Title: Social Norms and Household Savings Rates in China

Authors:

***Corresponding Author**

Yvonne Jie Chen

Affiliation: National University of Singapore, Lee Kuan Yew School of Public Policy

Email: sppcj@nus.edu.sg

Phone: +65-65161051

Zhiwu Chen

Affiliation: Faculty of Business and Economics, University of Hong Kong, Hong Kong

Email: zhiwu.chen@hku.hk

Phone: +852-39171271

Shijun He*

Affiliation: School of Economics, Southwestern University of Finance and Economics, Chengdu, China 611130

Email: hshj822@163.com

Phone: +86-18810818035

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Abstract

We study the effects of Confucian social norms on savings rates in China. In our simple two-period model, parents have the option to invest in either a risk-free asset or their children's human capital. We assume that the filial piety norms and thus the enforcement mechanisms for supporting old-age parents differ across regions. Consequently, the probability of children's non-performance of their repayment obligations to parents and the returns parents can expect from investing in their children vary. We test the model predictions using data from the China Household Finance Survey (CHFS). We find that stronger Confucian social norms reduce the gap in the savings rate between families with sons and with daughters. Modelling default by children as a function of the prevailing social norms gives us the flexibility to study the impacts of declining Confucian influence on consumption–savings trends in China.

1. Introduction

Household savings in China have increased significantly over the past three decades. Between 1978 and 2008, the rural household savings rate rose from 15% to 32%, and the urban savings rate from 15% to 28%.[1] Scholars have advanced several hypotheses to explain this trend and the changing age profile of savings behaviours (Banerjee et al., 2014; Chamon and Prasad, 2010; Choukhmane, Coeurdacier, and Jin, 2017; Ge, Yang, and Zhang, 2012; Kraay, 2000; Modigliani and Cao, 2004; Wei and Zhang, 2011b).

Theoretical models of Chinese household savings usually assume that parents view children as a form of investment for old-age support (Choukhmane, Coeurdacier, and Jin, 2017; Ge, Yang, and Zhang, 2012). In these models, parents decide how much to invest in their children's human capital based on the perceived returns, while children determine how much to repay their elderly parents based on the human-capital investments they received while young. Intergenerational transfers from adult children to elderly parents are widely documented in China and other developing countries and can take various forms, including cash transfer, co-residence and instrumental support (Chen, 2017; Oliveira, 2016). However, the motives and working mechanisms of these transfers remain unclear (Klimaviciute et al., 2017; Wang, 2010; Wu and Li, 2014). One piece of information missing from existing economic models is the enforcement mechanism for such intra-family risk-sharing arrangements between parents and children. The implicit inter-temporal financial exchange between parents and children might not be enforceable and could be subject to frequent default or under-performance if such mechanism is not reliably provided for.

Our paper fills this gap in the literature by relaxing the assumption that the rate of return on investment in children is ensured. We allow the rate of return to vary across regions and as a function of social norms. Our theoretical model and empirical evidence both indicate that the level of repayment from children to parents affects household savings decisions. We find that parents in regions with stronger Confucian social norms save less as the probability of receiving old-age support from children is higher than in other regions.

[1] Based on the International Monetary Fund and China's National Bureau of Statistics.

We build a simple two-period model in which parents have the option to invest in either a risk-free asset or their children's human capital. We assume that social norms and thus also the enforcement mechanisms for supporting old-age parents may differ by region. These filial piety norms determine the probability of children's non-performance on their repayment obligations to parents, which, in turn, affects the return parents expect from investing in their children.

China provides a good context to study the effect of social norms on household savings behaviour as Chinese modern culture is based on Confucianism, which has developed over more than two thousand years. The aspect of Confucianism most relevant to our research is the norms of filial piety, or *xiao*. Classical Confucian writings argue that children have unconditional obligations to their parents, including supporting them when they grow old.[2] However, even within China, the extent of Confucian influence varies significantly across regions due to historical and economic reasons (Cheung and Kwan, 2009). Existing studies have overlooked the impacts of the still-prevalent but weakening Confucian influence on savings behaviour in China. A self-interested adult always evaluates the costs and benefits of honouring and not honouring obligations to one's elderly parents. As the prevailing social norms change, the optimal decision may be to default or underperform in repayment to parents.

We construct two measures of the influence of Confucian filial piety: an innovative Confucian Index and the percentage of four-generation households in a region. The Confucian Index, constructed using the China Household Finance Survey (CHFS), records the percentage of respondents in a given locality who choose 'for old-age support' in response to the question 'why do you want to have children?' This index captures at least two aspects of a local region's Confucian influence. First, it indicates the degree to which Confucian filial piety has influenced the local culture. A higher Confucian Index indicates lower chances of default on repayment obligations by children and consequently more reliable returns from parental investment in children. Second, the Confucian Index measures the extent of need for children to be a reliable investment for old age as alternatives, such as financial products, are not available or reliable. A region with a high index value, therefore, may endogenously nurture a more Confucian culture, reducing the default probability of the implicit financial contract between parents and

[2] See Book II, verses 2.5 and 2.7 in *The Analects of Confucius* (2010).

children. Hence, we see the Confucian Index as measuring the reliability of the implicit intra-family financial contract in a given locality. In addition, we use the percentage of four-generation households in a region as an alternative measure of filial piety norms. The four-generation household measure is directly calculated from the 2010 census and matched with the CHFS data. These two measures are discussed in more detail in section 4.

Using our data set, we investigate how Confucian social norms affect household savings rates. In particular, we address two questions. First, do households living in regions with high Confucian social norms save less? Second, do parents in such regions receive more intergenerational transfers from their adult children? Our results indicate that compared to families with daughters, families with sons save less in regions with stronger Confucian social norms. Using data on intergenerational transfers, we find that sons from regions with high Confucian social norms do provide more support to their elderly parents, particularly in the form of co-residence. This is consistent with the assumption in our model that parents in more heavily Confucian-influenced regions chose to save less when young as they expect to later receive more support from their children.

Our survey data also show that as the size of localities increases, measures of Confucian social norms decrease, reflecting a possible negative correlation between economic development and Confucian influence. This is consistent with predictions in the literature that as Chinese society in general develops further, we expect continued decline in Confucian influence and thus worsening performance by adult children in honouring their implicit contract (Cheung and Kwan, 2009; Fu et al., 2016; Su, 2014).

This paper adds to the literature in several ways. First, we provide direct evidence supporting the key assumption in the lifecycle hypothesis: parents perceive children, especially sons, as a source of retirement income. Our survey data show that neither parental investment in children's human capital nor intergenerational transfers from adult children to old-age parents are altruistic. Second, we offer an alternative explanation for the high household savings rates in China. In addition to the savings pressure due to the one-child policy, the lack of financial development and the declining influence of Confucianism may contribute to China's ever-increasing savings rate. When external financial products, such as retirement funds and insurance instruments, are not widely available or affordable, individuals must use

other means to hedge against future risks and uncertainty. Traditionally, the most reliable answer is to rely on children, especially sons. However, investment in children's human capital is subject to significant risk and uncertainty, particularly after 1979, when the number of children a household may have is restricted. In addition, the diminishing 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, making children unreliable investment instruments. In other words, filial piety is no longer a guaranteed value shared by younger generations hence parents have to save more in order to achieve life-cycle consumption smoothing.

The remainder of the paper is organised as follows. We provide a literature review on the savings rate and Confucian social norms in section 2. In section 3, we then present a simple two-period model and derive testable predictions. In sections 4 and 5, we discuss the construction of two Confucian social norm measures, along with the data and empirical strategies. The empirical results and robustness checks are discussed in sections 6, 7 and 8. We make concluding remarks in section 9.

2. Literature review

2.1 High Savings Rate in Developing Countries

In order to explain the high savings rates in developing countries, Modigliani and Cao (2004) offer two key insights from the life-cycle theory of savings. First, the aggregate savings rate is a function of a country's long-term income growth. As a country's growth trend remains strong, households are incentivised to save more to take advantage of long-term growth. Second, demographic changes and the aggregate savings rate are closely related.

While the national savings rate is associated with the population's age composition, individual households' savings rates are determined by their lifetime utility maximisation and other household considerations, including fertility and human capital investment decisions (Becker, 1993; Schultz, 2007). Unravelling the determinants for changing savings behaviour at the household level, therefore, is challenging. Using the one-child policy as an instrument for fertility, Banerjee et al. (2014) find that households with more children save less. Wei and

Zhang (2011b) propose a theory based on the competitive savings motive to explain the high savings rate in Chinese households. Using both official census and household survey data, they find that in regions with abnormally high male/female ratios, parents with sons must save more to increase sons' future competitiveness in the marriage market (Wei and Zhang, 2011b). Many recent studies also suggest that the one-child policy has a significant impact on household savings behaviours. For example, Ge, Yang, and Zhang (2012) utilise a three-period, overlapping-generations model to show the effect of the one-child policy on the savings rate: older households save more for old-age security, while middle-age households save more due to the decreased burden of child rearing. Similarly, Choukhmane, Coeurdacier, and Jin (2017) show that the one-child policy can account for 30%–60% of the rise in aggregate savings.

2.2 The Role of Social Norms on Savings Behaviour

The theories discussed above, however, take the cultural and social norms in China as givens that do not change, even though social norms evolve (Cheung and Kwan, 2009; Fu et al., 2016; Su, 2014). Such cultural changes affect the reliability of intra-family, intertemporal, risk-sharing arrangements, in turn, affecting savings behaviour even by families with sons. Traditionally, households in developing countries rely heavily on intergenerational transfers from adult children to parents as a source of old-age support. The old-age-security hypothesis dates to at least Leibenstein (1957), who hypothesises 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, Coeurdacier, and Jin 2017).

The classic Becker model, however, assumes intra-family transfers to be altruistic, with the family continuing through an infinite sequence of dynasties (Becker, 1993). In this setting, parents make their consumption–saving–investment decisions to maximise the total household utility of consumption for not only the current but also future generations. The altruistic, dynastic household model focuses on transfers from parents to future generations, whereas the old-age-security hypothesis focuses on children's repayment obligations to parents and treats children as personalised instruments of inter-temporal risk hedging. The latter hypothesis is

supported by evidence from many countries of adult children repaying their elderly parents (Cox, Eser, and Jimenez, 1998).

For children to be reliable instruments of risk-hedging, however, supportive institutions and social norms must be in place to minimise the probability of children defaulting on the implicit inter-temporal contract. A self-centred adult evaluates the costs and benefits of repaying obligations and maintaining membership in the intra-family risk-sharing system or defaulting and exiting. Given that people cannot choose into which family to be born, they choose to stay in the given household system only if the return from intra-family exchange is higher than the external market rate or if external financial markets simply do not exist or are not reliable (Cigno, 1992). As Cigno (1992) argues, middle-aged persons can choose to default and have no children or to stay in the system and have as many children as possible. The social norms and the associated penalties for defaulting thus are key factors in determining where optimal cost–benefit trade-off.

The issue of compliance is especially challenging in the Chinese context for two reasons. First, when the one-child policy caps the number of children per household at one, there is no way to increase the effectiveness of risk-hedging by having more children. Even with a couple's sole child, there is no guarantee of filial piety unless social norms are adequately constraining and punitive. Second, in China and many other developing countries, financial markets are still under-developed and unreliable; consequently, intra-family transfer arrangements are often a better insurance option (Cox and Jimenez, 1992). Parents likely will continue to mix and optimise their portfolio of both financial assets and children. However, whether children continue to represent a more cost-effective, reliable hedge against old age and sickness depends on the extent to which cultural values continue to internalise enough costs for violating the implicit intra-family financial contract. If filial piety is no longer a valued, practiced virtue, and financial markets remain underdeveloped, parents have no alternative but to save more and consume less.

Several factors make the intra-family financial contract work: internalised guilt, economic incentives reinforced by the land property system, and population immobility across regions. Historically, the implicit intra-family financial contract in China has been enforced by Confucian values, which emphasise children's obligations to their parents and younger

brothers' obligations to elder siblings. These values and the resulting behavioural norms are internalised psychologically and enforced by a patrilineal property-inheritance system. Psychologically, as Young (2008) points out, social norms function in such a way that one who deviates from them not only feels a strong sense of guilt but also faces potential social exclusion and punishment. Kandori (1992) argues that social norms come with community-level economic penalties. Historically, in China, families, not individuals, traditionally own property and land, and the most senior surviving male is the head of the family until his death. Consequently, adult children have to honour Confucian norms for fear of losing the expected inheritance of property or land.

However, beginning about three decades ago, the pace of industrialisation increased, resulting in both rapid urbanisation and large-scale population mobility. Coupled with public ownership of all land in China, these changes have led to the rapid decline of Confucian influence (Cheung and Kwan, 2009; Fu et al., 2016; Su, 2014). As the psychological and economic costs of violating filial piety norms have declined, the implicit intra-family financial contract has become less and less enforceable. Although the on-going decline of Confucian values is a national trend, there remain, as our data show, large regional differences. This offers enough variability to study the impact of Confucian values on household savings.

3. Social Norms and Savings Behaviour: Theory

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

$$Max\ u(c_1) + \beta u(c_2)$$

$$s.t.\ c_1 + S = Y_1 - qn$$

$$c_2 = (Y_1 - qn - c_1)R + \gamma g(qn) + Y_2 \quad \text{(Eq. 1)}$$

where c_1 and c_2 are the consumption in periods 1 and 2, respectively; 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 (e.g. wedding gifts and college tuition); S is the amount saved in period 1; and R is the gross risk-free interest. The parents expect to receive $\gamma g(qn)$ from their adult children when they retire in the second period. Here, γ measures Confucian social norms 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.[3] As discussed, γ captures local social norms for supporting elderly parents. In our model, we use γ to represent the parents' subjective discount function applied to the return, $g(qn)$, from investing in their children.

Under China's strict birth-control policies, households may have no more than $\bar{n}$ children (i.e. $n \leqslant \bar{n}$). Suppose that a corner solution for fertility is obtained, and the household chooses to have $\bar{n}$ children. With a log-utility function, the optimal consumption in period 1 is:

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

Hence, the savings rate in period 1 is

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

If we further assume that only sons are obligated to provide old-age support, by following the Confucian tradition, then we can rewrite the return function from raising children as $z[1_{son}]\gamma g(qn)$, where $z[1_{son}]$ is the characteristic function that equals 1 if a household has a son and 0 otherwise. For households with only daughters, we should not expect to see a correlation between the Confucian social norms measure, γ, and the optimal savings rate as investing in daughters is not profitable. Consequently, it is predicted that households with sons will save less than those with only daughters. According to the separation theorem, parents' profit-maximising human-capital investment in children for households with sons is determined by

[3] For the sake of simplicity, assume that parents do not derive utility directly from raising a child.

$$\max_{q} \frac{z[1_{son}]\gamma g(q\bar{n})}{R} - q\bar{n} \quad \text{(Eq. 2)}$$

The optimal investment level derived from Eq. 2 is $q^* = q(\gamma, \bar{n}, R)$, and the marginal effect of social norms, γ, on the period-1 savings rate can be written as

$$\frac{\partial s_1}{\partial \gamma} = -\frac{1}{Y_1(1+\beta)}\left(\frac{z[1_{son}][g(q\bar{n}) + \gamma\bar{n}g'(q\bar{n})q_\gamma']}{R} - \bar{n}q_\gamma'\right) \quad \text{(Eq. 3)}$$

where q'_γ denotes the first order derivative of q w.r.t. γ. Rewriting Eq. 3, we get

$$\frac{\partial s_1}{\partial \gamma} = -\frac{1}{Y_1(1+\beta)}\frac{z[1_{son}][g(q\bar{n}) + \gamma\bar{n}g'(q\bar{n})q_\gamma']}{R} + \frac{1}{Y_1(1+\beta)}\bar{n}q_\gamma' \quad \text{(Eq. 4)}$$

The first term in Eq. 4 is the income effect, and the second term the substitution effect. Note that $q'_\gamma > 0$ due to the concavity of g (Banerjee et al., 2014). This means that the higher γ is, or the more prevalent Confucian values are, 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 as they expect to receive more transfers from their children in period 2. In contrast, the substitution effect leads them to save more as investment in children has become more profitable; consequently, they sacrifice some current consumption to increase their future consumption. For son families, the first-order condition of Eq. 2 leads to

$$z[1_{son}]\gamma g'(q\bar{n}) = R$$

Substituting the first-order condition into Eq. 3 yields

$$\frac{\partial s_1}{\partial \gamma}|_{son} = -\frac{g(q\bar{n})}{Y_1(1+\beta)} \quad \text{(Eq. 5)}$$

If we assume that households with only daughters do not benefit from a more Confucian cultural environment (i.e., $\frac{\partial s_1}{\partial \gamma}|_{daughter} = 0$ for daughter families), then Eq. 5 can be written as: $\frac{\partial s_1}{\partial \gamma}|_{son} - \frac{\partial s_1}{\partial \gamma}|_{daughter} = -\frac{g(q\bar{n})}{Y_1(1+\beta)}$ (Eq. 6)

Eq. 5 and Eq. 6 are always negative. This means that as Confucian influence increases, son families save less, and *vis versa*. As well, under our assumptions, the response of the savings rate to changes in Confucian social norms differs between son and daughter families.

Thus, when social norms become more Confucian, and returns from sons are more reliable, son families respond by reducing their savings more than daughter families.

In Appendix A, we introduce a stochastic version of this model. We show that when human capital investment is considered to be 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, however, is ambiguous.

4 Data and variables

4.1 China Household Finance Survey and measures of Confucian social norms

As mentioned in section 1, we construct two measures for Confucian filial piety norms: the innovative Confucian Index constructed based on CHFS data and the percentage of four-generation-households in a region constructed from the census. This section discusses and compares these two measures with conventional measures of Confucian social norms in the literature.

The first measure, the Confucian Index, is constructed using the CHFS. This biannual survey was first conducted in 2011 with 8,000 households. The follow-up survey in 2013 covered 29 provinces and more than 28,000 households, while the 2015 wave included more than 47,000 households. Compared to other Chinese household surveys, the CHFS has the most comprehensive information on household income and wealth. In addition to household background information, the survey has five broad modules in each wave: income, expenses, assets, liabilities and security and insurance. The survey follows a three-stage, stratified, random sampling design. In the first stage, counties (*Xian*) are chosen in each province, while in the second stage, urban communities and villages (*juweihui* or *cunweihui*) in chosen counties are selected. The last stage draws households from each urban community and village.[4]

This paper uses data from the 2013 wave of the CHFS, to which we attach a questionnaire focusing on social values, norms and preferences. The survey questionnaire includes the question, 'Why do you want to have children?', to which respondents can choose any number

[4] Data and survey documentation are available at http://www.chfsdata.org/.

of five choices: 1) to continue the family bloodline; 2) love for children and for personal connections; 3) old-age support; 4) everyone else does it; and e) other reasons.

Using information derived from this question, we construct the Confucian Index as follows. We set the old-age support indicator, Y_{ij}, for respondent i in county j at 1 if 'c) old-age support' is one of her choices and at 0 otherwise. The Confucian Index for county j is then:

$$ConfucianIndex_j = 100 \times (\sum_{i=1}^{N} Y_{ij})/N \text{ (Eq. 7)}$$

This measure reflects the local culture and parental expectations for their children. This Confucian Index can be easily re-constructed using follow-up. In the future, such longitudinal data will enable tracking changes in Confucian influence over time.

Table 1 summarises the average Confucian Index by locality type computed using Eq. 7. In the full sample, 57.8% of the respondents choose 'old-age support' as a reason for having children. The Confucian Index is the lowest for mega-cities (e.g. Beijing and Shanghai) among all locality types, indicating that these cities are the least Confucian. On average, 42.9% of people living in mega-cities view children as old-age investment. Moving from the top-tier cities to provincial capitals to prefectural cities and then to county towns and rural villages, the Confucian Index exhibits a clear rising pattern, implying a strong negative correlation between development and dependence on children for old-age support. Confucian social norms are more stressed and observed in villages, perhaps due to the need for economic security. In addition, the Confucian Index and the average household savings rate have a negative relationship across locality types.[5] The average household savings rate in mega-cities is 28.6%, compared to 8.3% in rural villages.

Figure 1 plots the relation between the county-level average household savings rates and the Confucian Index for the 264 counties with valid observations in the 2013 CHFS. The two variables clearly have a negative relationship. A simple regression of the former on the latter produces a coefficient of -0.23, with a t-statistic of -3.39 and an R^2 value of 0.36. Thus, for every 1% increase in the Confucian Index, the average savings rate decreases by 0.23%. The

[5] We define a household savings rate as *(Income–Expenditure)/Income*. We choose this definition over the conventional definition of *Log(income)–Log(Expenditure)* as taking the logarithm likely skews the savings rate when it is negative or close to 100%. For negative savings, taking the logarithm attenuates the negative savings rate. For savings rates close to 1, taking the logarithm leads to rates larger than 100%.

most plausible reason for the negative correlation could be the fact that Confucian values are negatively correlated with regional economic development (Cheung and Kwan, 2009). According to Modigliani and Cao (2004), the growth and savings rates in developing countries are positively correlated. More rigorous empirical analysis is performed in the next section, where an array of household and county level characteristics are controlled for in order to eliminate the omitted variable bias.

The second measure we use is the percentage of households with four generations living under the same roof in each county, constructed from the 2010 China Population Census. This measurement captures the co-residence status of families across counties. Reverence to parents is an important value emphasized in the Confucian system, so the ideal family structure is to have multiple generations living under one roof (see, e.g., Howard, 1992; Luong, 1989). Co-residence status, therefore, has been widely used in the sociology literature as a measure for filial piety social norms. We use the percentage of four-generation households as an alternative measure in our empirical analyses.

In section 8, we further show that there is a positive correlation between the conventional measures of Confucian filial piety, i.e. self-reported co-residence and financial transfers to elderly parents, with our proposed measures. Compared to the proxies commonly used in the literature, our measures of Confucian filial piety have several advantages.[6] First, self-reported behaviours usually display omitted variable bias in empirical analyses (i.e. unobservable household-level factors might drive financial transfers, co-residence status and the outcome variable of interest). Both Confucianism measures we propose are aggregated at the county level and can reduce concerns about omitted variable bias.[7] In particular, the proposed measurement using the percentage of four-generation households is extracted from the population census. It is subject to very few measurement or reporting errors compared to other

[6] Sociologists (more specifically, gerontologists) have conducted the majority of studies on filial piety. Discussions on measures of filial piety in the economics literature are relatively limited. Existing measures and proxies of broader Confucian social norms used in the literature include: the number of Confucian temples, ability to recite Confucian verses, time preferences of parents and share of educated workers (Kung and Ma, 2014; Liang, 2010; Liu, Meng, and Wang, 2014). These proxies, however, measure different aspects of Confucianism. For example, Kung and Ma (2014) use the number of Confucian temples to measure loyalty (*zhong*), Liu et al. (2014) use the probability of citing verses to measure familiarity with Confucian social norms, and Liang (2010) uses the time-discount factor as a measure for the value of human capital in different cultures.

[7] Omitted variable bias might still exist at the county level. We address this issue in section 5.

measures at the household level. Second, both proposed measures can be easily constructed in follow-up surveys and population censuses, allowing researchers to consistently trace changes in filial piety norms over time.

4.2 Data for Empirical Analysis

We include in our analysis only urban families with one unmarried child aged 7–21 years, and we exclude households with a single parent or three generations living together.[8] We thus restrict our sample in this way for several reasons. First, the one-child policy is much more strictly enforced in urban areas, as financial and administrative penalties such as fines and removal from office, are much more difficult to implement in rural areas (Short and Zhai, 1998). By restricting the sample to urban families we make the samples more comparable in terms of the policy constraints faced by the households. We also restrict our analysis to households with children ages 7–21 years because as outlined in Section 4, we are interested in the trade-offs between human capital investment and savings. Under the Compulsory Education Law of the People's Republic of China passed on 12 April, 1986, children who have reached the age six (seven in some regions) are required to enrol in school and complete at least nine years of compulsory education (Zhou and Zhu, 2007). Households with children this age should be the most active in making human capital investments and it fits the proposed theoretical framework.

Among the 264 counties with valid observations, 246 have at least one urban residential committee (*juweihui*), so we include only these 246 counties in our analysis.[9] Table 2 summarises the household savings rates for both the full and the restricted CHFS samples. Note that the summary statistics indicate that some households in our sample have negative savings rates. As discussed in Deaton (1997), it is not uncommon to find negative savings rates in household surveys, especially for poorer households.[10] The main reason for negative savings

[8] In section 8, we present results from when relaxing these sample restrictions.
[9] In section 8, we expand our sample to include rural communities. The results remain similar.
[10] Deaton (1997) discusses two potential reasons for negative savings rate in developing countries. First, the savings rate might have measurement errors as it usually relies on recall data. Second, individuals tend to underestimate income and overestimate consumption. Paxson (1992) proposes a third reason: the presence of inflation tends to overstate consumption relative to income as household surveys usually have different reference (reporting) periods for consumption and income.

rates is measurement errors. For instance, Orazio and Szekely (2000) show that in Thailand, the average savings rate is about 12%, but the average savings rate for the first income quintile is –32%. We cannot completely resolve the measurement error issue, as is the case for almost all savings measures. We conduct a battery of robustness checks to support our main findings (see section 8).

The final sample in our study includes 1,998 urban nuclear families in 246 counties. Of these, 816 families have one daughter, and 1,182 have one son. We address potential sample selection bias related to gender imbalance in section 7. Table 3 presents the descriptive statistics of the sample. Although the sample contains more single-child families with sons than daughters, other characteristics of the two subsamples, including the age profile and the magnitude of the average Confucian Index, are similar.

The first row in Table 3 displays the average savings rates for nuclear families with one unmarried child aged 7–21 years: 11.5% for this entire group, 9.2% for one-child families with daughters and 13% for those with sons. These average savings rates are comparable to those of urban nuclear families reported in the China Household Income Project (CHIP).[11] The difference in the savings rate between one-child families with daughters and sons is statistically significant. This is consistent with empirical evidence in the literature, as well as the theoretical discussion in Section 3.

5. Empirical Strategy

To evaluate the effects of Confucian social norms on household savings, we rely on the following multivariate regression:

$$savingrate_{ij} = \alpha_0 + \alpha_1 Confucian\_Measure_j + \alpha_2 Confucian\_Measure_j \times son_{ij} + \alpha_3 son_{ij} + \theta X_{ij} + \lambda_p + \epsilon_{ij} \quad \text{(Eq. 8)}$$

where $Confucian\_Measure_j$ is the measure of Confucian filial piety norms county j; son_{ij} equals 1 if household i in county j has a son, and 0 otherwise; X_{ij} is the set of household and respondent characteristics of household i in county j; and λ_p is the prefectural fixed effects.

[11] The data for the authors' own calculation are available upon request.

In Section 2, it is noted that under Confucian norms, parents expect to receive more old-age support from sons than daughters. We, therefore, include an interaction term, $Confucian\_Meausre_j \times son_{ij,}$ in the regression that allows us to compare household savings rates between son and daughter families across counties with different levels of Confucian influence. The coefficient α_1 in Eq. 8 captures the effect of Confucianism on savings by households with only daughters. Based on our assumption that Confucian norms impose more demanding repayment obligations on sons, the null hypothesis is that this coefficient is 0.

However, within any given prefecture, this specification might not capture county-level unobservables that simultaneously affect household savings and the Confucianism measure. In Eq. 9, therefore, we include a county fixed effects, δ_j. As a trade-off, the coefficient on the Confucian Index, α_1, in Eq. 8 is dropped.

$$savingrate_{ij} = \alpha_0 + \alpha_2 Confucian\_Measure_j \times son_{ij} + \alpha_3 \times son_{ij} + \theta X_{ij} + \delta_j + \epsilon_{ij} \quad \text{(Eq.9)}$$

We report the results based on both Eq. 8 and Eq. 9 in the next section. Coefficient α_2 measures the gap between son and daughter families in a given county in response to a change in Confucianism influence and corresponds to the theoretical predictions derived in Eq. 6 (i.e., : $\frac{\partial s_1}{\partial \gamma}|_{son} - \frac{\partial s_1}{\partial \gamma}|_{daughter} = -\frac{g(q\bar{n})}{Y_1(1+\beta)}$) (section 3). Based on Eq. 6, we expect α_2 to be negative. In other words, the gap in the savings rate between son and daughter families decreases when moving from less to more Confucian counties. To rule out any other unobservables that correlate with both Confucianism and the savings rate, we control for a rich set of household and respondent characteristics, X_{ij}, including household wealth, income, age, highest education, public-sector employment, receipt of a public pension, and the age of the child.

A concern about Eqs. 8 and 9 is that the sex ratio might be correlated with Confucian influence in a locality. Sex ratio is shown to be correlated with savings (Wei and Zhang, 2011a), so it might drive the observed effect. Figure 2 plots the county-level Confucian Index against the sex ratio and indeed shows a positive correlation between the two. We, therefore, include both the sex ratio and the interaction of sex ratio with sons in our specification:

$$savingrate_{ij} = \alpha_0 + \alpha_2 ConfucianIndex_j \times son_{ij} + \alpha_3\ son_{ij} + \theta X_{ij} + \Upsilon\ sex\_ratio_j \times son_{ij} + \Phi\ sex\_ratio_j + \lambda_p + \epsilon_{ij} \quad \text{(Eq.10)}$$

We expect coefficient Φ to be positive based on Wei and Zhang (2011): as the sex ratio increases, the average savings rate does too. If we control for county fixed effects instead of prefectural fixed effects, Eq. 10 becomes:

$$savingrate_{ij} = \alpha_0 + \alpha_2 Confucian\_Measure_j \times son_{ij} + \alpha_3\ son_{ij} + \theta X_{ij} + \Upsilon sex\_ratio_j \times son_{ij} + \delta_j + \epsilon_{ij} \quad \text{(Eq. 11)}$$

In Eq. 11, the difference in the savings rate between daughter and son families in a given county is ($\alpha_2\ Confucian\_Measure_j + \Upsilon\ sex\_ratio_j$). In other words, we allow the difference to vary with not only Confucianism but also the county-level sex ratio. Following (Wei and Zhang, 2011a)), we expect the coefficient Υ to be negative. [12,13]

As shown in Table 1, our sample has more families with one son than one daughter. The pattern is probably due to the practice of son-stopping-rules in China. If this is the case, families with a first-born daughter likely choose to have a second child and are not be retained in our sample. In section 8.4, we address the sample selection issue using a Heckman model and show that our results are not driven by sample selection bias.

6. Results

Table 4 presents the regression results for Eqs. 8–11, using Confucian Index as the measure for Confucian norms. Robust standard errors calculated at the community level *(jiedao)* and corresponding t-values reported in parentheses. Column 1 presents the results using prefectural fixed effects included in Eq. 8, while column 2 contains the results from county fixed effects

[12] Wei and Zhang (2011a) estimate the effect of the sex ratio on the household savings rate for urban nucleus households (households with one child younger than age 20 years) in Table 9 of their paper. The effect is estimated separately for families with sons and daughters. The coefficient is 1.54 for son families and 1.85 for daughter families, and both are statistically significant. This means a marginal increase in the sex ratio increases savings by daughter families more than son families. This is equivalent to observing a negative coefficient for the interaction term, $sex\_ratio_j \times son_{ij}$, in Eq. 11.

[13] We replicate Table 9 of Wei and Zhang (2011a) using our dataset and include the results in Table A1. Column (1) in Table A1 presents the results when the savings rate is computed using our definition of (income-expenditure)/income. Column (2) presents the results when using the savings definition from Wei and Zhang (2011a) (savings rate = log(income/consumption)). The estimated coefficient is 0.50 for son families and 0.79 for daughter families. Both estimates are statistically significant. Our replication produces estimates that have the same direction and relative magnitude as Wei and Zhang (2011a) (the coefficient is smaller for son families than daughter families). The magnitude of our replicated estimates is smaller due to the calculation of the savings rate (surveys might not always use the same items to compute the savings rate. For instance, the CHFS considers housing to be a form of savings, while the CHIP does not).

included in Eq. 9. Columns 3 and 4 present the results with additional controls for the sex ratio and the interaction of the sex ratio and sons.

As discussed in Section 5, the coefficient of interest is the interaction term, $Confucian\_Meausre_j \times son_{ij.}$ It is negative and statistically significant for all four specifications, as shown in Table 4, and its magnitude does not vary across specifications. Based on column 2, for every 1% drop in people who believe in Confucian filial piety values in a county, the savings rate gap between son and daughter families increases by 0.33% on average. The negative interaction term is in line with our hypothesis that in regions with stronger Confucian influence, families with sons have less need to save for old age and other contingencies than families with daughters. It is also consistent with the findings by Banerjee et al. (2014). In such regions, parents expect different financial returns from sons than daughters. However, in regions with little or no Confucian influence, son and daughter families have little or no differences in savings rate as both family types have to look for alternatives to prepare for future uncertainties. In this sense, the national decline in Confucian influence has contributed to the steady increase in savings.

Table 4 also indicates that the savings rate has a negative association with household wealth and a positive association with household income. Few previous studies directly estimate the relationship between household wealth and the savings rate due to data limitations. Our results show a statistically significant relationship between household wealth and the savings rate. For every 1 million RMB increase in accumulated wealth, the savings rate decreases by 4%. This is consistent with the theories suggested by Modigliani and Cao (2004).[14] In addition, state employees and those with public pensions have higher savings rates, contrary to conventional beliefs that once old-age and other future uncertainties are addressed, the pressure to save more decreases.

Columns 3 and 4 report the results for Eqs. 10 and 11 including both the sex_ratio_j and the interaction $sex\_ratio_j \times son_{ij}$ as controls. As expected, we observe a negative coefficient for $sex\_ratio_j \times son_{ij}$, meaning that an increase in the sex ratio decreases the savings gap between

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

son and daughter families. The coefficient for sex_ratio_j is positive, as expected, but neither of these coefficients is statistically significant.[15] The coefficient for the interaction term, $Confucian\_Measure_j \times son_{ij}$, is still negative and statistically significant, while the magnitude remains very close to that in columns 1 and 2. Columns 3 and 4 provide supporting evidence that the observed effect of Confucianism on the savings rate gap is not driven by the underlying differences in the sex ratio across counties.

From Eq. 8 and 10, we know that the aggregate effect of Confucian values on savings rate of son families equals to the sum of the coefficients for $Confucian\_Measure_j \times son_{ij}$ and $Confucian\_Measure_j$. Columns 1 and 3 in Table 4 indicate that the sum is negative, meaning that son families living in regions with higher Confucian influence save less. This is consistent with the theoretical predictions outlined in Eq. 5.

Table 5 reports the results when the percentage of four-generation households is used to proxy for Confucian-influence intensity. We follow the same empirical specifications as in section 5, only replacing the Confucian Index with the percentage of four-generation households in a county. The average value of the coefficient for *son* × *%four-generation-households* across all specifications in Table 5 is around -11. Thus, for every 1% increase in four-generation households, the savings rate of son families decreases by 11% compared to daughter families. The results are statistically significant and robust to various specifications. Similarly, columns 1 and 3 in Table 5 indicate that as the percentage of four-generation-households rises, savings rate for son families decrease. These findings are consistent with the results presented in Table 4 based on the Confucian Index.

7. Robustness checks

7.1 Specifications with Family Type

[15] Compared to Wei and Zhang (2011a), our results have the expected sign but lack of statistical significance. This is perhaps due to the prefectural fixed effects in our model, which controls for any prefectural-level unobservables correlated with both the sex ratio and the savings rate. Wei and Zhang (2011a) do not control for any locality fixed effects.

So far, in the empirical analysis, the households in the filtered sample are classified as either single-child son families or single-child daughter families based on the child's gender. In the theoretical model presented in Section 3, we assume that parents expect a return from sons but not daughters. However, some families with sons do not follow Confucian social norms and do not expect to receive old-age support from their sons, while some families expect to receive old-age support from their adult daughters. We, therefore, can further divide households into four types by the child's gender and the answers to the survey question: 'Why do you want to have children?'.

Table 6 defines four types of households and their average savings rates. According to Table 6, the high savings rate for households with sons is mainly driven by type-3 families, or one-child households with a son and parents who do not plan to rely on the child for old-age support and hence do not view children as an investment or insurance. In contrast, the low savings rate among daughter families is mainly driven by type-2 families who have a daughter and plan on her to provide old-age support. Given the large variation in the savings rates among the four family types, we add a family-type dummy in the regression model, as follows:

$$savginsrate_{ij} = \alpha_0 + \sum_{l=2}^{4} \alpha_l \times familytype_{ij} \times \lambda_l + \beta_l Confucian\_Measure_j + \sum_{l=2}^{4} \gamma_l \times familytype_{ij} \times Confucian\_Measure_j \times \lambda_l + \theta X_{ij} + \epsilon_{ij} \quad \text{(Eq.12)}$$

where *Confucian_Measure*$_j$ represents the level of Confucianism in county *j*. We use both the Confucian Index and the percentage of four-generation households for this measure in our analysis. λ_l is a family type dummy (λ_l =1 if family type = *l*; 0 otherwise). Moreover, we allow the effect of Confucianism on the household savings rate to vary by family type, using type-1 families (non-Confucian, single-child, daughter families) as the benchmark.

Table 7 presents the results from the regression equation (Eq. 12). Column 1 reports the OLS results using the Confucian Index, and column 2 the results using the percentage of four-generation households as a measure of Confucian influence. All regressions control for household and individual characteristics, as well as a county dummy. The coefficients for the interaction terms between family type and Confucianism are all negative and statistically insignificant, except for *Family_type*$_4$, which has statistically significant coefficients. Single-child son families that view children as investments in old-age support (type-4 family) do have lower savings rates in regions where Confucian social norms are dominant. This result also

indicates that the impact of Confucianism on the national savings rate is mainly driven by its influence on savings by type-4 families. In other words, in a region where Confucianism is dominant, one-child families who have sons and hold Confucian beliefs, all other things equal, save significantly less than non-Confucian, one-child daughter families (type 1). This is the main channel supporting our model's prediction.

7.2 Sample Selection Criteria

We present results with different sample filters in Table 8. Each cell in Table 8 reports the coefficient of the interaction term $Confucian\_Measure_j \times son_{ij}$ shown in Eq. 11. Column 1 show the results when using the Confucian Index, and columns 2 when using the percentage of four-generation households as the Confucian measure.

Table 8 Panel A reports the results when applying different cut-off levels based on savings rates. So far, we restrict our analysis to household observations with a savings rate greater than -200% to limit the impact of sampling and data collection errors. [16] As shown in Panel A, the coefficients for the interaction term, *Son x Confucian_Measure*, remain negative and statistically significant when including all households with savings rates greater than -130% (or greater than -100%) in the regression instead. The magnitude of the coefficients is close to the results reported in Table 4.

In the initial analyses, we include only one-child nuclear families with children aged 7–21 years. However, households with children in other age ranges might have different savings behaviour. We, therefore, check the robustness of our results by considering two alternative samples: one with children ages 7–16 years old and the other with children 12–21 years old in Table 8 Panel B. These groupings ensure that each remaining sample has sufficient observations. As shown Panel B, the coefficients remain negative but are not statistically significant. The values of the interaction-term coefficient for the 7–16-year-old sample are similar for the original full sample, but the corresponding estimates for the 12–21-year-old sample differ significantly. This indicates that Confucian social norms have different impacts

on household savings behaviour depending on children's ages. Confucian values have a stronger influence on the savings decisions by families with young children.

Table 8 Panel C displays the results using different *hukou* (urban residency) status and Han ethnicity as sample selection criteria.[17] It is clear that when either households with official urban residency or only Han households are used in the regressions, the coefficient estimates for the interaction term are, again, similar in both magnitude and statistical significance.

Finally, instead of only including urban households, we consider two alternative samples: (1) only rural households, and (2) a combined sample of both urban and rural households. These two samples are applied to not only the regressions but also the county-level Confucian Index calculations. The respective regression results are presented in Table 8 Panel D, and the coefficient estimates for the key interaction term remain similar.

7.3 Issues with Sample Selection

The preceding analyses are all based on the sample of urban nuclear-family households with only one child age 7–21 years. This sample selection ensures that we compare nuclear households with similar socioeconomic characteristics differing only in the child's gender. Due to the extreme Confucian preference for sons over daughters, the contrast between son and daughter families is important when investigating the impact of Confucian influence on savings behaviour. However, these selection criteria might lead to potential bias in the analysis as households that ignore the one-child policy and have more than one child are excluded from the sample but might be the most Confucian.

Table 9 summarises the sex ratio for the sample families in each of the five location types ranging from villages to mega cities. Figure 2 plots the relationship between the Confucian Index and the sex ratio in the sample by county. The correlation between the two is 0.26: the sex ratio increases significantly as does the Confucian Index, suggesting that regions with stronger Confucian influence likely have more families who violate the one-child policy and continue to have more children until a son is born. Note that under the one-child policy, an

[17] The one-child policy is much more strictly enforced among urban residents and Han Chinese, so we expect the results to be different when we limit the sample to urban residents or Han Chinese households.

urban household may have a second child only if at least one parent is an eligible ethnic minority, or both parents are from one-child families.[18] Thus, most urban households with more than one child must have violated the policy. If these households' behaviour is systemically different than the policy-obeying families with only one child, our results would be biased.[19] In this subsection, we address this potential sample bias issue and show that this bias does not drive our results.

We use two methods to correct for potential bias. Both methods show that after correction, our conclusion remains supported. The first correction method follows Wei and Zhang (2011b). We know the characteristics of households excluded by the selection criteria, so a Heckman two-step procedure can be used to correct for the selection bias. The two-step procedure is as follows:

$$savingrate_{ij} = \alpha_0 + \alpha_2 Confucian\_Measure_j \times son_{ij} + \alpha_3 \times son_{ij} + \theta X_{ij} + \delta_j + \epsilon_{ij} \quad \text{(Eq. 13a)}$$

$$Follow_{ij} = 1[\beta W_{ij} + u_{ij} > 0] \quad \text{(Eq. 13b)}$$

Equation 13a is the savings equation for urban nuclear families and takes the same specification as Eq. (9). The second equation (Eq. 13b) is a probit regression, in which $Follow_{ij}$ is a binary indicator that takes the value 1 if a household chooses to follow the one-child policy and 0 otherwise. We, therefore, should observe values only for $savingrate_{ij}$ if $follow_{ij} = 1$. In implementation, *Wij* in Eq. 13b includes household wealth, income, age, education, public-sector employment and receipt of a public pension. We also include parents' number of siblings and whether the first born is a son as the excluded instruments in Eq. 13b. In China, if parents

[18] Eight minority households in our one-child household sample satisfy the first condition. We do not exclude the eight households from our analysis. We perform robustness checks without these households, and the results do not change. None of the households in our sample satisfies the second condition.

[19] See Appendix C for an outline of the solution when the number of children is endogenised. We examine the socioeconomic characteristics and savings rates across household types defined by the number of children and combinations of gender. Based on the 2013 CHFS data, the average savings rate is -3.6% for households with two daughters but 9.3% for households with only one daughter and 13.0% for households with only one son. This difference is partly due to the fact that households with multiple children have more mouths to feed. However, all these averages are taken from savings rates with large standard deviations. A few patterns also stand out in the summary statistics. The average Confucian Index is significantly higher for households that do not follow the one-child policy than those that do. The former households also tend to have less wealth, lower income and a lower probability that the household head completed high school.

have more siblings, there is less pressure to have male offspring. We, therefore, believe the number of siblings influences the choice of fertility but does not directly affect the household savings rate. Table 10 reports the results from applying this procedure. Columns 1 reports estimation results using Confucian Index as the measure for Confucianism while column 3 reports results using percentage of four-generation households. Columns 2 and 4 are results of the selection equations. Using the Heckman procedure, coefficients for the interaction term, *Confucian_Measure×Son*, remain statistically significant in both specifications and their magnitudes are close to the OLS estimate.

The second method we use to correct selection bias is similar to the propensity-score matching approach. As the sample size of households with daughters is smaller than those with only sons, we use a propensity score matching method. We match the characteristics of son and daughter households based on the mean-square distance metric.[20] Taking the 816 daughter households as a given, we draw 816 households from the 1182 households with only a son and perform the OLS regressions with the resulting combined 1632 households. Result from the matching exercise is reported in Table 8 Panel E. The coefficient for the interaction term remains close to the baseline estimates employing the Confucian Index and four-generation household, respectively. But the coefficient for Confucian Index is not statistically significant.

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 norms or the probability of actual repayment from adult sons. To confirm that parents receive more transfer from sons, we investigate the differences in transfers to retired parents from adult sons and daughters. We use a subsample of 40–55 year-old adult children from the CHFS for this analysis.

Table 11 reports the probability of co-residence with retired parents and the amount of net cash transfers to parents in the most recent year by the gender of the adult child. It is clear from the table that both the probability of co-residence and the amount of cash transfers are

[20] Households are matched based the following variables: household wealth, household annual income, age of respondent, age-square of respondent, education of respondent, whether the respondent is a state employee and has pension, county level Confucian measure as well as sex ratio.

higher for sons than daughters. When the participant is an adult daughter, her annual net cash transfer to her parents is RMB 327 lower than to her parents-in-law. Adult sons, on average, provide RMB 670 more support to their parents than their parents-in-law. Similar patterns are observed, whether we treat urban and rural respondents together or separately. In addition, both the probability of co-residence and the amount of net cash transfer decrease when moving from rural villages to urban cities. Women in rural households are much more likely to live with their in-laws than women in metropolitan areas.

As a cross-check, we investigate whether our measure of Confucianism correlates with these variables. We construct variables capturing the amount of financial transfers and self-reported co-residence status for individual ages 40–55 years in our sample. The coefficient on the interaction term, *Confucian Measure x son,* is reported in Table 8, Panel F. Both estimates are positive. However, only the coefficient in the co-residence specification is statistically significant, probably due to large measurement errors in the self-reported financial transfer data. Our results indicate that compared to daughters, sons in counties with strong Confucian influence are more likely to co-reside with their elderly parents. These results provide further support for our Confucian measure.

9. Conclusions

In economic modelling, inter-generational financial obligations are often taken as a default-free arrangement. However, supportive social norms are essential for the enforcement of the implicit intra-family contract between parents and children and, more generally, for the functioning of the family as an internal financial market for its members. Culture changes over time as society adapts to technological and market developments, so we should not assume that the intra-family financial contract is exogenously default-free. In this paper, we incorporate into parents' decision-making framework a default probability that is a function of the community's prevailing social norms. Consequently, changing social norms affect parents' consumption-savings and investment behaviour. In particular, if and when social norms on children's repayment action become weaker and less binding, parents take risk-hedging for old age into their own hands and save more.

In the Chinese context, Confucianism is the main culture performing such implicit-contract enforcement functions and it heavily emphasises male children's obligations to repay their parents in times of need. For many centuries, this culture has promoted Chinese parents' exaggerated preference for sons at whatever costs. However, as concluded in the sociology and psychology literature, Confucian influence has declined, especially in recent decades, as the Chinese economy and society have experienced fast development and population mobility has risen at an unprecedented pace. Our model shows that this decline in Confucian influence might be a driver behind the continuing rise in household savings rates in China.

In this paper, we investigate our model predictions using the 2013 CHFS survey data from 29 provinces on all levels of localities, from villages to mega-cities. First, among our findings, one-child households with sons have significantly lower savings rates if parents live in regions with stronger Confucian belief (as measured by both the Confucian Index and the percentage of four-generation households in a region). Second, the gap in the savings rate between one-child households with sons and daughters is wider in regions with stronger Confucian influence. In other words, the declining Confucian influence affects the savings behaviour of families with sons more than families with daughters.

Both our model and the empirical results demonstrate that Chinese household savings rates are rising, in part, as children have become less reliable as parents' old-age support due to the declining influence of Confucianism. As long as the influence of Confucianism in China continues to wane, the high savings rate likely will persist unless financial development accelerates, and social security programmes become more widely available.

Appendix A: Model with Uncertainty

Let us assume that the return on human capital investment is risky; in other words, $g(.)$ is a random variable. This certainly affects parents' decisions. Given the one-child policy, we assume that the number of children in each household is exogenously fixed at 1. We assume that the gross return for each dollar of human capital investment in children is denoted by $R_i = \overline{R} + \frac{1}{\gamma}\varepsilon$, where ε is a random variable with a mean of 0 and variance of 1. Let the prevailing

interest rate be R, and $\bar{R} > R$ is the expected gross return from children. Note that in the regions with the weakest Confucian social norms (i.e., a low value for γ), the risk of human capital investment in children is higher as children are more likely to default on future repayment obligations.

The maximisation problem for 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 share of period-1 savings to be invested in the risk-free asset. The first-order conditions for the preceding equation 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 the 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 $c_1(\theta, \gamma, \beta)$ in 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 that parents invest in both the risk-free asset and their child. The optimal choice of θ then satisfies the following first-order and second-order conditions:

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

The optimal portfolio choice, therefore, satisfies

$$\frac{\partial \theta^*}{\partial \gamma} = \frac{-\beta(Y_1 - c_1)E[u'(c_2)\frac{1}{\gamma}\varepsilon]}{D} < 0 \text{ (Eq. A1)}$$

Hence, we have $\frac{\partial(1-\theta^*)}{\partial\gamma} > 0$. According to Eq. A1, the optimal investment in children still increases as social norms γ become more Confucian. It also implies that there exists a lower threshold on γ, say $\underline{\gamma}$, such that if social norms weaken further—that is, if children become too unreliable an investment instrument (i.e. γ is too low)—then parents will opt not to invest in children's human capital and instead put all their savings in the risk-free asset. If and when this happens, children are no longer an investment asset but a pure consumption good, as in the standard Becker model, and parents are purely altruistic. A mixed portfolio of both the risk-free asset and children is optimal only if $\gamma > \underline{\gamma}$; in other words, $0 < \theta < 1$ only if $\gamma > \underline{\gamma}$. As γ approaches 0, 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 but only the risk-free financial asset.

The effect of γ on period-1 consumption is

$$\frac{\partial c_1^*}{\partial\gamma} = \frac{-\beta\frac{1}{\gamma}E\left[\frac{Y_2}{c_2^2}\right]\frac{\partial\theta^*}{\partial\gamma}}{H} + \left(-\beta\frac{(\bar{R}-R)\frac{\partial\theta^*}{\partial\gamma}E\left[\frac{Y_2}{c_2^2}\right]+(1-\theta)\frac{1}{\gamma^2}E\left[\frac{Y_2}{c_2^2}\varepsilon\right]}{H}\right) \qquad \text{(Eq. A2)}$$

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

Our results indicate that when human capital investment is perceived as a risky asset, parents in more Confucian regions invest more in children than parents in less Confucian

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

Appendix B: Savings Decisions for Households with A daughter under Uncertainty

Following Appendix A, for daughter families, we have:

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

when $R - R_i > 0$,

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

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

we 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 $\frac{\partial V}{\partial \theta} = \beta(Y_1 - c_1)E(u'(c_2)(R - R_i)] = 0$, 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: Savings Decisions for Households not Following the One-child Policy

Based on savings equation outlined in section3, when the fertility constraint is not binding, the household savings rate is

$$s_1 = \frac{Y_1 - c_1^*}{Y_1} = 1 - \frac{1}{(1+\beta)Y_1}\left[Y_1 + \frac{Y_2}{R} + \frac{\gamma g(q\bar{n})}{R} - q\bar{n}\right] \quad \text{(Eq. A3)}$$

where *n* is the optimal number of children. Again, based on separation and profit maximisation, the optimal human capital investment per son is $q*(n, R, \gamma)$, by maximising Eq. 2.

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

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

Table 1 Confucian Index by Locality Type

Locality Type	Mega City	Provincial Capital	Prefectural City	County Town	Rural Villages
Confucian Index	42.9	43.4	51.6	61.4	73.3
Household Savings Rate (%)	28.6	16.3	14.2	11.6	8.3

Note: Mega cities include Beijing and Shanghai. Confucian Index for each locality type is calculated using Eq. 7. The calculations include all valid data points in the 2013 CHFS. Household savings rate is the average of all households with a calculated savings rate above -200%.

Table 2 Summary Statistics of Household Savings Rates for CHFS Samples

	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: We define a household's savings rate as *(Income–Expenditure)/Income*. Row 1 reports savings rates for all sample households with savings rate > –200% . Row 2 reports county level average savings rates for all counties. Row 3 reports county level average savings rates for all urban households in counties with at least one urban communities. 18 counties with no urban communities were excluded as a result. This is the final sample used in the empirical analysis presented in Section 5 and 6.

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

Variable	Full Sample	Households with One Daughter	Households with One Son
Panel A: Savings Rate (%)	11.5	9.3	13.0
	(58.1)	(55.6)	(59.8)
Panel B: Confucian Index	49.5	49.6	49.5
	(13.3)	(12.9)	(13.5)
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

Notes: 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 Eq. 7 for calculation of the three Confucian Indexes

Table 4 Effect of Confucian Index on Savings Rate

Dependent Var = Savings Rate	(1) Prefectural Fixed Effects	(2) County Fixed Effects	(3) Prefectural + Sex_ratio	(4) County +sex_ratio x son
Son	20.02**	18.72	36.97	38.44
	(2.36)	(2.11)	(1.07)	(1.08)
Confucian Index	0.33		0.25	
	(1.50)		(1.14)	
Confucian Index × Son	–0.35**	–0.32*	–0.33*	–0.30*
	(–2.09)	(–1.83)	(–1.96)	(–1.70)
Household Wealth (Millions RMB)	–3.96***	–4.44***	–3.93***	–4.46***
	(–4.11)	(–4.08)	(–3.64)	(–4.10)
Household Income (Thousands RMB)	0.24***	0.24***	0.24***	0.242***
	(9.61)	(9.46)	(9.59)	(9.46)
Age of Respondent	–4.31*	–4.52	–4.30**	–4.50**
	(–2.16)	(–2.14)	(–2.17)	(–2.13)
Education of Respondent	5.81**	5.87**	5.93**	5.81**
	(2.17)	(2.07)	(2.20)	(2.06)
Respondent is State Employee	13.51***	14.02***	13.45***	13.95***
	(5.43)	(5.43)	(5.40)	(5.40)
Respondent has Public Pension	6.85**	7.00**	6.82**	7.06**
	(2.29)	(2.22)	(2.28)	(2.23)
Age of Child	–0.62	–0.73*	–0.63	–0.74*
	(–1.51)	(–1.72)	(–1.54)	(–1.74)
Sex Ratio			0.39	

			(1.14)	
Sex Ratio × Son			–0.16	–0.19
			(–0.53)	(–0.60)
Prefecture Fixed Effects	Y	N	Y	N
County Fixed Effects	N	Y	N	Y
N	1998	1998	1998	1998
R^2	0.307	0.344	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 Eq. 7 for detailed definition of the index. All regressions also control for income-square and respondent age-square.
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. Robust standard errors are calculated, clustered at community *('jiedao'*) level. t-statistics are reported in parentheses.
5. *** Significant at 1% level, **Significant at 5% level, * Significant at 10% level

Table 5 Effect of Percentage of Four-Generation Households and Savings Rate

Dependent Var = Savings Rate	(1) Prefectural Fixed Effects	(2) County Fixed Effects	(3) Prefectural + Sex_ratio	(4) County +sex_ratio x son
Son	7.19**	7.14**	30.78	32.14
	(2.32)	(2.23)	(0.88)	(0.90)
%Four-Generation	8.33		6.33	
	(1.11)		(0.86)	
%Four-Generation × Son	–10.95	–10.2*	–10.49**	–9.74*
	(–2.09)	(–1.94)	(–1.99)	(–1.83)
Household Wealth (Mils RMB)	–3.93***	–4.44***	–3.91***	–4.46***
	(–3.60)	(–4.07)	(–3.60)	(–4.09)
Household Income ('000 RMB)	0.24***	0.24***	0.24***	0.24***
	(9.51)	(9.41)	(9.51)	(9.42)
Age of Respondent	–4.35**	–4.55**	–4.34**	–4.54**
	(–2.17)	(–2.14)	(–2.17)	(–2.14)
Education of Respondent	5.86**	5.96**	6.02**	5.88**
	(2.17)	(2.11)	(2.22)	(2.08)
Respondent is State Employee	13.56***	13.96***	13.41***	13.88***
	(5.47)	(5.42)	(5.41)	(5.38)
Respondent has Public Pension	6.75**	7.00**	6.78**	7.06**
	(2.25)	(2.21)	(2.26)	(2.23)
Age of Child	–0.61	–0.74*	–0.63	–0.75*
	(–1.49)	(–1.75)	(–1.54)	(–1.76)
Sex Ratio			0.46	

			(1.37)	
Sex Ratio × Son			–0.216	–0.23
			(–0.68)	(–0.71)
Prefecture Fixed Effects	Y	N	Y	N
County Fixed Effects	N	Y	N	Y
N	1998	1998	1998	1998
R^2	0.003	0.229	0.308	0.345

Notes:

1. 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 county level. Statistics are computed based on the 2010 China Population Census. All regressions also control for income-square and respondent age-square.
4. Robust standard errors are calculated, clustered at community ('jiedao') level. t-values are reported in parentheses.
5. *** Significant at 1% level ** Significant at 5% level * Significant at 10% level

Table 6 Household Savings Rate by Child's Gender and Reason to Have a Child

	Household with a Daughter		Household with a Son	
Whether he/she chose "for old-age insurance" as a reason for having child	N	Y	N	Y
	(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 7 Regressions with Flexible Coefficient on Family Types

Dependent Var = Savings Rate	Confucian Index	Four-generation households
	(1)	(2)
Family_type 2	19.85	-0.81
	(1.22)	(-0.16)
Family_type 3	38.76	30.04
	(1.08)	(0.84)
Family_type 4	57.10	34.55
	(1.52)	(0.96)
Family_type 2 × Confucian measure	–0.42	0.26
	(–1.35)	(0.03)
Family_type 3 × Confucian measure	–0.31	–3.59
	(–1.09)	(–0.47)
Family_type 4 × Confucian measure	–0.68**	–15.90*
	(–2.16)	(–1.85)
Household/Respondent Characteristics	Y	Y
County Fixed Effects	Y	Y
Observations	1998	1998
R^2	0.346	0.346

Notes:

1. See Table 6 for definitions of family types.
2. "Confucian measure" is either the Confucian Index or percentage of four-generation households, depending on the column heading.
3. All regressions control for sex ratio and interaction of sex ratio and son. 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, income-square, 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.
5. *** Significant at 1% level ** Significant at 5% level * Significant at 10% level

Table 8 Robustness check

	(1) Confucian Index	(2) Four-gen households
Panel A: Savings rate ranges		
Samples with Savings Rate > -130%	–0.29*	–7.26*
	(–1.77)	(–1.65)
	[1923]	[1923]
Samples with Savings Rate >-100%	–0.27*	–6.50
	(–1.74)	(–1.54)
	[1876]	[1876]
Panel B: Child age		
Households with a Child between 7 -16	–0.32	–9.33
	(–1.31)	(–1.44)
	[1282]	[1282]
Households with a Child between 12-21	–0.05	–5.41
	(–0.25)	(–0.86)
	[1450]	[1450]
Panel C: Hukou status and ethnicity		
Households with official urban Hukou only	–0.35*	–10.76*
	(–1.79)	(–1.84)
	[1642]	[1642]
Han Chinese households only	–0.33*	–10.95**
	(–1.83)	(–2.02)
	[1947]	[1947]
Panel D: Urban + rural		
Combined Sample	–0.37**	–9.39*
(Rural and Urban Households)	(–2.55)	(–1.88)
	[2357]	[2357]
Panel E: Matching		
Matched Sample of Son- and Daughter Households	–0.26	–9.35*
	(–1.42)	(–1.67)
	[1632]	[1632]
Panel F: Financial Transfers and Co-residence		
Annual net cash transfers to elderly parents (RMB)	0.02**	287.41
	(2.05)	(0.90)
	[2350]	[2264]
Probability of co-residing with elderly parents	0.02**	0.87**
	(2.05)	(2.29)
	[2257]	[2127]

Notes:

1. Each cell report the coefficient of the interaction term $Confucian\_Measure_j \times son_{ij}$ in Eq.11. Robust standard errors are calculated, clustered at community (*'jiedao'*) level. t-values are reported in parentheses. Numbers of observations are reported in square brackets. *** Significant at 1% level, ** Significant at 5% level, * Significant at 10% level
2. All regressions control for the following: whether the household has a son, household wealth, household annual income, income-square, 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, interaction of sex ratio and son and also a county fixed effects.
3. Other than Panel B, all regressions include households with one child between age 7–21
4. Panel E is estimated by mean-square distance matching. We match 816 daughter households with 816 households from the 1182 households with only a son and perform the OLS regressions with the resulting combined 1632 households. Households are matched based the following variables: household wealth, household annual income, age of respondent, age-square of respondent, education of respondent, whether the respondent is a state employee and has pension, county level Confucian measure as well as sex ratio.

Table 9 Gender Ratio for Sample Families

	Mega City	Provincial Capital	Prefectural City	County	Rural Villages
Children Gender Ratio for Nucleus Families in 2013 CHFS Survey	123	141	185	206	212
Gender Ratio for One-Child Families (child aged between 7-21)	109	127	190	205	215
Confucian Index	42.9	43.4	51.6	61.4	73.3

Note: Gender ratio is computed as the number of households with one son per 100 households with one daughter.

Table 10 Heckman Two-Step Results

Dependent Var = Savings Rate	Confucian Index		Four-generation Household	
	(1) Heckman	(2) Selection Model:	(3) Heckman	(4) Selection Model:
		Depend var = Nuclear family		Depend var = Nuclear family
Son	37.79		31.16	
	(1.22)		(1.01)	
Confucian Measure × Son	–0.32*		–10.02*	
	(–1.75)		(–1.83)	
Household Wealth (Millions RMB)	–4.23***	–0.04**	–4.25***	–0.04**
	(–5.32)	(–2.51)	(–5.35)	(–2.51)
Household Income (Thousands RMB)	0.24***	0.0003	0.24***	0.0003
	(18.20)	(1.51)	(18.21)	(1.51)
Age of Respondent	–4.04*	–0.02***	–4.10*	–0.02***
	(–1.89)	(–4.63)	(–1.92)	(–4.63)
Education of Respondent	3.56	0.41***	3.74	0.41***
	(1.09)	(4.66)	(1.15)	(4.66)
Respondent is State Employee	12.00***	0.35***	12.02***	0.35***
	(3.93)	(4.30)	(3.94)	(4.30)
Respondent has Public Pension	1.61	0.79***	1.87	0.79***
	(0.38)	(11.52)	(0.44)	(11.52)
Age of Child	–0.77*		–0.78**	

	(–1.93)		(–1.96)	
Son ×Sex Ratio	–0.20		–0.24	
	(–0.70)		(–0.87)	
Number of Siblings		–0.09***		–0.09***
		(–4.92)		(–4.92)
First child is son		0.50***		0.50***
		(8.63)		(8.63)
County Fixed Effects	Y	Y	Y	Y
mills ratio		–16.39*		–16.39*
λ		(–1.66)		(–1.66)
N		3125		3125

Note: Columns 1 and 2 report the 2-step selection results. Columns 2 and 4 are the selection equations. Number of siblings of parents and if the first child is a son are excluded as instruments.

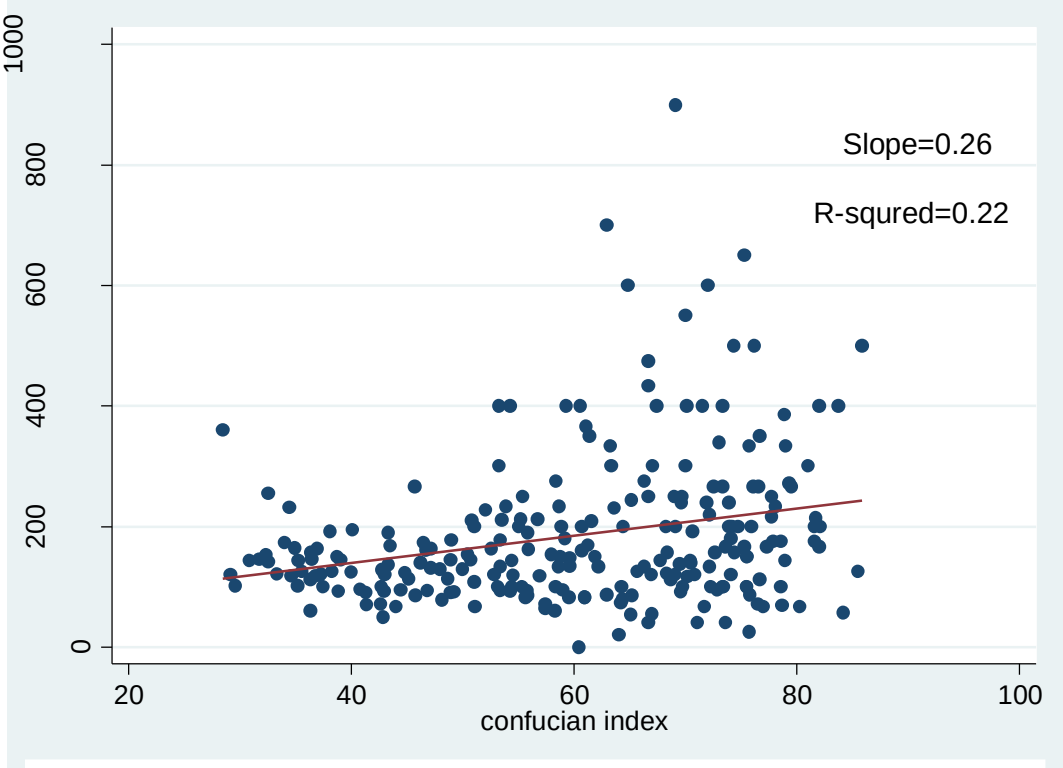
Table 11 Intergenerational Transfers and Co-residence with Retired Parents

	Panel A: % Living Together with		Panel B: Net Cash Transfer (RMB) 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

Figure 1 Confucian Index and Savings Rate

Note: x-axis is the Confucian Index as discussed in section 4， y-axis is county average savings rate, in percentage points, using samples reported in row 3 Table 2.

Figure 2 Gender Ratio among One-Child Households vs. Confucian Index



Note: x-axis is the Confucian Index as discussed in section 4, y-axis is the number of boys for each 100 girls among one-child households in a county.

Appendix Table A1: Replicating Wei and Zhang [2011]

	Dependent Var = 1-consumption/income		Dependent Var= Log(income/consumption)	
	(1)Son	(2)Daughter	(3)Son	(4)Daughter
Sex Ratio	0.47**	0.76***	0.50*	0.79***
	(2.14)	(3.74)	(1.76)	(3.15)
Household and Individual Characteristics	Y	Y	Y	Y
Gini at county level	Y	Y	Y	Y
N	1182	816	1182	816
R^2	0.206	0.204	0.350	0.364

Note: Regression use the same sample as main results (see footnote in Table 4). We control for all covariates mentioned in the footnote of Table 9 in Wei and Zhang (2011a), including household income, child age, education of respondent, age of respondent, as well as county level Gini coefficient. We do not control for household ownership as it is part of the savings that's computed by CHFS.

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