The Residential Choice of Siblings in China

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Abstract

In the last three decades, China has undergone a huge transformation, but family is still the main source of support for Chinese elderly. Furthermore, families are the main care providers for most children. The geographic distance between adult children and their parents is an important determinant of the childrens ability to fulll their elder care responsibilities and get childcare and daily chores assistance from their parents. We formulate a model to analyze how parental care burden, parental help and family structure interact in affecting children's residential decisions. Our main result is that the presence of a sibling has decisive impact on children's mobility, siblings are more likely to live further away from their parents than only children. Using data from the 2006 Chinese General Social Survey, we find evidence that confirms these patterns. Moreover, the sibship sex composition is important for adult children to make location decisions.

Keywords: living arrangement, proximity, sibling, strategic location choice

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1 Introduction

China is an ageing society. In 2012, there were 194 million Chinese aged sixty and older, which accounted for 14.3% of the total population.[1] Under the United Nations' medium fertility and mortality assumptions, Chen and Liu (2009) predict that there will be more Chinese aged 65 or older by 2050 than the current U.S. population. This rapidly ageing population will require a range of aged care and long-term care services. However, China's extremely limited social security system, and the historical inluence of Confucianism with its emphasis on filial piety mean that family is still the main pillar of the elderly's social support network (Shang and Wu 2011). However, in recent decades, the Chinese elderly are increasingly living away from their children (Zeng and Wang 2003). Three generations under one roof is no longer a general phenomenon.

Living arrangements are an important influence on the elderly's health and happiness (Chen and Short 2008; Wu and Schimmele 2008; Johar and Maruyama 2011; Sereny and Gu 2011; Chyi and Mao 2012). In this paper we study the determinants of family living arrangements, with a particular focus on two important factors: the need for elderly parental care and childcare. A child's residential location choice depends partly on the need for the child to fulfill their elderly care responsibilities (Zimmer 2005; Giles and Mu 2007). The higher cost of providing care from a far distance can be a barrier against labor mobility particularly among family members with strong filial commitment (Silverstein et al. 2008). In addition, families are the main care providers for most children (Shang and Wu 2011). Proximity of adult children to their parents may not be driven by the need to provide elderly care, but rather a family's desire for elderly parents to provide childcare and help with housework (Chen et al. 2000; Maurer-Fazio et al. 2011).

While residential proximity between adult children and their parents can be partly explained by the burden of elderly parental care or the benefit of elderly parental assistance, family structure also plays an important role. Siblings can share the burden of elderly care whilst only children cannot. If elderly care is viewed by adult siblings as a family public good, then a residential location choice of a child further from his parents can reduce his subsequent share of elderly care duties relative to his siblings (Konrad et al. 2002; Pezzin et al. 2007; Rainer and Siedler 2009). Furthermore, elderly parental help may be viewed as a common resource to be shared amongst siblings — elderly parents' energy is limited, they can not satisfy all their children's assistance needs (Kureishi and Wakabayashi 2010).

[1] Source: the Statistical Communiqué of the People's Republic of China on the 2012 National Economic and Social Development.

We aim to quantify these strategic incentives by examining the relationship between family structure and geographic proximity of children to their elderly parents. The basic questions that we address are the following: First, does the presence of siblings affect the proximity of a child to their parents, i.e., is an only child more likely to live close to his parents than a child who has siblings? Second, is the residential choice of the eldest child different from their siblings? In the process of answering these questions we will discern the other determinants of living arrangements of Chinese families?

We investigate these questions both theoretically and empirically. Our theoretical model consists of a two stage game in which the players are two adult siblings that sequentially decide where to live. After they settle, the children decide how to share the burden of elderly care to their parents, who, in return, decide how to distributed childcare and housework assistance to their children. In this way we combine two previous strands of literature that have studied the effect of either the burden of elderly care or the benefit of elderly assistance on familial living arrangements in isolation. In our model the trade-off children face between moving away and staying at home is clear. By moving away, siblings reduce the burden of parental care but also the benefit of parental assistance. Our theoretical model predicts that siblings are more likely to live apart from their parents than only children. Furthermore, it also predicts that the eldest child has no more chance to live apart from their parents than his siblings, there exists no birth order effect.

We empirically test our theoretical model using data from the 2006 Chinese General Social Survey (CGSS). Our estimation results support our theoretical prediction that siblings exhibit statistically significant higher probability of moving than only children. We also find that there is no statistically significant difference in the proximity of firstborn children and their parents compared to their siblings. Furthermore, male children are more likely to live close to their parents than their female siblings.

The remainder of this paper is organized as follows. Section 2 provides a literature review. We discuss our theoretic model in Section 3. We describes the data set as well as the estimation results in Section 4. Section 5 concludes.

2 Related Literature

This is the first paper to incorporate the effects of both elderly care burden and benefit on familial living arrangements. Most existing studies of elderly people's living arrangements focus solely on the direct relationship between adult children and their elderly parents (Lundberg and Pollak 2007; Giuliano 2007; Lei et al. 2011). A few papers analyse the strategic conflict among the adult siblings for

sharing the burden of parental care or the benefit of parental assistance. However, these papers only consider one of those factors in isolation.

Konrad et al. (2002) and Rainer and Siedler (2009) develop similar models of the residential location choice of siblings. They both consider a family that consists of parents and two children. The children treat elderly care visits as a public good; they care only about their private consumption and the total number of visits. The sequential order of location choice is determined by age — the firstborn child choosing first. Finally, the two children decide simultaneously how many parental care visits to make. Konrad et al. (2002) focus on the effect of birth order on the childrens' location decisions and allow for the possibility that the parents move after their children have chosen their locations. The total amount of visits is endogenously decided by the equilibrium of this sequential game. They show that the firstborn child may choose to locate far from his parental home, thus compelling the second-born child to live nearer to the parents and provide the majority of future parental care. Data from the 1996 German Aging Survey supports their theoretical result that the firstborn child locates further away from their parents than the second-born child or only child.

Unlike Konrad et al. (2002), Rainer and Siedler (2009) focus on the relative bargaining power that each sibling has within the family. They assume the parents are immobile and the children might move away to earning a higher wage rate. The total amount of elderly care is exogenously given, the division of elder care is determined by the Nash bargaining solution. Children can enhance their bargaining power by choosing residential place and obtaining higher income. Their theoretical model show that siblings exhibit higher mobility than only children and the firstborn child is more mobile than the second-born child. Data from the 1991, 1996 and 2001 German Socio-Economic Panels confirms the predicted effect of the presence of sibling on residential location choice but shows no significant birth order effect.

In contrast to the above two papers, Kureishi and Wakabayashi (2010) consider the effect of the benefit of parental assistance on familial residential location choice. Their theoretical model consists of 3 players, two adult children and their parents. The two children live at opposite end of a line segment to their parents. The first two stages of their three-stage model are the same as those in the model of Konrad et al. (2002). In stage 3, parents provide childcare to each of their children. Siblings care about receiving assistance and incur a fixed cost if they move; parents care about private consumption and assistance to their children. They show that a firstborn child is more likely to live closer to their parents than a second-born child or only child. Data from the 1998 and 2003 Japanese National Survey on Families support their theoretical conclusions, except that a firstborn daughter with a younger brother lives further away from her parents than her brother does.

The contrast of results of Konrad et al. (2002) and Rainer and Siedler (2009) with Kureishi and Wakabayashi (2010) is stark. In Konrad et al. (2002) and Rainer and Siedler (2009), there is a strategic incentive for siblings to choose a residence distant from their parents as a way of free-riding on the public good of parental care. In contrast, in Kureishi and Wakabayashi (2010) there is a strategic incentive for children to choose a residence close to their parents to capture a greater share of the common good of parental assistance. What can be said if both the burden of elderly care and the benefit of parental assistance are considered concurrently? In the following section, we present such a model and show that siblings show a greater propensity to move away from home than only children.

3 Model

3.1 Setting

We consider a family consisting of two children: the firstborn child F and the second-born child S.[2] Parents live and raise their children at home H. The children, who work and live at the same place, have two residential choices, they can either remain at home (location H) or move to the neighboring city (location A).

The labor market at home has a wage rate $w_H = 1$, meanwhile the labor market in the neighboring city has a wage rate $w_A > 1$. When the children are adults, they sequentially decide on where to work and live.

The adult children play a two-stage game. In stage 1, the firstborn child F decides his location $f \in \{A, H\}$. In stage 2, after observing the choice of the firstborn child, the second-born child S decides his location $s \in \{A, H\}$. Thus the strategy set of F is $\{A, H\}$, and the strategy set of S is $\{AA, AH, HA, HH\}$.[3]

Once the children settle, both of them have to spend time on childcare, housework and parental care. After children make their location choices, both children need to spend time c on childcare and housework, but their parents may contribute assistance. If a child moves away from his parents, he receives no assistance. If he is the only child who stays at home, he receives assistance c. If both children stay at home, they both receive assistance $\frac{c}{2}$.[4] In addition, F and S

[2] It can be easily extended to the family having more than two children, details can be seen in Appendix.

[3] The two-tuple $xy \in \{AA, AH, HA, HH\}$ denotes the action x that is chosen by S after F chooses A and the action y that is chosen by S after F chooses H.

[4] Kureishi and Wakabayashi (2010) have a similar assumption as ours, they assume parents give assistance to each of children depend on the location of their children.

together need to provide the aggregate amount g of parental care. If they live at different places, the child living at H provides all the required parental care to his parents, the other child is a free rider and does not provide any care. If they live at the same place, each of them provides $\frac{g}{2}$ care to their parents. Each care involves a time cost. The time cost per care is, by appropriate normalization, equal to 1 if the child stays at home and $\lambda > 1$ if the child lives in the neighboring city.[5] Accordingly, child i's ($i \in \{F, S\}$) initial time endowment m is allocated among paid market work h_i, childcare and housework c_i, and assistance to parents g_i: $m = h_i + c_i + g_i\lambda_i$, where $c_i \in \{0, \frac{c}{2}, c\}$, $g_i \in \{0, \frac{g}{2}, g\}$ and $\lambda_i \in \{1, \lambda\}$. Market work h_i earns child i an income $w_i h_i$, where $w_i \in \{1, w_A\}$. For the simplification of analysis, we suppose child i only cares about his/her private consumption $x_i = w_i(m - c_i - g_i\lambda_i)$.[6]

According to the above setting, we get the following game tree, where $\alpha =$

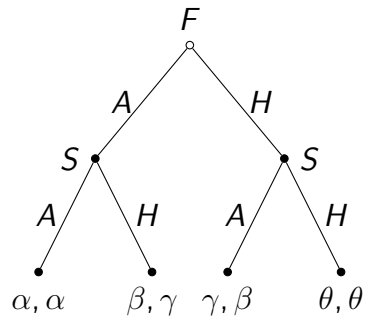

Figure 1: Two children's game tree

$w_A(m - c - \frac{g}{2}\lambda), \beta = w_A(m - c), \gamma = m - g$ and $\theta = m - \frac{c}{2} - \frac{g}{2}$, we assume that they are all bigger than 0. The first element at each terminal node is F's payoff, the second one is S's payoff.

3.2 Equilibrium

For the convenience of analysis, we assume that when the siblings are indifferent of their two residential choices, they will choose to live with their parents. We find the subgame perfect equilibrium (spe) by backward induction.

[5] It should be noted that we can let λ equal 1 without changing the results, but the convenience of providing parental care is affected by the distance between parents and their children, hence we assume $\lambda > 1$ here.

[6] Since c and g are fixed, we can also assume children care about not only x but also fixed utility of c and g and the results does not be influenced.

Theorem 1. *If $\alpha > \gamma$, the spe is (A, AA); if $\alpha \leq \gamma, \theta < \beta$ and $\beta > \gamma$, the spe is (A, HA); if $\alpha \leq \gamma, \theta < \beta$ and $\beta \leq \gamma$, the spe is (H, HA); if $\alpha \leq \gamma$ and $\theta \geq \beta$, the spe is (H, HH).*

Proof. See Appendix. □

According to Theorem 1, there exists no birth order effect in our model. This is unlike the above literature, they all show that the firstborn child has an advantage by making decision firstly. The difference depends on the assumptions, living close to the parents can bring benefit and cost to the child, the literature only focus on either the benefit or the cost. When we combine the benefit and the cost, the birth order effect dissolves.

Corollary 1. *If $c = 0$, the firstborn child is more likely to live further away from their parents than the second-born child.*

When we assume children cannot get benefit from their parents, $\alpha = w_A(m - \frac{g}{2}\lambda)$, $\beta = w_A m$, $\gamma = m - g$ and $\theta = m - \frac{g}{2}$. Since $\beta > \theta > \gamma$, in terms of Theorem 1, if $\alpha > \gamma$, the spe is (A, AA); if $\alpha \leq \gamma$, the spe is (A, HA). Hence the firstborn child is more likely to live further away from their parents than the second-born child.

Corollary 2. *If $g = 0$, the firstborn child is more likely to live closer to their parents than the second-born child.*

When we assume children can get benefit from their parents without any cost, $\alpha = w_A(m - c) = \beta, \gamma = m$ and $\theta = m - \frac{c}{2}$. Following Theorem 1, if $\alpha \leq \theta$, the spe is (H, HH); if $\theta < \alpha \leq \gamma$, the spe is (H, HA); if $\alpha > \gamma$, the spe is (A, AA). Hence the firstborn child is more likely to live closer to their parents than the second-born child.

The above two corollaries are consistent with the literature. When we consider one aspect of cause of rivalrous relationship among siblings in the family, we may find that the firstborn child always has first-mover advantage. In some cases, comparing with his gain, the firstborn child can make his younger siblings get less by moving first. Children with siblings can share the burden of elder care with their siblings, but only children have to undertake all the responsibility for caring their parents. Meanwhile, only children can get all the benefits from their parents alone, whereas children with siblings have to partake the advantages from their parents.

For the intuitional comparative analysis, we use the following figure to compare the different behavioral patterns of only children and children with siblings.[7]

[7] Here, We assume that $m = 8$, $w_A = 2$ and $\lambda = 4$.

According to the above analysis, there are four regions in Figure 2, Q_1, Q_2, Q_3 and Q_4 indicate four subgame perfect equilibrium outcomes $(A, A), (A, H), (H, A)$ and (H, H) respectively. The left side of line V represents the only child chooses to leave and the right side of line V represents he chooses to stay. It is obvious that when the only child chooses to leave, both siblings choose to leave too, but not vise versa. Furthermore, if $c = 0$, the possible spe outcomes are (A, A) and (A, H), the firstborn child has more flexible mobility. If $g = 0$, the possible spe outcomes are $(A, A), (H, A)$ and (H, H), the firstborn child is more likely to stay at home.

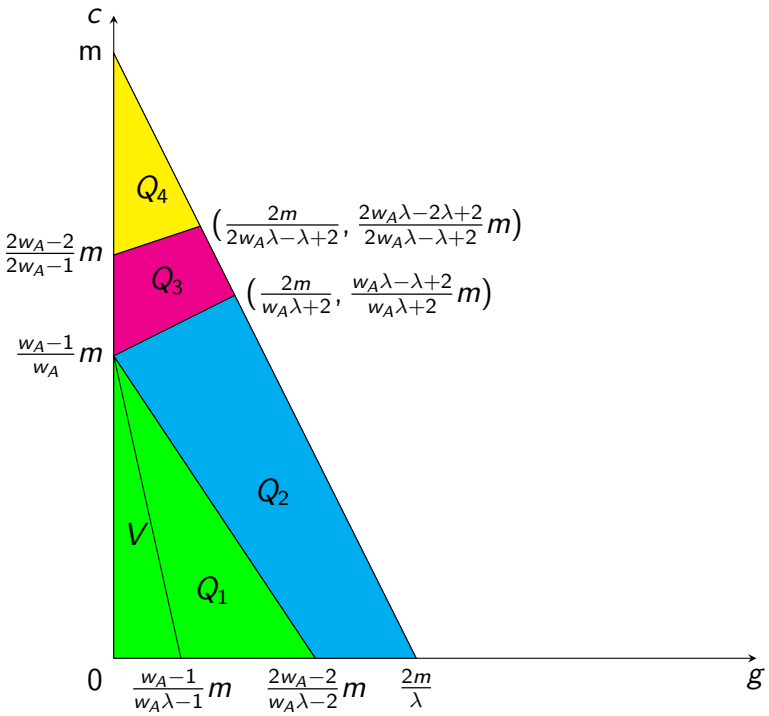

Figure 2: Subgame perfect equilibrium outcomes

In summary, children with siblings live on average further away from their parents than only children. It is ambiguous on the comparison of the location of the firstborn child and the second-born child. In terms of Theorem 1, we get the corollary as follows.

Corollary 3. *Children with siblings are more likely to live further away from their parents than only children.*

Proof. See Appendix. □

3.3 Discussion

Unlike extant theoretical models (Konrad et al. 2002; Rainer and Siedler 2009; Kureishi and Wakabayashi 2010), we do not analyze children's endogenous choice of elder care and parents' choice of providing assistance to their children. We use the simple model instead of more elaborate ones because the main purpose of our model is to incorporate the benefits and costs from parents in one model, the exogenous payoff assumption makes analysis clear and concise. However, Kureishi and Wakabayashi (2010) has a different assumption with others. They assume children live apart from their parents in the first stage. Does this assumption change our result? If we follow their assumption, it is obvious that the game tree of our model does not change. Hence, This assumption does not change our model's result.

Furthermore, our theoretical model does not take into account that the elderly's son and daughter may differ in their preferences over parental care. In China's traditional culture, sons carry on the family line and are obliged to be the primary caregivers of their parents. Daughters marry into somebody else's family and should look after their parents-in-law firstly. Our model extends to this case straightforwardly, when one of the two children is female, the male one's equilibrium behavior is similar to the only child. Therefore, we may expect that the sibship sex composition affects the children's geographic mobility. We investigate this deduction when exhibiting the empirical evidence.

Finally, we assume the parents' living place are immobile. In fact, parents may coreside with their children temporarily. When their grandchildren are young, their children may invite them to coreside and provide assistance to childcare and housework. When they need elder care, they may move to their children's place, so that their children can providing parental care expediently. Since our data is cross-sectional, there is no information about this mobility phenomenon. We need longitudinal data to investigate it. However, because the constraint of social security relations and medical insurance, it is very difficult for the elderly to move into children's house permanently.

4 Empirical Analysis

4.1 Data

Most previous studies of coresidence and proximity have used the elderly parent as the unit of observation and considered the distances between adult children and their parents. In this paper, we use the adult child as the unit of observation.

Our sample comes from the 2006 Chinese General Social Survey (CGSS),

the newest CGSS data available.[8] The survey follows a multi-stage stratified sampling strategy, it is nationally representative with a sampling frame including 28 provinces of mainland China (excluding Ningxia, Qinghai and Tibet).

The 2006 CGSS family questionnaire sample includes 3,208 individuals aged 18 to 70. In this sub-sample, we restrict to respondents who have been married at least once and have at least one surviving parent at the time of the survey. Excluding cases with missing values for analytic variables, the final sample size is 1,645 individuals ranging from 19 to 69 years old. About 81% of the sample individuals were aged between 25 and 50 years old, about 98% of the sample individuals' parents were aged over 50.

In the 2006 CGSS family questionnaire, the distance between respondents and their parents are classified into seven types: this household, the same or adjacent dwelling/courtyard, within 15 minutes by foot, within 30 minutes by car, 0.5-1 hour by car, 1-3 hours by car, and more than 3 hours by car. We combine these seven types into three categories, we let 0 denote this household type, 1 denote the following three types and 2 denote those individuals for whom distance is more than half an hour by car. Thus 0 indicates that people coreside with their parents, 1 indicates people who live near to their parents and 2 indicates people who live far from their parents.

In our study, we investigate whether the residential choice of firstborn child is different from their siblings and whether children with siblings are more likely to live further away from their parents than only children. We define "only" as a respondent who has no sibling. We also define "firstborn" as the respondent who is the eldest child and "other" as the respondent who is not the eldest child. Table 1 shows the child type distribution according to the distance between children and their parents. In each row, the number is the ratio of observations to the total observations. The table indicates that both firstborn and non-firstborn siblings locate on average further away from their parents than only children. As we can see, about 11.6% of all siblings (9.62% of firstborn, 12.36% of other) live with their parents, compared with 13.45% of only children. In the highest distance category, we find 42.02% of all firstborn children and 36.64% of all other siblings, but only 31.93% of all only children.

Besides the variable of interest, we also include a set of socioeconomic characteristics of adult children and their parents that might affect a person's geographic mobility. On the children's side, we include age, sex, educational level, the presence of children aged 13 and less, whether or not the residence is urban and the region of residence (eastern, central and western) as control variables.

[8] So far, only the 2003, 2005 and 2006 CGSS are available to the public. Amongst these surveys, only the 2006 survey contains information on distance between respondents and their parents, hence it is suitable for the purpose of our study.

On the parents' side, we include age (if both parents are alive, we include the age of the eldest), *hukou* status of the father, whether one of the parents has passed away, whether the educational level of both parents is below high school, health status (if both parents are alive, we use the lower of the two) and whether the parents own the child's house.

Table 2 details the mean, standard deviation and coding scheme of the variables used in this study. We see that the patterns of male people and female people are similar. Comparing people who live in urban and rural areas, the table shows that on average, people who live in an urban area are likely to be more educated, more likely to have more educated parents and more likely to have parents who have city non-agricultural hukou than their rural counterparts. Of our sample, about 69% live in urban areas, while the remainder people live in rural areas. To control for possible differences in the level of distance between children and parents due to regional variation, we include dummy variables for eastern, central and western region.

4.2 Results

Our theoretical model is not to specify a structural equation to be estimated, but rather to make sense of the empirical results in the next section. We test whether the residential choice of firstborn child is different from their siblings and whether children with siblings are more likely to live further away from their parents than only children.

We model the choice of the children's residential location by using an ordered logit model. However, Compton and Pollak (2009) argue that the logit model treats coresidence as the limiting case of proximity, but the multinomial logit does not. Thus, base on the distance categories, we also compare these results to a multinomial logit regression.

The regression equations we use are as follows:

$$\begin{aligned} D_i^* &= \alpha + \alpha_1 F_i + \alpha_2 R_i + \alpha_3 X_i + \varepsilon_i \\ D_i &= m \quad \textit{if } \tau_m \leq D_i^* < \tau_{m+1} \quad \text{for } m = 0 \text{ to } 2, \end{aligned} \tag{1}$$

and

$$\ln \Omega_{m|b}(x) = \ln \frac{\Pr(D = m|x)}{\Pr(D = b|x)} = x\alpha_{m|b} \quad \text{for } m = 0 \text{ to } 2. \tag{2}$$

The dependent variable D is the geographic distance between an adult child and his parents, m are the three discrete categories (0 to 2), F denotes the eldest sibling, R denotes younger sibling, and ε_i represents the usual error term, b denotes the base category of residential proximity, which we choose to be 2

in our estimation, thus the comparison group is people who live far from their parents.

Estimation results are collected in Table 3. The second column shows the results from the ordered logit regression, we display the logit coefficeients as odd ratios. The third and fourth column presents the results from a multinomial logit regression, we display the coefficients as relative risk ratios. Both regression get similar results. The most important result is that both firstborn and other are significant and positive. That is, both firstborn and second born siblings consistently locate further away from their parents than only children. Moreover, the coefficients for firstborn and non-firstborn siblings are not significantly different from each other.[9] This is unlike the result of Konrad et al. (2002) that firstborn children are more likely to live farther away from their parents than the second born children. Meanwhile, our results is not in consistent with those of Kureishi and Wakabayashi (2010) who find firstborn children are more likely than second born children to live close to their parents. Our findings are in accord with those of Shelton and Grundy (2000), Compton and Pollak (2009) and Rainer and Siedler (2009, 2010), they find that only children live on average closer to their parents than children with a sibling.

As for our control variables, being male, parental house ownership, parents' age, having widowed parent and parent's hukou status are negatively correlated with geographic mobility. On the other hand, respondent's age, urban residence and father's agriculture hukou are positively associated with geographic mobility.

Since being male is highly significant and has highly negative coefficient, we want to know whether siblings effect exists in different gender group. In Table 4, the second and the third column displays the results. There is no siblings effect in male group, however, siblings effect exists in female group. This might be caused by social norms in China that sons rather than daughters should live together with their parents.

The above results indicate that adult siblings consistently locate further away from their parents than only children and male children are more likely to live with or close to their parents. We now investigate whether the location behavior of adult children varies depending on the birth order and sibship sex composition. Table 4 presents the empirical results from the ordered logit regression, as in the previous regressions, the reference category is respondents who are only children. First, we distinguish between nine different child-type dummy variables: firstborn son who have only younger sister, firstborn sons who have at least one younger brother, firstborn daughter who have only younger sister, firstborn daughter who have at least one younger brother, other son who have only sister, other son who

[9] We omit only children type from the sample to clarify whether a birth order effect exists. We find no significant evidence to support it.

have at least one brother, other daughter who have only sister, other daughter who have at least one brother. Then we distinguish between five different child-type dummy variables: male children who have only female siblings, male children who have at least one brother, female children who have only female siblings, female children who have at least one brother, and only children. These two different child-type classifications get similar results. Compare to being only child, being only son is more likely to live close to parents, being a daughter with brothers is more likely to live further away from parents, other type children are not statistically different. Hence, we find that the siblings' gender and sibship sex composition is important for adult children's location decisions. The social norm in China motivates the sons to take the lion's share of parental care, the presence of a brother makes daughters have more mobility. But only having sisters brings more pressure to sons, this makes sons choose to live close to parents with higher probability. In addition, there exists no birth order effect.

5 Conclusion

In this paper, we analyze both theoretically and empirically the residential location choice of siblings who provide care for parents and receive childcare and housework assistance from their parents. Our theoretical model suggests that children with siblings live further away from their parents than only children, but whether firstborn siblings are different with other siblings is ambiguous. Conditional on socioeconomic characteristics, our empirical analysis supports the theoretical conjecture.

Our empirical analysis also indicates that male child and female child have different patterns of location choice. Male children are inclined to live closer to their parents, male children with siblings and only children have no significant difference. Female children with siblings live on average further away from their parents than only children. This phenomenon might be cause by China traditional norm. Confucian cultural tradition requires son take the burden of the family, however daughter has important responsibility for her parents-in-law in patrilineal society.

Our findings are contrast to those of Konrad et al. (2002) and Kureishi and Wakabayashi (2010), but the results of our paper are consistent with those of Shelton and Grundy (2000), Compton and Pollak (2009) and Rainer and Siedler (2009, 2010) and Rainer and Siedler (2009, 2010). In our model the trade-off children face between moving away and staying at home is clear, the presence of sibling can make adult child get more flexibility. Our paper gives a contribution in the sense that it enables us to explain cross-country differences in siblings' preferences regarding residential locations.

Appendix

Proof of Theorem 1. It is obvious that the spe is variational according to the parameters. Firstly we show the four strategy profiles are subgame perfect equilibria under different conditions. We only analyze one case, the other cases can be analyzed using the same method.

If $\alpha > \gamma$, using the backward induction. Considering the second stage, S makes choice. Looking the terminal nodes of the game tree, if F chooses A, S will choose A. If F chooses H, since $w_A > 1$ and $\lambda > 1$, $\beta = \alpha + w_A\frac{g}{2}\lambda > \gamma + w_A\frac{g}{2}\lambda > m - g + \frac{g}{2} > m - \frac{c}{2} - \frac{g}{2} = \theta$, S will also choose A. Then consider the first stage, since $\alpha > \gamma$, F will choose A. Thus the spe is (A, AA).

Similarly, we can get the other results. □

Proof of Corollary 3. Now we consider a family consisting of parents and an only child, other things are same as the two children family case. If the only child chooses A, he gets $w_A(m - c - g\lambda)$. If he chooses H, he gets $m - g$. Then if $w_A(m-c-g\lambda) > m-g$, the only child will choose A; if $w_A(m-c-g\lambda) \leq m-g$, the only child will choose H.

Compare the location decisions of the only child and each of those of F and S. When the only child chooses A, $w_A(m - c - g\lambda) > m - g$, then $\alpha = w_A(m - c - \frac{g}{2}\lambda) > m - g = \gamma$. According to Theorem 1, both siblings choose A too. In addition, if $\alpha > \gamma > w_A(m - c - g\lambda)$, both siblings leave but the only child stays.

Thus we declare that children with siblings are more likely to live further away from their parents than only children. □

Furthermore, we can easily expand our model to the family having more than two children. Supposing the family have n ($n > 2$) children and other assumptions are unchanged.when $w_A(m-c-g\lambda) > m-g$, considering the last stage, child (L) makes residential decision. If none of his elder siblings choose H, L can get $w_A(m - c - \frac{g}{n}\lambda)$ by choosing A and get $m - g$ by choosing H, it is obvious that he will choose A. If some (k) of his elder siblings choose A, L can get $w_A(m - c)$ by choosing A and get $m - (1 - \frac{1}{k})c - \frac{1}{k}g$ by choosing H, since $w_A(m - c) > m - g + w_A g\lambda > m > m - (1 - \frac{1}{k})c - \frac{1}{k}g$, L will choose A. Hence all the children choose A in the equilibrium. In addition, if $w_A(m-c-\frac{g}{n}\lambda > m-g > w_A(m-c-g\lambda)$ and $w_A(m-c) > m$, all the children leave but the only child stays.

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Tables

Table 1: Distance between parents and children

		Distance			
		0	1	2	obs.
Child type	firstborn	9.62%	48.36%	42.02%	426
	other	12.36%	51.00%	36.64%	1,100
	only	13.45%	54.62%	31.93%	119

[1.] % indicates the percentages of different child types.

Table 2: Descriptive Statistics

Varibles	Male (n=730)	Female (n=915)	Urban (n=1,128)	Rural (n=517)	Total (n=1,645)	Coding Scheme
Distance	1.06 (.695)	1.42 (.570)	1.35 (.636)	1.06 (.649)	1.26 (.653)	0(coresidence) to 2(more than half an hour driving)
Firstborn	.25 (.434)	.26 (.441)	.26 (.436)	.27 (.443)	.26 (.438)	0(no),1(yes)
Only	.08 (.275)	.06 (.246)	.09 (.292)	.03 (.157)	.07 (.259)	0(no),1(yes)
Other	.66 (.472)	.67 (.470)	.65 (.477)	.71 (.455)	.67 (.471)	0(no),1(yes)
Dependent child less than 14	.48 (.500)	.47 (.498)	.45 (.498)	.53 (.499)	.48 (.500)	0(no),1(yes)
Age	39.95 (9.326)	38.70 (9.323)	39.36 (9.358)	39.02 (9.327)	39.25 (9.347)	19 to 69
Education	.56 (.497)	.63 (.483)	.46 (.499)	.89 (.311)	.60 (.490)	0(otherwise), 1(below high school)
Parents'estate	.12 (.326)	.06 (.238)	.08 (.271)	.10 (.304)	.09 (.282)	0(no),1(yes)
Parents' age	68.25 (10.173)	67.77 (9.993)	67.77 (9.975)	68.39 (10.291)	67.96 (10.076)	the eldest one, 44 to 102
Widowed	.41 (.492)	.35 (.476)	.35 (.479)	.42 (.494)	.37 (.484)	0(no),1(yes)
Parents' education	.87 (.338)	.88 (.327)	.83 (.376)	.97 (.168)	.87 (.332)	0(otherwise), 1(below high school)
Parents' health	.28 (.452)	.30 (.457)	.30 (.457)	.28 (451)	.29 (.455)	0(otherwise), 1(poor health)
Father's hukou	.69 (.464)	.67 (.470)	.54 (.499)	.98 (.124)	.68 (.467)	0(city non-agricultural), 1(otherwise)

Table 3: Regression Results

	Ordered Logit	Multinomial Logit	
	Distance from parents	Live with parents	Live near parents
Children's characteristics			
Firstborn	.448**	-.727*	-.419*
	(.212)	(.391)	(.243)
Other	.349*	-.663*	-.220
	(.199)	(.363)	(.228)
Male	-.983***	2.253***	.516***
	(.104)	(.223)	(.114)
Dependent child	.047	-.040	-.037
	(.124)	(.223)	(.136)
Age	.021*	-.065***	.009
	(.011)	(.019)	(.011)
Education	.089	.042	-.200
	(.121)	(.225)	(.132)
Urban	1.065***	-1.405***	-1.140***
	(.131)	(.231)	(.144)
Parents' characteristics			
Own house	-1.675***	2.462***	.510*
	(.226)	(.303)	(.267)
Age	-.014*	.051***	-.011
	(.009)	(.015)	(.010)
Widowed	-.471***	1.036***	.265**
	(.115)	(.215)	(.127)
Education	-.134	.309	.110
	(.164)	(.344)	(.179)
Health	-.033	.193	-.076
	(.116)	(.209)	(.116)
Hukou	.450***	-.276	-.584***
	(.130)	(.255)	(.141)
Observations	1,645	417	933

[1.] Control variables for eastern, central and western area have been included in all regressions but are not reported.

[2.] robust standard errors in parenthesis.

[3.] *, ** and *** denote statistical significance at the 10%, 5% and 1% levels.

Table 4: Sibship Sex Composition Regression Results

	Birth order and sibship sex composition		Only sibship sex somposition
Firstborn			
Male, only have sister	-.535 (.355)	Male, only have sister	-.482* (.272)
Male, have at least one brother	.369 (.264)	Male, have at least one brother	-.009 (.210)
Female, only have sister	.388 (.326)	Female, only have sister	.371 (.258)
Female, have at least one brother	1.017*** (.234)	Female, have at least one brother	1.003*** (.201)
Other Child			
Male, only have sister	-.449 (.326)		
Male, have at least one brother	-.133 (.218)		
Female, only have sister	.351 (.310)		
Female, have at least one brother	.996*** (.208)		

[1.] Non-reported covariates as in Table 3 excluding the dummy variable for birth order and gender.
[2.] robust standard errors in parenthesis.
[3.] *, ** and *** denote statistical significance at the 10%, 5% and 1% levels.