Brothers, Sisters, and Support to Older Parents: Separate Spheres Across and Within Support Types?*

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Abstract

Adult children, especially sons, are often considered a linchpin of support to older parents in many patriarchal societies. We develop a model of transfers from adult children to older parents as existing in separate spheres depending on the child's gender and type of transfer. Using data from the China Health and Retirement Longitudinal Study, we find strong evidence of such differentiation. Coresidential support comes almost exclusively from sons as do large transfers, while daughters are more likely to make smaller transfers. Interestingly, crowding-out of financial transfers by siblings occurs primarily within gender: sons give less when they have more brothers but not when they have more sisters, and daughters give less when they have more sisters but not when they have more brothers. This pattern is present for both in-kind and cash transfers, suggesting that support from adult children may not be substitutable between genders, even for relatively fungible currencies.

JEL: D13, J13, J14, J16

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1 Introduction

Support from adult children to older parents plays a critical role in many societies. The reliance on children for support, with transfers flowing predominantly from adult children to older parents, has indeed been well-documented in developing countries such as China (Oliveira, 2016), and are opposite from the direction of transfers flows observed in developed nations such as the United States (McGarry, 2016). Alongside this reliance on family for support, there may also exist cultural norms that dictate which gender is expected to shoulder the primary responsibility for parents, with sons being the norm in many patrilocal and patriarchal societies (Das Gupta et al., 2003; Ebenstein and Leung, 2010; Jayachandran, 2015; National Research Council, 2012). Given these norms, while transfers from daughters can seemingly provide support in much the same way as transfers from sons, these transfers may be viewed differently insofar as they are not expected or part of the traditional cultural landscape. Such gender-differentiated perceptions may lead to differing patterns of support from adult sons and daughters to older parents.

In this study, we build on these ideas to introduce the notion of the existence of separate "spheres" of transfers from adult children to their older parents. In a setting with strong son preference, parents may, in effect, have separate perception of transfers from sons and daughters, with transfers from one gender being valued differently than those from the other, even if the financial value of the gifts is the same. Such gender-differentiated views may in turn affect patterns of support from sons and daughters who factor in parental well-being in their transfer behavior. As such, the gender of the donor matters and the substitutability of transfers across children may differ between and within genders. Similarly, there may exist separate perceptions by types of transfers, with greater or lesser substitutability across genders for some transfer types than for others. Whereas the idea of separate spheres has been applied to the division of household production or market work, and thus across types of tasks (Lundberg and Pollak, 1993; Nugent, 2013), in our case, the notion of gender-specific spheres is applied to upward intergenerational transfers, and thus not only *across* transfer types but also *within* a given transfer type.

We examine two types of support to older parents: shared residence and financial transfers, the latter including both cash and in-kind gifts. Both types of gifts may also carry some degree of symbolism, playing an important role in strengthening family bonds (Emery et al., 2019; Ho, 2019; Hwang, 1987; Xie and Zhu, 2009). We model coresidence and financial transfers as distinct items because of their very different nature. Coresidence is an experience good wherein the transfer affects family utility both from the financial value of shared housing and from the experience of

living together. Furthermore, there is a public aspect of shared residence that is less prominent for financial transfers. Individuals outside the household will know that the parent is the recipient of a housing transfer and which child is providing that assistance. With social norms in China being such that sons are expected to provide for parents, a parent may fear that they will lose face if they are observed to be living with a daughter, or the son himself may face criticism if he is leaving this role to a sister. In contrast, financial transfers are less readily observed by others, making it possible to conceal a transfer from a daughter or publicize a transfer from a son. Therefore, financial transfers from daughters may be discounted less heavily than would housing transfers. In addition to these potential differences in value due to the type of support, financial transfers from sons and daughters may be viewed differently if transfers from sons are expected, while transfers from daughters are unanticipated given patriarchal norms. Thus, despite the seeming fungibility, financial transfers from sons and daughter may not be substitutable across children of different genders.[1]

The empirical analyses use data from the China Health and Retirement Longitudinal Study (CHARLS), a nationally representative survey of the Chinese population ages 45 or older. The survey collects information on the demographic and socioeconomic characteristics of older respondents and each of their adult children, and importantly for our study, information regarding coresidence with, and financial transfers from children. CHARLS is ideal for our focus on sibling interactions in that most of the children in the sample were born prior to the 1979 one child policy (OCP) and as such, they have several siblings. This family structure allows us to examine differences in patterns of giving by the gender of the child. To assess the extent to which transfers from sons and daughters exists in separate spheres, we analyze the potential for crowding-out of transfers by siblings, looking at differences in the substitution of transfers within and across genders. Finally, we compare the patterns of crowd-out across two very different types of transfers:

[1]The notion that transfers from sons and daughters may be viewed differently is similar in spirit to early work by Richard Thaler (Thaler, 1990, 2008) that posits that individuals may have separate "mental accounts" for income from different sources. This sort of mental accounting can lead to behavior that may appear puzzling on the surface but are observed regularly in empirical studies. Income from a windfall gain, for example, is typically spent on different items than is income from regular labor earnings. Even expected income that is received irregularly, such as a bonus for job performance, has been shown to be associated with a different marginal propensity to consume than income in the form of regular payments (Agarwal and Qian, 2014; Fagereng et al., 2021). Similarly, Duflo and Udry (2004) show that in Côte d'Ivoir, husbands and wives farm different crops and that income from these different sources is allocated to the purchase of different goods. Work in anthropology too draws on this idea and posits a sharp distinction between income from sources viewed as good or "appreciated" such as agriculture, and income from bad or "bitter" sources that comes from activities associated with disapproval such as the sale of ancestral land (Shipton, 1989; Werthmann, 2003).

coresidence, wherein we would expect assistance from at most one child at a time, and financial transfers, wherein additional transfers would be expected to have a positive marginal utility. Within the category of financial transfers, we also look separately at in-kind versus cash gifts.

Formally examining these patterns and assessing the nature of crowding-out of transfers among siblings poses several identification challenges. First, there is difficulty in determining causality. Unobserved factors such as parental preferences may simultaneously drive both family size or composition, and support from children. For instance, parents who place great value on family relationships may both have more children and instill in their children a greater sense of familial obligations. To mitigate such concern, we follow recent literature (Breschi and Lenzi, 2016; Deuflhard et al., 2019; Emran and Hou, 2013; Ho, 2022; Millimet and Roy, 2016), and employ a heteroscedastic-based instrumental variable strategy à la Lewbel (2012). Such instrumental variable method works in a similar way to traditional instruments (Rigobon, 2002, 2003) and its assumptions are easily tested using standard tests, which we elaborate on below. Second, consistent with the traditional quality-quantity (QQ) trade-off, family size may affect the educational attainment of children, the eventual incomes of children, and thus their ability to provide for parents. To deal with these issues, we employ a two-step approach similar in spirit to that proposed by Bagger et al. (2021), which we detail below.

Consistent with our separate spheres framework, we find that parents are significantly more likely to coreside with a son than with a daughter. Moreover, an increase in the number of brothers is associated with a decrease in the probability that any particular child coresides with their parent, while an increase in the number of sisters does not really matter. With respect to financial transfers, we find that daughters are more likely to provide financial transfers to parents than are sons, but conditional on providing financial transfers, sons provide significantly larger transfers than do daughters. Interestingly, we find patterns of giving that indicate that crowding-out of financial transfers occurs primarily within gender: An increase in the number of brothers leads to a substantial decrease in the amount of financial transfers that a son provides to his parents, while an increase in the number of sisters leads to a much smaller decline (if any). The reverse is true for daughters, with much larger crowding-out from an increase in the number of sisters than in the number of brothers. This result holds consistently across a variety of robustness checks and suggests that transfers from daughters operate as substitutes for each other in one sphere, while transfers from sons do so in a different sphere. The results are consistent with the presence of gender-differentiated spheres both across different types of support and within a given type of support. Whereas sons may retain the primary responsibility of support to parents, daughters may also

desire to give to parents, except that transfers from sons and daughters are potentially still viewed differently and thus display differentiated patterns, irrespective of their fluidity.

This study relates to the broad literature that links family size to support from adult children to older parents. There is consistent empirical evidence demonstrating that a larger number of children is associated with greater total support to older parents (Chen and Fang, 2021; Cunningham et al., 2013; Oliveira, 2016; Zimmer and Kwong, 2003). However, the evidence regarding the relationship between the number of children and support from any one child is less consistent. Regarding help with personal care, studies have repeatedly found that the amount of care from any one child tends to decline when other siblings provide the same type of support or when there is an increase in the number of siblings (Antman, 2012; Bergeot, 2024; Brown, 2006; Checkovich and Stern, 2002), while the evidence is more mixed when considering monetary transfers from children to parents. Antman (2012) finds that greater money transfers from siblings increases one's own money transfers in Mexico while Rosenzweig and Zhang (2014) find that those from larger families tend to provide lower financial transfers in China. Missing from these discussions is the role that the gender of siblings may play in reinforcing or crowding-out old age support from any one son or daughter. We begin to provide that missing piece by examining how the number of brothers and sisters may influence support from any one child with respect to different types of support.

Our study is also related to Grigoryeva (2017), who finds that sons (daughters) provide less (more) care to parents if they have sisters (brothers), a result consistent with the fact that daughters provide more of the care to parents than sons in the United States (McGarry and Schoeni, 1995). Similarly, Bergeot and van Soest (2021) model adult children's care as a function of the care provided by their siblings, and find that children are more likely to free-ride on sisters in France. Our work differs from Grigoryeva (2017) and Bergeot and van Soest (2021) in that we examine shared housing and financial transfers—two important types of support in China—rather than caregiving, and address the issue in the context of a culture with strong son preference and reliance on adult children for support.[2] Our work is also complementary to Guo and Zhang (2020), who show that parents are more (less) likely to instill filial piety in sons (daughters) when the latter have a male

[2]Caregiving is less salient in our context as only 18% of children (and their spouses) provided help with activities of daily living (ADL) or instrument ADL (IADL) to their parents, which contrast with the 74% of children who make financial transfers to parents. We thus follow recent literature on China (Guo and Zhang, 2020; Oliveira, 2016) and focus predominantly on financial transfers. Analyses on the sample of children with a parent with at least one ADL or IADL limitation were also consistent with within but not across gender crowd-out. However, these findings need to be interpreted with caution as 46% of children had missing values for the outcome of help with ADL/IADL.

co-twin in Kunming, the capital city of Yunnan province. This is consistent with parents expecting sons to provide greater support than daughters in China. Our work differ from Guo and Zhang (2020) in several ways. First, we examine a nationally representative dataset of middle age and older respondents, and can thus focus on actual (rather than expected) support from adult children to older parents. Second, Guo and Zhang (2020) focus on the presence of a male rather than a female sibling, while we focus on an increase in the number of brothers or sisters. By doing so, we can differentiate the effects of brothers on transfers separately from the effects of sisters in absolute rather than in relative terms.[3] We thus introduce the notion of separates spheres in upward family transfers, by paying particular attention to the differences in patterns of giving by the gender of the child and the potential for crowding-out of transfers across siblings based on the genders of the siblings and the type of support. To the best of our knowledge, this study is the first to document the presence of gender-differentiated spheres for a seemingly substitutable currency such as cash.

This paper proceeds as follows: Section 2 presents a stylized framework to conceptualize the idea of separate spheres across and within which children of different genders may operate. Section 3 presents the data and provides some descriptive statistics. Section 4 elaborates on the identification issues related to the testable predictions of the model and outlines our empirical strategy. We present the main results in Section 5 along with several robustness checks. Section 6 provides some additional discussion on potential mechanisms, and a final section 7 concludes.

2 Conceptual Framework

This section presents a gendered public goods model to help conceptualize the idea of separate spheres across and within support types from children of different genders. Below, we also examine some alternative theories of behavior based on a standard public goods and gendered competition frameworks but show that these alternative theories are inconsistent with the empirical patterns. As avenues for future exploration, we discuss some supplementary mechanisms that could potentially also generate separate spheres in upward intergenerational transfers in Section 6.

[3]For example, suppose that an additional brother decreases transfers by 10 percent while an additional sister increases transfers by 1 percent. Our empirical strategy enables us to make such distinction. Conversely, should we rely on the presence of a male rather than female sibling, we would only be able to tell that an additional brother decreases transfers by 11 percent more relative to an additional sister but not whether this is because an additional brother decreases transfers by 10 percent while an additional sister increases transfers by 1 percent or because an additional brother decreases transfers by 0 percent while an additional sister increases transfers by 11 percent.

2.1 Gendered Public Goods Model

We begin with the often-used assumption that familial support is based on an altruistic motive. Such a framework has received substantial support in the literature examining behavior in China and elsewhere (Bergeot, 2024; Brown, 2006; Cai et al., 2006; McGarry and Schoeni, 1995; Oliveira, 2016). We consider a multi-donor framework with one parent, the "recipient", and n altruistic children, the "donors". Because we are examining differences in giving associated with the gender of the child, we specify our model to focus on families in which there is at least one son and one daughter. Denoting sons with subscript S and daughters with subscript D, we have number of sons $n_S \geq 1$, number of daughters $n_D \geq 1$, and total number of children $n = n_S + n_D \geq 2$.

Let I_i denote income that child i has at his or her disposal. Without loss of generality, we assume that all sons have the same income I_S and that all daughters have the same income I_D.[4] Consistent with evidence of the existing gender-wage gap in China (Iwasaki and Ma, 2020), we further assume that $I_S > I_D$. Moreover, consistent with the QQ trade-off, we posit that the incomes of children decline with family size such that $\frac{\partial I_i}{\partial n_g} \leq 0$ with $g = S, D$ (Becker, 1974; Bagger et al., 2021). We establish that this correlation exists in our data (Appendix Table A1).

Each child cares about his / her own consumption, $c_i \in R_+$, and about parental well-being. A child may affect parental utility by providing support to their parent through coresidence, $h_i \in \{0,1\}$, or financial transfers, $t_i \in R_+$. Without loss of generality, we assume that coresidence entails a psychological or privacy cost $\gamma_i > 0$ to the child, which may differ across children.[5] For example, sons may face a lower privacy cost than daughters if they were brought up to expect to provide such support to parents (Das Gupta et al., 2003; Emery et al., 2019; Jayachandran, 2015), as per China's patrilocal norms. Financial transfers entail a budgetary cost by decreasing the amount available for the child's own consumption.

The parent cares about both coresidential support and financial transfers from children. With regard to coresidence, the utility the parent receives depends on which child is providing the support. Parental utility from housing is given by: $H = max\{\delta_1 h_1, ..., \delta_n h_n\}$, where $\delta_i \in R$ is the child-specific parameter that captures how the parent weights coresidence with different children. A parent may assign a higher δ_i to sons than daughters given patrilocal norms (Das Gupta et al., 2003; Emery et al., 2019; Jayachandran, 2015), but may also value more highly coresidence with

[4] We make this simplifying assumption to capture the key intuitions of the model; we extend the model to the case where children have different income levels within gender later on.

[5] This privacy cost can also be thought to include any cost from shared food, utilities, etc. Distinct financial transfers to co-resident parents are reported in the survey and we include those separately. The predictions of the model would still hold even without any privacy cost in the model.

a child whom the parent favors for reasons in addition to gender, such as emotional closeness. In contrast to the utility from shared residence that comes from a single child, the parent cares about *total* financial transfers but potentially differentially for the total from all sons $\left(T_S = \sum_{S=1}^{n_S} t_S\right)$, and total from all daughters $\left(T_D = \sum_{D=1}^{n_D} t_D\right)$. We assume that given the fungibility of financial transfers, parents make no distinction as to which son or which daughter provided support, but rather care only about the total received from each gender. H, T_S and T_D may therefore be considered as family public goods towards which each child may contribute.

A child i solves:

$$\max_{c_i>0, h_i\in\{0,1\}, t_i\geq 0} u(c_i) + \underbrace{v(T_S) + v(T_D) + H}_{Parent's\ Utility} - \underbrace{\gamma_i h_i}_{Privacy\ Cost}$$

subject to the budget constraint:

$$c_i + t_i = I_i.$$

We assume that u and v are strictly concave and twice continuously differentiable functions: $u' > 0$ and $u'' < 0$; $v' > 0$ and $v'' < 0$. Furthermore, utility is separable in the three public goods H, T_S and T_D. We provide evidence consistent with such separability in empirical Sections 3 and 5. The child's problem may be solved as part of a two-stage optimization problem: First, the child determines the coresidential support to the parent, taking into account privacy costs, and second, the child determines financial transfers to the parent, taking into account budget costs.

First Stage Optimization: Coresidence

Each child chooses coresidence:

$$\max_{h_i\in\{0,1\}} H - \gamma_i h_i,$$

where $H = max\{\delta_1 h_1, ..., \delta_n h_n\}$.

It is straightforward to see that the parent will not share a home with any child if there is no child for whom $\delta_i > 0$, that is, parents do not value coresidence with any child. Moreover, child i will potentially provide coresidential support only if child i derives some surplus from the arrangement: $\delta_i - \gamma_i \geq 0$.

To establish whether any child would reside with the parent, we proceed in two steps. First,

there must exist a child i such that:

$$\delta_i - \gamma_i \geq \delta_j \, , \forall j \neq i. \tag{1}$$

This condition is written from child i's point of view. Specifically, the left-hand side of the inequality denotes the benefit of coresidence by child i, δ_i, minus the cost incurred by child i, γ_i. Conversely, the right-hand side of the inequality denotes the benefit of coresidence by child j, δ_j; as it is the sibling who is coresiding with the parent, child i does not incur any cost. Thus for child i to coreside with the parent, it must be that the child i derives a greater net benefit from coresiding him/herself compared to letting another sibling coreside.[6]

Second, if condition (1) is satisfied, then the child with the greatest residential surplus ($\delta_i - \gamma_i$), may provide the coresidential support. To see this, consider a family with three children in which

$$\delta_1 - \gamma_1 > \delta_2 \text{ and } \delta_2 - \gamma_2 > \delta_3.$$

Intuitively, Child 1 will coreside with the parent because Child 1 receives a larger net benefit from providing coresidential support than if Child 2 or 3 were to do so. Similarly, Child 2 and 3 themselves receive larger benefits, δ_1, with Child 1 coresiding and incur no privacy cost, γ_i $i = 2,3$. If Child 1 did not exist, then Child 2 would provide the coresidential support. This structure leads to two testable predictions.

PREDICTION 1 (Coresidence propensity): Sons are more likely to provide coresidence support to parents than daughters.

As discussed above, coresidence is an experience good that is also publicly observable. Given that sons are expected to provide for parents in China (Ebenstein and Leung, 2010; National Research Council, 2012), a parent may lose face if they are observed to be living with a daughter rather than a son, or a son may be ashamed if he leaves this responsibility to his sister. In the light

[6]Given the non-cooperative nature of the public goods setting, there may exist situations where some parents do not coreside with any child, as children may prefer to free-ride on their siblings. For example, consider the situation where we have three children $i = 1,2,3$ with, respectively, $\delta_1 = 10$, $\delta_2 = 9$, and $\delta_3 = 8$, and $\gamma_1 = \gamma_2 = \gamma_3 = 3$. In this case, condition (1) is never satisfied. Child 1 would prefer that Child 2 or 3 coreside with the parent ($\delta_1 - \gamma_1 < \delta_j$ for $j = 2,3$) while both Child 2 and 3 would prefer that Child 1 coresides with the parent ($\delta_j - \gamma_j < \delta_1$ for $j = 2,3$). Absent of cooperation among siblings, no one will reside with the parent as they hope for their sibling to do so. The assumption of non-cooperation among siblings is relatively common in the literature (Bergeot, 2024; Oliveira, 2016).

of patrilocal norms, δ_i is thus likely to be greater for sons than for daughters—a parent simply prefers to reside with a son (Emery et al., 2019). And relatedly, privacy costs γ_i are likely to be lower for sons than daughters as expectations of support from sons are likely ingrained in children from an early age (Guo and Zhang, 2020).

PREDICTION 2 (Brothers crowd-out coresidence): An increase in the number of siblings decreases the probability that a son or daughter provides coresidence support to the parent. And the effect of an additional brother is greater than that of an additional sister.

An additional brother will reduce the probability that any sibling i provides coresidence by increasing the probability that another child in the family has a higher residential surplus, $\delta_j - \gamma_j$. These observations do not preclude daughters from providing coresidential support to parents, but given the preference for sons over daughters (Das Gupta et al., 2003; Emery et al., 2019; Jayachandran, 2015), the crowding-out effect of an additional brother will be larger than for a sister, and larger within rather than across genders.

Second Stage Optimization: Financial Transfers

Each child chooses financial transfers:

$$\max_{\{t_i\}} u\left(\underbrace{I_i - t_i}_{c_i}\right) + v\left(\sum_{S=1}^{n_S} t_S\right) + v\left(\sum_{D=1}^{n_D} t_D\right),$$

where the expression for consumption is derived from the budget constraint $c_i = I_i - t_i$.[7]

Given the separate gender-specific spheres existing for financial transfers, the second stage problem reduces to that of a gender-specific public good problem with homogeneous children within gender.[8] Under a symmetric Nash equilibrium among children of gender $g = S, D$, the optimal level of transfers to the parent is the solution to the following conditions:

$$\begin{aligned} -u'(I_g - t_g) + v'(n_g t_g) &= 0 \quad if \quad t_g > 0, \\ -u'(I_g - t_g) + v'(n_g t_g) &< 0 \quad if \quad t_g = 0, \end{aligned} \tag{2}$$

[7] As coresidence and privacy costs enter additively in a coresident child's utility function, they would not affect the optimization with respect to t_i. The above second stage problem is thus relevant to both coresident and non-coresident children.

[8] We discuss extensions with heterogeneity within a gender below.

where t_g denotes the optimal financial transfers from each child of gender $g = S, D$.

A child will provide financial transfers if the marginal utility from providing transfers is greater than the marginal utility from consumption at $t_g = 0$. From Appendix A.1, an increase in the number of brothers or sisters will have an indeterminate effect on the probability that a child provides financial support, that is, the extensive margin of transfers. Intuitively, an increase in the number of siblings of a given gender, n_g, may (i) decrease the individual amount of transfers from a child, t_g (shown below), and (ii) increase the total transfer amount from all children of gender $g = S, D$, T_g (shown in Appendix Section A.2). On the one hand, the decrease in t_g will increase consumption, c_g, which implies a decrease in the marginal utility from consumption as $u(c)$ is concave. On the other hand, the increase in T_g implies a decrease in the marginal utility from transfers as $v(T_g)$ is also concave. Whether an increase in the number of siblings will increase or decrease the probability that a child makes a transfer will thus depend on the relative magnitudes by which the marginal utilities from consumption and transfers change. If the marginal utility of consumption decreases by more (less) than the marginal utility from transfers, then the probability that the child makes a transfers will increase (decrease).

PREDICTION 3 (Transfer propensity): An increase in the number of brothers or sisters may increase or decrease the probability that a child provides financial support.

Consider next how an increase in the number of siblings will affect financial transfers on the intensive margin (i.e., when the first order conditions are satisfied with equality and $t_i > 0$). Taking the derivative of equation (2) with respect to t_S, n_S and n_D and rearranging, we obtain the following partial effects for children of gender $g = S, D$:

$$\frac{\partial t_g}{\partial n_g} = \frac{u'' \cdot \frac{\partial I_g}{\partial n_g} - v'' \cdot t_g}{u'' + v'' \cdot n_g} < 0. \tag{3}$$

$$\frac{\partial t_g}{\partial n_{-g}} = \frac{u'' \cdot \frac{\partial I_g}{\partial n_{-g}}}{u'' + v'' \cdot n_g} \leq 0. \tag{4}$$

From the partial effects, an increase in the number of brothers *unambiguously* leads to a decrease in the financial transfers provided by a son and *may* lead to a decrease in the financial transfers provided by a daughter. The reverse is true for an increase in the number of sisters; an increase in the number of sisters *unambiguously* leads to a decrease in the financial transfers provided by a daughter and *may* lead to a decrease in the financial transfers provided by a son.

The partial effect (3) can be decomposed into two separate effects. The first stems from the QQ trade-off in that given resource constraints, parents will likely have invested less in any particular child if they have more children, leading to a lower income for the child, and lower transfers. The second effect, one of free-riding, stems from the fact that transfers from sons and transfers from daughters are substitutable within gender and can therefore crowd-out transfers by a same-gender sibling. Thus, (3) is unambiguously negative. Conversely, the sign of the partial effect (4) depends on how the QQ trade-off operates between genders. If the number of siblings of the opposite gender does not impact parental investments in a particular child, then financial transfers from a son (for example) would not depend on the number of sisters, and visa versa. We investigate this mechanism empirically below.

Comparing expressions (3) and (4), we can see that if $\left|\frac{\partial I_g}{\partial n_g}\right| \geq \left|\frac{\partial I_g}{\partial n_{-g}}\right|$, then $\left|\frac{\partial t_g}{\partial n_g}\right| > \left|\frac{\partial t_g}{\partial n_{-g}}\right|$; if the income of a child of gender g is reduced by the same or by a greater amount when the child has an additional sibling of the same gender than when they have an additional sibling of the opposite gender, then the financial support from that child will be crowded out to a greater extent when the child has an additional same-gender sibling than an opposite-gender sibling. Conversely, if $\left|\frac{\partial I_g}{\partial n_g}\right| < \left|\frac{\partial I_g}{\partial n_{-g}}\right|$, then $\left|\frac{\partial t_g}{\partial n_g}\right| \gtreqless \left|\frac{\partial t_g}{\partial n_{-g}}\right|$. In particular, for $\left|\frac{\partial I_g}{\partial n_g}\right|$ close enough to $\left|\frac{\partial I_g}{\partial n_{-g}}\right|$, we may still have $\left|\frac{\partial t_g}{\partial n_g}\right| > \left|\frac{\partial t_g}{\partial n_{-g}}\right|$. Otherwise, $\left|\frac{\partial t_g}{\partial n_g}\right| \leq \left|\frac{\partial t_g}{\partial n_{-g}}\right|$.

Appendix Table A1 provides some suggestive evidence that predictors of a child's income may be reduced by the same or by a greater margin when the child has an additional sibling of the same gender than of the opposite gender. For example, having one more brother decreases the probability that a son has high school education or more by 2.1 percentage points ($p < .01$) while an additional sister decreases the probability that a son has has high school education or more by 0.9 percentage points ($p < .10$). The difference between the two effects are statistically significant at the 10% level. Similarly, having one more brother decreases the probability that a daughter has high school education or more by 1.7 percentage points ($p < .01$) whereas an additional sister decreases such probability by 2.1 percentage points ($p < .01$), although the difference between the two estimates is not statistically significant. Given that education attainment may determine individual child income, we expect $\left|\frac{\partial I_g}{\partial n_g}\right| \geq \left|\frac{\partial I_g}{\partial n_{-g}}\right|$, which leads to our final prediction.

PREDICTION 4 (Transfers crowd-out): A larger number of same-gender siblings leads to a larger decrease in the amount of financial transfers provided by a child, than would a larger number of opposite gender siblings.

2.2 Model Extensions and Alternative Models

Our model can be extended to the case in which sons and daughters care differentially about parental well-being, possibly due to patriarchal values (e.g., a son may feel more of an obligation to his own family than a daughter). The model can also be extended to the case where the incomes of children differ within gender, possibly due to different abilities. As shown in Appendix A.2 the predictions presented above carry over with these extensions.

We also explore the implications of two additional competing models in the appendices. The first is a standard public good model wherein total transfers from sons and daughters constitute one single public good (Appendix A.3). The second is a gendered competition model wherein sons and daughters compete for parental resources, modeled in our exposition as a bequest or attention from the parent (Appendix A.4). This competition model has the opposite prediction from the separate spheres model presented here, in that transfers from any one child can *increase* with the addition of a sibling as children compete for parental favor. We fail to find empirical support for either of these two competing models but discuss some potential supplementary mechanisms that may generate similar patterns in Section 6.

3 Descriptive Statistics

We now turn to an empirical analysis of transfers from children to parents to assess whether the patterns of transfer behavior align with the notion of gender-differentiated spheres of support within and across support types. To do so, we draw on the CHARLS, a panel study of the Chinese population ages 45 or older. The study surveys approximately 10,000 households and 17,500 individuals across 28 provinces in China (CHARLS Research Team, 2013). It follows the framework of the Health and Retirement Study (HRS) in the United States and similar "sister surveys" such as the English Longitudinal Study of Aging (ELSA) and the Survey of Health, Aging and Retirement in Europe (SHARE).

CHARLS contains detailed information on demographic and socioeconomic characteristics of the survey respondents, including information regarding each of their children. Importantly for our study, these data include information on financial transfers (both monetary and in-kind gifts) between parents and their children, as well as information regarding their living arrangements. We focus our main analytic sample to observations from the 2015 wave, which is the latest wave to have been subject to the rigorous cleaning and imputation procedures that the CHARLS team

undertook to create child level data sets. Nevertheless, we also perform sensitivity analyses on adjacent waves, 2013 (subject to the same data cleaning and imputation as for 2015) and 2018 (subject to the authors' own cleaning).[9]

3.1 Sample

While most of the data in CHARLS are reported at the respondent (parent) level, our analyses are primarily based on adult children. To create our child-level sample, we take the information relevant to each child as reported by the parent and merge it with family-level data.[10] The selection criteria for our child-level sample are illustrated in Appendix Figure A1.

We begin with an initial sample of 32,630 children. Because our focus is on support from children to their parents, we limit our sample to children in families in which the parent (or the average age of both parents in two-parent families) is 60 or older and the child is 25 years old or older, and thus unlikely to still be in school. These restrictions reduce the sample to 18,848 children. To examine the role of a child's gender in determining the distribution of support among siblings, we further require that there be at least two children in the family, and at least one son and one daughter. These restrictions reduce our sample to 15,599 children. Finally, we delete 486 observations for children with missing values on financial transfers and one outlier with reported transfers of 100 million yuan (over $14 million). Our final analytic samples consist of 15,113 children from 4,077 families, of which 7,535 observations are for sons and 7,578 are for daughters.

Note that most children in our sample would have been born prior to the 1979 OCP as well as prior to the introduction of sex-screening technology in the 1980s in China. As described above, the majority of families have at least two children of different genders so that limiting the sample to such families is not very restrictive. Nevertheless, we conduct sensitivity analyses removing the age and gender composition restrictions as external validity checks, and find the results to be very similar to those from the mixed-gender sample. We also report the results of analyses for separate sub-samples of urban and rural respondents (the latter of which, was bounded only at the third birth under the OCP (Zhang, 2017), for families with and without coresident children, and separately for each adjacent survey wave. The results are robust to these sub-sample analyses.

[9]The first wave of the survey was fielded in 2011, but due to changes in the questions on financial transfers, we do not use data from this wave. The wording of questions regarding financial transfers in the 2011 wave appears to have led to substantial under-reporting of transfers relative to later waves.

[10]In the case of a married couple, one spouse is designated as the family respondent and provides information on children.

Table 1 reports selected summary statistics separately by the gender of the child, divided approximately equally between sons and daughters. Sons have approximately 1.43 brothers and 1.86 sisters, while daughters, on average, have 1.87 brothers and 1.45 sisters. The average age of children is 44 and nine percent are reported to be in poor or very poor health. Sons in our sample have more schooling than daughters: 57 percent of sons but just 43 percent of daughters have a middle school education or more. Rural residence still dominates in this cohort with 50 percent of sons and 60 percent of daughters living in a rural area, consistent with the greater schooling of sons and their more likely migration to an urban area. Nearly all children in our sample are married: 90 percent of sons and 93 percent of daughters. Average household income in the past year for a son or a daughter are very similar, at around 34,000 yuan ($\approx$ 5,100 USD).[11]

Table 1 Socio-economic Characteristics of Children

	Sons		Daughters	
	Mean/Prop.	SD	Mean/Prop.	SD
Age	43.64	(8.14)	43.86	(8.00)
Relative birth order	0.53	(0.39)	0.47	(0.38)
No. of brothers	1.43	(1.21)	1.87	(1.03)
No. of sisters	1.86	(1.02)	1.45	(1.24)
Prop. primary school or less	0.43	(0.49)	0.57	(0.50)
Prop. middle school	0.35	(0.48)	0.26	(0.44)
Prop. high school or more	0.22	(0.42)	0.17	(0.37)
Prop. married	0.90	(0.30)	0.93	(0.25)
No. of children	1.65	(0.99)	1.75	(0.84)
Prop. live in urban area	0.50	(0.50)	0.40	(0.49)
Prop. in poor health	0.09	(0.28)	0.09	(0.29)
Household income (yuan)	33,915.11	(43,413.84)	34,776.93	(43,285.01)
No. of children	7,535		7,578	

Note: Means or proportions and standard deviations (in parentheses) from the child sample. Relative birth order – elaborated on below – is a measure of birth order that is scaled by sibship size to lie between 0 and 1, with 0 denoting the oldest and 1 denoting the youngest child in the family.

The situation of the parents is also likely to impact transfers. Table 2 reports selected summary statistics at the household level for the parents (respondents). The average age of parents is 70.

[11]Each child's household income is reported in categories by the parent chosen to be the family respondent. We use the midpoint of the category to proxy a child's income and treat it as a continuous value. Income is missing for 29 percent of children. So, we use cross-wave imputations, drawing on data from the 2011 to 2018 waves. This imputation method reduces the percent of missing values to 1 percent for sons and 2 percent for daughters. The difference by gender is not significantly different from zero at the 10 percent level. We use a dummy variable to control for missing income in our regression analyses. All monetary variables have been deflated to 2018 values in this study.

Schooling levels are low for this cohort: 31 percent report being illiterate, while just 22 percent have middle school education or more.[12] Consistent with the greater longevity of women, 10 percent of the parents are unmarried males while 26 percent are unmarried females. Because most of this cohort's was child-bearing years prior to the establishment of the OCP, they have nearly four (3.8) children on average. Approximately two-thirds of households are located in a rural area, 45 percent reported being in poor or very poor health, and average wealth is a bit less than 400,000 yuan ($\approx$ 60,000 USD).

Table 2 Socio-economic Characteristics of Parents

	Mean/Prop.	SD
Age	70.12	(7.35)
Prop. illiterate	0.31	(0.46)
Prop. primary school	0.47	(0.50)
Prop. middle school or more	0.22	(0.41)
Prop. married	0.64	(0.48)
Prop. single male	0.10	(0.29)
Prop. single female	0.26	(0.44)
No. of children	3.80	(1.46)
Prop. live in urban area	0.36	(0.48)
Prop. in poor health	0.45	(0.50)
Net household wealth (yuan)	398,883.40	(5,931,293.00)
No. of parents	4,077	

Note: Means or proportions and standard deviations (in parentheses) from the parent sample.

3.2 Old Age Support by Child Gender

Our study focuses on support for parents in the forms of coresidence and financial transfers. While the direction of financial gifts is obvious, shared living arrangements could potentially indicate mutual support or support from parent to child. Past literature has found evidence of positive associations between the likelihood of coresidence with parents and children's filial piety and parental needs, as well as the provision of grandchild care (Zhang et al., 2014). As a proxy for the primary direction of the coresidence transfer, we use the homeownership status of the child. If a child lives with the parent and is reported to own a home, we presume that the parent is the primary beneficiary

[12]For married couples, age is the average age of the two spouses, schooling is that reported for the husband, and health is a measure of whether either spouse reports being in poor or very poor health. Wealth and urban residence are measured at the household level.

of the shared living arrangement.[13] As shown in Table 3, 22 percent of sons provided residential support to parents compared to 3 percent of daughters, a statistically significant difference at the one percent level.

Table 3 Support from Sons and Daughters

	Sons	Daughters	Difference
Prop. coresident homeowner	0.22	0.03	0.19***
	(0.00)	(0.00)	(0.01)
Prop. gave financial support	0.70	0.78	-0.08***
	(0.01)	(0.01)	(0.01)
Amount of financial support (>0)	2,755.81	1,743.08	1,012.73***
	(127.84)	(68.47)	(140.59)
No. of children	7,535	7,578	

Note: Means or proportions and standard errors (in parentheses) from the child sample. Two-tailed proportion or t-tests of differences are reported. $^{*}p < .10;^{**}p < .05;^{***}p < .01$.

We define financial support to parents as any monetary or in-kind transfers that children made over the previous year. Monetary transfers can include cash or payment of bills, while in-kind transfers include the value of gifts of food and clothing and other items. As shown in Table 3, the vast majority of children give financial transfers to parents. Moreover, significantly more daughters than sons made a financial transfer: 70 percent of sons versus 78 percent of daughters. However, conditional on making a transfer, sons provided an average of 2,756 yuan ($\approx$ 413 USD) while daughters provided an average of just 1,743 yuan ($\approx$ 261 USD). These differences by gender on both the extensive and intensive margins are again statistically significantly different from zero at the one percent level.

Table 4 examines the differences in giving by residency status. Consistent with the conceptual framework, there are no statistically significant differences in financial support by whether the parent coresides with the child. In particular, all four gender-specific comparisons of coresident

[13]Our measure of coresidence is based on the question "Where does this [child's name] normally live now?". A child is considered to coreside with the parent if the child lives in the same household or courtyard and as non-coresident if the child lives in another household, province/city/district, or abroad. Home ownership status of each child comes from the question: "Does [child's name] own a house?" Approximately 63 percent of sons who are living with a parent own a house as do 60 percent of daughters. Sensitivity analyses ignoring home ownership status, as well as sensitivity analyses that add the condition that the parent themselves does not own a house (11 percent of sons and 1.4 percent of daughters owned a house and lived with parents who did not fully or partially own a house) yield qualitatively similar results. We control for parental wealth (inclusive of housing wealth) and the number of grandchildren in the main analyses presented below. We further perform sensitivity analyses controlling for intervivos transfers of time and money from parents to children to capture potential mutual exchanges that could drive co-residence. Our results are robust to these inclusions.

and non-coresident giving (gave financial support and amount of financial support given, by living arrangement) are not statistically significantly different from zero at the 10 percent level. These results are broadly consistent with the separability of residential and financial support assumed in Section 2.1. We revisit this discussion in Section 5.

Table 4 Financial Support from Sons and Daughters by Coresidency

	Sons		Daughters	
	Coresident	Non-Resident	Coresident	Non-Resident
Gave financial support	0.70	0.69	0.75	0.78
	(0.01)	(0.01)	(0.03)	(0.00)
Amount of financial support (>0)	2,747.45	2,758.14	1,919.97	1,737.97
	(162.93)	(157.06)	(193.82)	(70.23)
No. of children	1,636	5,899	220	7,358

Note: Means and standard errors (in parentheses) from the child sample.

4 Empirical Strategy

The conceptual framework in Section 2 implies that support from a child will be a function of a child's own gender as well as the number of brothers and sisters the child has. We discuss the identification challenges arising in this empirical exercise and present a two-step estimation strategy that also employs an instrumental variable strategy.

4.1 Identification

A straightforward ordinary least squares (OLS) regression model at the child level is:

$$S_{ij} = \beta_0 + \beta_1 Male_{ij} + \beta_2 Brothers_{ij} + \beta_3 Sisters_{ij} + \beta_4 \left(Male_{ij} \times Brothers_{ij}\right)$$

$$+ \beta_5 \left(Male_{ij} \times Sisters_{ij}\right) + \theta_B' BirthOrder_{ij} + \theta_E' Economic_{ij} + \theta_C' X_{ij}^C + \theta_P' X_j^P + \varepsilon_{ij}, \qquad (5)$$

where S_{ij} represents old age support from child i in family j, alternatively, coresidential support yes/no), financial support (yes/no) and the natural logarithm of the amount of financial support conditional on positive values.

$Male_{ij}$ is a dummy variable that takes a value of 1 if child i is male and a value of 0 otherwise. $Brothers_{ij}$ is the number of brothers that child i has, and $Sisters_{ij}$ denotes the number of sisters. We include interaction terms between $Brothers_{ij}$ and $Male_{ij}$ and between $Sisters_{ij}$ and $Male_{ij}$ to allow for differential effects of brothers and sisters by the gender of the child. The coefficients of interests are the βs. β_1 captures differences in the level of parental support by child gender. β_2 and β_3 capture the responsiveness of support from daughters with respect to an additional brother or sister while $(\beta_2+\beta_4)$ and $(\beta_3+\beta_5)$ capture the responsiveness support from sons to an additional brother or sister, respectively.

While our focus is on these βs, equation (5) also includes a set of additional control variables likely to be correlated with parental support. $BirthOrder_{ij} = \frac{RawBirthOrder-1}{FamilySize-1}$ captures relative birth order, a measure of birth order that is scaled to lie between 0 and 1, with 0 denoting the oldest and 1 denoting the youngest child in the family (Eirnaes and Pörtner, 2004). We include the interaction of $BirthOrder_{ij}$ with $Male_{ij}$ to allow for the possible differential effect of birth order by gender.[14] $Economic_{ij}$ represents a vector of variables approximating the child's economic status and ability to make transfers. It includes indicators for whether child i has a middle school education, or a high school education or more (with the reference category being primary school or less), and the inverse hyperbolic sine transformation of household income of the child $sinh^{-1}(HH\ income)$.[15] It further includes interaction terms between the education indicators and $Male_{ij}$, and an interaction term between $sinh^{-1}(HH\ income)$ and $Male_{ij}$ to allow for the fact that sons likely earn more than daughters, and if married, may have a greater say in determining how household income is used than would a married daughter. We also control for an indicator for missing child income as well as its interaction with child gender.

The child's other control variables, X_{ij}^C, include demographic characteristics: a second order polynomial in age, male (yes/no), married (yes/no), married interacted with male, number of children (i.e., the grandchildren of the respondent), number of children interacted with male, an indicator of poor health (yes/no), and whether the child lives in an urban area (yes/no). The control variables for the characteristics of the child's parents (X_j^P), include a second order polynomial in age, single male (yes/no), single female (yes/no), indicator variables for primary school or middle school or more (with the reference category being illiteracy), an inverse hyperbolic sine transfor-

[14] The results and inferences are robust to including a vector of indicators for whether the child i is the second, third, fourth, or fifth or higher child in family j, with the reference category being the first born, and to using indicators for just the oldest and youngest child.

[15] We use the inverse hyperbolic sine as an approximation of the natural logarithm because it is defined for zero (and negative values).

mation of household net wealth, an indicator for missing net wealth (yes/no), an indicator of poor health (yes/no), urban residence (yes/no), and dummy variables for each province. ε_{ij} is an error term that is clustered at the family level to allow for within-family correlations.

This simple formulation (5) raises two specific challenges to identification. First, unobserved family-level characteristics may affect parental support from children as well as affect the number of brothers and sisters (i.e., family size). For example, parents with preferences for a larger family may also instill in their children more altruistic norms and loyalty to family. If so, then one would expect a positive correlation between the number of siblings and the error term ε, and OLS estimates of $\beta_2 - \beta_5$ would be biased upward. To address this omitted variables issue, we use a heteroscedastic-based instrumental variable estimator as proposed by Lewbel (2012). Rather than rely on external instruments, this method relies on constructing valid instruments based on assumptions regarding the covariance of the heteroscedastic error terms with a set of regressors, which we elaborate on below. This method has become popular recently for cases in which external instrumental variables are weak or unavailable (Breschi and Lenzi, 2016; Deuflhard et al., 2019; Emran and Hou, 2013; Ho, 2022; Millimet and Roy, 2016).[16]

The second concern with a simple OLS approach is that the number of brothers and sisters are likely to be jointly endogeneous with a child's schooling level and income, given the traditional QQ trade-off. We put the QQ trade-off assumption to a test in Appendix Table A1 and find negative associations between a child's education and household income and the number of siblings, a result consistent with less investment in children in larger families. To mitigate this multi-endogeneity issue, we adopt a two-step estimation strategy similar in spirit to that proposed by Bagger et al. (2021) and applied in recent studies such as Bratti et al. (2020). The first step employs a set of family fixed effect models to estimate the effect of a child's relative birth order and economic variables on the provision of support to parents. The second step calculates a value for predicted

[16]We also considered a traditional external instrumental variables approach with instrumental variables being (i) the gender of the first born child, (ii) first-born twin boys and twin girls, and (iii) the number of brothers and sisters of the parents. Prior work has shown a correlation between these variables and family size (Beaujouan and Solaz, 2019; Lee, 2007; Oliveira, 2016). However, these instrumental variables were unappealing for the following reasons: (i) gender of the first born child is often posited to affect old age support directly (Horioka et al., 2018; Jayachandran and Pande, 2017), thus violating the exclusion restriction, (ii) the number of first-born twins in the data is very small: just 0.26 percent and 0.33 percent of children were in families with first-born twin boys or twin girls, respectively. Moreover, recent work has shown that twin births may not be exogenous (Bhalotra and Clarke, 2019a,b), (iii) as with (i), unobserved family preferences in the parental generation's birth family, could simultaneously drive norms of old age support and fertility in a family, again violating the exclusion restriction. The Kleibergen-Paap Wald rk F tests further indicate that these constitute weak instruments (Kleibergen-Paap $F < 1$) in the current context.

support net of the estimated effects of birth order and of the economic variables based on the estimates from the first step, along with a Lewbel (2012) instrumental variable strategy, to identify the effects of the number of brothers and sisters as well as their interaction terms on old age support.

4.2 First Step: Family Fixed Effects Models

The first step estimates a family fixed effects (FE) version of our primary specification (5):

$$S_{ij} = \alpha_0 + \alpha_1 Male_{ij} + \alpha_B' BirthOrder_{ij} + \alpha_E' Economic_{ij} + \alpha_C' X_{ij}^C + \mu_j + \eta_{ij}, \tag{6}$$

where μ_j is an unobserved family fixed effect that captures characteristics that are specific to a particular family and do not vary across children. These include parental variables, X_j^P, as well as unobserved family characteristics such as beliefs regarding familial obligations and attitudes towards altruism. Note further that the number of brothers and sisters as well as their interactions with $Male_{ij}$ are absorbed by the family fixed effects specification. We cluster the standard errors at the family level because errors within a family may be correlated.

Variation across siblings allows us to identify the effects of birth order, education, and income. As discussed above, the second step of our estimation strategy uses the predicted values of S_{ij}, net of birth order and economic effects as the dependent variable, such that $\hat{S}_{ij} = S_{ij} - \hat{\alpha}_B' BirthOrder_{ij} - \hat{\alpha}_E' Economic_{ij}$.[17]

4.3 Second Step: Heteroscedastic Based Instrumental Variable Models

Our second step is to estimate the effects of the number of brothers and the number of sisters on support to parents net of birth order and economic effects ($\hat{S}_{ij}$). To do so, we employ a two-stage least squares (2SLS) estimation strategy following Lewbel (2012). This method constructs valid instrumental variables by exploiting the heteroscedasticity of the error terms from regressions predicting the value of the endogenous predictors.

[17] To the extent that the *Economic* variables capture child quality or income I, this strategy enables us to identify partial effects (3) and (4) net of the QQ trade-off effects. Sensitivity analyses excluding *Economic* variables as controls yielded similar results and inferences (available upon request), suggesting that either *Economic* variables are not proxying for I or that the QQ trade-off does not affect old age support by much in our context.

Consider the following regressions for the of set endogenous predictors y_{ij}:

$$y_{ij} = \Theta' X_{ij} + \zeta_{ij}, \tag{7}$$

where $y_{ij} = \left\{Brothers_{ij}, Sisters_{ij}, Male_{ij} \times Brothers_{ij}, Male_{ij} \times Sisters_{ij}\right\}$ and $X_{ij} = \left\{X_j^P, X_{ij}^C\right\}$.

In the presence of heteroscedastic error terms, ζ, 2SLS models using $(Z - \bar{Z})\,\hat{\zeta}$ as instruments for y yield consistent estimates of $\beta_2 - \beta_5$, where Z is a subset of X and $\bar{Z}$ is the sample mean of Z. We employ second order polynomials in the ages of the child and of the parent, gender of the child, and whether the parent is a single male or female as our Z in the main analyses. In sensitivity analyses, we also set $Z = X$, and the results were quantitatively very similar.

Consistent estimates of $\beta_2 - \beta_5$ may be obtained as follows:

a. *Construct instrumental variables:* Estimate $\hat{\Theta}$ by OLS regression of (7) and obtain the residuals $\hat{\zeta}$. Construct the instrumental variables $(Z - \bar{Z})\,\hat{\zeta}$.

b. *Estimate the first stage of the 2SLS:* Regress y_{ij} on X_{ij} and $(Z - \bar{Z})\,\hat{\zeta}$:

$$y_{ij} = \Theta' X_{ij} + \Omega' (Z - \bar{Z})\,\hat{\zeta} + \zeta_{ij}, \tag{8}$$

and obtain the predicted values, $\hat{y}_{ij}$.

c. *Estimate the second stage of the 2SLS:* Regress $\hat{S}_{ij}$ (predicted from the first step family fixed effects regressions (6)) on $\hat{y}_{ij}$ (predicted from the first stage of the 2SLS (8)):

$$\hat{S}_{ij} = \beta_0 + \beta_1 Male_{ij} + \beta_2 \widehat{Brothers}_{ij} + \beta_3 \widehat{Sisters}_{ij} + \beta_4 \left(\widehat{Male_{ij} \times Brothers_{ij}}\right)$$

$$+ \beta_5 \left(\widehat{Male_{ij} \times Sisters_{ij}}\right) + \theta_C' X_{ij}^C + \theta_P' X_j^P + \varepsilon_{ij}, \tag{9}$$

These heteroscedastic-based instrumental variables work in a similar fashion to traditional external instrumental variables and are equivalent to having probabilistic instruments or shifters (Rigobon, 2002, 2003). For instance, consider two sub-samples, one with a larger variation in family size and another with a smaller variation. The sub-sample with the larger variance is more likely to include families in the tails of the distribution of family size than is the sub-sample with a smaller variation. In a standard instrumental variables approach, valid external instruments will shift family size. In our heteroscedastic instrumental variable approach, shocks to family size are more likely to occur in the sub-sample with the larger variance compared to the sub-sample with

the smaller variance. The constructed instrumental variables are thus equivalent to having probabilistic instruments and the 2SLS strategy estimates the causal effects of the endogenous predictors on the main outcomes of interest (Deuflhard et al., 2019; Emran and Hou, 2013).

Formally, identification requires that $cov\left(Z,\zeta^2\right) \neq 0$. This assumption implies that ζ is heteroscedastic with respect to Z. The constructed instrumental variables will be stronger when this covariance is higher, and weaker when the covariance is lower. This assumption is testable using standard tests of heteroscedasticitity and is reflected in the F-statistic for $(Z-\bar{Z})\,\hat{\zeta}$ in the first-stage regressions. The assumption is easily satisfied in our data: Breusch-Pagan tests of heteroscedasticity always reject the presence of constant variances at the 1 percent statistical level in equation (7) and the F-statistics are always above 100, suggestive of strong instruments.[18] The test statistics are reported for the main results in next section.

A second identifying assumption is that $cov\left(Z,\varepsilon\zeta\right) = 0$. This assumption requires that the covariates Z, that are used to construct the instrumental variables, are uncorrelated with the product of the heteroscedastic errors. Lewbel (2012) shows that the two identification assumptions are satisfied in models in which the correlation of errors is due to an unobserved common characteristic. In the context of this study, parents with a preference for a larger family may also raise children who are more generous or more committed to family themselves. In this case, one may expect a correlation between ε and ζ due to a common unobserved family taste component. If the correlation of errors is only due to this unobserved family taste component, then the two assumptions would be satisfied in our context. While the second assumption cannot be directly tested, we report the p-values from Hansen tests of the hypothesis that the overidentifying restrictions in the 2SLS estimation are valid at the bottom of all regression tables below. Failure to reject the hypothesis provides additional evidence in support of the estimator, although rejecting the hypothesis does not necessarily point to an identification failure (Angrist and Pischke, 2008; Deuflhard et al., 2019; Emran and Hou, 2013). The Hansen J-tests fail to reject the null hypothesis at the 5 percent statistical level in most specifications, which gives us greater confidence in the validity of the constructed instruments.

Finally, because the dependent variables in equation (9) are predicted from the first step, and because the residuals across siblings of the same family may be correlated, we follow Bagger et al.

[18]The Breusch-Pagan test is applicable to pooled OLS (Angrist and Pischke, 2008). However, as we have a *de facto* panel with potential correlation in ζ_{ij} among children of the same family, we also perform separate tests by birth order such that we have only one child from each family in each test. Once again, the null hypothesis of constant variances is always rejected, even when we apply the stringent Bonferroni correction for multiple hypothesis testing and multiply the p-values by five (for the five birth orders).

(2021), and block-bootstrap the standard errors at the family level using 200 repetitions.

5 Results

This section presents the results on the responsiveness of support from sons and daughters to the number of brothers and sisters, using the two-step estimation outlined above. In line with the key predictions of the separate spheres framework, we find that sons are more likely to provide coresidence than daughters and the probability that any child coresides with parents decreases when the child has more brothers but not more sisters. Moreover, we find that the number of siblings has mixed effects on the probability that any child provides financial transfers. Finally, there is significant evidence of crowd-out of financial transfers by siblings, with this crowding-out far stronger within gender than between genders; each daughter gives less when she has more sisters but not when she has more brothers, while each son gives less when he has more brothers but not when he has more sisters. These patterns are robust for both cash and in-kind transfers, for children in families with non-coresident children only, across the sub-samples of rural and urban families, and across a battery of additional sensitivity analyses.

5.1 First Step: Responsiveness to Birth Order and Economic Variables

The first estimation step employs a family fixed effects model (6) to estimate the relationship between relative birth order, education, and income, and support from children to their parents. As shown in Table 5, we find that the youngest son is 4.4 percentage points more likely to coreside with parents than the oldest son ($p < .01$). Moreover, youngest daughters are 3.4 percentage points less likely to give financial transfers than oldest daughters ($p < .10$). There is no apparent pattern by birth order in the amount of financial support. The results and inferences are robust when we control for raw birth order indicators (see footnote 14) or for indicators for being the oldest or youngest in lieu of relative birth order.

These results may seem surprising given that some prior research has found a preference towards eldest sons in Asian countries such as Japan and India (Horioka et al., 2018; Jayachandran and Pande, 2017). However, while evidence of gender bias in China abounds (Das Gupta et al., 2003; Ho, 2019; Huang et al., 2024; Jayachandran, 2015), evidence towards eldest son bias is lacking and often anecdotal. Wang et al. (2020) point out that the existence of an eldest son preference in China has not been verified in rigorous empirical work. Using data from the China Family Panel

Table 5 Responsiveness of Support to Birth Order, Education, and Income

	Co-resident Homeowner (1)	*Gave Financial Support* (2)	*Ln(Amount of Financial support)* (3)
Sons			
Relative birth order	0.044***	0.018	0.021
	(0.016)	(0.017)	(0.058)
Middle school	-0.043***	0.029**	0.017
	(0.012)	(0.012)	(0.040)
High school or more	-0.113***	0.058***	0.185***
	(0.014)	(0.015)	(0.049)
Sinh^{-1}(HH income)	0.006***	0.011***	0.023***
	(0.001)	(0.002)	(0.006)
Daughters			
Relative birth order	-0.022	-0.034*	-0.042
	(0.014)	(0.018)	(0.058)
Middle school	0.012	0.021*	0.157***
	(0.009)	(0.012)	(0.037)
High school or more	0.036***	0.042***	0.360***
	(0.012)	(0.016)	(0.051)
Sinh^{-1}(HH income)	0.001	0.012***	0.022***
	(0.001)	(0.002)	(0.005)
Child gender			
Male	0.141***	-0.189***	0.261**
	(0.026)	(0.036)	(0.119)
R-squared	0.137	0.052	0.069
Mean/prop. of dependent var.	0.123	0.738	6.801
No. of children	15,113	15,113	11,151

Note: Marginal effects and standard errors (in parentheses) are reported. The first step employs family fixed effects models and cluster standard errors at the family level. Child control variables include second order polynomials in age, indicators for male, married (and its interaction with male), poor health, urban region, and number of children (and its interaction with male). Note that parent variables, family size, and sibship gender composition are absorbed by the family fixed effects. $^{*}p < .10;^{**}p < .05;^{***}p < .01$.

Studies, they find no evidence of preference towards eldest sons relative to younger sons in terms of educational investments. Our findings are also consistent with the findings of Compton and Pollak (2015) in the United States, Konrad et al. (2002) in Germany, and Lei et al. (2015) in China, all of which find that younger children (and youngest sons in the case of China) are more likely to coreside with parents than older children.[19]

[19]One suggested explanation for such finding is that older children have a first-mover advantage and choose to locate further away from parents making it difficult to provide care or share housing, and thus shifting any future burden to younger siblings (Konrad et al., 2002).

The results also indicate that while the probability of coresidence decreases with education for sons, it increases with education for daughters. Education could affect the probability of coresidence in two ways: First, more schooling typically implies greater income, making it more likely that a child would have resources necessary to support a coresidential arrangement. Second, education could be associated with a greater probability of migrating away from home (Adda et al., 2022). Our results indicate that for sons, who are likely to be the primary earners in their families, the migration effect dominates, while for daughters, the likely secondary earners, the resources play the greater role. With respect to financial transfers, we find that for both sons and daughters, greater education is associated with a greater probability and amount of transfers, with the positive effects of high school being significantly different from zero. The result is consistent with most other work showing that children with more resources provide greater financial transfers to parents (Cai et al., 2006; Raut and Tran, 2005).

5.2 Second Step: Responsiveness to Sibling Gender Composition

Our second estimation step uses the coefficient estimates from the first step (shown in Table 5) to calculate a measure of predicted support, net of birth order and economic effects. Using this measure as the dependent variable, we estimate the relationship between support from sons and daughters and the number of brothers and sisters they have, using the 2SLS procedure from regression (9).[20] The results for the coefficients of interest are reported in Table 6 with additional coefficients estimates contained in Appendix Table A3.

We find that sons are 15.5 percentage points more likely to provide coresidential support than daughters ($p < .01$), which is consistent with Prediction 1 of the gendered public goods model. Moreover, sons are 16.2 percentage points less likely to give financial transfers ($p < .01$). However, when making financial transfers, sons give amounts that are 20.1 percent larger than those from daughters ($p < .10$). These findings align with the descriptive statistics presented in Section 3.2.

An increase in the number of brothers leads to a 4.4 percentage points decrease ($p < .01$) in the probability that a son coresides with his parent, but the effect of an additional brother for daughters is just 0.7 percentage points ($p < .01$), indicating that coresidence with a daughter is a poor substitute for living with a son. Moreover, an increase in the number of sisters has a statistically insignificant effect on coresidency for sons and a small 0.4 percentage points decrease

[20] OLS estimates of (5) are reported in Appendix Table A2 and are very close to the estimates from two-step estimation. Probit and tobit estimates (not shown) of discrete and censored outcomes, respectively, also yielded similar marginal effects to OLS estimates.

Table 6 Responsiveness of Support to Sibling Gender Composition

	Co-resident Homeowner (1)	*Gave Financial Support* (2)	*Ln(Amount of Financial support)* (3)
Sons' responsiveness to			
No. of brothers	-0.044***	0.018***	-0.104***
	(0.005)	(0.007)	(0.020)
No. of sisters	0.003	-0.020***	-0.019
	(0.005)	(0.007)	(0.022)
Daughters' responsiveness to			
No. of brothers	-0.007***	0.010*	-0.027
	(0.002)	(0.006)	(0.019)
No. of sisters	-0.004**	-0.005	-0.091***
	(0.002)	(0.006)	(0.018)
Child gender			
Male	0.155***	-0.162***	0.201*
	(0.021)	(0.030)	(0.107)
R-squared	0.091	0.058	0.146
Hansen overid J stat [p-val]	34.27 [0.08]	23.26 [0.50]	17.30 [0.84]
1st Stage Tests			
Breusch-Pagan χ^2 stat [p-val]			
Brothers	796.27 [0.00]	796.27 [0.00]	785.92 [0.00]
Sisters	361.60 [0.00]	361.60 [0.00]	203.53 [0.00]
Male x Brothers	7,044.23 [0.00]	7,044.23 [0.00]	5,945.54 [0.00]
Male x Sisters	7,651.62 [0.00]	7,651.62 [0.00]	6,403.56 [0.00]
Kleibergen-Paap F stat	401.50	401.50	361.73
Mean/prop. of dependent var.	0.123	0.738	6.801
No. of children	15,113	15,113	11,151

Note: Marginal effects and standard errors (in parentheses) are reported. The second step uses the predicted measures of support from the first step, net of birth order, education and household income effects, and a heteroscedastic based instrumental variable strategy. Child control variables include second order polynomials in age, indicators for male, married (and its interaction with male), poor health, urban region, and number of children (and its interaction with male). Parent control variables include second order polynomials in age, indicators for single male, single female, primary school, middle school or more, poor health, and urban region, $sinh^{-1}$(household net wealth), an indicator for missing wealth, and dummies for province of residence. Standard errors are block-bootstrapped at the family level using 200 repetitions. Hansen tests of the hypothesis that the over-identifying restrictions are valid; F tests of whether the instruments are jointly significant from the first stage of the second step; and Breusch-Pagan tests of the hypothesis of constant variances in equation (7). $^{*}p < .10$;$^{**}p < .05$;$^{***}p < .01$.

in the probability that a daughter coresides with parents ($p < .05$). These findings are consistent with Prediction 2 and suggest that coresidential support from sons and daughters fall into different spheres.

Looking at whether any financial support is given to parents, we find that an additional brother increases the probability that a son makes a transfer by 1.8 percentage point ($p < .01$) but leads to a smaller 1 percentage point increase for daughters ($p < .10$). Conversely, an increase in the number of sisters is associated with a 2 percentage point decrease in the probability that a son gives a transfer ($p < .01$) but has no statistically significant effect on daughters. These mixed findings are consistent with Prediction 3 of the gendered public goods model, in that the number of siblings may increase or decrease the probability that a child makes a transfer, depending on whether the marginal utility of consumption decreases by more or less than the marginal utility from transfers. Recall though that the vast majority of children give to parents in our setting (see Table 3) so that the patterns of transfers at the intensive margin are more pertinent.

When turning to the amount of transfers, we find strong evidence of gender-specific crowd-out. An additional brother is associated with a 10.4 percent decrease in the amount ($p < .01$), while an additional sister leads to just a statistically insignificant 1.9 percent decrease. For daughters, the reverse is true, with an additional sister leading to a 9.1 percent decrease in the amount ($p < .01$) while an additional brother is associated with a statistically insignificant 2.7 percent decline. These results are again consistent with the prediction of our model, Prediction 4. In particular, financial transfers are crowded-out to a much greater extent (approximate 3 to 5 times greater) when there is an increase in number of same-gendered siblings relative to opposite-gendered siblings, again pointing to the existence of separate spheres of support even within a relatively fluid currency.[21]

5.3 Additional Inferences

We now explore support from children in greater detail, first by disaggregating financial transfers into those transfers made as cash gifts and those transfers that are made in-kind, second, by examining the behavior of children in families with and without a coresident child, and third, by assessing whether there are differences in behavior between rural and urban families.

[21]The results on financial transfers were also robust to controlling for coresidence as follows. From the first step, use the family fixed effects model to estimate old age support net of birth order, economic and coresidence effects, and from the second step, use 2SLS to estimate the effects of the number of brothers and sisters on the net predicted old age support from the first step. The findings were also robust to additionally controlling for proximity (living in a different household but in the same village or neighborhood). Results are available upon request.

Cash and In-Kind Transfers. We previously defined financial support to include both the transfer of cash (including payment of bills) and gifts in-kind (including items such as food and clothing). Among the 74 percent of children making a financial transfer of some sort, 44 percent made gifts of both types, 28 percent made only cash transfers, and 28 percent made only gifts in-kind. However, the average value of cash transfers, at 2,091 yuan, is more than twice as large as the average value of in-kind gifts, at 993 yuan. When cash and in-kind gifts are examined separately by gender, daughters are more likely to provide both cash transfers and in-kind support than sons, with the difference larger for the latter type of gift. Fifty-five percent of daughters and 51 percent of sons provide cash transfers while 61 and 47 percent of daughters and sons provide in-kind gifts, respectively. However, in terms of the conditional amounts, sons again provide more of each: sons transfer an average of 2,690 yuan in cash compared to 1,534 yuan for daughters, and 1,157 yuan in in-kind gifts compared to 867 yuan for daughters. As Table 7, shows, these patterns hold in the multivariate analysis, except for the amount of in-kind transfers, which is not statistically significantly different between sons and daughters.

Table 7 also reports the responsiveness of cash and in-kind transfers to the gender composition of a child's siblings. The results and inferences for both types of giving are qualitatively similar to those reported for the pooled outcome of any financial support in Table 6. Specifically, our estimates indicate that an additional brother decreases the amount of son's cash transfer by 15.4 percent and the amount of in-kind transfer by 11.8 percent ($p < .01$). Looking at the marginal effect of an additional sister, the magnitudes are statistically insignificant at 3.3 percent and 1.1 percent, respectively. Meanwhile, an additional brother decreases the amount of cash support from a daughter by an insignificant 3 percent and the amount of in-kind support by 4.3 percent ($p < .10$), while an additional sister decreases cash support by 11.5 percent and in-kind support by 11.1 percent ($p < .01$). Thus, Prediction 4 holds for both cash and in-kind support: siblings of the same gender crowd-out transfers by more than siblings of a different gender, irrespective of the type of financial transfer.

Families With and Without Coresident Children. Because coresidence and financial transfers are potentially substitutable, families in which a parent coresides with one child may behave differently from families without such arrangement. To explore this possibility, we repeat our analysis separately for the subsample of children in families that have at least one coresident child and the subsample of children in families that have no coresident child in Table 8. The marginal effects for the variables of interest for each subsample are qualitatively similar to those reported in Ta-

Table 7 Responsiveness of Cash and In-Kind Support to Sibling Gender Composition

	Cash Support		*In-Kind Support*	
	Gave Any	*Ln(Amount)*	*Gave Any*	*Ln(Amount)*
	(1)	(2)	(3)	(4)
Sons' responsiveness to				
No. of brothers	0.030***	-0.154***	0.008	-0.118***
	(0.007)	(0.022)	(0.008)	(0.025)
No. of sisters	-0.009	-0.033	-0.029***	-0.011
	(0.007)	(0.024)	(0.007)	(0.027)
Daughters' responsiveness to				
No. of brothers	0.020***	-0.030	-0.005	-0.043*
	(0.008)	(0.020)	(0.008)	(0.021)
No. of sisters	0.023***	-0.115***	-0.024***	-0.111***
	(0.007)	(0.019)	(0.007)	(0.020)
Child gender				
Male	-0.051	0.415***	-0.261***	-0.108
	(0.035)	(0.117)	(0.033)	(0.130)
R-squared	0.083	0.207	0.075	0.147
Hansen J stat [p-val]	23.58 [0.49]	21.59 [0.60]	16.64 [0.86]	30.19 [0.18]
Mean/prop. of dependent var.	0.530	6.818	0.543	6.011
No. of children.	15,113	8,007	14,845	8,057

Note: Marginal effects and standard errors (in parentheses) are reported. The second step uses the predicted measures of support from the first step, net of birth order, education and household income effects, and a heteroscedastic based instrumental variable strategy. Child control variables include second order polynomials in age, indicators for male, married (and its interaction with male), poor health, urban region, and number of children (and its interaction with male). Parent control variables include second order polynomials in age, indicators for single male, single female, primary school, middle school or more, poor health, and urban region, $sinh^{-1}$(household net wealth), an indicator for missing wealth, and dummies for province of residence. Standard errors are block-bootstrapped at the family level using 200 repetitions. Hansen tests of the hypothesis that the over-identifying restrictions are valid. $^{*}p < .10;^{**} p < .05;^{***} p < .01$.

ble 6. Unsurprisingly, the results for coresidence support are even stronger while the results for the amount of financial transfers are slightly weaker when only families with a coresident child contribute to the estimation. Nevertheless, for both subsamples the effects of same and opposite gender children lead to the same conclusions as for the full sample. The estimates indicate that crowding-out of the amount of financial transfers occurs primarily among siblings of the same gender, with brothers having a large and significantly negative effect for sons but less so daughters, and sisters having large and significantly negative effects for daughters but not for sons.

The consistency of our results when focusing solely on families in which there are no coresident children suggests that the crowding-out of financial transfers is unlikely due to substitution between

Table 8 Responsiveness of Financial Transfers in Families with and without Coresident Children

	With Coresident Children			*Without Coresident Children*	
	Co-resident Homeowner	*Gave Financial Support*	*Ln(Amount of Financial support)*	*Gave Financial Support*	*Ln(Amount of Financial support)*
	(1)	(2)	(3)	(4)	(5)
Sons' responsiveness to					
No. of brothers	-0.127***	0.018	-0.067*	0.018**	-0.129***
	(0.008)	(0.011)	(0.034)	(0.009)	(0.028)
No. of sisters	-0.006	-0.026**	0.016	-0.015*	-0.045
	(0.007)	(0.010)	(0.034)	(0.009)	(0.028)
Daughters' responsiveness to					
No. of brothers	-0.020***	0.003	-0.042	0.015*	0.001
	(0.005)	(0.009)	(0.028)	(0.009)	(0.026)
No. of sisters	-0.011**	-0.012	-0.047*	0.002	-0.115***
	(0.005)	(0.011)	(0.030)	(0.008)	(0.021)
Child gender					
Male	0.430***	-0.137***	0.190	-0.164***	0.230*
	(0.044)	(0.053)	(0.158)	(0.039)	(0.136)
R-squared	0.225	0.078	0.143	0.059	0.155
Hansen J stat [p-val]	50.02 [0.00]	26.92 [0.31]	14.33 [0.94]	21.31 [0.62]	37.38 [0.04]
Mean/prop. of dependent var.	0.317	0.738	6.661	0.738	6.889
No. of children	5,862	5,862	4,325	9,251	6,826

Note: Marginal effects and standard errors (in parentheses) are reported. The second step uses the predicted measures of support from the first step, net of birth order, education and household income effects, and a heteroscedastic based instrumental variable strategy. Child control variables include second order polynomials in age, indicators for male, married (and its interaction with male), poor health, urban region, and number of children (and its interaction with male). Parent control variables include second order polynomials in age, indicators for single male, single female, primary school, middle school or more, poor health, and urban region, $sinh^{-1}$(household net wealth), an indicator for missing wealth, and dummies for province of residence. Standard errors are block-bootstrapped at the family level using 200 repetitions. Hansen tests of the hypothesis that the over-identifying restrictions are valid. $^{*}p < .10;^{**}p < .05;^{***}p < .01$.

coresidency and financial support within gender. This conclusion is consistent with our earlier discussion based on Table 4, pointing to a potential separability between coresidence and financial transfers. Sensitivity analyses controlling for coresidency in the first stage family fixed effect regressions and using measures of old age support net of the effects of coresidency, birth order, and economic variables in the second step regressions, yielded similar results (see Footnote 21).

Rural and Urban Families. Finally, rural families may be more likely to adhere to traditional values and norms of behavior than urban families (Xie and Zhu, 2009). We therefore re-examine our main results, running the regressions separately for children whose parents live in a rural or urban area, and assessing whether the separation of transfers into separate spheres is more stark for rural families. Table 9 reports the results.

The results for the effect of same and opposite gendered siblings are as before in both samples. The marginal effects for number of brothers and number of sisters in the results for coresidential support are very similar across sub-samples, with brothers largely crowding-out support for sons, but doing so far less so for daughters. With respect to financial support, the addition of a same-gendered sibling has a much larger (negative) effect on the amount than the addition of an opposite gendered sibling, indicating that the same gender-specific patterns exist within families regardless of location.

5.4 Robustness Checks

As checks on the robustness of our conclusions, we re-estimate the main model for various alternative specifications and samples: estimating the effect of the number of sons relative to that of daughters conditional on the total number of children, controlling for inter vivos transfers that a child receives from parents (if any), removing sample restrictions on age and gender composition of families, and finally, estimating the model separately for adjacent survey waves.

The Relative Effects of Sons. As most children in our sample were born prior to the one-child policy and prior to the mid-1980s, sex-selective abortion is unlikely in our context (Junhong, 2001). A regression of sex ratio (number of sons divided by the total number of children) on indicators for family of sizes 3, 4, and 5 or more, with family of size 2 being the reference category, reveals that the sex ratio is similar among families with 2 or 3 children but that larger families tend to have fewer sons. Thus, while families with 2 and 3 children may have similar gender composition,

Table 9 Responsiveness of Support for Rural and Urban Households

	Co-resident Homeowner (1)	*Gave Financial Support* (2)	*Ln(Amount of Financial support)* (3)
A. Rural			
Sons' responsiveness to			
No. of brothers	-0.046***	0.018**	-0.092***
	(0.006)	(0.008)	(0.027)
No. of sisters	-0.002	-0.023***	-0.015
	(0.006)	(0.007)	(0.027)
Daughters' responsiveness to			
No. of brothers	-0.006**	0.010	-0.008
	(0.002)	(0.008)	(0.023)
No. of sisters	-0.005**	-0.004	-0.079***
	(0.003)	(0.006)	(0.020)
Child gender			
Male	0.223***	-0.112***	0.416***
	(0.024)	(0.042)	(0.132)
R-squared	0.107	0.053	0.166
Hansen overid J stat [p-val]	34.40 [0.08]	18.22 [0.79]	18.29 [0.77]
Mean/prop. of dependent var.	0.129	0.750	6.696
No. of children	10,033	10,033	7,522
B. Urban			
Sons' responsiveness to			
No. of brothers	-0.040***	0.007	-0.122***
	(0.007)	(0.011)	(0.037)
No. of sisters	0.012	-0.018	-0.008
	(0.008)	(0.011)	(0.041)
Daughters' responsiveness to			
No. of brothers	-0.007*	0.007	-0.048
	(0.004)	(0.011)	(0.038)
No. of sisters	-0.001	-0.010	-0.107***
	(0.004)	(0.013)	(0.033)
Child gender			
Male	-0.001	-0.263***	-0.262
	(0.033)	(0.046)	(0.197)
R-squared	0.125	0.099	0.119
Hansen overid J stat [p-val]	24.66 [0.42]	24.54 [0.43]	20.86 [0.65]
Mean/prop. of dependent var.	0.111	0.714	7.019
No. of children	5,080	5,080	3,629

Note: Marginal effects and standard errors (in parentheses) from two-step estimation. $^{*}p < .10;^{**}p < .05;^{***}p < .01$.

we cannot rule out son-preferring fertility stopping rule for larger families. We, therefore, attempt to estimate the effect of the number of sons and its interaction with *Male* conditional on the total number of children and its interaction with *Male*, using both our analytical sample and the sample of children in families with two to three children only. To do so, we run OLS regressions similar to eq. (5) but on the number of sons and children rather than the number of brothers and sisters, and control for the same set of covariates.

From Appendix Table A4, we can see that the results and inferences are very similar to those of Table 6. Specifically, the effect of having one more brother relative to one sister in Table A4 are very similar to the differences between the responsiveness to having one more brother and the responsiveness to one more sister in Table 6 for all outcomes. For example, focusing on Panel A Column (3) of Table A4, we see that sons decrease the amount of financial support by 8.6 percent more when there is an increase in the number of male as opposed to female children. Turning to Column (3) of Table 6, we see that this difference is close to the difference between the marginal effects of sons' responsiveness to the number of brothers and sisters: -0.104 – (-0.019) = -0.085, corresponding to 8.5 percent. Therefore, our inference that brothers tend to crowd out financial transfers mostly from sons while sisters matter to a lesser extent for sons still hold in this exercise. Similarly, from Panel A Column (3) of Table A4, we see that daughters increase the amount of financial support by 6.2 percent more when there is an increase in the number of male as opposed to female children. Turning to Column (3) of Table 6, we see that this difference is close to the difference between the marginal effects of daughters' responsiveness to the number of brothers and sisters: -0.027 – (-0.091) = 0.064, corresponding to 6.4 percent. Thus, our inference that sisters tend to crowd out financial transfers mostly from daughters while brothers matter to a lesser extent for daughters also holds.[22]

Inter Vivos Transfers from Parents. Financial support flows predominantly from children to parents in China. Only 19 percent of sons and 16 percent of daughters *receive* financial transfers from parents, compared to 70 percent of sons and 78 percent of daughters who *give* transfers

[22]We are grateful to the editor for suggesting the tests based on gender composition of children to improve the transparency of our results. We also performed two additional exercises that exploit the gender composition of siblings. First, we estimated the effects of having a second born brother (instead of a sister) on first-born sons' and daughters' support to older parents, among families with at least two children. Second, we use our family fixed effects model (6) and include an interaction between the proportion of sons (out of all children in the family) and *Male*. In both exercises, the results once again suggested that brothers matter for coresidence and that they crowd-out financial transfers mostly from brothers but not from sisters. Results are available upon request.

to parents. When examining transfers from parents by the gender of the child, the strong son preference embedded in the Chinese culture continues to be observed. Conditional on receiving a transfer from parents, sons receive on average 4,535 yuan while daughters receive far less than half as much, just 1,970 yuan. Looking at comparable numbers for the provision of assistance in the form of care for grandchildren, 24 percent of sons and just 5 percent of daughters receive help from parents. These differences are all statistically significant at the 1 percent level.

To assess whether these downstream transfers affect our behaviors of interest—the responsiveness of children's upstream transfers to the gender composition of siblings, we repeat the two-step estimation procedure used in our primary analysis but include controls for the receipt of transfers from parents. We include indicators regarding grandchild care (yes/no), financial assistance (yes/no), and a variable measuring the amount of any financial assistance.[23] The downstream transfer measures are included as control variables in the first step family fixed effect estimation to allow for the possibility that inter vivos transfers from parents to children may be endogenously determined with sibling gender composition. The dependent variables used in the second step are thus old age support (coresidence or financial transfers) net of the estimated effects of birth order, education, household income, and now, inter vivos transfers from parents.

As shown in the top panel of Appendix Table A5, the estimates from the first estimation step show that the receipt of grandchild care is positively related to coresidence and amount of financial support from children ($p < .01$). The probability that a parent makes a financial transfer is positively related to the likelihood of receiving financial transfers from a child ($p < .01$). However, the greater the amount of transfer from the parent, the less likely the child is to give ($p < .05$). From the bottom panel of Table A5, our results and inferences regarding the responsiveness of sons and daughters to the number of brothers and sisters are similar to those in Table 6. Both sons and daughters are less likely to provide coresidence support to parents in response to an increase in the number of brothers ($p < .01$). In addition, both sons and daughters significantly decrease the amount of financial support to parents in response to an increase in the number of siblings of the same gender ($p < .01$) and do so to a far lesser extent in response to an increase in the number of siblings of the opposite gender (very small magnitudes and not statistically significant). Thus, the notion of separate spheres of giving, including the dominance of sons with regard to coresidence and the strength of within-gender crowding-out for the amount financial transfers, remains robust

[23] Among those who received grandchild care help, a large proportion, 27 percent, had missing hours. We thus exclude the amount of time transferred but include the number of grandchildren and its interaction with child gender as proxies and part of the control variables.

when controlling for parental intervivos transfers.

Extending the Sample to Younger and Single-gender Families. The main analyses were based on the sample of children documented in Appendix Figure A1. That is, limited to children in families where the average age of parents is 60 years old or older, all children in the family are 25 years old or older, and there is at least one son and at least one daughter in the family. Appendix Table A6 removes the age restrictions and the sibling structure (mixed gender) restriction. The results and inferences are qualitatively similar to those reported in Table 6.

Adjacent Waves Our analyses thus far have relied on observations from the 2015 wave, as it was the latest wave that had undergone the rigorous cleaning of the CHARLS team to create the child-level data sets. As an additional check of the robustness of our conclusions, we compare these results to analyses that estimate the same specifications separately for adjacent waves 2013, which was subject to the same rigorous cleaning as 2015, and 2018, which has not been processed by the CHARLS team as have data from the earlier waves.

As shown in the top panels of Appendix Tables A7 and A8, we find similar results with crowding-out of coresidence only due to brothers and not sisters, and a strong asymmetry in the crowd-out of the amount of financial transfers by gender from the 2013 wave. As shown in Column (3) of Table A7 and Columns (2) and (4) of Table A8, the responsiveness of the amount of financial transfers to the number of siblings of the same gender is far larger than that for opposite gendered siblings, irrespective of the type of financial transfer. We also tested the robustness of our results to using the 2018 wave of data in the bottom panels of Appendix Tables A7 and A8. While there are no statistically significant patterns for coresidence, the asymmetry in the crowd-out of the amount of financial transfers by gender is still present for both cash and in-kind transfers.

6 Discussion

In line with Predictions 1 and 2 of our contextual framework, the results of our regression analyses examining coresidency are consistent with China's patrilocal culture: Sons are the main providers of coresidential support and the crowding-out of such support is far greater among brothers than sisters. Similarly, the estimates examining the relationship between additional siblings and financial support are consistent with Predictions 3 and 4: The likelihood of transfers may increase or

decrease with an additional sibling, and crowding-out of the amount of financial transfers is substantially larger within gender than between genders. These conclusions are robust across various samples and hold for both cash and in-kind gifts.

While this study is the first to present a gendered public goods model of upward transfers and document empirical patterns consistent with gender-differentiated spheres, there may be alternative mechanisms that drive the empirical findings. In the next subsection, we examine the implications for two alternative frameworks, a standard public good framework and a model of gendered competition, and show that neither model is consistent with our findings. We limit our attention to testing the predictions on financial transfers as past literature using these models tend to focus on that currency. We then discuss some supplementary mechanisms that could also potentially generate gender-differentiated spheres in giving, considering these fertile ground for future work.

6.1 Alternative Models

While there are numerous alternative models that can be posited as alternatives to our preferred framework, we focus here on two models that are prominent in the literature and potentially relevant to our context: the standard public good model and the Tullock contest model.

Standard public good model. The common framework for the depiction of transfers within the family is a standard public good model, which we illustrate formally in Appendix A.3. Here, financial transfers from sons and daughters are additive rather than separable and enter equally into the parental (and thus the altruistic child's) utility function. In this case, sons would likely still provide greater transfers than daughters because they have higher incomes, but parents would not distinguish between transfers from either gender. In addition, an increase in the number of brothers will crowd-out financial transfers (whether made by either a son or a daughter), by a greater margin than would an increase in the number of sisters. The empirical results in Table 6 do not support this conclusion—an additional brother crowds-out financial transfers from other sons to a far greater extent than it crowds-out transfers from daughters, and the reverse is true for an additional sister. These patterns are inconsistent with the standard public good model.

Competition among sons and among daughters. A second alternative to our framework is a Tullock contest model (Chang, 2009). In such a model, it is assumed that children make financial transfers to their parents to compete with their siblings for a "reward" from the parents. Past studies

have found a positive relationship between bequeathable wealth or expected/intended bequests and the amount of attention, assistance, or financial transfers received from children in multi-children families, and with weaker or no effect for single-child families (Almås et al., 2020; Bernheim et al., 1985; Ho, 2022). These past findings suggest that when children must compete with siblings, greater transfers are given to parents in anticipation of a potential reward.[24] Given these results, and the tradition of sons inheriting bequests in China (Yang, 2013), we consider an alternative model, wherein sons compete for parental bequests by providing transfers to parents. We envision that daughters instead compete with their sisters for attention or praise from their parents, but not bequests. This framework is consistent with our idea that parents view support from sons and daughters differently, perhaps viewing sons as carrying on the family legacy and name and thus being stewards of the estate.

This model is laid out formally in Appendix A.4. While it generates similar predictions for sons and daughters as our spheres framework, with stronger within than across gender effects on giving to parents, the signs of the effects predicted by a Tullock contest model are in the opposite direction from those posed by our model. Intuitively, if children are "competing" for an eventual inheritance in the case of sons, or for attention in the case of daughters, we should see a "crowding-in" of sorts, particularly with respect to the first same-gendered sibling: moving from no brothers to one brother would result in an *increase* in transfers by sons, while moving from no sisters to one sister would result in an *increase* in transfers by daughters. We put this hypothesis to the test by performing separate analyses on families with one or two sons and on families with one or two daughters in Appendix Table A9 to assess directly the impact of the first same-gendered sibling. As seen in Column (3) of the table, we continue to find negative associations between the financial transfers of sons and the number of brothers and between financial transfers of daughters and the number of sisters, a result which is not consistent with the Tullock contest model of financial support.

6.2 Supplementary Mechanisms

As our empirical work shows, different patterns exist for transfers from sons and those from daughters, with transfers to parents apparently occupying separate spheres. We focused on the role of traditional cultural norms, the visibility of transfers, and the preferences of parents as potential explanations for the distinction by gender. Here, we consider two related ideas that we suggest as

[24]Note that as discussed in Section 4 and in Footnote 13, all regression analyses control for parental wealth including housing wealth. From Appendix Table A3, we also find a positive association between parental wealth and coresidency and the amount of transfers ($p < .05$).

avenues for future research. First, the role of gender-specific information flows within the family, and second, the interaction of the gender of the child and parent with there potentially being a same gender affinity between fathers and sons and between mother and daughters.

Information transmission. Intuitively, one might expect that there could be differences by gender in how parents communicate with their children and in what information they share with those children. For example, parents may share more information about their own financial circumstance with sons rather than daughters or may discuss with daughters the transfer (or other behaviors) of sisters, but discuss with sons, the behavior of their brothers. It is also possible that siblings share information directly with each other about their own giving or about a parent's need. Brothers might share more with brothers, and sisters more with sisters. Such a situation may also lead to the presence of gendered public goods, with sons caring only about the total transfers from all brothers and daughters caring only about the total transfers from all sisters. The model would then be solved in a similar fashion to the second stage optimization problem documented in Section 2.

Heterogeneity analyses by whether the child contacts the parent at least once a month or not (Appendix Table A10) still showed somewhat larger a crowd-out within than between genders, irrespective of the frequency of contact. To the extent that the frequency of contact is a good proxy for information transmission from parents to adult children, it is unlikely that parents are sharing information based on gender. Additionally, we find that only 8.8 percent of respondents gave or received transfers from siblings, suggesting that exchanges among siblings may not be very prevalent. Nevertheless, these patterns do not necessarily rule out the information channel since we do not observe what family members discuss with each other. We believe that the idea of how information is shared could be a potential avenue for further investigation.

Gender of the parent recipient. A second possible avenue is whether the gender of the parent affects patterns of giving. There is a great deal of evidence in the literature that households do not pool income completely, and that husbands and wives may prefer to spend their resources on different goods (Duflo, 2003; Lundberg et al., 1996). One can imagine that if daughters share the tastes of their mothers or simply feel a closer bond with their mothers than with their fathers (and the reverse for sons) then daughters may give primarily to mothers and sons to fathers. In this case, crowding-out would primarily exist within gender—with sisters crowding-out gifts to their mothers, and sons crowding-out gifts to their fathers. As before, such mechanism may also lead to the presence of gendered public goods and the model can once again be solved in a similar way to

the second stage optimization problem from Section 2.

Unfortunately, in our data we know only the total amount received by the parental household and cannot distinguish to which parent the transfers are made. We explored giving to unmarried (widowed) mothers, unmarried (widowed) fathers, and married parents separately, and found generally similar patterns with respect to crowding-out of financial transfers (Appendix Tables A11 and A12). The results suggest that the gender of the parent may not matter, although we acknowledge that some of the established differences by gender may continue either because the unmarried parent values transfers from sons and daughters differently or because families are just continuing to follow earlier patterns from when the parents were both alive. We consider future data collection on who gets the handout from who and how the money is spent based on different sources, to be fertile avenues to explore.

Irrespective of the specific mechanism driving the presence of separate spheres in support from adult children to older parents, this study provides strong evidence of the existence of gender differentiated spheres and offers an original explanation for the existence of such spheres. We do not intend to rule out any specific mechanism (e.g., mental accounting, information transmission, or gender of the recipient parent) but instead, argue that these channels could all lead to the presence of gendered spheres, similar in spirit to our proposed framework. We believe that this does not decrease the novelty of our research in that we provide concrete and robust evidence of gender-differentiated spheres across various types of support, and demonstrate the presence of within rather than between gender crowd-out, even for a fungible currency such as money transfers. No past research has highlighted such patterns in upward intergenerational support.

7 Conclusion

In this study, we provide a relatively novel framework for considering upstream family transfers, a framework in which there are separate "spheres" of support from adult children to older parents. Here, we define spheres by the type of support and the gender of the donor child, as might be most applicable to countries with a strong patrilocal and patrilineal culture. We focus our attention on transfer behavior in China, a country where support from adult children to older parents is very common. Our measure of support encompasses support of two types: (i) coresidence and (ii) financial transfers. The two types differ in important respects: Coresidence is an experience good, can be provided by only one child, and is more visible to those outside the household than are

financial transfers. In contrast, financial transfers are far less experiential than coresidence, can be provided simultaneously by multiple children, and are less visible to others.

Given patrilocal norms, coresidence with sons may be valued while coresidence with daughters may be shamed. We indeed find that coresidence is provided predominantly by sons, and that crowding-out of a child's coresidential support would be primarily driven by brothers rather than sisters. How financial transfers are viewed may also differ by the gender of the donor: transfers from sons may be expected given patrilineal norms whereas transfers from daughters may be viewed as windfall gains, as in they are not expected. We find that crowing-out of both cash and in-kind transfers occur predominantly within gender, with an additional sibling of the same gender decreasing transfers by a larger amount than one more sibling of the opposite gender.

The potential for these separate spheres suggests that we may need to rethink the models of transfer behavior that are traditionally employed in many contexts. The substitutability of financial support from children may vary with the gender of the child and with the gender(s) of any siblings. Consider the context of the standard altruistic model (Becker, 1974) wherein children care about the well-being (utility) of the parent. If the parent values support from one type of child more so than another (e.g., a son's gift means more to the parent than that from a daughter), then the standard predictions of redistributive neutrality will likely fail. Furthermore, support among siblings may be allocated more efficiently than a standard public good model would indicate. For instance, if a dollar (yuan) from a son is more valuable to a parent than a dollar from a daughter, then the daughter could more efficiently add to parental utility by transferring to her brother who would then use his sibling's gift to provide for the parent. The same level of utility of the parent (and thus of the altruistic children) could be "bought" for less with the indirect transfer. Alternatively, in a model of exchange (Cox, 1987) parents may be willing to "pay a higher price" for coresidence from particular children. We leave such interesting extensions for future research.

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A Appendix

A.1 Extensive Margin of Financial Transfers

We examine how an increase in the number of siblings may affect financial transfers at the extensive margin (i.e., the probability of making financial transfers). From the first order condition (2), a child of gender $g = S, D$ would provide financial support to the parent if marginal utility from providing transfers is greater than marginal utility from consumption when transfers are zero: $v'(n_g t_g) > u'(I_g - t_g)$ at $t_g = 0$. In other words, the marginal rate of substitution between transfers and consumption, evaluated at zero transfers, needs to be positive for a child to provide any financial support to the parent.

Denote the marginal rate of substitution between transfers and consumption for a child of gender $g = S, D$ as $MRS_g = \frac{v'(n_g t_g)}{u'(I_g - t_g)}$. Differentiating this expression with respect to n_g and n_{-g}, respectively, we have:

$$\frac{\partial MRS_g}{\partial n_g} = \frac{1}{(u')^2} \cdot \left\{ u' \cdot v'' \cdot \left[t_g + n_g \frac{\partial t_g}{\partial n_g} \right] - v' \cdot u'' \cdot \left(\frac{\partial I_g}{\partial n_g} - \frac{\partial t_g}{\partial n_g} \right) \right\}.$$

$$\frac{\partial MRS_g}{\partial n_{-g}} = \frac{1}{(u')^2} \cdot \left\{ u' \cdot v'' \cdot \left[n_g \frac{\partial t_g}{\partial n_{-g}} \right] - v' \cdot u'' \cdot \left(\frac{\partial I_g}{\partial n_{-g}} - \frac{\partial t_g}{\partial n_{-g}} \right) \right\}.$$

Evaluating these expressions at $t_g = 0$ and using the partial effects (3) and (4), we have:

$$\frac{\partial MRS_g}{\partial n_g}|_{t_g=0} = \frac{1}{(u')^2} \cdot \left[\frac{u'' \cdot v'' \cdot n_g}{u'' + v'' \cdot n_g} \cdot \frac{\partial I_g}{\partial n_g} \cdot (u' - v') \right] \gtreqless 0.$$

$$\frac{\partial MRS_g}{\partial n_{-g}}|_{t_g=0} = \frac{1}{(u')^2} \cdot \left\{ \frac{u'' \cdot v'' \cdot n_g}{u'' + v'' \cdot n_g} \cdot \frac{\partial I_g}{\partial n_{-g}} \cdot (u' - v') \right\} \gtreqless 0.$$

Given concavity of u and v and the fact that $\frac{\partial I_g}{\partial n_g} \leq 0$ for $g = S, D$, the partial effects depend on the sign of $u' - v'$. In particular, if the marginal utility from consumption is greater than the marginal utility from transfers ($u' - v' > 0$), then the probability that the child will make a transfer to the parent (weakly) increases in the number of siblings of gender $g = S, D$, $\frac{\partial MRS_S}{\partial n_g}|_{t_S=0} \geq 0$. Conversely, if the marginal utility from consumption is lower than the marginal utility from transfers, $u' - v' < 0$, then the probability that the child will make a transfer to the parent (weakly) decreases in the number of siblings of gender $g = S, D$, $\frac{\partial MRS_S}{\partial n_g}|_{t_S=0} \leq 0$.

A.2 Extended Gendered Public Good Model

We extend the model to allow sons and daughters to care differently about parental well-being and for heterogeneous incomes of children within a gender. As before, we consider a multi-donor framework with one recipient parent and n altruistic children. Because we are examining differences associated with the gender of the child, we again specify our model to focus on families in which there is at least one son and one daughter. Denoting sons with subscript S and daughters with subscript D, we thus have number of sons $n_S \geq 1$, number of daughters $n_D \geq 1$, and number of children $n = n_S + n_D \geq 2$.

Let I_i denote income of child i. Consistent with empirical evidence on the gender-wage gap in China (Iwasaki and Ma, 2020), we assume that sons have higher income than daughters. Thus, as before, sons earn more than daughters, $I_S > I_D$, but income may differ within gender in this extended model. Moreover, we posit that $\frac{\partial I_i}{\partial n_g} \leq 0$ with $g = S, D$, to capture the fact that parents may have had fewer resources to invest in a child if there were a larger number of children to provide for (Becker, 1974; Bagger et al., 2021). Thus, the child's income may depend on sibship size. We establish that this correlation exists in our data (Appendix Table A1).

Each child cares about his / her own consumption, $c_i \in R_+$, and about parental well-being. A child may affect parental utility by providing support to their parent through coresidence, $h_i \in \{0,1\}$, or financial transfers, $t_i \in R_+$. Without loss of generality, we assume that coresidence entails a psychological or privacy cost $\gamma_i > 0$ to the child, which may differ across children. For example, sons may face a lower privacy cost than daughters if they were brought up to expect to provide such support to parents (Das Gupta et al., 2003; Emery et al., 2019; Jayachandran, 2015), as per China's patrilocal norms . Financial transfers entail a budgetary cost by decreasing the amount available for the child's own consumption.

The parent cares about both coresidential support and financial transfers from children. With regard to coresidence, the utility the parent receives depends on which child is providing the support. Parental utility from housing is given by: $H = max\{\delta_1 h_1, ..., \delta_n h_n\}$, where $\delta_i \in R$ is the child-specific parameter that captures how the parent weights coresidence with different children. A parent may assign a higher δ_i to sons than daughters given patrilocal norms (Das Gupta et al., 2003; Emery et al., 2019; Jayachandran, 2015), but may also value more highly coresidence with a child whom the parent favors for reasons in addition to gender, such as emotional closeness. In contrast to the utility from shared residence that comes from a single child, the parent cares about *total* financial transfers but potentially differentially for the total from all sons $\left(T_S = \sum_{S=1}^{n_S} t_S\right)$, and

total from all daughters $\left(T_D = \sum_{D=1}^{n_D} t_D\right)$. We assume that given the fungibility of financial transfers, parents make no distinction as to which son or which daughter provided support, but rather care only about the total received from each gender. H, T_S and T_D may therefore be considered as family public goods towards which each child may contribute.

A child i solves:

$$\max_{c_i>0, h_i\in\{0,1\}, t_i\geq 0} u(c_i) + \theta_i \left[\underbrace{v(T_S) + v(T_D) + H}_{Parent's\ Utility} \right] - \underbrace{\gamma_i h_i}_{Privacy\ Cost}$$

subject to the budget constraint:

$$c_i + t_i = I_i.$$

θ_i is an altruism parameter: it captures the weight that a child puts on a parents' utility. We assume that all sons have the same θ_S and all daughters have the same θ_D, and that sons weakly care more about parents than daughters, potentially due the former's ingrained obligation to take care of parents in old age: $\theta_S \geq \theta_D$. We further maintain the assumption that u and v are strictly concave and twice continuously differentiable functions: $u' > 0$ and $u'' < 0$; $v' > 0$ and $v'' < 0$. Furthermore, the parent's utility is separable in the three public goods H, T_S and T_D. We provide evidence consistent with such separability in the empirical Sections 3 and 5. The child's problem may be solved as part of a two-stage optimization problem: First, the child determines coresidence support to the parent and second, the child determines financial transfers to the parent.

First Stage Optimization: Coresidence

Each child chooses coresidence:

$$\max_{h_i\in\{0,1\}} \theta_i H - \gamma_i h_i,$$

where $H = max\{\delta_1 h_1, ..., \delta_n h_n\}$.

It is straightforward to see that no child will provide coresidence support to the parent if the parent does not value or dislikes coresidence with any child: $\theta_i \delta_i \leq 0\ \forall i$. The parent must value coresidence from children for the parent to stand a chance at receiving such support. Moreover, child i may provide coresidence support only if child i derives a surplus from the arrangement: $\theta_i \delta_i - \gamma_i \geq 0$. No child will provide coresidence support to the parent if $\theta_i \delta_i - \gamma_i < 0\ \forall i$.

Furthermore, for the parent to benefit from coresidence support, there must exists a child i:

$$\theta_i \delta_i - \gamma_i \geq \theta_i \delta_j \ , \forall j \neq i. \tag{A1}$$

To see this, consider the case where $\theta_i \delta_i - \gamma_i < \theta_i \delta_j$ for all i, j. Then, child i may free-ride on sibling j by not coresiding, and thus save on the cost γ_i while enjoying the benefits $\theta_i \delta_j$. However, sibling j will also reason in a similar way and seek to free-ride on other siblings so that no one would provide coresidence support. Thus, condition (A1) must hold for the parent to benefit from coresidence support from children.

Additionally, provided that (A1) is satisfied, there is a hierarchy such that the child with the highest residential surplus, $\theta_i \delta_i - \gamma_i$, will be the one to provide coresidence support to the parent. To see this, consider a family with three children:

$$\theta_1 \delta_1 - \gamma_1 > \theta_1 \delta_2 \text{ and } \theta_2 \delta_2 - \gamma_2 > \theta_2 \delta_3.$$

It is straightforward to see from the above inequalities that $\delta_1 > \delta_2 > \delta_3$. Moreover, Child 1 will coreside with the parent since Child 1 gets greater net benefits from providing coresidence support than allowing Child 2 or 3 to do so: $\theta_1 \delta_1 - \gamma_1 > \theta_1 \delta_2 > \theta_1 \delta_3$. Similarly, Child 2 and 3 get greater benefits: $\theta_2 \delta_1$ and $\theta_3 \delta_1$, respectively, by letting child 1 coreside with the parent and do not need to incur the cost, γ_i $i = 2, 3$, themselves. Conversely, if Child 1 did not exist, then Child 2 would provide the coresidence support rather than child 3. Thus, the child with the highest residential surplus is the most likely to coreside with the parent.

Several observations stem from this hierarchical structure. First, given patrilocal norms, δ_i is likely to be higher for a son than for a daughter (Das Gupta et al., 2003; Emery et al., 2019; Jayachandran, 2015). Similarly, sons are also more likely to be conditioned to provide coresidential support to parents and as such γ_i is likely to be lower for a son than for a daughter (Guo and Zhang, 2020). Thus, a son is more likely to satisfy condition (A1) and is also more likely to provide coresidential support to a parent than is a daughter. Therefore, Prediction 1 also holds in the extended model. Second, an increase in the number of brothers is expected to lead to a greater probability that at least one other brother will have a greater residential surplus: $\theta_j \delta_j - \gamma_j$ that the child himself due to patrilocal norms. Thus, an increase in the number of brothers will decrease the probability that a son or daughter provides coresidential support to the parent. Therefore, Prediction 2 also holds in this extended model.

Second Stage Optimization: Financial Transfers

Each child chooses financial transfers:

$$\max_{\{t_i\}} u(I_i - t_i) + \theta_i \left[v\left(\sum_{S=1}^{n_S} t_S \right) + v\left(\sum_{D=1}^{n_D} t_D \right) \right],$$

where the expression for consumption is derived from the budget constraint $c_i = I_i - t_i$.

Given the separate spheres in financial transfers, the second stage problem reduces to that of a gender specific public good problem with heterogeneous children within a gender. Under a Nash equilibrium among children of gender $g = S, D$, the optimal level of transfer to the parent is the solution to the following conditions:

$$\begin{array}{rcl} -u'(I_i - t_i) + \theta_i v'\left(\sum_{j=1}^{n_g} t_j\right) & = & 0 \quad if \quad t_i > 0, \\ -u'(I_i - t_i) + \theta_i v'\left(\sum_{j=1}^{n_g} t_j\right) & < & 0 \quad if \quad t_i = 0, \end{array} \tag{A2}$$

where t_i denotes the optimal financial transfers that each child i provides to the parent.

Following similar line of proof as in Appendix A.1, it is straightforward to show that an increase in the number of brothers or sisters will have an indeterminate effect on the probability that a child provides financial support to parents, which aligns with Prediction 3.

We now examine how an increase in the number of siblings may affect financial transfers at the *intensive* margin (i.e., when the first order conditions are satisfied with equality and $t_i > 0$). Denote $T_g = \sum_{j=1}^{n_g} t_j$, total transfers from gender $g = S, D$. Totally differentiating the equation in (A2) with respect to t_i, n_g and n_{-g}:

$$\left[u''(I_i - t_i) + \theta_i v''(T_g)\right] \cdot \partial t_i + \left[-u''(I_i - t_i) \cdot \frac{\partial I_i}{\partial n_g} + \theta_i v''(T_g) \cdot \frac{\partial T_g}{\partial n_g} \right] \partial n_g - u''(I_i - t_i) \cdot \frac{\partial I_i}{\partial n_{-g}} \partial n_{-g} = 0.$$

Rearranging and simplifying, we obtain the following partial effects for transfers from child i of gender g:

$$\frac{\partial t_i}{\partial n_g} = \frac{u'' \cdot \frac{\partial I_i}{\partial n_g} - \theta_i v'' \cdot \frac{\partial T_g}{\partial n_g}}{u'' + \theta_i v''} < 0. \tag{A3}$$

$$\frac{\partial t_i}{\partial n_{-g}} = \frac{u'' \cdot \frac{\partial I_i}{\partial n_{-g}}}{u'' + \theta_i v''} \leq 0. \tag{A4}$$

The weak inequality in (A4) stems from concavity of u and v and the assumption that $\frac{\partial I_i}{\partial n_{-g}} \leq 0$. To prove the inequality in (A3), we next show that $\frac{\partial T_g}{\partial n_g} > 0$. From (A2), we can write transfers as:

$$t_i = I_i - u'^{-1}\left[\theta_i v'\left(T_g\right)\right].$$

Recall that children of the same gender have the same $\theta_i = \theta_g$. Denote total income of children of gender g as $I_g = \sum_{j=1}^{n_g} I_j$. We then sum transfers across children of gender g:

$$T_g = I_g - n_g u'^{-1}\left[\theta_g v'\left(T_g\right)\right]$$

Rewrite the above expression:

$$-u'\left(\frac{I_g - T_g}{n_g}\right) + \theta_g v'\left(T_g\right) = 0.$$

Totally differentiate the above expression with respect to T_g and n_g to get:

$$\left[u''\left(\frac{I_g - T_g}{n_g}\right)\cdot\frac{1}{n_g} + \theta_g v''\left(T_g\right)\right]\cdot\partial T_g - \left[u''\left(\frac{I_g - T_g}{n_g}\right)\cdot\frac{\left(n_g\frac{\partial I_g}{\partial n_g} - \left(I_g - T_g\right)\right)}{{n_g}^2}\right]\partial n_g = 0.$$

Rearranging the above expression, we get

$$\frac{\partial T_g}{\partial n_g} = \frac{1}{{n_g}^2}\cdot\frac{u''\cdot\left(n_g\frac{\partial I_g}{\partial n_g} - \left(I_g - T_g\right)\right)}{u''\cdot\frac{1}{n_g} + \theta_g v''} > 0.$$

The inequality stems from concavity of u and v, and the assumption that $\frac{\partial I_g}{\partial n_g} > \frac{I_g - T_g}{n_g}$. The latter assumption posits that an additional child of gender g would increase the income of children by more than the average consumption of children, such that parents can now receive higher transfers from children. This assumption may apply to forward looking parents who optimize fertility to receive maximum transfers from children and is consistent with past findings from literature that total support from children tends to increase in the number of children (Chen and Fang, 2021; Cunningham et al., 2013; Oliveira, 2016). Thus, total transfers from a given gender increase in the number of children of that gender. It follows that the inequality in (A3) holds.

From the partial effects (A3) and (A4), an increase in the number of brothers [sisters] leads to a decrease in the financial transfers provided by a son [daughter] to the parent and *may* lead to a decrease in the financial transfers provided by a daughter [son] to the parent. The former effect stems from the fact that sons and daughters provide financial support to parents in separate spheres such that an increase in the number of brothers [sisters] crowd-outs financial support from any particular son [daughter]. The latter effect stems from the fact that parents may have invested less in a son [daughter] if they have more daughters [sons] due to limited resources, thereby leading to a fall in the son's [daughter's] income. Nevertheless, if the number of sisters [brothers] does not decrease parental investments in a son [daughter], then financial transfers from the son [daughter] would not depend on the number of sisters [brothers]. We investigate this potential investment channel empirically.

Additionally, comparing expressions (A3) and (A4), we can see that if $\left|\frac{\partial I_g}{\partial n_g}\right| \geq \left|\frac{\partial I_g}{\partial n_{-g}}\right|$, then $\left|\frac{\partial t_g}{\partial n_g}\right| > \left|\frac{\partial t_g}{\partial n_{-g}}\right|$. Thus if the income of a child of gender g is crowded-out by the same or by a greater extent when the child has more siblings the same gender compared with siblings of a different gender, then the financial support that the child provides to the parent will be crowded-out by a greater extent when the child has more siblings of the same gender compared to siblings of a different gender. Conversely, if $\left|\frac{\partial I_g}{\partial n_g}\right| < \left|\frac{\partial I_g}{\partial n_{-g}}\right|$, then $\left|\frac{\partial t_g}{\partial n_g}\right| \gtreqless \left|\frac{\partial t_g}{\partial n_{-g}}\right|$. In particular, for $\left|\frac{\partial I_g}{\partial n_g}\right|$ close enough to $\left|\frac{\partial I_g}{\partial n_{-g}}\right|$, we may still have $\left|\frac{\partial t_g}{\partial n_g}\right| > \left|\frac{\partial t_g}{\partial n_{-g}}\right|$. Otherwise, $\left|\frac{\partial t_g}{\partial n_g}\right| \leq \left|\frac{\partial t_g}{\partial n_{-g}}\right|$. Thus, prediction 4 still holds in the extended model.

Thus, if our model is extended to allow heterogeneous income of children as well as differential altruism towards the parent for sons and daughters, the key predictions (1 to 4) continue to hold: Sons are more likely to provide coresidence support than daughters; an increase in the number of brothers decreases the probability that a son or daughter provides coresidence support; an increase in the number of siblings has an indeterminate effect on the probability that a child provides financial support to parents; and an increase in the number of siblings of the same gender leads to a decrease in the financial transfers provided by a child by a larger margin while an increase in the number of siblings of a different gender may decrease financial transfers provided by a child by a smaller margin.

A.3 Standard Public Good Model

Consider the model in Section 2.1 but assume that financial support from sons and daughters are not separable. A parent's utility function is thus $C_P + v(T_S + T_D) + H$ and child i solves:

$$\max_{c_i>0, h_i\in\{0,1\}, t_i\geq 0} u(c_i) + \underbrace{C_P + v(T_S + T_D) + H}_{Parent's\ Utility} - \underbrace{\gamma_i h_i}_{Privacy\ Cost}$$

subject to the budget constraint:

$$c_i + t_i = I_i.$$

The child problem may once again be solved as part of a two-stage optimization problem. The first stage of the problem is as before so we turn our attention to the second stage of the problem. Each child chooses financial transfers:

$$\max_{\{t_i\}} u(I_i - t_i) + v\left(\sum_{S=1}^{n_S} t_S + \sum_{D=1}^{n_D} t_D\right).$$

with the budget constraint $c_i = I_i - t_i$. Note the difference from the second stage of the gendered spheres model wherein t_S and t_D enter separately.

Under a symmetric Nash equilibrium within gender and focussing on interior solutions, the first order conditions for a son and a daughter are respectively given by:

$$-u'(I_S - t_S) + v'(n_S t_S + n_D t_D) = 0,$$

$$-u'(I_D - t_D) + v'(n_S t_S + n_D t_D) = 0.$$

Thus, it is straightforward to show that because $I_S > I_D$, sons will make larger transfers than daughters: $t_S > t_D$.

Totally differentiating the above two conditions with respect to t_S, t_D, n_S and n_D yields

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix} \begin{bmatrix} \partial t_S \\ \partial t_D \end{bmatrix} = \begin{bmatrix} -e \\ -f \end{bmatrix} \partial n_S + \begin{bmatrix} -g \\ -h \end{bmatrix} \partial n_D,$$

where

$$\begin{array}{rclcrcl} a &=& u''(I_S - t_S) + v''(n_S t_S + n_D t_D) n_S & ; & e &=& v''(n_S t_S + n_D t_D) t_S \\ b &=& v''(n_S t_S + n_D t_D) n_D & ; & f &=& v''(n_S t_S + n_D t_D) t_S \\ c &=& v''(n_S t_S + n_D t_D) n_S & ; & g &=& v''(n_S t_S + n_D t_D) t_D \\ d &=& u''(I_D - t_D) + v''(n_S t_S + n_D t_D) n_D & ; & h &=& v''(n_S t_S + n_D t_D) t_D \end{array}.$$

The Jacobian determinant is

$$|J| = \begin{vmatrix} a & b \\ c & d \end{vmatrix} = u''_S \cdot u''_D + n_S \cdot u''_D \cdot v'' + n_D \cdot u''_S \cdot v'' > 0.$$

Using Cramer's rule, the partial effects for sons are given by

$$\frac{\partial t_S}{\partial n_S} = -\frac{1}{|J|}\left[t_S \cdot u''_D \cdot v''\right] < 0,$$

$$\frac{\partial t_S}{\partial n_D} = -\frac{1}{|J|}\left[t_D \cdot u''_D \cdot v''\right] < 0.$$

From these two partial effects, it can be shown that with $t_S > t_D$, $\left|\frac{\partial t_S}{\partial n_S}\right| > \left|\frac{\partial t_S}{\partial n_D}\right|$. Thus, an increase in the number of brothers crowds-out financial transfers from sons by more than an increase in the number of sisters.

And similarly for daughters:

$$\frac{\partial t_D}{\partial n_S} = -\frac{1}{|J|}\left[t_S \cdot u''_S \cdot v''\right] < 0,$$

$$\frac{\partial t_D}{\partial n_D} = -\frac{1}{|J|}\left[t_D \cdot u''_S \cdot v''\right] < 0.$$

Thus, with $t_S > t_D$, once again, $\left|\frac{\partial t_D}{\partial n_S}\right| > \left|\frac{\partial t_D}{\partial n_D}\right|$ and an increase in the number of brothers crowds-out financial transfers from daughters by more than an increase in the number of sisters.

Thus, the key difference between the predictions of the gendered public good model and the standard public good model, is that in the former, crowding-out of financial transfers occurs primarily within gender while in the latter, crowding-out of financial transfers occurs predominantly with respect to brothers rather than sisters. The weight of the empirical evidence does not lend support to the latter.

A.4 Gendered Competition Model

Finally, we examine a gendered competition model. Suppose that financial transfers from children are symbolic, demonstrating close familial ties, rather than providing needed financial support to the parent (Hwang, 1987; Rosenzweig and Zhang, 2014; Xie and Zhu, 2009). These transfers can therefore be used to "purchase" attention, bequests, or other items from parents, leading to competition among children (Bernheim et al., 1985; Ho, 2022; Almås et al., 2020). Consider a framework where sons compete for financial favors, that is, bequests, while daughters compete for attention. The genders may be inverted without loss of generality or there may be competiton for other rewards. For simplicity, we focus here on support from children in the form of financial transfers, although the same concept can be applied to coresidence.

Sons compete for bequests

Suppose that sons provide financial support to older parents because they anticipate bequests. A son solves

$$\underset{c_i,t_i}{Max}\, u(c_i)$$

subject to

$$c_i + t_i = I_i + \frac{t_i}{\sum_{S=1}^{n_S} t_S} B,$$

where B denotes the total bequests that the parent gives to sons. The bequest share is allocated according to a Tullock contest function.

Under a symmetric Nash equilibrium among sons,

$$\frac{(n_S - 1)\, t_S B}{(n_S t_S)^2} = 1.$$

Simplifying,

$$t_S = \frac{n_S - 1}{n_S^2} B.$$

Thus, financial support increases in bequests. The partial effect with respect to the number of sons is

$$\frac{\partial t_S}{\partial n_S} = -\frac{(n_S - 2)}{n_S^3} B.$$

Note that t_S is non-monotonic in n_S. In particular, if $n_S = 1$, then $t_S = 0$; if $n_S = 2$, then t_S increases;

and if $n_s > 2$, then t_S decreases. Thus, if we compare families with one son to families with 2 sons, we should observe that t_S increases in n_S.

Daughters compete for attention

Suppose that daughters provide financial support to older parents only because they want attention from the parent. A daughter solves

$$\underset{c_i,t_i}{Max}\, u(c_i) + \frac{t_i}{\sum_{s=1}^{n_S} t_s} A$$

subject to

$$c_i + t_i = I_i,$$

where A denotes the total attention that the parent gives to daughters. The attention share is allocated according to a Tullock contest function.

Under a symmetric Nash equilibrium among daughters,

$$\frac{(n_D - 1)\, t_D A}{(n_D t_D)^2} = u'(I_D - t_D).$$

Simplifying,

$$t_D = \frac{n_D - 1}{u' \cdot n_D^2} A.$$

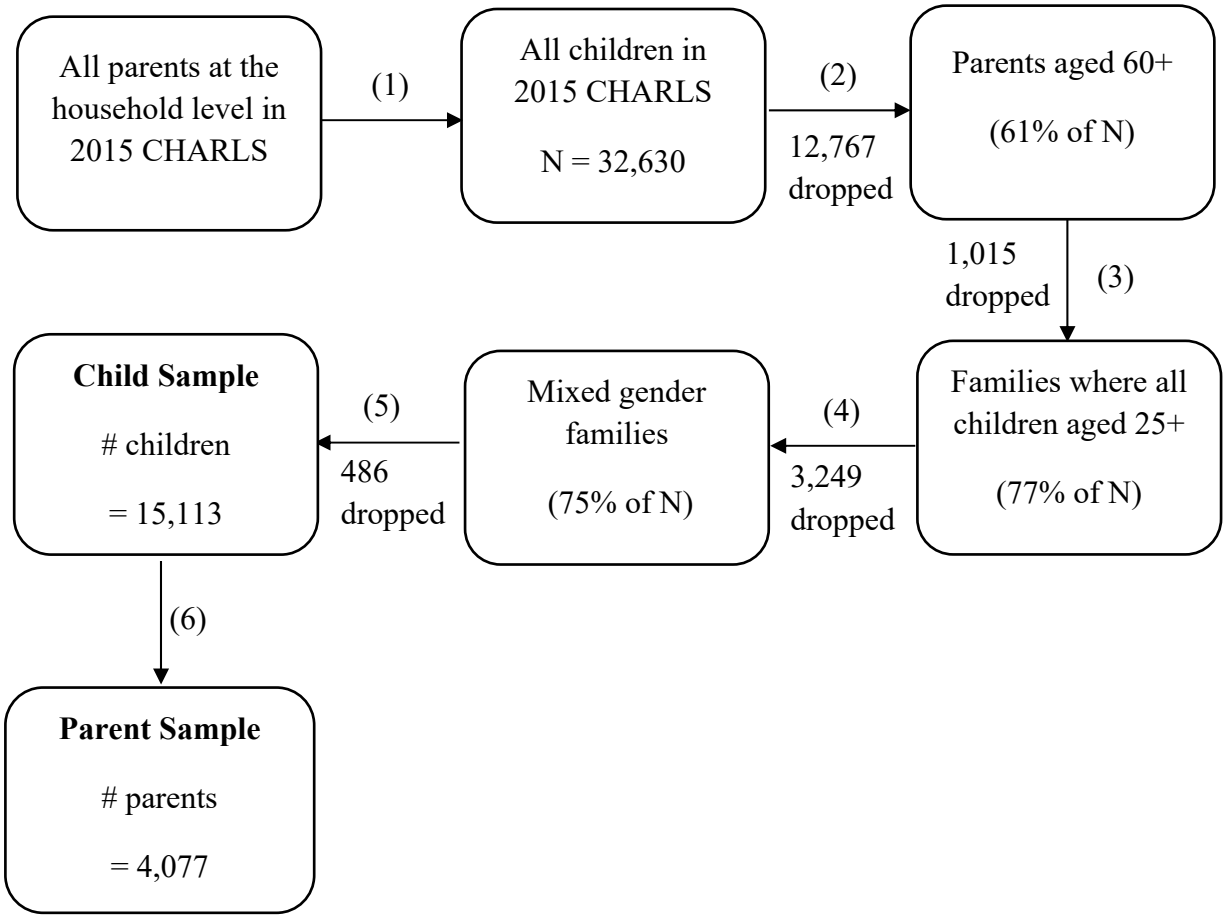
Thus, financial support from daughters increase in attention for daughters. Totally differentiate the Nash condition, use the expression for t_D, and simplify to get

$$\frac{\partial t_D}{\partial n_D} = -\frac{(n_D - 2)}{n_D^3 [-u'' \cdot t_D + u']} A.$$

Note that t_D is non-monotonic in n_D. In particular, if $n_D = 1$, then $t_D = 0$; if $n_D = 2$, then t_D increases; and if $n_D > 2$, then t_D decreases. Thus, if we compare families with one daughter to families with 2 daughters, we should observe that t_D increases in n_D.

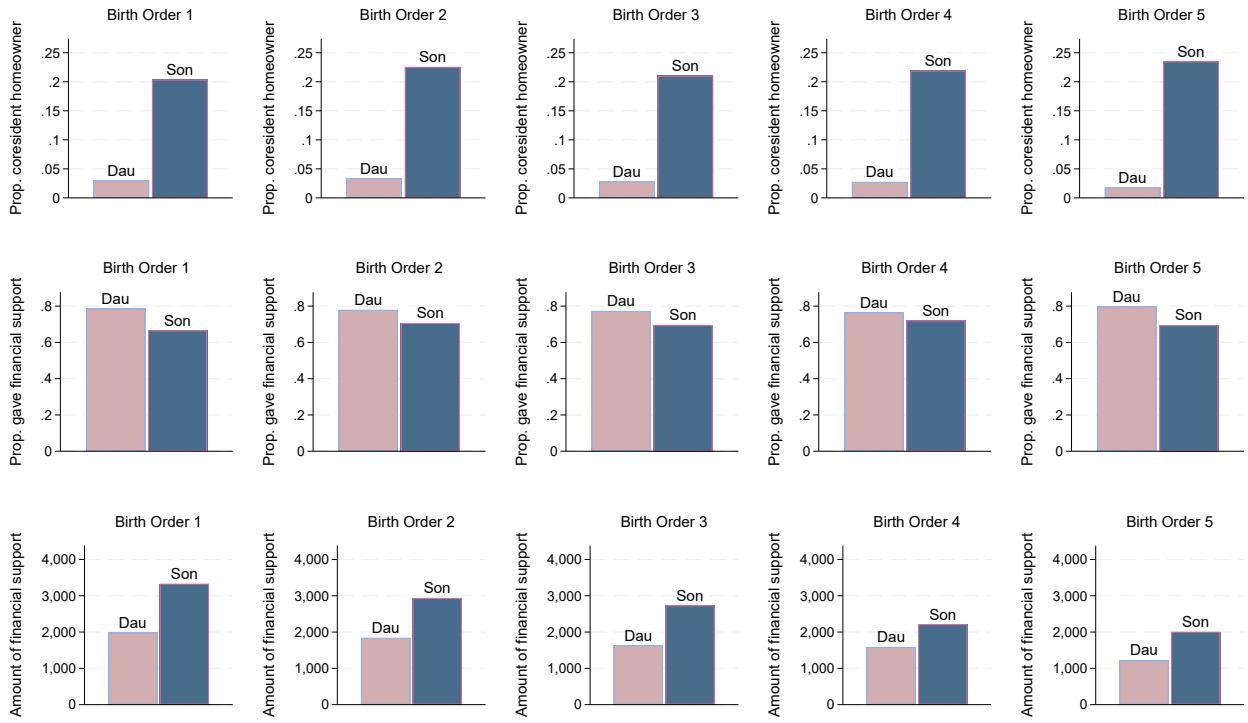
Thus, the key difference in the predictions between the gendered public goods model and the competition model is that in the former, we expected crowding-out of financial transfers, while in the latter, we expect some crowding-in of financial transfers. As shown in the text, the empirical evidence does not support a competition model.

Figure A1 Sample Selection



Note: The sample selection and construction are as follows: (1) reshape the CHARLS sample of parents into a sample containing all living children; limit the sample to children in families where (2) the parent is aged 60 and above, (3) all children are aged 25 and above, and (4) there are mixed gender children (at least one son and one daughter); (5) after Step 4, drop missing values and outliers on the selected sample to get the child sample; (6) reshape the child sample to the respondent level to get the parent sample.

Figure A2 Support from Sons and Daughters by Birth Order



Note: Means or proportions for sons and daughters from the child sample. The top, middle, and last rows depict, respectively, the proportion of children who are coresident homeowners, the proportion of children who gave financial support, and the amount of financial support at the intensive margin.

Table A1 Responsiveness of Predictors of Child Income to Sibling Gender Composition

	≤ Primary (1)	*Middle* (2)	*≥ High School* (3)	*HH Income* (4)
Sons' responsiveness to				
No. of brothers	0.021***	-0.001	-0.021***	-815.82
	(0.006)	(0.006)	(0.005)	(604.43)
No. of sisters	0.011*	-0.003	-0.009*	224.02
	(0.006)	(0.006)	(0.005)	(522.09)
Daughters' responsiveness to				
No. of brothers	0.033***	-0.014**	-0.017***	-142.36
	(0.007)	(0.006)	(0.005)	(579.46)
No. of sisters	0.029***	-0.010**	-0.021***	-33.76
	(0.005)	(0.005)	(0.005)	(514.84)
Child gender				
Male	0.095***	-0.034	-0.066**	452.90
	(0.030)	(0.034)	(0.026)	(2,419.91)
R-squared	0.255	0.046	0.228	0.129
Hansen J stat [p-val]	22.81 [0.53]	23.12 [0.51]	46.77 [0.00]	24.79 [0.42]
Mean/prop. of dependent var.	0.497	0.305	0.193	34,347.25
No. of children	15,113	15,113	15,113	15,113

Note: Marginal effects and standard errors (in parentheses) are reported. We employ two step estimation where the first step is a family FE regression of education or income on $Male$, $BirthOrder$, and X_{ij}^{C}, and the second step follows equation (9). The second step use the predicted measures of support from the first step, net of birth order effects, and a heteroscedastic based instrumental variable strategy. Child control variables include second order polynomials in age, indicators for male, married (and its interaction with male), poor health, and urban area, number of children (and its interaction with male). Parent control variables include second order polynomials in age, indicators for single male, single female, primary school, middle school or more, poor health, and urban region, $sinh^{-1}$(net household wealth), an indicator for missing net wealth, and dummies for province of residence. Standard errors are block-bootstrapped at the family level using 200 repetitions. Hansen tests of the hypothesis that the overidentifying restrictions are valid. $^{*}p < .10;^{**}p < .05;^{***}p < .01$.

Table A2 Responsiveness of Support from OLS and Two-Step Estimation

	Co-resident Homeowner (1)	*Gave Financial Support* (2)	*Ln(Amount of Financial support)* (3)
A. OLS			
Sons' responsiveness to			
No. of brothers	-0.041***	0.019***	-0.100***
	(0.004)	(0.006)	(0.021)
No. of sisters	0.005	-0.019***	-0.015
	(0.005)	(0.007)	(0.022)
Daughters' responsiveness to			
No. of brothers	-0.010***	0.009	-0.023
	(0.002)	(0.006)	(0.019)
No. of sisters	-0.006**	-0.006	-0.085***
	(0.002)	(0.006)	(0.017)
Child gender			
Male	0.158***	-0.187***	0.178
	(0.025)	(0.040)	(0.134)
R-squared	0.121	0.066	0.189
Mean/prop. of dependent var.	0.123	0.738	6.801
No. of children	15,113	15,113	11,151
B. Two-Step Estimation			
Sons' responsiveness to			
No. of brothers	-0.044***	0.018***	-0.104***
	(0.005)	(0.007)	(0.020)
No. of sisters	0.003	-0.020***	-0.019
	(0.005)	(0.007)	(0.022)
Daughters' responsiveness to			
No. of brothers	-0.007***	0.010*	-0.027
	(0.002)	(0.006)	(0.019)
No. of sisters	-0.004**	-0.005	-0.091***
	(0.002)	(0.006)	(0.018)
Child gender			
Male	0.155***	-0.162***	0.201*
	(0.021)	(0.030)	(0.107)
R-squared	0.091	0.058	0.146
Mean/prop. of dependent var.	0.123	0.738	6.801
No. of children	15,113	15,113	11,151

Note: Panel A reports results from OLS regresssions of (5), with standard errors (in parentheses) clustered at the family level. Panel B replicates the results in Table 6 from two-step estimation of (9). $^{*}p < .10;^{**}p < .05;^{***}p < .01$.

Table A3 Selected Coefficients from Two-Step Estimation of (9)

	Co-resident Homeowner (1)	*Gave Financial Support* (2)	*Ln(Amount of Financial support)* (3)
Child characteristics			
Age	0.004	0.008*	-0.024*
	(0.003)	(0.005)	(0.014)
Age squared	-0.000	-0.000*	0.000
	(0.000)	(0.000)	(0.000)
Married*Male	0.003	0.084***	-0.027
	(0.019)	(0.028)	(0.098)
Married	-0.006	0.070***	-0.098
	(0.009)	(0.020)	(0.066)
No. of children*Male	0.030***	-0.003	0.046
	(0.007)	(0.008)	(0.026)
No. of children	-0.008***	0.007	-0.060***
	(0.003)	(0.006)	(0.021)
Lives in urban area	-0.050***	0.030***	0.383***
	(0.006)	(0.009)	(0.027)
Poor health	0.019**	-0.084***	-0.309***
	(0.010)	(0.015)	(0.049)
Parent characteristics			
Age	-0.001	0.018	-0.072*
	(0.006)	(0.012)	(0.037)
Age squared	0.000	-0.000	0.000*
	(0.000)	(0.000)	(0.000)
Primary school	-0.005	-0.008	0.183***
	(0.008)	(0.013)	(0.043)
Middle school or more	-0.005	-0.028	0.304***
	(0.010)	(0.018)	(0.055)
Single male	0.029***	-0.018	-0.168**
	(0.010)	(0.019)	(0.069)
Single female	0.043***	0.041***	-0.015
	(0.008)	(0.014)	(0.049)
Lives in urban area	0.005	-0.066***	0.030
	(0.006)	(0.012)	(0.038)
Poor health	-0.008	0.013	-0.086***
	(0.006)	(0.010)	(0.033)
Sinh^{-1}(Net household wealth)	0.001**	0.001	0.010***
	(0.001)	(0.001)	(0.004)
R-squared	0.091	0.058	0.146
Mean/prop. of dependent var.	0.123	0.738	6.801
No. of children	15,113	15,113	11,151

Note: Marginal effects and standard errors (in parentheses) are reported from two-step estimation corresponding to Table 6. Additional controls include indicators for missing value for net household wealth and province. $^{*}p < .10;^{**}p < .05;^{***}p < .01$.

Table A4 Effects of Sons Relative to Daughters

	Co-resident Homeowner (1)	*Gave Financial Support* (2)	*Ln(Amount of Financial support)* (3)
A. Analytical Sample			
No. of male children × male	-0.042***	0.023**	-0.148***
	(0.007)	(0.010)	(0.030)
No. of male children	-0.004	0.015*	0.062***
	(0.003)	(0.008)	(0.023)
No. of children × male	0.011**	-0.012*	0.071***
	(0.002)	(0.007)	(0.022)
No. of children	-0.006**	-0.006	-0.085***
	(0.002)	(0.006)	(0.017)
Male	0.193***	-0.212***	0.189
	(0.027)	(0.042)	(0.141)
Son's responsiveness w.r.t.			
Male vs. female children	-0.047***	0.038***	-0.086***
	(0.007)	(0.009)	(0.029)
No. of female children	0.005	-0.018***	-0.014
	(0.005)	(0.006)	(0.021)
R-squared	0.121	0.066	0.189
Mean/prop. of dependent var.	0.123	0.738	6.801
No. of children	15,113	15,113	11,151
B. Sample with 2-3 Children			
No. of male children × male	-0.049**	0.013	-0.302***
	(0.024)	(0.026)	(0.095)
No. of male children	0.006	0.012	0.108
	(0.009)	(0.022)	(0.070)
No. of children × male	0.030	-0.036	0.088
	(0.026)	(0.027)	(0.105)
No. of children	-0.026***	-0.012	-0.121**
	(0.010)	(0.022)	(0.071)
Male	0.110	-0.246***	0.517
	(0.069)	(0.084)	(0.327)
Son's responsiveness w.r.t.			
Male vs. female children	-0.043*	0.025	-0.194**
	(0.022)	(0.025)	(0.092)
No. of female children	0.004	0.024	-0.034
	(0.024)	(0.026)	(0.102)
R-squared	0.135	0.067	0.186
Mean/prop. of dependent var.	0.133	0.737	7.110
No. of children	5,012	5,012	3,692

Note: OLS regressions include child control variables: second order polynomials in age, indicators for male, poor health, urban region, and marital status, number of children, relative birth order, education, income (and their interactions with male); parent control variables: second order polynomials in age, indicators for single male, single female, number of children and its interaction with male, primary school, middle school or more, poor health, and urban region, sinh1(household net wealth), an indicator for missing wealth, and dummies for province of residence. $^{*}p < .10;^{**}p < .05;^{***}p < .01$.

Table A5 Responsiveness of Support Controlling for Inter Vivos from Parents

	Co-resident Homeowner (1)	*Gave Financial Support* (2)	*Ln(Amount of Financial support)* (3)
A. First Step			
Sons			
Any grandchild care	0.118***	0.033**	0.315***
	(0.014)	(0.014)	(0.047)
Any transfers from parents	-0.120**	0.292***	0.114
	(0.055)	(0.056)	(0.234)
Sinh^{-1}(Amount from parents)	0.014**	-0.041***	-0.036
	(0.007)	(0.008)	(0.032)
Daughters			
Any grandchild care	0.087***	-0.011	0.275***
	(0.024)	(0.025)	(0.086)
Any transfers from parents	-0.045	0.230***	-0.201
	(0.051)	(0.067)	(0.227)
Sinh^{-1}(Amount from parents)	0.010	-0.031***	0.025
	(0.007)	(0.010)	(0.034)
R-squared	0.149	0.054	0.079
B. Second Step			
Sons' responsiveness to			
No. of brothers	-0.038***	0.017**	-0.096***
	(0.004)	(0.007)	(0.023)
No. of sisters	0.004	-0.021***	-0.017
	(0.005)	(0.007)	(0.023)
Daughters' responsiveness to			
No. of brothers	-0.006***	0.010	-0.027
	(0.002)	(0.007)	(0.022)
No. of sisters	-0.003	-0.005	-0.084***
	(0.002)	(0.007)	(0.018)
Child gender			
Male	0.170***	-0.143***	0.265**
	(0.021)	(0.035)	(0.113)
R-squared	0.090	0.058	0.146
Hansen overid J stat [p-val]	39.13 [0.03]	20.85 [0.65]	15.84 [0.89]
Mean/prop. of dependent var.	0.123	0.741	6.786
No. of children	13,945	13,945	10,336

Note: Marginal effects and standard errors (in parentheses) from two-step estimation. The first step employs family FE models - controlling for birth order, economic, and child variables - and cluster standard errors at the family level. The second step uses the predicted measures of support - net of the effects of birth order, education, income, grandchild care, and transfers from parents - and 2SLS; controls include both parent and child variables; and standard errors are block-bootstrapped at the family level using 200 repetitions. $^{*}p < .10;^{**}p < .05;^{***}p < .01$.

Table A6 Responsiveness of Support without Age or Gender Composition Restrictions

	Co-resident Homeowner (1)	*Gave Financial Support* (2)	*Ln(Amount of Financial support)* (3)
A. Including Younger Families			
Sons' responsiveness to			
No. of brothers	-0.040***	0.018***	-0.118***
	(0.004)	(0.006)	(0.020)
No. of sisters	-0.004	-0.024***	-0.003
	(0.004)	(0.006)	(0.021)
Daughters' responsiveness to			
No. of brothers	-0.005***	0.004	-0.032**
	(0.002)	(0.006)	(0.016)
No. of sisters	-0.004**	-0.009*	-0.080***
	(0.002)	(0.005)	(0.015)
Child gender			
Male	0.071***	-0.055***	0.255***
	(0.008)	(0.018)	(0.071)
R-squared	0.090	0.095	0.140
Hansen overid J stat [p-val]	59.06 [0.00]	27.53 [0.28]	28.57 [0.24]
Mean/prop. of dependent var.	0.101	0.676	6.948
No. of children	23,489	23,489	15,883
B. Including Single Gender Families			
Sons' responsiveness to			
No. of brothers	-0.044***	0.016**	-0.110***
	(0.004)	(0.006)	(0.021)
No. of sisters	0.000	-0.005	-0.023
	(0.004)	(0.005)	(0.017)
Daughters' responsiveness to			
No. of brothers	-0.017***	0.015***	-0.055***
	(0.002)	(0.006)	(0.017)
No. of sisters	-0.004	-0.001	-0.082***
	(0.002)	(0.006)	(0.016)
Child gender			
Male	0.163***	-0.186***	0.177*
	(0.017)	(0.027)	(0.092)
R-squared	0.087	0.056	0.144
Hansen overid J stat [p-val]	44.45 [0.01]	27.46 [0.28]	15.60 [0.90]
Mean/prop. of dependent var.	0.128	0.731	6.841
No. of children	17,838	17,838	13,043

Note: Marginal effects and standard errors (in parentheses) are reported. $^{*}p < .10;^{**}p < .05;^{***}p < .01$.

Table A7 Responsiveness of Support for Adjacent Waves

	Co-resident Homeowner (1)	*Gave Financial Support* (2)	*Ln(Amount of Financial support)* (3)
A. 2013 Wave			
Sons' responsiveness to			
No. of brothers	-0.020***	0.023***	-0.128****
	(0.005)	(0.008)	(0.024)
No. of sisters	-0.006	-0.016**	-0.058**
	(0.006)	(0.008)	(0.027)
Daughters' responsiveness to			
No. of brothers	0.001	0.005	-0.005
	(0.002)	(0.007)	(0.024)
No. of sisters	-0.003*	-0.001	-0.103***
	(0.002)	(0.008)	(0.022)
Child gender			
Male	0.129***	-0.180***	0.512***
	(0.026)	(0.043)	(0.124)
R-squared	0.083	0.082	0.171
Hansen overid J stat [p-val]	29.62 [0.20]	29.14 [0.21]	28.99 [0.22]
Mean/prop. of dependent var.	0.075	0.741	6.536
No. of children	11,689	11,689	8,656
B. 2018 Wave			
Sons' responsiveness to			
No. of brothers	0.006	0.006	-0.173***
	(0.006)	(0.008)	(0.021)
No. of sisters	-0.001	-0.006	-0.064***
	(0.007)	(0.007)	(0.021)
Daughters' responsiveness to			
No. of brothers	-0.002	-0.016**	-0.060**
	(0.004)	(0.007)	(0.024)
No. of sisters	-0.002	-0.016**	-0.062***
	(0.004)	(0.006)	(0.018)
Child gender			
Male	0.080***	-0.180***	0.224**
	(0.024)	(0.032)	(0.101)
R-squared	0.110	0.060	0.136
Hansen overid J stat [p-val]	23.71 [0.48]	14.32 [0.94]	31.84 [0.13]
Mean/prop. of dependent var.	0.135	0.786	6.870
No. of children	13,912	13,912	10,939

Note: Marginal effects and standard errors (in parentheses) from two-step estimation.
$^{*}p < .10;^{**}p < .05;^{***}p < .01$.

Table A8 Responsiveness of Financial Transfers for Adjacent Waves

	Cash Support		*In-Kind Support*	
	Gave Any	*Ln(Amount)*	*Gave Any*	*Ln(Amount)*
	(1)	(2)	(3)	(4)
A. 2013 Wave				
Sons' responsiveness to				
No. of brothers	0.024**	-0.166***	0.008	-0.092***
	(0.010)	(0.023)	(0.009)	(0.027)
No. of sisters	-0.012	-0.082***	-0.016*	-0.027
	(0.009)	(0.026)	(0.009)	(0.033)
Daughters' responsiveness to				
No. of brothers	0.021**	-0.012	-0.005	-0.000
	(0.008)	(0.023)	(0.010)	(0.026)
No. of sisters	0.007	-0.124***	-0.012	-0.092***
	(0.009)	(0.021)	(0.009)	(0.021)
Child gender				
Male	0.008	0.531***	-0.267***	0.202
	(0.041)	(0.135)	(0.047)	(0.154)
R-squared	0.098	0.220	0.069	0.174
Hansen J stat [p-val]	27.00 [0.30]	24.35 [0.44]	22.79 [0.53]	24.93 [0.41]
Mean/prop. of dependent var.	0.531	6.511	0.507	5.865
No. of child-wave obs.	11,689	6,202	11,600	5,884
B. 2018 Wave				
Sons' responsiveness to				
No. of brothers	0.014	-0.218***	-0.010	-0.143***
	(0.009)	(0.019)	(0.009)	(0.028)
No. of sisters	0.012	-0.088***	-0.021**	-0.087***
	(0.008)	(0.021)	(0.008)	(0.024)
Daughters' responsiveness to				
No. of brothers	0.008	-0.065***	-0.034***	-0.064***
	(0.008)	(0.020)	(0.008)	(0.023)
No. of sisters	0.020**	-0.095***	-0.029***	-0.094***
	(0.008)	(0.012)	(0.007)	(0.019)
Child gender				
Male	-0.047	0.362***	-0.240***	-0.039
	(0.034)	(0.123)	(0.034)	(0.111)
R-squared	0.084	0.197	0.082	0.157
Hansen J stat [p-val]	24.51 [0.43]	51.85 [0.00]	16.03 [0.89]	26.22 [0.34]
Mean/prop. of dependent var.	0.546	6.885	0.622	6.078
No. of child-wave obs.	13,912	7,599	13,676	8,504

Note: Marginal effects and standard errors (in parentheses) from two-step estimation. $^{*}p < .10;^{**}p < .05;^{***}p < .01$.

Table A9 Responsiveness of Support for Children in Families with 1 or 2 Sons or Daughters

	Co-resident Homeowner (1)	*Gave Financial Support* (2)	*Ln(Amount of Financial support)* (3)
A. Families with 1-2 sons			
Sons' responsiveness to			
No. of brothers	-0.053***	0.040**	-0.262***
	(0.014)	(0.014)	(0.056)
No. of sisters	-0.001	-0.011	-0.025
	(0.007)	(0.008)	(0.027)
Daughters' responsiveness to			
No. of brothers	-0.004	0.025*	-0.082*
	(0.005)	(0.015)	(0.044)
No. of sisters	-0.002	0.000	-0.102***
	(0.003)	(0.008)	(0.021)
Child gender			
Male	0.131***	-0.160***	0.322**
	(0.027)	(0.047)	(0.138)
R-squared	0.118	0.061	0.147
Hansen overid J stat [p-val]	37.63 [0.04]	33.21 [0.10]	29.55 [0.20]
Mean/prop. of dependent var.	0.121	0.742	6.890
No. of children	10,325	10,325	7,656
B. Families with 1-2 daughters			
Sons' responsiveness to			
No. of brothers	-0.044***	0.018**	-0.106***
	(0.006)	(0.009)	(0.029)
No. of sisters	-0.004	-0.002	-0.010
	(0.012)	(0.014)	(0.057)
Daughters' responsiveness to			
No. of brothers	-0.006**	0.013*	-0.029***
	(0.003)	(0.007)	(0.025)
No. of sisters	-0.012	0.003	-0.117***
	(0.006)	(0.013)	(0.046)
Child gender			
Male	0.158***	-0.152***	0.076
	(0.027)	(0.041)	(0.145)
R-squared	0.079	0.055	0.142
Hansen overid J stat [p-val]	33.88 [0.09]	29.97 [0.19]	22.00 [0.58]
Mean/prop. of dependent var.	0.134	0.742	6.910
No. of children	10,147	10,147	7,527

Note: Marginal effects and standard errors (in parentheses) are reported. $^{*}p < .10;^{**}p < .05;^{***}p < .01$.

Table A10 Heterogeneity Analyses by Frequency of Contact

	Co-resident Homeowner (1)	*Gave Financial Support* (2)	*Ln(Amount of Financial support)* (3)
A. Contact Rarely			
Sons' responsiveness to			
No. of brothers	-0.060***	0.011	-0.155***
	(0.006)	(0.007)	(0.026)
No. of sisters	0.001	-0.019**	-0.031
	(0.008)	(0.009)	(0.028)
Daughters' responsiveness to			
No. of brothers	-0.009***	0.008	-0.037
	(0.003)	(0.009)	(0.024)
No. of sisters	-0.009***	-0.002	-0.056**
	(0.003)	(0.008)	(0.024)
Child gender			
Male	0.186***	-0.094**	0.365**
	(0.027)	(0.045)	(0.149)
R-squared	0.141	0.067	0.174
Hansen overid J stat [p-val]	31.88 [0.13]	24.23 [0.45]	231.44 [0.01]
Mean/prop. of dependent var.	0.140	0.721	6.873
No. of children	7,922	7,922	5,708
B. Contact Frequently			
Sons' responsiveness to			
No. of brothers	-0.022***	0.023**	-0.040
	(0.006)	(0.009)	(0.029)
No. of sisters	0.001	-0.021**	-0.011
	(0.008)	(0.009)	(0.032)
Daughters' responsiveness to			
No. of brothers	-0.006*	0.013*	-0.017
	(0.003)	(0.008)	(0.025)
No. of sisters	0.000	-0.005	-0.121***
	(0.004)	(0.008)	(0.025)
Child gender			
Male	0.143***	-0.140**	0.049
	(0.038)	(0.059)	(0.168)
R-squared	0.064	0.052	0.147
Hansen overid J stat [p-val]	21.99 [0.58]	20.49 [0.67]	20.21 [0.69]
Mean/prop. of dependent var.	0.104	0.757	6.724
No. of children	7,191	7,191	5,443

Note: Marginal effects and standard errors (in parentheses) from two-step estimation. $^{*}p < .10;^{**}p < .05;^{***}p < .01$.

Table A11 Responsiveness of Support to Single Parents

	Co-resident Homeowner (1)	*Gave Financial Support* (2)	*Ln(Amount of Financial support)* (3)
A. Single Mothers			
Sons' responsiveness to			
No. of brothers	-0.058***	0.031***	-0.131***
	(0.008)	(0.008)	(0.025)
No. of sisters	0.003	-0.003	-0.018
	(0.009)	(0.009)	(0.029)
Daughters' responsiveness to			
No. of brothers	-0.008**	0.020***	-0.067***
	(0.004)	(0.008)	(0.025)
No. of sisters	0.002	0.006	-0.086***
	(0.005)	(0.007)	(0.022)
Child gender			
Male	0.237***	-0.201***	0.554***
	(0.043)	(0.060)	(0.210)
R-squared	0.110	0.080	0.171
Hansen overid J stat [p-val]	19.37 [0.25]	23.82 [0.09]	19.52 [0.24]
Mean/prop. of dependent var.	0.150	0.749	6.567
No. of children	4,414	4,414	3,308
B. Single Fathers			
Sons' responsiveness to			
No. of brothers	-0.050***	-0.003	-0.242***
	(0.013)	(0.015)	(0.053)
No. of sisters	0.022	-0.023	-0.060
	(0.019)	(0.021)	(0.066)
Daughters' responsiveness to			
No. of brothers	-0.010	-0.012	-0.070
	(0.009)	(0.016)	(0.044)
No. of sisters	-0.019***	-0.026	0.046
	(0.007)	(0.016)	(0.045)
Child gender			
Male	0.021	-0.186*	0.089
	(0.067)	(0.105)	(0.484)
R-squared	0.062	0.090	0.140
Hansen overid J stat [p-val]	15.55 [0.48]	26.24 [0.05]	21.64 [0.16]
Mean/prop. of dependent var.	0.140	0.704	6.572
No. of children	1,468	1,468	1,033

Note: Marginal effects and standard errors (in parentheses) from two-step estimation. $^{*}p < .10;^{**}p < .05;^{***}p < .01$.

Table A12 Responsiveness of Support to Married Parents

	Co-resident Homeowner (1)	*Gave Financial Support* (2)	*Ln(Amount of Financial support)* (3)
Sons' responsiveness to			
No. of brothers	-0.034***	0.013	-0.062*
	(0.006)	(0.009)	(0.032)
No. of sisters	-0.000	-0.029***	-0.043
	(0.006)	(0.008)	(0.030)
Daughters' responsiveness to			
No. of brothers	-0.007***	0.008	-0.001
	(0.003)	(0.009)	(0.029)
No. of sisters	-0.004**	-0.009	-0.111***
	(0.002)	(0.009)	(0.024)
Child gender			
Male	0.130***	-0.147***	0.000
	(0.023)	(0.040)	(0.138)
R-squared	0.081	0.061	0.136
Hansen overid J stat [p-val]	17.64 [0.35]	17.19 [0.37]	7.55 [0.96]
Mean/prop. of dependent var.	0.107	0.738	6.949
No. of children	9,231	9,231	6,810

Note: Marginal effects and standard errors (in parentheses) from two-step estimation. $^{*}p < .10;^{**}p < .05;^{***}p < .01$.