' relative education, which represents their relative lifetime income, is higher, and vice versa. Column 1 of Table 5 presents the estimation results of Equation (2) for males. The result shows that the estimated β is positive and statistically significant among males. Column 2 controls for average brothers' education as a robustness check. The estimation results suggest that a one-year increase in the relative education of brothers leads to an increase in the brother effect of 0.005. As above, the number of brothers does not have any effect on home ownership among females, as shown in columns (3) and (4).

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[17]$BroRelativeEducation = BrothersAverageYearsofEducation - RespondentsYearsofEducation$

A Potential Indirect Channel

Zhou (2014) suggests that having more brothers could reduce an individual's savings rate in China due to precautionary motives. Her explanation for this phenomenon also includes brothers providing financial assistance to one another. Therefore, the fact that brothers provide financial support to individuals could potentially also affect home ownership in an indirect channel: brothers reduce one's precautionary savings, and hence, individuals could allocate more money to housing purchases. The direct channel (brothers provide money to purchase housing) and the indirect channel are likely to be complementary and are not mutually exclusive. We further test the possibility of this indirect channel by examining the effect of brothers on home ownership among individuals with different levels of risk. If such an indirect effect exists, we should observe high-risk individuals experiencing a larger brother effect on housing, and vice versa. We use the type of company at which an individual is employed to indicate an individual's risk. We find that compared to individuals who work in government sectors or for SOEs, people who work for private firms have a higher job turnover rate and are less likely to have any form of medical insurance or employment insurance.[18] Therefore, we define an individual as high risk if he works for a private firm. We interact this risk indicator with number of brothers. The coefficient of this interaction term estimates the difference in the brother effect between the high-risk group and the low-risk group. The estimation results in Table 6 show that the coefficient of the interaction term is not significantly different from zero. This suggests that the brother effect does not differ between the high-risk group and the low-risk group. We therefore conclude that we did not find evidence of such an indirect effect.[19]

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[18]CFPS 2008 provide information on the number of times an individual has changed his/her job. We regress this job turnover rate variable on a working-at-private-firms dummy. The coefficient of the working-at-private-firms dummy is positive and statistically significant at the 10% level. Using CFPS 2008 and 2010 data, we also regress whether an individual has any type of medical insurance and whether an individual has employment insurance on the working-at-private-firms dummy. The coefficient of working-at-private-firms is negative and statistically significant at the 1% level in both regressions. These results suggest that if an individual works for a private firm, he/she is likely to have a high job turnover rate and is less likely to have any medical insurance or employment insurance. All regressions discussed here control for age, gender, years of education, marital status, number of children and province dummies. Standard errors are clustered at the county level. Estimation results are available upon request.

[19]Zhou (2014) finds that regardless of one's housing status and amount of housing loans, the estimated size of the brother effect on precautionary savings is the same. This may suggest that even if there is such an indirect effect, it is

7 Conclusion

This paper studies how members of extended families have helped one another purchase housing since the privatization of the Chinese housing market. We find that siblings are the second-most important borrowing resource in urban China. In addition, most siblings do not impose a repayment deadline and do not charge interest when they lend money to their siblings.

The paper finds that, for males, having more brothers instead of sisters increases the probability of owning a home among individuals in urban China born between 1949 and 1978 . The estimated relative effect of brothers is likely to be a lower bound of the absolute effect of brothers. When testing the channel, we find that males with a low income or a low education level exhibit a stronger brother effect than do individuals with a high income or a high education level. We also find that the brother effect is stronger when brothers have a higher level of education than the individual in question. However, there is no such brother effect for females. Thus, the variation in gender composition across families from the baby boom generation is an important factor influencing the distribution of home ownership in urban China.

While this paper focuses on the case of China, the findings may be applied to other countries, especially developing countries where individuals rely heavily on family members or relatives instead of formal financial markets for credit. Further research may examine this phenomenon using international data.

Appendix

A. Older Brothers VS Younger Brothers

The effect of older brothers may differ from that of younger brothers, and the differences may depend on their ages. We compare the effect of older brothers with that of younger brothers in two

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likely to be independent of the direct effect in the housing purchasing decision.

age groups: 30-40 years old and 41-60 years old. The estimation results are reported in Appendix Table 2. For the younger age group, the effect of older brothers is much larger than that of younger brothers: having one more older brother (instead of a sister) increases home ownership by 0.046, and the coefficient is statistically significant at the 1% level. By contrast, the coefficient of younger brothers is only 0.013, and it is not significantly different from zero. The elder brothers of these younger individuals are in their prime age; they are likely to have accumulated a certain amount of wealth and are hence able to help their siblings. By contrast, their younger brothers are likely to have worked only for a few years and have not accumulated enough wealth to help others.

The effects of older brothers and younger brothers are completely reversed when we focus on individuals above 40 years old. While older brothers do not affect the home ownership of individuals in this age group, their younger brothers do. The coefficient of younger brothers is 0.05 and is statistically significant at the 5% level. The elder brothers of individuals between 41 and 60 years of age face higher health risks and some may have already retired.[20] The younger brothers, however, are more likely to still be working and benefiting from the rapid income growth in China. Compared to the elder brothers of these 40 to 60 year olds, the younger brothers are more likely to be able to provide support and financial aid.

B. Conceptual Framework

Our analysis examines the effect of having brothers on home ownership. In this section, we develop a simple two-period model and suggest that individuals with more brothers, particularly those low-income individuals or individuals with wealthy brothers, are more likely to own a house.

Assume that housing can be purchased only in period 1. H is a binary variable that equals one if the individual buys housing. The price of housing P is exogenously given. Individual i needs to consume consumption goods in both periods one and two, denoted C_1 and C_2, respectively. The

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[20]Health care reform and pension reform in the 1990s and 2000s caused health care expenditures to become a major concern for individuals.

individual's income in both periods is assumed to be fixed at Y. If an individual decides to buy

housing in period 1, that is $H = 1$, this individual may have access to two borrowing resources:

brothers and banks (mortgage). Assume that the amounts of borrowing from brothers and banks

are B and M, respectively. The amount of borrowing from brothers faces an upper limit $\bar{B}$, which is

assumed to be an increasing function of the number of brothers N and the brothers' average income

I, that is, $\partial \bar{B}/\partial N > 0$ and $\partial \bar{B}/\partial I > 0$. Descriptive evidence in the previous section suggests that

the interest charged when borrowing from brothers is generally very low and in most cases is zero.

For simplicity, in the model, we assume that there is no interest when borrowing from brothers.

The interest on a mortgage is $R_M > 0$. The discount factor δ is a positive value between 0 and

1. For simplicity, assume that $\delta = 1/(1 + R_M)$. Individual i maximizes utility subject to budget

constraints in periods one and two.

$$\max_{\{C_1, C_2, H, M, B\}} U(C_1, H) + \delta U(C_2, H)$$

$$s.t. \ PH + C_1 = Y + M + B,$$

$$C_2 + B + (1 + R_M)M = Y,$$

$$B \leq \bar{B}(N, I).$$

To simplify the analysis, we use the utility function below for the following analysis:

$$U(C, H) = ln(C) + \alpha ln(1 + PH), \ \alpha > 0 \ P \gg 1.$$

To solve the maximization problem, we first consider the case in which the individual does not

buy housing, that is, $H = 0$. The optimal consumption in periods one and two is equal to the income

Y, as $\delta = 1/(1 + R_M)$. There is no savings or deposit. The utility is thus given by

$$u_0^* = (1 + \delta) \ln Y.$$

We then consider the case of buying housing, that is, $H = 1$. We first consider the scenario in which the individual needs to borrow from a bank to buy housing. In this case, M^* is a function of $\bar{B}$. Note that if the individual has brothers and chooses to borrow from a bank, he will borrow from brothers at the maximum level, that is $B^* = \bar{B}(N, I)$, because borrowing from brothers is cheaper than borrowing from a bank. We can derive the optimal utility as follows:

$$u_1^* = (1 + \delta) \ln \frac{((1 + \delta)Y + (1 - \delta)\bar{B}(N, I) - P)(1 + P)^\alpha}{1 + \delta}.$$

Whether the individual chooses to buy housing is determined by the relative size of u_1^* and u_0^*. The individual chooses to buy housing, that is, $u_1^* \geq u_0^*$, if

$$\bar{B}(N, I) \geq \frac{\delta P - (1 + \delta)(1 - (1 + P)^{-\alpha})Y}{1 - \delta}.$$

Because $\bar{B}$ is an increasing function of the number of brothers N and their average income I, the individual is more likely to buy housing when N and/or I is larger.

We then consider the scenario in which the individual can borrow from his brothers an amount sufficient to purchase housing, without needing recourse to further borrowing, $\bar{B}(N, I) \geq B^*$, and $M^* = 0$. A housing purchase without borrowing from banks could also be attributed to a relatively low housing price. The optimal utility derived from the maximization is given by

$$u_1^* = (1 + \delta) \ln \frac{\delta^{\delta/1+\delta}(2Y - P)(1 + P)^\alpha}{1 + \delta}.$$

To make $u_1^* \geq u_0^*$, we must have

$$(1 + P)^\alpha (2 - \frac{P}{Y}) \geq \frac{1 + \delta}{\delta^{\delta/1+\delta}}.$$

This condition is very likely to be met if P is not too big to be close to $2Y$ and α is not too small. If $\bar{B}(N,I) \geq B^* = \frac{(1-\delta)Y+\delta P}{1+\delta}$, then the individual can purchase the housing without borrowing from a bank. As $\bar{B}(\cdot)$ is an increasing function of N and I, this condition is likely to be satisfied if the individual has more brothers and/or brothers are wealthy.

In summary, whether borrowing from brothers provides sufficient credit for an individual's housing purchase, a higher upper limit of borrowing from brothers always leads to a greater likelihood of purchasing housing by providing a low cost of borrowing and extending an individual's borrowing limit. In other words, the quantity and quality (income) of brothers are both helpful for an individual's housing purchase.

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Figure 1: Distribution of Years in Which Housing Was Purchased
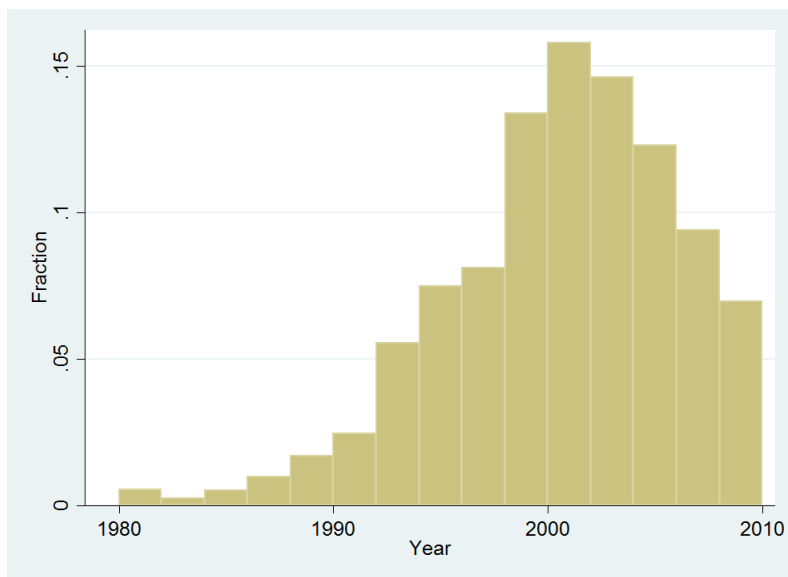
Data Source: CFPS 2008 and 2010.

Figure 2: Age Profile of Housing Ownership by Number of Siblings (Males)

(a) Housing ownership by number of brothers
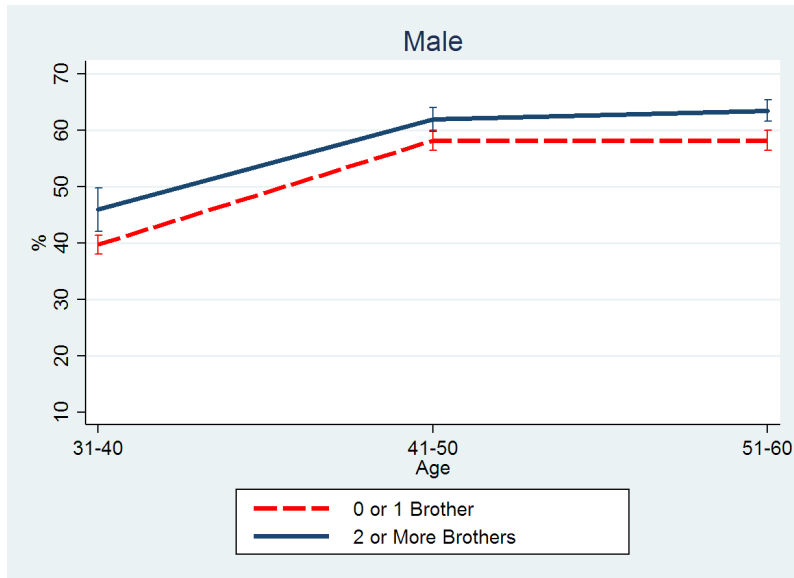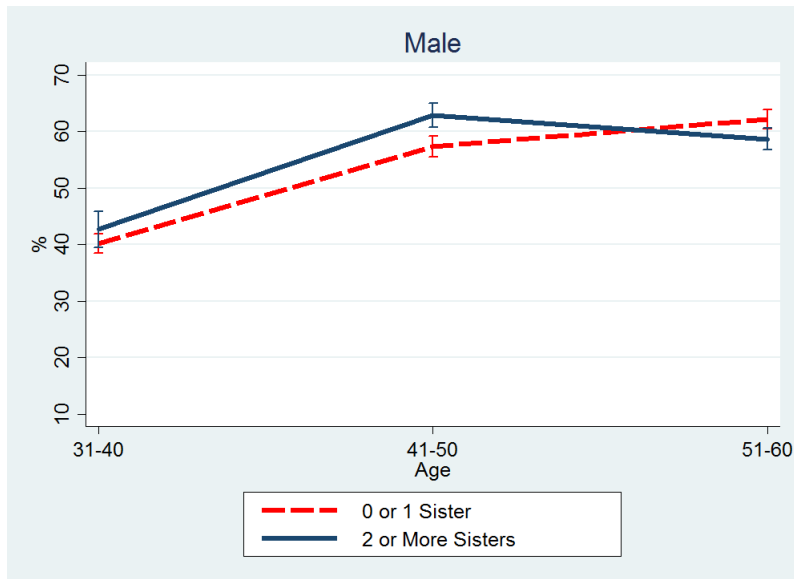
(b) Housing ownership by number of sisters

Note: The Y axis is the proportion of individuals own a house. Samples are restricted to urban residents. Sample size is 3464. Bars represent standard errors of mean. Data Source: CFPS 2008 and 2010.

Figure 3: Age Profile of Housing Ownership by Number of Siblings (Females)

(a) Housing ownership by number of brothers
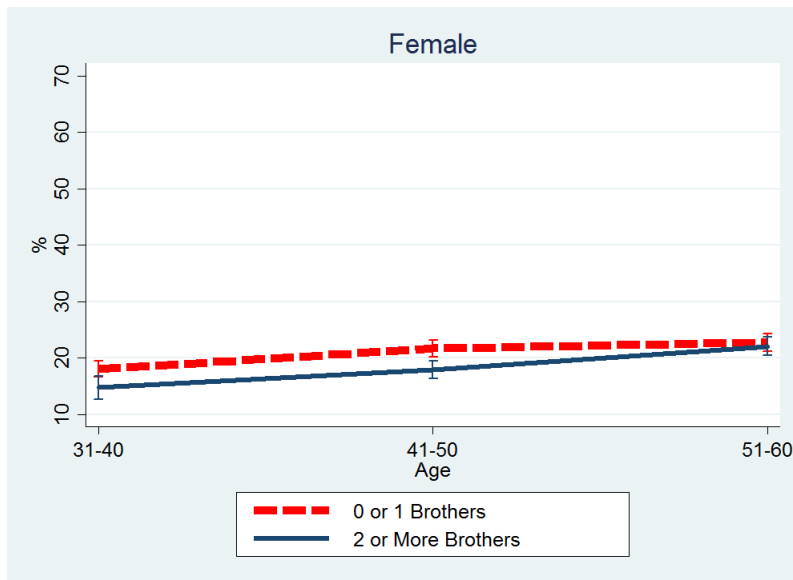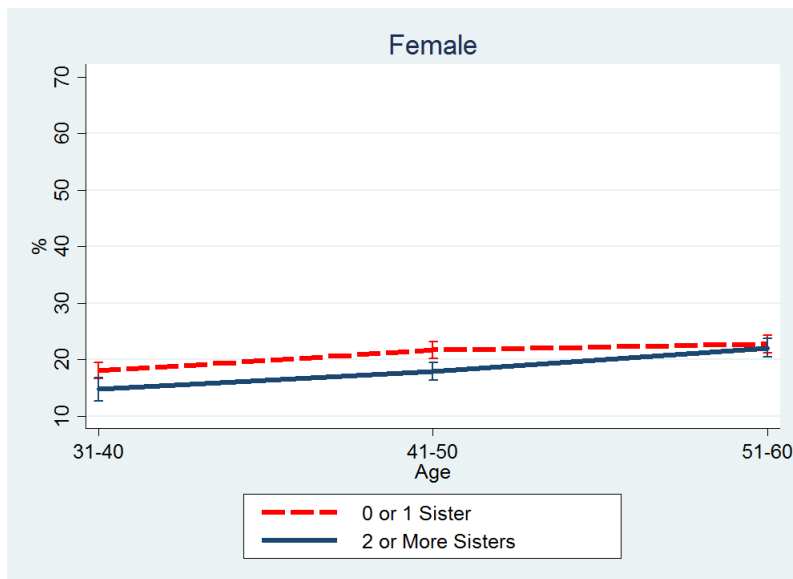
(b) Housing ownership by number of sisters

Note: The Y axis is the proportion of individuals own a house. Samples are restricted to urban residents. Sample size is 3596. Bars represent standard errors of mean. Data Source: CFPS 2008 and 2010.

Figure 4: Source of Identification: Among Each Sibling Group, Having More Brothers Increases the Probability of Owning Housing for Males
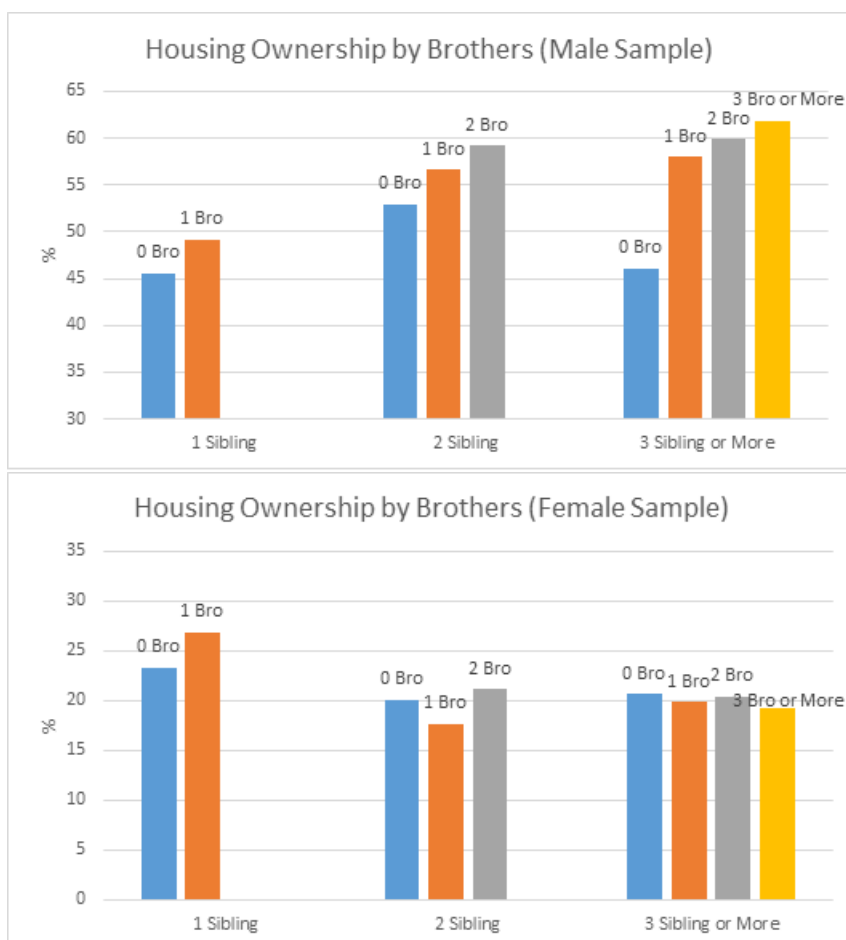
Data Source: CFPS 2008 and 2010.

Table 1. Borrowing Resources for Purchasing Housing and Siblings' Altruistic Lending

Borrowing Resources	Percentage
Bank	60.0
Siblings	22.8
Parents	5.0
Children	1.8
Other Relatives	12.0
Non-relatives	11.6

Conditional on Borrrowed from Siblings	Percentage
There is a repayment deadline	7.6
Siblings charge an interest	3.5

Data Source: CHFS 2011.

Table 2. Baseline Estimation: Effect of the Number of Brothers on Individual's Housing Ownership

VARIABLES	Dependent Variable: Housing Ownership							
	Males				Females			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Brother	0.024***	0.031***	0.028***	0.027***	-0.005	0.005	0.007	0.003
	(0.007)	(0.009)	(0.009)	(0.009)	(0.006)	(0.008)	(0.008)	(0.008)
Education	0.007**	0.007**	0.004*	0.003	0.013***	0.013***	0.012***	0.010***
	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
Marriage			0.175***	0.173***			-0.173***	-0.169***
			(0.031)	(0.032)			(0.033)	(0.033)
Employment Status			0.100***	0.088***			0.046***	0.034**
			(0.016)	(0.016)			(0.017)	(0.017)
Female Children			0.053***	0.051***			0.005	0.005
			(0.016)	(0.017)			(0.012)	(0.013)
Male Children			0.050***	0.046**			-0.007	-0.004
			(0.018)	(0.018)			(0.012)	(0.012)
Personal Income				0.012***				0.020***
				(0.003)				(0.006)
Household Income				-0.004				-0.015***
				(0.017)				(0.003)
Sibling dummies		Yes	Yes	Yes		Yes	Yes	Yes
Observations	3,759	3,759	3,759	3,662	3,857	3,857	3,857	3,753
Adjusted R-squared	0.076	0.079	0.083	0.087	0.065	0.070	0.071	0.076

Notes: All regressions include age-group dummies, province fixed effects, and survey-year fixed effects. Standard errors in parentheses are clustered at county level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 3. Robustness Check

VARIABLES	SOE Housing	Housing Ownership		Housing Ownership (at Household Level)	
	Male	Male	Male	Male	Female
	(1)	(2)	(3)	(4)	(5)
Brother	0.007	0.031**	0.037***	0.038***	0.003
	(0.008)	(0.013)	(0.011)	(0.010)	(0.009)
Brother-in-law				0.011	0.037***
				(0.009)	(0.009)
Sibling Dummies	Yes	Yes	Yes	Yes	Yes
Sibling-in-law Dummies				Yes	Yes
Observations	3,735	1,470	2,244	2,792	2,660
Adjusted R-squared	0.081	0.087	0.039	0.103	0.073

Notes: The second column excludes individuals who purchased housing between 1994 and 1997. The third column excludes individuals born after 1965. The last two columns use "housing owned either by a wife or a husband" as dependent variable. All regressions include education, marital status, employment status, female children, male children, individual income, household income, age group dummies, province fixed effects, and survey-year fixed effects. Standard errors in parentheses are clustered at county level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 4: The Brother Effect by Individual's Income and Education

| | Dependent Variable: Housing Ownership | | | |
| | Male | | Female | |
VARIABLES	Low	High	Low	High
Panel A. By Income Level				
Brother	0.046***	0.005	-0.000	0.007
	(0.012)	(0.014)	(0.011)	(0.011)
Sibling Dummies	Yes	Yes	Yes	Yes
Observations	1,932	1,827	1,929	1,928
Adjusted R-squared	0.097	0.078	0.080	0.055
Panel B. By Education Level				
Brother	0.037***	0.019	0.009	0.001
	(0.013)	(0.015)	(0.009)	(0.014)
Sibling Dummies	Yes	Yes	Yes	Yes
Observations	1,935	1,824	2,225	1,632
Adjusted R-squared	0.087	0.089	0.049	0.079

Notes: An individual's life income is low if his years of education are below or equal to 9 years; an individual's life income is high if his years of education are above 9 years. All regressions include education, marital status, employment status, female children, male children, individual income, household income, age group dummies, province fixed effects, and survey-year fixed effects. Standard errors in parentheses are clustered at county level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 5. Heterogeneity of the Brother Effect: Brothers Effect Is Larger if Brothers Are Relatively Rich

| VARIABLES | Dependent Variable: Housing Ownership | | | |
| | Male | | Female | |
	(1)	(2)	(3)	(4)
Brother	0.035***	0.040***	0.004	-0.003
	(0.009)	(0.011)	(0.008)	(0.009)
Brother×Brother Relative Education	0.004**	0.005**	0.001	0.000
	(0.002)	(0.002)	(0.001)	(0.002)
Average Brothers Education		-0.002		0.003
		(0.002)		(0.002)
Sibling Dummies	Yes	Yes	Yes	Yes
Observations	3,704	3,704	3,757	3,757
Adjusted R-squared	0.064	0.064	0.056	0.057

Notes: "Brother Relative Education" is defined as average brothers' years of education minus individual's years of education. All regressions include education, marital status, employment status, female children, male children, individual income, household income, age group dummies, province fixed effects, and survey-year fixed effects. Standard errors in parentheses are clustered at county level. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: The Brother Effect and Individual's Potencial Risks

| VARIABLES | Dependent Variable: Housing Ownership | | | |
| | Male | | Female | |
	(1)	(2)	(3)	(4)
Brother	0.025**	0.024**	0.001	-0.002
	(0.010)	(0.010)	(0.008)	(0.008)
Brother× Working-at-Private-Firm	0.008	0.011	0.007	0.024*
	(0.014)	(0.017)	(0.012)	(0.014)
Working-at-Private-Firm		-0.009		-0.046*
		(0.031)		(0.027)
Sibling Dummies	Yes	Yes	Yes	Yes
Observations	3,662	3,662	3,753	3,753
Adjusted R-squared	0.087	0.087	0.076	0.077

Note: Variable "Working-at-Private-Firm" is a dummy variable equal to one if an individual is working at private firm, and zero otherwise. All regressions include education, marital status, employment status, female children, male children, individual income, household income, age group dummies, province fixed effects, and survey-year fixed effects. Standard errors in parentheses are clustered at county level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Appendix Table 1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.
Housing Ownership	7616	0.370	0.483
Brother	7616	1.323	1.179
Sibling	7616	2.654	1.769
Female	7616	0.506	0.500
Years of Education	7616	9.942	3.803
Individual's Income	7615	1.347	2.474
Household Income	7416	0.014	0.395
Marriage	7616	0.928	0.258
Employment	7616	0.523	0.500
Female Children	7616	0.507	0.643
Male Children	7616	0.572	0.620
Age	7616	46.443	8.277
Brothers Average Years of Education	7520	7.136	5.119
SOE Housing	7570	0.176	0.381
Working-at-Private-Firm	7616	0.239	0.426

Note: Brothers Average Years of Education equals to zero if an individual does not have a brother.

Appendix Table 2. Compare Younger Brother Effect and Elder Brother Effect Among Different Age Groups

VARIABLES	Dependent Variable: Housing Ownership			
	Male		Female	
	Age 30-40	Age 41-60	Age 30-40	Age 41-60
Younger Brother	0.013	0.050**	-0.003	0.002
	(0.012)	(0.024)	(0.011)	(0.014)
Elder Brother	0.046***	-0.001	0.013	0.005
	(0.012)	(0.033)	(0.012)	(0.022)
Sibling Dummies	Yes	Yes	Yes	Yes
Observations	2,695	1,064	2,746	1,111
Adjusted R-squared	0.020	0.109	0.053	0.090

Notes: All regressions include education, marital status, employment status, female children, male children, individual income, household income, age group dummies, province fixed effects and survey-year fixed effects. Standard errors in parentheses are clustered at county level. *** p<0.01, ** p<0.05, * p<0.1.

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