Confucianism, Social Norms and Household Savings Rates in China

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October 20, 2016

Abstract

We study the effect of (declining) Confucian social norms on human capital investment and savings rates in China. In our simple two-period model, parents have the option to invest in either a risk-free asset or the human capital of their child. We assume that social norms, and thus enforcement mechanisms, for supporting old-age parents may differ across regions. Consequently, these cultural norms for acceptable filial piety determine the probability of children's non-performance on their repayment obligations to parents, which in turn affects the variation in returns that parents can expect to receive from investing in their children. Modeling default by children as a function of the prevailing social norms gives us the flexibility to study the impact of the declining Confucian influence on China's consumption-saving trends. Using data from the China Household Finance Survey, this paper adds to the current literature in several ways. First, we provide evidence to support the key assumption in the life-cycle hypothesis in Modigliani and Cao [2004]: that parents view their children, especially sons, as a source of retirement income. Thus, parents' investments in children's human capital are not altruistic; nor are intergenerational transfers from adult children to old-age parents. Second, we offer an alternative explanation for high household savings in China. In addition to the One Child Policy and the gender imbalance-induced pressure to save more, the lack of financial development and the declining influence of Confucianism are also significant contributors to China's rising savings rates by widening the gap between son and daughter families.

1 Introduction

Household savings rates in China have been growing rapidly over the past three decades. The average household savings rate has grown from fifteen percent in 1990 to over thirty percent in recent years (Chamon and Prasad [2010], Modigliani and Cao [2004]). Various hypotheses have been proposed to explain this as well as the changing age profile of saving behavior. Based on the life-cycle hypothesis framework,

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Modigliani and Cao [2004] point out that the increased employment-to-minor ratio as a result of the post-1979 One Child Policy is a main contributor to the increasing savings rate. This arises both from the fact that there are "fewer mouths to feed" and the cultural reason that Chinese families view children as a substitute for life-cycle saving. Empirically, Banerjee et al. [2014] show that families with sons tend to save less than those with only daughters; this finding is consistent with the life-cycle hypothesis and in line with the Confucian tradition in which adult sons have more obligations to care for parents.

Intergenerational transfers from adult children to elderly parents are common and widely documented in China and other developing countries (Oliveira [2016]). However, the motives for and working mechanisms of these transfers are still unclear. When Chinese household savings are studied, it is usually assumed that parents view children as a form of investment for old-age insurance and future risk events. Parents decide how much to invest in children's human capital based on the perceived return from such investments, while children determine how much to repay their elderly parents based on the human capital investment they received while young (Ge et al. [2012], Choukhmane et al. [2013]). One piece that is missing from such economic models is whether the enforcement mechanisms needed for such intra-family risk-sharing arrangements between parents and children are reliably provided. If not, the implicit inter-temporal financial exchange between parents and children may not be enforceable. Previous research suggests that a sense of guilt and explicit sanctions against children who ignore such obligations function as mechanisms through which the intra-family exchange is made whole (Cox et al. [1998]).

In this paper, we study the effect of Confucian social norms on household savings rates. Existing studies have overlooked the impact of the still prevalent but weakening Confucian social norms on saving behavior in China. After all, a self-interested adult will always be evaluating the costs and benefits of honoring her obligations to her elderly parents vis-a-vis not doing so. As the prevailing social norms change, the optimal decision may be her to default on the children-to-parents repayment obligations.

We build a simple two-period model in which parents have the option to invest in either a risk-free asset or the human capital of their child. We assume that social norms, and hence enforcement mechanisms, for supporting old-age parents may differ in each region. Thus, these norms for acceptable filial piety determine the probability of children's non-performance on their repayment obligations to parents, which in turn varies the return that parents can expect to receive from investing in their children. Modeling default by children as a function of the prevailing social norms gives us the flexibility to study the impact of the declining Confucian influence on China's consumption-saving trends.

This paper adds to the current literature in several ways. First, we provide direct evidence supporting the key assumption in the life-cycle hypothesis: that parents perceive their children, especially sons, as a source of retirement income. Our survey data show that parents' investments in children's human capital

are not altruistic nor are intergenerational transfers from adult children to old-age parents. Second, we offer an alternative explanation for high household savings in China. In addition to the One Child Policy and the gender imbalance-induced pressure to save more, the lack of financial development and the declining influence of Confucianism are also significant contributors to China's ever-increasing household savings rate. When external financial products such as retirement funds and insurance products are not widely available, individuals must hedge against future risks and uncertainties with other means. Traditionally, the most reliable way has been to have more children, especially sons, to provide old age and sickness insurance. However, the One Child Policy has since 1979 restricted this option. In addition, the declining influence of Confucianism—especially in cities—and increased population mobility across regions have increased the rate at which children default on their obligations to parents and hence render children unreliable investment instruments. In other words, filial piety is no longer a guaranteed value shared by younger generations.

Our research uses survey data collected by the China Household Finance Survey (CHFS), which is the most comprehensive survey on household assets in China. It has nationally representative samples that cover 29 provinces. The survey was conducted in the years 2011 and 2013. In this study we use the samples collected in the 2013 wave. A crucial innovation in our research is the construction of an Confucian Index, which is the percentage of respondents in a given city or town that choose "For old age support" as an answer to the survey question "Why do you want to have children?". This index captures at least two elements about the local region's values. First, it indicates the degree of Confucian influence in the local culture and acceptable social norms. In this sense, a higher Confucian Index indicates a more reliable return from investing in children and hence a lower chance that children will default on their repayment obligations to parents in the future. That is, a high Confucian Index value implies a low default probability on children-to-parents obligations. Second, the Confucian Index may measure the extent of "need" for children to be a reliable investment instrument for old age because other alternatives such as financial products are not available or reliable. If so, a region with a high index value may endogenously develop a culture that is more Confucian and emphasizes filial piety more heavily, serving to reduce the default probability of the implicit financial contract between parents and children. Thus, we interpret the Confucian Index as measuring the reliability of the implicit intra-family financial contract in a given community.

Using our data set, we investigate how savings rates are affected by Confucian social norms or by the declining trend thereof. We focus on the following questions. First, do households living in regions with a high Confucian Index save less? Second, do parents in such regions receive more intergenerational transfers from their adult children? Our results indicate that the gap of savings rates between household with a son and daughter is widened for regions with declined Confucian influence. Or in other words, comparing to

daughter families, son families in regions with lower level of Confucian social norm save more than those regions with higher level. Using data on intergenerational transfers, we also find that sons from regions with a higher Confucian Index provide more monetary support to their elderly parents. This finding can be possibly explained by the endogeneity of culture that parents in high Confucian social norm regions have strong financial needs to rely on their children for old age.

Our survey data also show that as size of the city increases, the value of the index - and thus the influence of Confucianism - reduces. Furthermore, the influence of Confucian filial piety is expected to continue to decline. With time, even parents with sons will have to save more than prior generations, in anticipation that their implicit financial contract with children will be more likely to be broken. Therefore, Chinese household savings have been on the rise partly due to the declining influence of Confucianism.

The remainder of the paper is organized as follows. We provide a literature review on savings rate and Confucian social norms in section 2. In section 3, a simple two-period model is presented and testable predictions are derived. In section 4 and 5, we discuss the data and preliminary analyses. Empirical results are presented in sections 6 through 7, and concluding remarks are made in section 9.

2 Literature Review

2.1 High Savings Rate in Developing Countries

Household savings have increased significantly over the past three decades in China. Rural household savings rate rose from 15% to 32%, while urban savings rate rose from 15% to 28%[1]. This dramatic trend has remained a puzzle for economists (Kraay [2000], Chamon and Prasad [2010]). Many theories have been proposed to explain the sharp change in Chinese household saving behavior. Modigliani and Cao [2004] offer two key insights from the life-cycle theory of saving. First, the aggregate savings rate is a function of a country's long-term income growth. As China's growth trend continues to be strong, Chinese households are incentivized to save more in order to take advantage of long-term growth. Second, there is a causal relationship between demographic changes and the aggregate savings rate. Many empirical studies have attempted to estimate the impact of the demographic structure on savings. Using the One Child Policy as an instrument for fertility, Banerjee et al. [2014] find that the number of children in a household is negatively correlated to the household's savings rate. While the national savings rate is associated with the age composition of its population, household savings rates are determined by each household's lifetime utility maximization process, together with other household economic matters including fertility and hu-

[1] Authors' calculation using China Statistical Year Books.

man capital investment decisions (Becker and Lewis [1973], Schultz [2007]). Unraveling the causal effect of demographic structure on saving behavior is hence challenging. For example, using provincial data and a dynamic panel analysis, Horioka and Wan [2007] does not find the age structure to have an impact on household savings rate.

Wei and Zhang [2011a] propose a theory based on the competitive savings motive to explain the high savings rate. Using both census and household survey data, they find that when the male/female ratio is abnormally high, parents have to save more in order to increase their son's competitiveness in the marriage market. In a recent paper, Ge et al. [2012] utilize a three-period overlapping-generations model to show the effect of the One Child Policy on savings rate. They demonstrate that older households save more for old-age security reasons, while middle-age households save more due to the decreased burden of child bearing.

2.2 The Role of Social Norms on Saving Behavior

Existing theories are compelling and have helped us to understand the drivers of increasinglysavings rates in China. But these studies have taken the cultural and social norms in China as a given that does not change. The reality is that social norms have been endogenously evolving in response to changes in the social, cultural and economic conditions of China. Such changes in social norms should impact the reliability of intra-family inter-temporal risk-sharing arrangements, which in turn will affect saving behavior even for families with sons.

Traditionally, households in developing countries have relied heavily on intergenerational transfers from adult children to parents as a source of old-age support. The old-age-security hypothesis dates back at least to Leibenstein(1957), who hypothesizes that parents view children as an investment asset. This view is supported by household surveys in developing countries where parents typically indicate old-age security as the key motive for having children (Choukhmane et al. [2013]).

In the classic Becker model, however, intra-family transfers are assumed to be altruistic, with the family continuing throu gh an infinite sequence of dynasties (Becker [1981]). In this setting, parents make their consumption-saving-investment decisions to maximize the total household utility of consumption not only for the current generation but also of their children's and grandchildren's generations, and so on. The altruistic dynastic-household model focuses on transfers from parents to future generations, whereas the old-age-security hypothesis focuses on the repayment obligations of children to parents and treats children as personalized instrument of inter-temporal risk hedging. The latter hypothesis is supported by evidence

in many countries of adult children repaying their elderly parents (Cox et al. [1998]).

For children to be an acceptable instrument of insurance and risk-hedging, reliable institutions or social norms must exist to minimize the default probability of the implicit intra-family inter-temporal contract and to ensure compliance by the children. An egoistic adult will evaluate the costs and benefits of repaying the obligations and maintaining membership in the intra-family risk-sharing system, as opposed to defaulting and exiting the system. Given that a person cannot choose which family to be born into, he will choose to stay in the given household system only if the return from intra-family exchange is higher than the external market rate (Cigno [1992]), or if the external financial markets simply do not exist. As Cigno [1992] argues, a middle-aged person can choose to default and have no children of his own or stay in the system and have as many children as he can. Thus, the social norms and the associated penalties for defaulting are key factors in determining where the optimal cost-benefit tradeoff lies.

The issue of compliance is particularly challenging in the Chinese context for two reasons. First, when the number of children per household is fixed at one under the One Child Policy, there is no way to increase the risk-hedging effectiveness by having more children. Even for the sole child a couple can have, there is no certainty for filial piety or future repayment to parents by the child unless the social norms are extremely constraining and punitive. Second, in China and many other developing countries, the financial markets are still under-developed and unreliable; as a result, intra-family transfer arrangements are often a better insurance option (Cox and Jimenez [1992]). Parents will likely continue to mix and optimize their portfolio of both financial assets and children (as personalized insurance instruments). But whether children continue to represent a more cost-effective and reliable hedge against old age and sickness depends on the extent to which the cultural values and social norms continue to internalize high enough costs for violating the implicit intra-family financial contract. If filial piety is no longer a valued and practiced virtue and if financial markets remain under-developed, parents will have no alternative but to save more and consume less.

In this paper, we hypothesize that parents' expectations of the future return from investing in children are a function of changing social norms for old-age support. In order for them to raise children as a way to engage in intra-family financial exchange as opposed to relying on external markets, they have to believe with enough confidence that their children will follow through on the implicit contract and repay the investment in the future. In our model, parents decide on the following: 1) whether or not to invest in their children, and 2) how much to invest.

Traditionally, the implicit intra-family financial contract has been enforced via the Confucian value system, which predominantly emphasizes the children-to-parents obligations as well as the younger brother's obligations to elder siblings. These values and the resulting behavioral norms are internalized both psy-

chologically and through a patrilineal property inheritance system. Psychologically, as Young [2008] points out, social norms function in such a way that if one deviates from the norms, he not only has to feel a strong sense of guilt but also face the prospect of social exclusion and punishment. Economically, Kandori [1992] argues that social norms come with community-level penalties that apply to those who do not conform. In addition, as property and land were traditionally owned at the family level instead of at the individual level, and the most senior surviving male was the head of the family until his death, adult children were forced to honor Confucian filial piety norms for fear of losing the expected property or land ownership. Therefore, several factors made the intra-family financial contract work: internalized guilt, economic incentives reinforced by the land property system, and population immobility across regions (so as to make the community static).

However, beginning about three decades ago, the pace of industrialization increased, resulting in both rapid urbanization and large-scale population mobility. Coupled with the public ownership system of all land in China, these changes have led to rapid decline of Confucian influence and its core social norms. As both the psychological and economic costs of deviating from filial piety norms have declined, the implicit intra-family financial contract has become less and less enforceable. Even though the continuous decline of Confucian influence is a national trend in China, there are, as our data will show, vast differences across regions. This offers us enough variability to study the impact of this trend on both household level and aggregate savings rates.

3 Social Norms and Saving Behavior: Theory

In this section, we build a two-period model to illustrate how social norms filial piety can impact human capital investment and household saving behavior, by extending the model of Ge et al. [2012] to our present context. Suppose an agent lives for two periods and receives an income of Y_1 and Y_2, respectively, in periods 1 and 2. In period 1, the agent decides on the amount to save, S, and the number of children to have, n. The financial savings are assumed to earn a risk-free gross return, $R(.)$, over period 2. The return from investing in children is $g(.)$ if the children do not default on the implicit financial contract. First, we consider the case where there is no uncertainty. For simplicity, assume there is no credit constraint between periods. Suppose the agent wants to maximize the following lifetime utility:

$$\begin{aligned} Max \quad & u(c_1) + \beta u(c_2) \\ s.t. \quad & c_1 + S = Y_1 - qn \end{aligned} \tag{1}$$

$$c_2 = (Y_1 - qn - c_1)R + \gamma g(qn) + Y_2$$

where $c_1$and c_2 are the respective consumption in periods 1 and 2; $u(.)$ is the period utility of consumption; β is the subjective discount factor; n is the number of children; q is the human capital investment per child, such as wedding gifts and college tuition; and R is the gross risk-free interest. Parents are expected to receive $\gamma g(qn)$ from their adult children when they retire in the second period, where γ is the Confucian Index in the region where the agent lives and $g(qn)$ is the promised return function from investing in children (which is increasing and concave in qn) provided that there is no future default by the children[2]. As discussed above, the Confucian Index γ captures the local social norms for supporting elderly parents. In our model, we use γ to represent the parents' subjective discount function that isapplied to the return, $g(qn)$, from investing in their children.

Due to the strict birth-control policies in China, households are allowed to have no more than $\bar{n}$ children, i.e. $n \leq \bar{n}$. Suppose a corner solution for fertility is obtained and the household chooses to have $\bar{n}$ children. With a log utility function, the optimal period 1 consumption is:

$$c_1^* = \frac{1}{1+\beta}[Y_1 + \frac{Y_2}{R} + \frac{\gamma g(q\bar{n})}{R} - q\bar{n}]$$

Hence the period 1 savings rate is

$$s = \frac{Y_1 - c_1^*}{Y_1} = 1 - \frac{1}{(1+\beta)Y_1}[Y_1 + \frac{Y_2}{\beta} + \frac{\gamma g(q\bar{n})}{R} - q\bar{n}]$$

In this model, parents are profit-maximizing when they decide how much to invest in their children. They will keep investing more in children until the marginal return from such investment equals the marginal cost. Optimal period 1 consumption is increasing, while the optimal savings rate is decreasing, in the level of Confucian filial piety or the region's Confucian Index, γ.

If we further assume, following the Confucian tradition, that only sons are obligated to provide old-age support, then we can rewrite the return function from raising children as $z[1_{boy}\gamma g(q\bar{n})]$, where $z[1_{boy}]$ is the characteristic function that equals 1 if a household has a son and 0 otherwise.For households with only daughters, we shall not expect to see a correlation between the Confucian Index, γ, and the optimal savings rate, because investing in daughters is not profitable. A resulting prediction is that households with a son will save less than those with only daughters. According to the separation theorem, for households with

[2]For simplicity, assume that parents do not derive utility directly from raising a child.

sons, the parents' profit-maximizing human-capital investment in children is determined by

$$\max_{q} \frac{z[1_{boy}]\gamma g(q\bar{n})}{R} - q\bar{n} \tag{2}$$

Let the optimal investment level derived from the above equation be $q^* = q(\gamma, \bar{n}, R)$, then the marginal effect of social norms, γ, on the period 1 savings rate can be written as

$$\frac{\partial s_1}{\partial \gamma} = -\frac{1}{Y_1(1+\beta)} \left(\frac{z[1_{boy}] \left[g(q\bar{n}) + \gamma g'(q\bar{n}) q'_\gamma \right]}{R} - \bar{n} q'_\gamma \right) \tag{3}$$

Rewriting equation (3), we get

$$\frac{\partial s_1}{\partial \gamma} = -\frac{1}{Y_1(1+\beta)} \frac{z[1_{boy}] \left[g(q\bar{n}) + \gamma g'(q\bar{n}) q'_\gamma \right]}{R} + \frac{1}{Y_1(1+\beta)} \bar{n} q'_\gamma \tag{4}$$

The first term in the above equation is the income effect, and the second term the substitution effect. Note that $q'_\gamma > 0$ due to the concavity of $g(.)$. This means that the higher the Confucian Index, or the more prevalent the Confucian values, the more the parents are willing to invest in children. However, an increase in the value of social norms, γ, has two effects on the household savings rate. The income effect leads parents to save less because they expect to receive more transfers from their children in period 2, but the substitution effect leads them to save more because investment in children is now more profitable and hence they will sacrifice some current consumption to increase their future consumption. Hence the overall effect of γ on first period savings rate is ambiguous.

However, if we assume households with only daughters will not benefit from a more Confucian cultural environment, e.g. the first component in equation 4 is zero. In this case, we can compute the effect of γ on the savings rate gap between son and daughter family as follows

$$\frac{\partial s_1}{\partial \gamma}|_{son} - \frac{\partial s_1}{\partial \gamma}|_{daughter} = -\frac{1}{Y_1(1+\beta)} \frac{z[1_{boy}] \left[g(q\bar{n}) + \gamma g'(q\bar{n}) q'_\gamma \right]}{R} \tag{5}$$

Equation (5) captures the aggregate effect of γ on the gap of savings rate between son and daughter families. The sign of (4) is always negative. Thus, when social norms become more Confucian and returns from sons are more reliable, we will see a larger gap in savings rate between the two. Households with sons will save, even more, in first period, comparing to households with daughters.

In Appendix A, we introduce a stochastic version of the above model. We show that when human capital investment is considered as a risky asset, parents in regions with stronger Confucian influence invest more in their children's human capital. The impact on the optimal savings rate is, however, ambiguous.

4 Data and Construction of the Confucian Index

4.1 China Household Finance Survey and the Construction of the Confucian Index

This paper uses the data set from the 2013 China Household Finance Survey (CHFS). The survey interviewed 28,228 households across 29 provinces in China. We attached a questionnaire that asked the respondent, "What is the purpose of having a child?", to which respondents could choose any number of five choices: a) to continue the family blood line, b) out of love for children and for personal connections, c) for old-age support, d) because everyone else does it, and e) other reasons.

CHFS follows a three-stage stratified random sampling design. The first stage selects counties (*Xian*) from each province. The second stage selects residential committees and villages (*Juweihui* or *Cunweihui*) from a chosen county. The last stage selects households from each residential committee or village.

A Confucian Index that measures the local region's filial piety attitudes is constructed using two different methods. In the first method, we let the old-age support indicator, Y_{ij}, for respondent i in county j to be equal to 1 if "c) for old-age support" is one of her choices and 0 otherwise. The Confucian Index for each county j is calculated as follows:

$$ConfucianIndex_j = 100 \times \frac{\sum_{i=1}^{N} Y_{ij}}{N} \tag{6}$$

In the second method, we use the information on the order of choices made by the respondent to construct the index. Since the question has multiple choices, we assign a value of 4 to a respondent if she chooses option c) as her first choice, 3 if c) is her second choice, 2 if c) is her third choice so on so forth. Hence Confucian Index 2 at the county level is calculated as the arithmetic average of each individual in the county as per equation (6).

Table 1 summarizes the average Confucian Index by county type, respectively, according to equation (6). The first row of Table 1 shows the value of Confucian Index calculated using method 1. It is clear that the value of the Confucian Index for large cosmopolitan municipalities like Beijing and Shanghai is the lowest among all city types, indicating these cities to be the least Confucian societies. On average, 42.9% of people living in these mega cities view children as old-age security investment. Going from the top-tier mega cities to provincial capital cities, to prefectural cities and then to county towns and rural villages, the value of the Confucian Index shows a clear rising trend, implying that the Confucian social norms are more emphasized and needed in villages for economic security reasons. This indicates a strong negative correlation between access to modern finance and dependence on children for old-age support since external financial products

are the more readily available in the mega cities and least accessible in rural villages[3]. Confucian Index 2 is constructed using the order of the chosen options. As shown in Table 1, Confucian Index 2 also increases as we go from mega cities to rural villages. Table 1 also demonstrates a negative relationship between the Confucian Index and the average household savings rate across county types. The average household savings rate for households in municipalaties is 28.6%, compared to 8.3% for households in rural villages.

Figure 1 plots the correlation between the county-level average household savings rate and the value of the Confucian Index for the 264 counties with valid observations in the 2013 CHFS survey. There is a clear negative correlation between the two variables using the cross-sectional data. A simple linear regression shows the coefficient to be -0.23, with a t-statistic of -3.39 and an R^2 value of 0.36. The regression coefficient means that for every 1% increase in individuals who believes the purpose of having children is for old age security, the average savings rate decreases by 0.23%. Although no causal inference can be made by this simple correlation, the negative coefficient shows that if we expect the Confucian social norm to decline over time, we would probably expect to see an increase in the average savings rate at the same time. More rigorous empirical analysis will be performed in the next section.

4.2 Data for Empirical Analysis

In the empirical analysis below, we use the average value of the Confucian Index constructed by method 1 described in the previous section at the county level. Following Wei and Zhang [2011a], we only include urban families in our analysis. We exclude urban families with more than one child, single-parent families as well as families with three generations living together. Only urban families with one unmarried child between ages seven and twenty-one are included in our study[4]. There are altogether 264 counties with valid observations to the perception question. Among them, 246 counties have at least one urban residential committee (*Juweihui*). We therefore include only these 246 counties in our analysis. In the robustness check section, we repeat the regressions with rural communities and show that the results remain unchanged.

The final sample in our study consists of 1,998 nuclear families in 246 urban counties; of these, 816 families have one daughter and 1,182 have one son[5]. Table 3 shows the descriptive statistics of our sample. Although there is a difference in sample size between single-child families with a daughter or a son, the distribution of parental characteristics and children's age profile are very similar. The Confucian Index among these families is 49.3 and it is similar between daughter and son single-child families.

[3] Hence, a negative correlation between modern finance and prevalence of Confucianism in a society.

[4] In section 7 we show results when these sample selection criteria are relaxed.

[5] In section 7 we discuss the potential sample selection bias for the imbalanced panel

Table 2 summarizes the household savings rate in the full sample of CHFS[6]. Table 3, row 1 displays the savings rate for nuclear families with one unmarried child between 7 and 21. The average savings rate for these urban nucleus families is 11.5%, and the savings rate for families with daughters is 9.2% and sons 13%. This value is comparable to the savings rate among urban nuclear families in the China Household Income Project (CHIP)[7] . The difference between the savings rate for daughter and son single-child families is statistically significant. Section 5 discusses the potential mechanisms that lead to this difference.

The question of whether parents perceive children as a form of investment has been debated for a long time. Surveys in developing countries sometimes have attempted to address this question and parents often indicate that children are a form of investment. To our knowledge, this has not been studied in China. In our survey, 57.8% respondent chose "for old age support" as one of the reasons to have children. To further understand their views on raising children, we ask them how they plan for retirement. To this, 41.8% of the respondents choose "support from children" as one of their answers. This finding indicates that in a Confucian society like China, receiving old-age support from adult children is a commonly accepted social norm.

5 Empirical Analysis

To identify the effect of Confucian Index on household savings rate, we rely on the following multivariate regression

$$savingrate_{ij} = \alpha_0 + \alpha_1 ConfucianIndex_j + \alpha_2 ConfucianIndex_j \times son_{ij} + \alpha_3 son_{ij} + \theta X_{ij} + \lambda_p + \epsilon_{ij} \quad (7)$$

Where $ConfucianIndex_j$ is the index of county j, measuring the percentage of respondents in the given county who choose "for old-age insurance" as a reason for having children. son_{ij} equals 1 if household i has a son and 0 otherwise; and X_{ij} is a set of household characteristics of household i living in county j. We are interested in estimating the effect of $ConfucianIndex$ on household savings rate. It was noted in section 2 that under Confucian social norms, parents expect to receive more old-age support from sons than from daughters, hence we include an interaction term the interaction term $ConfucianIndex_j \times son_{ij}$ in the regression. This allows us to compare household savings rate between son and daughter families across counties with different levels of Confucian Index. However, the distribution of $ConfusianIndex$ across

[6]We define household savings rate as $\frac{Income-Expenditure}{Income}$. We choose this definition over the conventional definition of $Log(income) - Log(Expenditure)$ because taking logarithm will likely skew savings rate when it is negative or close to 100%. For negative savings, taking the logarithm attenuates the negative savings rate. For savings rate close to 1, taking logarithm leads to savings rate larger than 1.

[7]Authors' own calculation. Data available upon request.

counties are unlikely to be random. For example, there might be unobserved characteristics at prefecture or county level that also correlate with household savings rate. To overcome this issue, we include in the baseline regression a prefecture fixed effect λ_p. As Confucian Index varies within a given prefecture, this specification allows us to identify coefficients α_1, α_2 and α_3.

However, at any given prefecture, county level unobservables that simultaneously affect household savings rate and the Confucian Index are not captured by this specification. Therefore in equation 8, we include a county level fixed effect δ_j, which captures all county invariant error component that affects savings rate in the cross-sectional data. As a trade-off, coefficient on the Confusian Index hence coefficient, α_1 , in equation (7) will not be identified.

$$savingrate_{ij} = \alpha_0 + \alpha_2 ConfucianIndex_j \times son_{ij} + \alpha_3 \times son_{ij} + \theta X_{ij} + \delta_j + \epsilon_{ij} \tag{8}$$

We report results using both specification 7 and 8 in the next section. Per the discussion in section 3, the aggregate effect of Confucian Index on household savings rate depends on the trade-off between the income and substitution effect of raising a child. Coefficient α_1 in the baseline regression equation 7 captures the effect of the Confusian Index on savings rate for households with a daughter. Based on our assumption that the social norm only puts constraints on sons, this coefficient is expected to be zero. After adding the county fixed effect, as shown in equation 8, coefficient α_1 is absorbed and coefficient α_2 is identified by comparing savings rate between son and daughter families within a county. Therefore coefficient α_2 estimates the gap in household savings rate between son and daughter families at a given level of Confucian social norm.

6 Results

In Table 4, we present the OLS results using the Confucian Index calculated with method 1. Robust standard errors clustered at the community level *('jiedao')* are calculated and corresponding t-values are reported in parentheses. Columns 1- 3 present results using equation 7 while column 4 presents results with county fixed effects as in equation 8.

The coefficients for the Confucian Index on the household savings rate, as presented in columns 2 and 3, are positive and statistically significant. Coefficients for the interaction term $son \times ConfucianIndex$ is negative and statistically significant. Since the absolute value of coefficient on Confucian Index is larger than that of the interaction term, the aggregate effect of Confucian Index on household savings rate is positive for households with a son. However, once we include the prefecture fixed effect, as shown in column 4, coefficient on the Confucian Index becomes positive but insignificant. This shows that a large

amount of correlation between Confucian Index and household savings rate can be explained by prefecture level heterogenity. Meanwhile, the interaction term remains negative and statistically significant, with a value very close to that in column 3. As shown in column 4, on average, for every 1% drop in people that believing in having children for old support purpose in the county, the savings rate gap for a son family and daughter family will increase by 0.33%.

Column 5 reports the results with county fixed effects. The coefficient of the interaction term remains very similar to that of column 3 and 4 and is statistically significant. The negative interaction term shows that other things being equal, the effect of Confusian Index on household savings rate is significantly less for families whose single child is a son than those with a daughter. This is inline with our hypothesis and consistent with the findings by Banerjee et al. [2014]. It also provides evidence that parents harbor different expectations of financial returns from sons than from daughters. It also means that in localities with a higher Confucian Index, the savings rate differential between families with a son and those with a daughter will be even bigger than in localities with a lower Confucian Index. On average, every 1% decrease in the population that believes in the Confucian social norm leads to about 0.3% increase in the savings gap between son and daughter families. Thus, stronger decline in Confucian influence leads families with one son to save even less than otherwise.

Table 4 also indicates that the savings rate is negatively associated with household wealth and positively associated with household income. Very few previous studies have directly estimated the relationship between household wealth and the savings rate due to data limitations. Our results show a statistically significant relationship between household wealth and savings rate. For every one million RMB increase in accumulated wealth, the savings rate will decrease by 4%. This is consistent with theories suggested by Modigliani and Cao [2004][8]

7 Robustness Checks

7.1 Alternative measure of Confucian social norm

The Confucian Index used in previous sections are constructed from averaging responses in a county, which is subject to measurement error. Therefore in this section, we use an alternative measure of Confucian social norms to check the robustness of our results. We exploit the exogenous variation of family structures and use the percent of households living in a four-generation households in a county as a measure for Confucian social norms. We match the counties in our final sample with the 2010 census and calculate the percentage

[8]Modigliani and Cao (2004) suggest that savings rate should be positively correlated with household income growth rate. If we assume households with higher wealth experience slower income growth, then our results are consistent with their theory.

of families living in a four-generation households for each county. Four-generation households are defined as households with parents, grand-parents, great grand-parents (either maternal side or paternal kin) and children living in together. These households are likely to be those that have strong beliefs in the Confucian filial piety social norms.

Table 5 presents the OLS results using the alternative measure of Confucian social norms. We follow the exact same empirical specification used in section 5, only replacing Confucian Index with percent of four-generation-househoulds in a county. The average value of the coefficient for $son \times \%four - generation - households$ across all specifications in Table 5 is around -11, which means that for every 1 percent increase in households living in a four-generation households, the savings gap between son and daughter families increases by 11%. The results are statistically significant and robust to various regression specifications. This pattern is consistent with the main results presented in the previous section.

Although the percent of four-generation households in a county also captures the influence of social norms, we prefer to use the Confucian Index constructed from our survey for several reasons. First, the Confucian Index can be easily re-constructed from follow-up CHFS surveys. With longitudinal data, we are able to compare changes in Confucian social norms, as measured by the Confucian Index, over time. The time trend of the index provides valuable information on understanding changes in culture and social norms. In contrast, data on the four-generation households are only available in decennial surveys. The number is very small, and as the one-child generation enters retirement, we believe that the number will further decline. Therefore the measure will be much less variable across counties and over time compared to the the Confucian Index measure. Hence overall the Confucian Index is preferred to the percent of four-generation households as a measure for regional Confucian social norms.

7.2 Specification with family type

In the empirical analysis presented in the previous sections, households are classified as either single-child son family or a single-child daughter family based on the gender of the child. In the theoretical model presented in section 3, we assume that parents expect returns from sons but not daughters. However, there are families with a son that do not follow the Confucian social norms and do not expect to receive old-age support from their son. On the other hand, there are families that expect to receive old-age support from their adult child, even if they have a daughter. Therefore we can further partition households into four types conditioned on the gender of the child and their answer to the question "why do you want to have children?".

Table 7 summarizes the average savings rate for these four types of households. Table 7 indicates that

the high savings rate for households with a son is mainly driven by type-3 families, i.e. families with a son that do not expect to receive any old-age support from their children. In contrast, the low savings rate among households with a daughter is mainly driven by type-2 families, i.e. families with a daughter that expect to receive old-age support from their children. Given the large variation in savings rate among the four family types, we add a family type dummy in the regression model as follows:

$$\begin{aligned} savingrate_{ij} &= \alpha_0 + \sum_{l=2}^{4} \alpha_l \times familytype_{ij} \times l + \beta_l ConfucianIndex_j \\ &\quad + \sum_{l=2}^{4} \beta_l \times familytype_{il} \times l \times ConfucianIndex_j + \theta X_{ij} + \epsilon_{ij} \end{aligned} \tag{9}$$

Table 8 presents results from regression equation (9). The dependent variable for the regressions is household savings rate. Column 1 reports the OLS result using the Confucian Index calculated per method 1 on household savings rate. Column 2 reports the result using percent of four-generation households on savings rate. All regressions control for household and individual characteristics as well as county dummy. The coefficients for the interaction terms of family type dummy variables and Confucian Index are all negative. This means that compared to single-child daughter families without a perception of old-age support (type-1 family), single-child daughter families with a perception of old-age support and single-child son families without a perception of old-age support will decrease household savings rate as a result of increasing Confucian social norms. In particular, the coefficients for $familytype_4 \times ConfucianIndex$ are statistically significant in all three models. This result implies that single-child son families with a perception of old-age support (type-4 family) will decrease their savings rate under the influence of local social norms. On average, based on the OLS results in column 1, a 1% increase in the Confucian Index leads to a 0.68% decrease in the household savings rate for these families, using a type-1 family as the base case. The result also indicates that the changes in savings rate in response to local social norms are mainly driven by this particular family type. In other words, if a region has more male single child families that believe in of having children for old-age support, the savings rate of that area will decrease more significantly as a result of stronger Confucian social norms. This is consistent with the assumption made in our theoretical model.

7.3 Robustness checks with different sample selection criteria

In all empirical analyses presented in section 5, we use families with a savings rate greater than -200%. Table 9 reports results when sample sizes with different savings rates are chosen. Columns 1 and 3 report the coef-

ficient using the Confucian Index as the measure for social norms, while columns 2 and 4 use the alternative measure. As shown in columns 1 and 3, the coefficients for the interaction term $ConfucianIndex \times son$ are still negative and statistically significant in the regressions when households with savings rates greater than -130% or greater than -100% are chosen instead. The magnitude of the coefficient remains close to the results reported in Table 4.

In the initial analysis, we include nuclear families with children aged from 7 to 21. However, saving behaviors might be different for households with children in various age groups. We therefore further categorize the sample based on a child's age profile into 7-16 years old and 12-21 years old, respectively. These groupings ensure that there are sufficient observations in each subsample. As shown in columns 1 and 3 in Table 10, the coefficients of the interaction term of $ConfucianIndex \times son$ are still negative but not statistically significant. The value of the interaction coefficient for group 7-16 is very similar to that of the full sample. This indicates that the Confucian social norms have a different impact on the saving behaviors of different age groups. Table 11 reports results using different hukou and ethnicity status[9] . The coefficients of the interaction term are, again, very close to the full sample and statistically significant.

Lastly, we report results using different methods of constructing the Confucian Index values. Column 1 of Table 12 reports the result when the Confucian Index is computed by including all rural communities in the county. This index captures the spillover effect of the social norms in the rural communities to the urban communities. Column 2 reports the results when the Confucian Index is constructed using the ordering method outlined in section 4, i.e. index values are calculated using information on the order of the chosen options in the multiple choice question. All results remain similar to that of the original sample.

7.4 Issues with Sample Selection

The empirical analyses presented in previous sections only include urban nuclear families with one child between age 7 – 21. This sample selection criteria ensures that we are comparing nuclear households with similar socioeconomic characteristics. However, the selection criteria might lead to potential bias in the analysis because households that fail to follow the One Child Policy will be excluded from our sample. Table 13 summarizes the gender ratio of children born to nuclear families across the five location types. Figure 2 plots the relationship between the Confucian Index and the gender ratio of nuclear families by county. The correlation coefficient is about 0.26. The ratio increases significantly as the Confucian Index

[9] As one child policy was much more strictly enforced among the urban residents and among han ethnicity, the effect might be different once we limit our sample to these subcategories.

value goes up. The high gender imbalance leads to concerns that households in regions with higher Confucian Index value are more likely to have more than one child, especially when the first-born is a daughter. If the behaviors of these households that violate the One Child Policy are systemically different from the single-child families had they had only one child, our results would be biased[10]. In this section, we will discuss the sample selection bias and show that our results are not driven by this selection in observance of the One Child Policy.

A first step to check sample selection is to compare baseline characteristics between households that strictly follow the One Child Policy and those that do not. An urban household would be allowed to have a second child if the couple satisfies one of the following: 1. At least one parent is an eligible ethnic minority. 2. If both parents are from single-child families. There is a very high probability that households in our sample with more than one child are violating the One Child Policy[11],[12].

We use two methods to correct for the potential bias in sample selection. Both methods show that after correction, the results remain similar to our OLS estimates, which means that our results have external validity. The first correction method follows Wei and Zhang [2011b]. As we know the characteristics of households that were filtered out by our selection criteria, a Heckman two-step procedure can be used to correct for the selection bias. The idea of the two-step procedure is as follows:

$$\begin{aligned} Y_1 &= X_1\beta_1 + u_1 \\ Y_2 &= 1[X_2\beta_2 + u_2 > 0] \end{aligned}$$

The first equation in the above system is the savings equation for urban nuclear families. It takes the same specification as equation (8). The second equation is a probit regression that takes value 1 if a household chooses to follow the one-child policy. Therefore we would only observe values for Y_1 if $Y_2 = 1$. Table 14 report the results using the procedure. In particular, we use the number of siblings of the parents as excluded instruments in the selection model. In China, if parents have more siblings, there is less pressure to

[10]Please see Appendix C for an outline of the solution when number of children is endogenized

[11]There are 8 minority households in our sample that satisfy the first condition. We have performed robustness checks without these households and the results don't change. For consistency of analysis, we keep the 8 households in our sample below. None of the households in our sample satisfies the second condition. For households in our sample, however, it is still possible to have two children under the One Child Policy if the child between age 7-21 is the youngest and is the only child born after 1979. Due to data limitations, we are not able to identify the precise age of married children living outside the households. However, for households to fall in this category, there would need to be 14 years between the youngest and second youngest child, which is quite unlikely in urban China.

[12]We summarize the socioeconomic characteristics and savings rate of households by number of children and gender combinations. Based on our calculation, the average savings rate for households with two daughters is -3.6%, compared to 9.3% for households with one daughter and 13.0% for households with one son. However, all these savings rate measures have large standard deviations and the 95% confidence interval includes 0. A few patterns stand out from the summary statistics. First, the average Confucian Index for households that do not follow the One Child Policy is significantly higher than for those that opt to follow the policy. These households also tend to have less wealth, income and savings compared to single-child families. For these families, there is a much lower probability that the head of the household has competed high school.

have a male offspring. Therefore we believe the number of siblings variable affects the choice of fertility but does not affect household savings directly. The coefficient for the interaction term $Son \times ConfucianIndex$ using the Heckman model is about -0.32 and it is very similar compared to the OLS estimate.

The second method we use is similar to propensity score matching. As the sample size of households with one daughter is much smaller than that with one son, we match the characteristics of son households with that of daughters households using the closest distance matching algorithm. We draw 816 households from the panel of 1182 households with one son and perform the OLS regression again with the combined 1632 households. As shown in column 3 of Table 10, the resulting coefficients using the Confucian Index and the alternative measure using percent of four-generation households are close to the estimation using the orginal sample. The results produced by both the Heckman and matching procedures provide support for our model specification outlined in previous sections, and we believe that our results are not driven by the sample selection.

8 Culture for old-age support and intergenerational transfers

Our hypothesis relies on the assumption that the return from parents' investment in children depends on local social norms, or the probability of actual repayment by their son after he grows up. In order to validate that parents do receive more transfers from sons, we investigate the difference between transfers to retired parents from sons and from daughters. We use a subsample of respondents between ages 40 and 55 for this part of our analysis.

Table 6 reports the probability of co-residence and the amount of net cash transfers to parents according to the gender of the child. It is clear from the table that both the probability of co-residence and the amount of cash transfers is higher for sons than for daughters. When the respondent is a daughter, the annual net cash transfer to her parents is 327 RMB lower than to her parent-in-law. The difference is 670RMB when the respondent is a son. Similar patterns are observed when we use the pooled sample or samples for rural households alone. If we further decompose the transfer pattern by type of prefectural cities, we see that women in rural households are much more likely to live with their in-laws than those in metropolitan areas.

9 Conclusions

Social norms are essential as an enforcement mechanism that ensures the fulfillment of the implicit intra-family financial contract between parents and children. The family acts as an implicit annuity market for the

parents and a borrowing market for the children. The gender imbalance increases the liquidity constraint of sons and increases the competitive demand for wealth prior to the sons' marriage. Hence the savings rate is jointly determined by the gender of the child, gender imbalance, and the intensity of Confucian influence in the region where the family lives. The empirical results in this paper support the life-cycle view of saving. We find evidence that households with a son save significantly less than those with a daughter. But, if the local Confucian influence is low, even parents with a son will have to save more than those parents with a son in other regions. Our survey findings are consistent with our theoretical model's predictions, where the amount invested in the child is derived from the parents' life-time utility optimization. Both our model and the empirical results based on our survey indicate that a strong belief in raising children for old-age support and hence a strict adherence to Confucian values reduces the savings rate for local families with a son but does not necessarily affect those parents with only daughters. Our research shows that Chinese household savings rates have been on the rise because financial products are not as readily available, and children have become less reliable as parents' old-age support due to the declining influence of Confucian values. In addition, if parents have a son, they have to save more for his education and for his future marriage. As long as the influence of Confucianism continues to decline in China, the high savings rate will likely persist unless financial development accelerates and social security programs become more widely available.

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Appendix

Appendix A: Model with uncertainty

Let's assume that human capital investment return is risky, i.e. $g(.)$ is a random variable. This certainly affects parents' decisions. Due to the One Child Policy, we assume that the number of children in each household is exogenously fixed at one. Assume the gross return for every dollar of human capital investment on children is denoted by $R_i = \overline{R} + \frac{1}{\gamma}\varepsilon$, where ε is a random variable with mean 0 and variance 1. $\overline{R} > R$ and is the expected gross return from children. Note that in regions where the social norms are less Confucian (i.e. a low value for γ), the risk of human capital investment in children will be higher as the children are more likely to default in future repayment obligations.

The maximization problem for the parents then becomes:

$$\begin{aligned} Max \quad & u(c_1) + \beta E u(c_2) \\ s.t. \quad & c_1 = (1-s)Y_1 \\ & c_2 = sY_1(\theta R + (1-\theta)R_i) + Y_2 = (Y_1 - c_1)(\theta R + (1-\theta)R_i) + Y_2 \end{aligned}$$

where θ is the fraction of period-1 savings to be invested in the risk-free asset. The first-order conditions for the above yield

$$u'(c_1) - \beta E[(\theta R + (1-\theta)R_i)u'((Y_1 - c_1)(\theta R + (1-\theta)R_i) + Y_2)] = 0$$

and the second-order condition yields

$$H = u"(c_1) + \beta E[(\theta R + (1-\theta)R_i)^2 u"((Y_1 - c_1)(\theta R + (1-\theta)R_i) + Y_2)] < 0$$

Assuming a log utility, we arrive at the following equation:

$$\frac{1}{c_1} = \beta E\left[\frac{(\theta R + (1-\theta)R_i)}{(Y_1 - c_1)(\theta R + (1-\theta)R_i) + Y_2}\right]$$

The effect of γ on human capital investment and savings rate can be derived as follows. From the first-order conditions, we know that c_1 is a function of θ, and

$$\frac{\partial c_1}{\partial \theta} = \frac{E[\{u'(c_2) + u"(c_2)(Y_1 - c_1)(\theta R + (1-\theta)R_i)\}(R - R_i)]}{H}$$

Substituting the optimal solution for $c_1(\theta, \gamma, \beta)$ into the objective function, we have

$$V = u(c_1(\theta, \gamma, \beta)) + \beta E(u((Y_1 - c_1(\theta, \gamma, \beta))(\theta R + (1-\theta)R_i) + Y_2)]$$

If an interior solution is obtained, then we must have $0 < \theta < 1$, which means parents will invest in both a risk-free asset and their child. Then the optimal choice of θ satisfies the following first-order and second-order conditions:

$$\begin{aligned}
\frac{\partial \mathrm{V}}{\partial \theta} &= \beta(Y_1 - c_1)E(u'(c_2)(R - R_i)] = 0 \\
D = \frac{\partial^2 V}{\partial \theta^2} &= -\beta E[\{u'(c_2) + u"(c_2)(Y_1 - c_1)(\theta R + (1-\theta)R_i)\}(R - R_i)]\frac{\partial c_1}{\partial \theta} \\
&\quad +\beta(Y_1 - c_1)^2 E[u"(c_2)(R - R_i)^2] \\
&= (-\beta E[\{u'(c_2) + u"(c_2)(Y_1 - c_1)(\theta R + (1-\theta)R_i)\}(R - R_i)]^2 \\
&\quad +Hg\beta(Y_1 - c_1)^2 E[u"(c_2)(R - R_i)^2])/H
\end{aligned}$$

Therefore the optimal portfolio choice satisfies

$$\frac{\partial \theta^*}{\partial \gamma} = \frac{-\beta(Y_1 - c_1)E[u'(c_2)\frac{1}{\gamma}\varepsilon]}{D} < 0$$

Hence we have $\frac{\partial(1-\theta^*)}{\partial \gamma} > 0$. By equation (10), the optimal investment in children is still increasing as the social norms γ become more Confucian. It also implies that there exists a lower threshold on γ, say $\underline{\gamma}$, such that if the social norms fall lower than this–that is, if children become too unreliable as an investment instrument (i.e. γ is too low), then parents will opt out of investing in their children's human capital and put all the savings in the risk-free asset. If and when this happens, the children will no longer be an investment asset but a pure consumption good as in the standard Becker model, and the parents are purely altruistic. A mixed portfolio of both the risk-free asset and children will be optimal only if $\gamma > \underline{\gamma}$, i.e. $0 < \theta < 1$ only if $\gamma > \underline{\gamma}$. As γ approaches zero, the risk of investing in children's human capital becomes very large. In the extreme, parents might choose not to invest in children's human capital at all and only hold the risk-free financial asset.

The effect of γ on period-1 consumption is

$$\frac{\partial c_1^*}{\partial \gamma} = \frac{-\beta \frac{1}{\gamma} E\left[\frac{Y_2}{c_2^2}\varepsilon\right] \frac{\partial \theta^*}{\partial \gamma}}{H} + \left(\frac{(\overline{R} - R)\frac{\partial \theta^*}{\partial \gamma} E\left[\frac{Y_2}{C_2^2}\right] + (1-\theta)\frac{1}{\gamma^2} E\left[\frac{Y_2}{c_2^2}\varepsilon\right]}{H} \right)$$

Because $E\left[\frac{1}{c_2^2}\varepsilon\right] < 0$, $\frac{\partial \theta^*}{\partial \gamma} < 0$ and $H < 0$, the first term in the above equaition, $\frac{-\beta \frac{1}{\gamma} E\left[\frac{Y_2}{c_2^2}\varepsilon\right] \frac{\partial \theta^*}{\partial \gamma}}{H} > 0$, captures the income effect of an increase in γ. When the social norms become more Confucian, the return from investing in children will be less uncertain and hence the parents are willing to consume more in period 1. As in the certainty model, the first part of equation (11) is the income effect and it is always greater than zero. The second part is the substitution effect: as the return uncertainty of human capital investment decreases, the parents will want to invest more and spend less in period 1. And the substitution effect is always less than zero. The sign of the overall effect of γ on period-1 consumption is thus ambiguous. Therefore, in the presence of uncertainty, the effect of γ on household savings rate, $\frac{\partial s}{\partial \gamma} = \frac{\partial(\frac{Y_1 - c_1^*}{Y})}{\partial \gamma}$, is also ambiguous.

Our results indicate that when human capital investment is perceived as a risky asset, parents in more Confucian regions will invest more in their children than in less Confucian regions. But the impact of social norms on the optimal savings rate is ambiguous.

For families with daughters, their optimal savings rate under uncertainty is equivalent to the case when $\theta = 1$. As $\frac{\partial c_1}{\theta} < 0$ (see Appendix B), it means that families with just daughters will, regardless of the social norm level γ, have the lowest period-1consumption and the highest savings rate but put all their savings in the risk-free asset and invest nothing in their daughters' human capital. This is indeed the common behavior of families with daughters in China. As in the model without uncertainty, families with daughters would save more than those with sons because daughters are not considered an investment for old age and sickness.

Appendix B

$$\begin{aligned}\frac{\partial c_1}{\partial \theta} &= \frac{E[\{u'(c_2)+u"(c_2)(Y_1-c_1)(\theta R+(1-\theta)R_i)\}(R-R_i)]}{H} \\ &= \frac{E\left[\frac{Y_2}{[(Y_1-c_1)(\theta R+(1-\theta)R_i)+Y_2]^2}(R-R_i)\right]}{H} \\ &= \frac{E\left[\frac{Y_2}{[(Y_1-c_1)(R-(1-\theta)(R-R_i))+Y_2]^2}(R-R_i)\right]}{H}\end{aligned}$$

When $R-R_i>0$,

$\frac{Y_2}{(Y_1-c_1)(R-(1-\theta)(R-R_i))+Y_2} > \frac{Y_2}{(Y_1-c_1)R+Y_2}$

multiply both sides by $\frac{1}{(Y_1-c_1)(R-(1-\theta)(R-R_i))+Y_2}(R-R_i)$, get

$\frac{Y_2}{[(Y_1-c_1)(R-(1-\theta)(R-R_i))+Y_2]^2}(R-R_i) > \frac{Y_2}{[(Y_1-c_1)R+Y_2][(Y_1-c_1)(R-(1-\theta)(R-R_i))+Y_2]}(R-R_i)$

Similarly, when $R-R_i<0$, we have

$\frac{Y_2}{[(Y_1-c_1)(R-(1-\theta)(R-R_i))+Y_2]^2}(R-R_i) > \frac{Y_2}{[(Y_1-c_1)R+Y_2][(Y_1-c_1)(R-(1-\theta)(R-R_i))+Y_2]}(R-R_i)$

Using $\frac{\partial V}{\partial \theta}=\beta(Y_1-c_1)E(u'(c_2)(R-R_i)]=0$, so we can

$E\left\{\frac{Y_2}{[(Y_1-c_1)(R-(1-\theta)(R-R_i))+Y_2]^2}(R-R_i)\right\} > \frac{Y_2}{[(Y_1-c_1)R+Y_2]}E\left\{\frac{Y_2}{[(Y_1-c_1)(R-(1-\theta)(R-R_i))+Y_2]}(R-R_i)\right\}=0.$

It means $\frac{\partial c_1}{\partial \theta}=\frac{E\left\{\frac{Y_2}{[(Y_1-c_1)(R-(1-\theta)(R-R_i))+Y_2]^2}(R-R_i)\right\}}{H}<0.$

Appendix C: Saving decision for households who do not follow the One Child Policy

Based on savings equation (3), when the fertility constraint is not binding, the household savings rate is

$$s_1=\frac{Y_1-c_1^*}{Y_1}=1-\frac{1}{(1+\beta)Y_1}\left[Y_1+\frac{Y_2}{R}+\frac{\gamma g(q\bar{n})}{R}-q\bar{n}\right]$$

where $\bar{n}$ is the optimal number of children. Again based on separation and profit maximizing, the optimal human capital investment per son is $q*(n,R,\gamma)$ that maximizes equation (5).

$$Max_q\frac{\gamma g(qn)}{R}-qn$$

For households that opt to have more than one child, it must be the case that the value of the above equation is higher when $n > 1$ vs. $n = 1$.

Table 1: Confucian Index by County Type

County Type	Municipalities	Provincial Capital	Prefectural City	County Town	Rural Villages
Confucian Index1	42.9	43.4	51.6	61.4	73.3
Confucian Index2	139	138	165	197	241
Household Savings Rate	28.6	16.3	14.2	11.6	8.3

Note: Municipalities include Beijing and Shanghai. Confucian Index for each city type is calculated using equation (6). The calculations include all valid data points in the 2013 CHFS. Household savings rate is the average of all households with savings rate above -200%.

Table 2: Summary Statistics of Household Savings Rate for CHFS

	Observations	Mean	Median	Min	Max	StdDev
Full Sample*	23244	13.8	31.9	-199.7	99.8	62.43
All counties	264	11.6	12.7	-47.5	42.2	13.6
Counties with at least one urban community**	246	12.7	14.0	-59.1	46.2	15.3

Note: *Sample with savings rate > -200% ; **18 counties with no urban communities were excluded from the empirical analysis presented in section 5

Table 3: Descriptive Statistics for Urban Nuclear Families with One Child between 7 – 21

Variable	Full Sample	Households with One Daughter	Households with One Son
Panel A: Savings Rate (%)	11.5	9.3	13.0
(Income-Expenditure)/Income	(58.1)	(55.6)	(59.8)
Panel B: Confucian Index			
Confucian Index 1	49.5	49.6	49.5
	(13.3)	(12.9)	(13.5)
Confucian Index 2	157	158	157
	(44)	(42)	(45)
Panel C: Other Household Characteristics			
Age of Respondent	41.2	41.4	41.2
	(5.3)	(5.2)	(5.3)
Age of Child	14.4	14.4	14.4
	(4.2)	(4.0)	(4.2)
Household Wealth (Millions RMB)	1.17	1.13	1.20
	(2.1)	(1.81)	(2.20)
Household Income (Thousands RMB)	112.8	105.4	117.9
	(279.5)	(236.5)	(305.8)
Panel D: Other Respondent Characteristics			
% Have completed high school	0.36	0.39	0.35
	(0.48)	(0.49)	(0.48)
% With public pension	0.61	0.65	0.59
	(0.49)	(0.48)	(0.49)
% With medical insurance	0.10	0.10	0.09
	(0.30)	(0.31)	(0.29)
% Work for a public sector or state-owned enterprise	0.40	0.40	0.40
	(0.49)	(0.49)	(0.49)
% Female	0.45	0.47	0.44
	(0.50)	(0.50)	(0.50)
Observations	1998	816	1182

Note: Nuclear families are defined as three-person households with both parents and one child living together. Households whose parents are living separately from their child are excluded from the sample. Samples are restricted to non-village nuclear families with only one unmarried child aged between 7 and 21. Savings Rate is calculated as (income-expenditure)/expenditure. Households with Savings Rate <-200% are excluded from the sample. Please refer to Table 1 for calculation of the three Confucian Indexes

Table 4: Effect of Confucian Index on Savings Rate - OLS Results

Dependent Var Savings Rate	(1)	(2)	(3)	(4)	(5)
Son	16.43*	20.20**	49.72	36.97	38.44
	(1.77)	(2.49)	(1.56)	(1.07)	(1.08)
Confucian Index	0.010	0.44***	0.35**	0.25	
	(0.07)	(3.32)	(2.56)	(1.14)	
Son × Confucian Index	-0.26	-0.34**	-0.31*	-0.33*	-0.30*
	(-1.39)	(-2.11)	(-1.84)	(-1.96)	(-1.70)
Household Wealth (Millions RMB)		-4.32***	-4.31***	-3.93***	-4.46***
		(-4.15)	(-4.11)	(-3.64)	(-4.10)
Household Income (Thousands RMB)		0.25***	0.24***	0.24***	0.242***
		(10.59)	(10.49)	(9.59)	(9.46)
Age of Respondent		-3.45*	-3.52*	-4.30**	-4.50**
		(-1.86)	(-1.92)	(-2.17)	(-2.13)
Education of Respondent		4.10	4.29*	5.93**	5.81**
		(1.57)	(1.65)	(2.20)	(2.06)
Respondent is State Employee		14.31***	14.04***	13.45***	13.95***
		(5.99)	(5.84)	(5.40)	(5.40)
Respondent has Public Pension		6.89**	6.81**	6.82**	7.06**
		(2.48)	(2.46)	(2.28)	(2.23)
Age of Child		-0.70*	-0.67*	-0.63	-0.74*
		(-1.80)	(-1.72)	(-1.54)	(-1.74)
Sex Ratio			0.65***	0.39	
			(3.29)	(1.14)	
Sex Ratio × Son			-0.28	-0.16	-0.19
			(-0.97)	(-0.53)	(-0.60)
Prefecture Dummy	N	N	N	Y	N
County Dummy	N	N	N	N	Y
N	1998	1998	1998	1998	1998
R^2	0.003	0.226	0.231	0.308	0.345

Notes:
1. Son = 1 if the nuclear household has a son. Son = 0 if the household has a daughter.
2. Confucian Index is calculated as the percentage of households in the city that chooses "for old-age security" as a reason for having a child. Please refer to Table 1 for detailed definition of the index.
3. Sex Ratio is the ratio of boys/girls for the population between 7 and 21 years old at the city level. Statistics are computed based on 2010 China Population Census.
4. Regressions (3) to (5) also control for household income-square and respondent age-square
Robust standard errors are calculated, clustered at community ('jiedao') level. t-values are reported in parentheses.
*** Significant at 1% level, **Significant at 5% level, * Significant at 10% level

Table 5: Effect of % Four-Generation Households on Savings Rate

Dependent Var = Savings Rate	(1)	(2)	(3)	(4)	(5)
Son	9.07***	9.03***	43.51	30.78	32.14
	(2.73)	(3.06)	(1.36)	(0.88)	(0.90)
Four Generation	8.55**	16.90***	15.69***	6.33	
	(2.02)	(4.66)	(4.22)	(0.86)	
Son ×Four Generation	-12.60**	-13.75***	-13.51**	-10.49**	-9.74*
	(-2.21)	(-2.67)	(-2.56)	(-1.99)	(-1.83)
Household Wealth (Mils RMB)		-4.21***	-4.20***	-3.91***	-4.46***
		(-4.00)	(-3.98)	(-3.60)	(-4.09)
Household Income ('000 RMB)		0.24***	0.24***	0.24***	0.24***
		(10.59)	(10.51)	(9.51)	(9.42)
Age of Respondent		-3.64**	-3.66**	-4.34**	-4.54**
		(-1.98)	(-2.00)	(-2.17)	(-2.14)
Education of Respondent		3.86	4.15	6.02**	5.88**
		(1.48)	(1.59)	(2.22)	(2.08)
Respondent is State Employee		14.56***	14.16***	13.41***	13.88***
		(6.07)	(5.87)	(5.41)	(5.38)
Respondent has Public Pension		6.99**	7.02**	6.78**	7.06**
		(2.50)	(2.52)	(2.26)	(2.23)
Age of Child		-0.70*	-0.69*	-0.63	-0.75*
		(-1.80)	(-1.78)	(-1.54)	(-1.76)
Sex Ratio			0.68***	0.46	
			(3.66)	(1.37)	
Sex Ratio × Son			-0.315	-0.216	-0.23
			(-1.08)	(-0.68)	(-0.71)
Prefecture Dummy	N	N	N	Y	N
County Dummy	N	N	N	N	Y
N	1998	1998	1998	1998	1998
R^2	0.003	0.229	0.235	0.308	0.345

Note:
1. % Four-generation households at the city level. Four-generation households are defined as households with parents, grandparents, great grandparents (either maternal or paternal side) and children living together. The statistics are calculated from the 2010 China Population Census.
2. Son = 1 if the nuclear household has a son. Son = 0 if the household has a daughter.
3. Sex Ratio is the ratio of boys/girls for the population between 7 to 21 years old at the city level. Statistics are computed based on the 2010 China Population Census.
4. Regressions 3-5 also include income square, respondent age square. Robust standard errors are calculated, clustered at community ('jiedao') level. t-values are reported in parentheses.
*** Significant at 1% level ** Significant at 5% level * Significant at 10% level

Table 6: Statistics of Intergenerational Transfers and Co-residence with Retired Parents

	Panel A: % Living Together with		Panel B: Net Cash Transfer To		
	Parents	Parents-In-Law	Parents	Parents-In-Law	Difference
Full Sample					
Daughters	5.9	8.5	2027	2354	-327
Sons	19.0	1.0	2476	1806	670
Urban					
Daughters	6.0	7.0	2374	2772	-398
Sons	14.9	1.2	3001	2267	734
Rural					
Daughters	5.1	11.6	921	1001	-81
Sons	24.4	0.7	1350	961	389
Metropolitan and provincial capital city					
Daughters	6.9	7.2	2787	3021	-234
Sons	14.3	1.3	3439	2818	621
Prefecture city and county town					
Daughters	5.7	7.1	2039	2572	-533
Sons	15.3	1.2	2641	1846	795

Table 7: Households Savings Rate by Child's Gender and Reasons to Have a Child

	Household with a Daughter		Household with a Son	
Whether choose "for old-age insurance"	N	Y	N	Y
as a reason for having child	(type-1 family)	(type-2 family)	(type-3 family)	(type-4 family)
Average Household Savings Rate (%)	11.2	6.5	16.3	9.4

Table 8: Regressions with Flexible Coefficient on Family Types

Dependent Var = Savings Rate	Confucian Index	Four-generation households
	(1)	(2)
Family_type2	19.85	-0.81
	(1.22)	(-0.16)
Family_type3	38.76	30.04
	(1.08)	(0.84)
Family_type4	57.10	34.55
	(1.52)	(0.96)
Confucian Index		
Family_type2 × Confucian Index	-0.42	0.26
	(-1.35)	(0.03)
Family_type3 × Confucian Index	-0.31	-3.59
	(-1.09)	(-0.47)
Family_type4 × Confucian Index	-0.68**	-15.90*
	(-2.16)	(-1.85)
Household/Respondent Characteristics	Y	Y
County Dummy	Y	Y
Observations	1998	1998
R^2	0.346	0.346

Notes: 1. See Table 7 for definitions of family types.
2. Confucian Index is calculated as percentage of households in the city that chooses "for old-age security" as a reason for having a child. Please refer to Table 1 for a detailed definition of the index.
3. Sex Ratio is the ratio of boys/girls for the population between 7 and 21 years old at the city level. Statistics are computed based on the 2010 China Population Census.
4. Other Individual/Household Characteristics include: household wealth, household annual income, age of respondent, age-square of respondent, education of respondent, whether respondent has medical insurance, public/private pension, whether respondent is a state employee, age of child and age-square of child.
*** Significant at 1% level ** Significant at 5% level * Significant at 10% level

Table 9: Results using Samples with Different Savings Rates

	Samples with Savings Rate > -130%		Samples with Savings Rate >-100%		Counties with more than 2 urban communities	
	(1)Confucian Index	(2)Four-gen households	(3)Confucian Index	(4)Four-gen households	(5)Confucian Index	(6)Four-gen households
Son	41.16	35.49	24.25	19.06	37.87	33.30
	(1.37)	(1.17)	(0.87)	(0.68)	(1.03)	(0.90)
Son × Index	-0.29*	-7.26*	-0.27*	-6.50	-0.28	-7.93
	(-1.77)	(-1.65)	(-1.74)	(-1.54)	(-1.46)	(-1.31)
Household/Respondent Characteristics	Y	Y	Y	Y	Y	Y
County Dummy	Y	Y	Y	Y	Y	Y
Observations	1923	1923	1876	1876	1702	1702
R-squared	0.317	0.317	0.323	0.323	0.308	0.308

Notes:
1. Son = 1 if the nuclear household has a son. Son = 0 if the household has a daughter.
2. Confucian Index is calculated as percentage of households in the city that chooses "for old-age security" as a reason for having a child. Please refer to Table 1 for detailed definition of the index.
3. Sex Ratio is the ratio of boys/girls for the population between 7 and 21 years old at the city level. Statistics are computed based on the 2010 China Population Census.
4. Other Individual/Household Characteristics include: household wealth, household annual income, age of respondent, age-square of respondent, education of respondent, whether respondent has medical insurance, public/private pension, whether respondent is a state employee, age of child and age-square of child.
Robust standard errors are calculated, clustered at community ('jiedao') level. t-values are reported in parentheses.
*** Significant at 1% level
** Significant at 5% level
* Significant at 10% level

Table 10: Results using Samples with different Child Age Profiles

	Households with a Child between 7 -16		Households with a Child between 12-21		Matching	
	(1)Confucian Index	(2)Four-gen households	(3)Confucian Index	(4)Four-gen households	(5)Confucian Index	(6)Four-gen households
Son	16.29	2.48	41.38	41.39	30.39	25.84
	(0.37)	(0.05)	(1.06)	(1.08)	(0.79)	(0.68)
Son × Index	-0.32	-9.33	-0.05	-5.41	-0.26	-9.35*
	(-1.31)	(-1.44)	(-0.25)	(-0.86)	(-1.42)	(-1.67)
Household/Respondent Characteristics	Y	Y	Y	Y	Y	Y
County Dummy	Y	Y	Y	Y	Y	Y
Observations	1282	1282	1450	1450	1632	1632
R^2	0.338	0.339	0.323	0.323	0.372	0.373

Notes: 1. Son = 1 if the nuclear household has a son. Son = 0 if the household has a daughter.
2. Confucian Index is calculated as percentage of households in the city that chooses "for old-age security" as a reason for having a child. Please refer to Table 1 for a detailed definition of the index.
3. Sex Ratio is the ratio of boys/girls for the population between 7 and 21 years old at the city level. Statistics are computed based on the 2010 China Population Census.
4. Other Individual/Household Characteristics include: household wealth, household annual income, age of respondent, age-square of respondent, education of respondent, whether respondent has medical insurance, public/private pension, whether respondent is a state employee, age of child and age-square of child.
Robust standard errors are calculated, clustered at community ('jiedao') level. t-values are reported in parentheses
*** Significant at 1% level ** Significant at 5% level * Significant at 10% level

Table 11: Results using Samples with Different Hukou Status and Ethnic Group

	Samples with urban Hukou		Samples with Han ethnicity only	
	(1)Confucian Index	(2)Four-generation households	(3)Confucian Index	(4)Four-generation households
Son	29.18	20.44	39.30	32.32
	(0.75)	(0.52)	(1.10)	(0.90)
Son × Index	-0.35*	-10.76*	-0.33*	-10.95**
	(-1.79)	(-1.84)	(-1.83)	(-2.02)
Household/Respondent Characteristics	Y	Y	Y	Y
County Dummy	Y	Y	Y	Y
Observations	1642	1642	1947	1947
R^2	0.370	0.370	0.348	0.348

Notes: 1. Son = 1 if the nuclear household has a son. Son = 0 if the household has a daughter.
2. Confucian Index is calculated as percentage of households in the city that chooses "for old-age security" as a reason for having a child. Please refer to Table 1 for a detailed definition of the index.
3. Other Individual/Household Characteristics include: household wealth, household annual income, age of respondent, age-square of respondent, education of respondent, whether respondent has medical insurance, public/private pension, whether respondent is a state employee, age of child and age-square of child.
Robust standard errors are calculated, clustered at community ('jiedao') level. t-values are reported in parentheses
*** Significant at 1% level ** Significant at 5% level * Significant at 10% level

Table 12: Results using Different Index Values

	Rural Communities Only	Full Sample using Order of Choice	Full Sample (Rural and Urban)	
	(1)Confucian Index	(2)Confucian Index	(3)Confucian Index	(4)Four-generation households
Son	37.51	40.64	51.07	43.86
	(1.06)	(1.14)	(1.50)	(1.29)
Son × Index	-0.31**	-0.09*	-0.37**	-9.39*
	(-1.97)	(-1.75)	(-2.55)	(-1.88)
Household/Respondent Characteristics	Y	Y	Y	Y
County Dummy	Y	Y	Y	Y
Observations	1998	1998	2357	2357
R^2	0.345	0.345	0.313	0.312

Notes:
1. Son = 1 if the nuclear household has a son. Son = 0 if the household has a daughter.
2. Confucian Index is calculated as percentage of households in the city that chooses "for old-age security" as a reason for having a child. Please refer to Table 1 for a detailed definition of the index.
3. Sex Ratio is the ratio of boys/girls for the population between 7 and 21 years old at the city level. Statistics are computed based on the 2010 China Population Census.
4. Other Individual/Household Characteristics include: household wealth, household annual income, age of respondent, age-square of respondent, education of respondent, whether respondent has medical insurance, public/private pension, whether respondent is a state employee, age of child and age-square of child.
Robust standard errors are calculated, clustered at community ('jiedao') level. t-values are reported in parentheses
*** Significant at 1% level ** Significant at 5% level * Significant at 10% level

Table 13: Gender Ratio of Children Born to Nuclear Families[1]

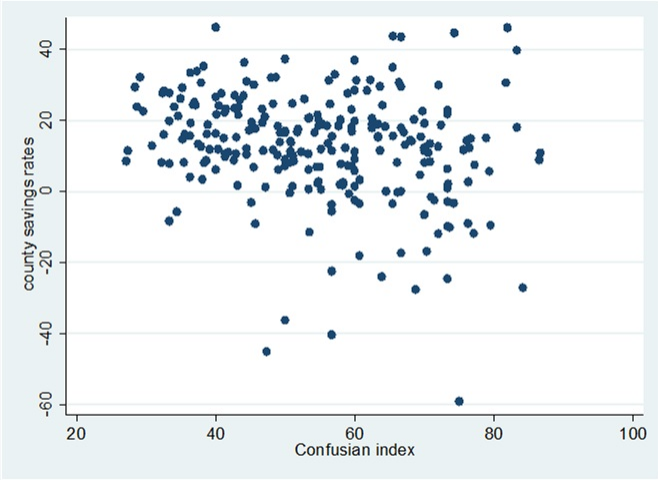
	Municipalities	Provincial Capital	Prefectural City	County	Rural Villages
Gender Ratio of Nucleus Families	123	141	185	206	212
Gender Ratio of Nucleus Families (child age between 7-21)	109	127	190	205	215
Confucian Index1	42.9	43.4	51.6	61.4	73.3

1. #households with one son per 100 households with one daughter

Table 14: Heckman Two-Step Result

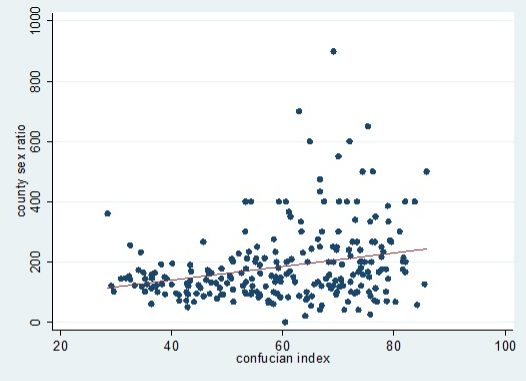
Dependent Var = Savings Rate	(1)OLS	(2)Heckman	Selection Model:
			Depend var = Neuclear family
Son	38.44	37.79	
	(1.08)	(1.22)	
Son × Confucian Index	-0.30*	-0.32*	
	(-1.70)	(-1.75)	
Household Wealth	-4.46***	-4.23***	-0.04**
(Millions RMB)	(-4.10)	(-5.32)	(-2.51)
Household Income	0.24***	0.24***	0.0003
(Thousands RMB)	(9.46)	(18.20)	(1.51)
Age of Respondent	-4.50**	-4.04*	-0.02***
	(-2.13)	(-1.89)	(-4.63)
Education of Respondent	0.05**	0.05*	0.41***
	(2.00)	(1.96)	(4.66)
Respondent is State Employee	5.81**	3.56	0.35***
	(2.06)	(1.09)	(4.30)
Respondent has Public Pension	13.95***	12.00***	0.79***
	(5.40)	(3.93)	(11.52)
Age of Child	7.06**	1.61	
	(2.23)	(0.38)	
Sex Ratio	-0.74*	-0.77*	
	(-1.74)	(-1.93)	
Son ×Sex Ratio	-0.19	-0.20	
	(-0.60)	(-0.70)	
Number of Siblings			-0.09***
			(-4.92)
First child is son			0.50***
			(8.63)
County Dummy	Y	Y	Y
mills ratio			-16.39*
λ			(-1.66)
N	1998		3125
R^2	0.308		

Figure 1: Confucian Index and Savings Rate



Note: y-axis is the Confucian Index as discussed in section 4. x-axis is county average savings rate, in percentage points.

Figure 2: Gender Ratio of Children Born to Nuclear Families vs. Confucian Index



Note: y-axis is the Confucian Index as discussed in section 4. x-axis is the number of boys born to a one-child family per 100 girls born to a one-child family.