Three Essays in Family Economics

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ABSTRACT

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This dissertation contains three essays. It provides analysis on issues concerning about family economics.

The first essay investigates issues about intergenerational transfer in China. Does parental support in China respond to low income of the elderly? Intergenerational transfers from adult children to their parents are thought to contribute a significant portion of old-age support in China. With a fast growing elder population and an increasing old-age dependency ratio, it is important to understand these transfers. This study investigates the determining factors of intergenerational transfers in China. This line of research is still lacking due to the scarcity of detailed household data. Past studies on private transfers in China could not differentiate between intergenerational versus intragenerational transfers. Using pilot data from the newly released China Health and Retirement Longitudinal Study (CHARLS), I found that around half of the sampled households received transfers from adult children and the amount of transfer is as much as two-thirds of household income per capita. Data also showed that poorer households are more likely to receive transfers. Data suggested that people in the poor province (Gansu) have a higher degree of dependence on adult children, as the source of providing old-age support and living arrangement. Seeing

how private transfers are large, widespread, and responsive to income, the benefits from instituting appropriate public policy would likely accrue in part to younger generations by lessening their burden of familial support.

The second essay examines the effect of social father on the well-being of out-of-wedlock children. Social fathers, defined as stepfathers or unrelated cohabiting romantic partners of biological mothers, have become more widespread as a result of the increasing out-of-wedlock childbearing. With more young children living with social fathers, it is important to understand the effect of social fathers on the well-being of children. Previous research focused more on such effect on older children or adolescents. Using data from the Fragile Families and Child Wellbeing Study (FFCWS), I find that children with social fathers scored around three points less in a cognitive ability test than children living only with biological mothers. I used the propensity score matching method to address the selection issue for which the child's mother self-selected into having a new partner. Social fathers will be more common because of the widespread of non-marital births. Any negative effect caused by the social fathers will affect a large portion of child population.

The third essay evaluates the association between the timing of parenthood and the timing of retirement. Is late parenting associated with late retirement? The trend of parenthood timing is under drastic change. The birth rate for women aged 30-34 rose from 52.3 births per 1000 women in 1975 to 96.5 births per 1000 women in 2010 while the birth rate for women aged 20-24 went down from 113 births to 90 births per 1000 women during the same period. The children may still be very young when their parents enter their retirement age. In the Health and Retirement Study (HRS), 20% of respondents' children lived with them while nearly 30% of these children were below 18 years of age. Despite the potential importance of this issue, economists have not done much research on it. Using the HRS, this study found that parents who have their first child before or at age 30 retire earlier than parents who have their

first child after age 30. This positive association holds for different sub-groups of the sample. With significant portion of people delaying their parenthood and a large group of people entering their retiring age, it is very important for policy makers and economists to understand how the timing of parenthood associates with the timing of retirement.

Table of Contents

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Chapter 1

Private Old-Age Support in China: New Evidence from the Rich and the Poor

1.1 Introduction

Private inter-household transfers have an important role in resource reallocation, especially in developing countries. A significant portion of the private transfers are intergenerational - between parents and adult children. The main objective of this study is to investigate how the income of elderly relates to the intergenerational transfers from their children in two China's provinces. This paper answers the following questions: Does parental support respond to low income of the elderly? What factors other than elderly income stimulate parental support in China?

The pattern of intergenerational transfers in China and in most developing countries has been found to be totally different from that of developed countries. In developed countries, such as the U.S., intergenerational transfers are more likely to flow from parents to adult children. In developing countries, the opposite direction is more common[1].

Because private transfers from children to parents appear to function like old-

[1]For example, using a U.S. dataset, Gale and Scholz (1994) found that 84.2 percent of private transfer recipients received money from parents but only 3.6 percent received money from children. Lee, Parish and Willis (1994) found that around 75 percent of those sampled in Taiwan gave money to parents while only 18 percent transferred money to children.

age support, there is an urgent need to study these transfers considering the rapid aging of China's population. The percentage of people aged 60 or above will increase from 10 percent in 2000 to an estimated 23 percent in 2030. The main reason of the aging population is the drastic decline in total fertility rate[2] over the past several decades. The rate dropped from around 6 in the late 60s to below 2 in mid-90s (United Nations, 2008)[3]. At present, a large cohort of adults in China is at the end of their childbearing age. This generation also has a much lower fertility rate than the previous generation. They will pass their 60th birthday in the next 10-15 years. With an increasing demand of old age support, it is necessary to examine how the future needs of the elderly can be satisfied.

In China, public old-age support programs are quite small and the coverage is limited. Old-age pension spending in China was around 400 billion yuan in 2005, or 2.2 percent of China's GDP. This figure was relatively low considering old-age spending in the US was 5.6 percent of GDP in 2005. The coverage of the pension system was still small with 43 million old-age pension recipients, around 20 percent of the older population[4] (Salditt, Whiteford and Adema, 2008). New old-age support programs are also developed, but their scopes are not big and are often targeted to urban areas (Zimmer and Kwong, 2003).

Even with the availability of public old-age support, adult children are still the major source of old age support for parents in China[5]. In the sample I used, parental support contributed around 60 percent of per capita household income among transfers recipients. This may be unheard of in developed countries. Yet, it should not

[2]The average number of children a hypothetical cohort of women would have at the end of their reproductive period if they were subject during their whole lives to the fertility rates of a given period and if they were not subject to mortality. It is expressed as children per woman.

[3]The drop was most pronounced during the late 70s and the early 80s after the one-child policy was introduced in 1978.

[4]Aged 60 or older.

[5]For example, in the China Urban Labor Survey, conducted in 2002, around 60 percent of the respondents agreed that adult children should take some responsibility in supporting their parents. Also, 90 percent of the respondents are willing to support their parents (Cai, Giles and Meng, 2006).

be surprising considering the fact that filial piety has been the core value in Chinese culture for two thousand years. Supporting elderly parents, especially financially, is always viewed as the responsibility of children. It has also been institutionalized by law (Chou, 2011a)[6]. Apart from the law, a voluntary contract called "family support agreement" between older parents and adult children emerged in 1984, with details on how the old-age family members are supported[7]. With a significant portion of old-age support coming from the children, a thorough understanding of private transfers in China is necessary. Issues such as how public pension system can supplement private transfers, or whether public pension will crowd out private transfers will be crucial for the development of effective and efficient old-age support policies.

Adult children, the main suppliers of private old age support, are also deeply affected by the rapid aging of China's population. The old-age dependency ratio[8] is estimated to increase from 1:10 in 2000 to around 1:4 in 2030 (United Nations, 2008). Demographic changes in China and the one-child policy have led to the emergence of the 4-2-1 family structure (four grandparents, two parents and one child) as the new dominant form (Zhang and Goza, 2006). The sandwich generation, mid-aged adults who simultaneously care for their parents and their children, oftentimes needs to take care of four aging parents and the child. Most people of the sandwich generation agree that it is almost impossible for their single child to support four grandparents and two parents in the future. Some of them who are financially capable are actively making their own retirement plan (Zhang and Goza, 2006). A functional and sustainable public old-age support system may lessen the burden of supporting their aging parents for the sandwich generation at present and provide them financial support in the

[6]For example, the Law of the People's Republic of China on Protection of the Rights and Interests of Elderly provides guidelines on the legal responsibilities of family members in providing economic support, household, care in daily living, medical care and expenses, and emotional support for adults aged 60 or above (National People's Congress of the People's Republic of China, 1996).

[7]See Chou (2011a,b) for detailed discussion on "family support agreement."

[8]The old-age dependency ratio is the ratio of the population aged 65 years or above to the population aged 15-64.

future.

The pattern of intergenerational transfers is very likely to be diverse in different areas in China because of the significant income gap and the uneven coverage of the pension system. The economic growth of China in the past 20 years has been spectacular[9] but the growth pattern has been uneven. The inequality between rural and urban areas and the income gap between coastal and inland area has been rising (Goh, Luo and Zhu, 2009; Ravallion and Chen, 2007). Apart from that, the coverage of China's pension system mainly limits to urban areas[10]. Most of rural population is still without pension coverage[11]. Due to the income gap and the uneven coverage of pension system, intergenerational transfer is a more important source of old age support in rural or poor areas than in urban or rich areas.

Intergenerational transfer in China is still under-researched because of a lack of high quality household data. Recent papers (Cai, Giles and Meng, 2006; Liu and Reilly, 2004; Secondi, 1997) have investigated private transfers between family members in China. Due to limitations of the datasets, their studies focused on all financial transfers or remittances made by non-coresiding family members or friends. The researchers could not differentiate intragenerational transfers from intergenerational transfers since they included transfers from friends and family members other than adult children. Past studies also had limited information regarding the suppliers of the transfers.

A new and detailed micro-level dataset, the China Health and Retirement Lon-

[9]The annual per capita growth rate has been about 9 percent since 1990. The overall living standards have also improved significantly with significant poverty reduction (Chen and Ravallion, 2007).

[10]China established a pension system as early as in the 50s through the state Council's Regulations on Labor Insurance. It targeted the state enterprises employees by providing them retirement income. Employees of private sectors are not required to participate in the system. Though reforms of expanding coverage of the system have been done throughout the years, the pension system's coverage is still limited mainly to urban areas. Around half of urban employees are covered (Cai, Giles and Meng, 2006; Dong and Ye, 2003; Salditt, Whiteford and Adema, 2008).

[11]For example, in 2000, around 7 percent of rural population aged 60 or above received public old-age support, while 85 percent of them received support from family members (Salditt et al., 2008).

gitudinal Study (CHARLS), contains in depth information of each transfer received by the households. CHARLS enables researcher to focus solely on intergenerational transfers from children to parents. CHARLS contains information on two provinces in China: Zhejiang, a rich coastal province and Gansu, a poor inland province. Because of radical variation in terms of economic development between them, their transfer patterns are very likely to be significantly different. This unique setting enables me to compare and contrast the transfer patterns between these two radically different provinces.

Results showed that intergenerational transfers are widespread in China with nearly half of the households in the sample received positive net transfer from the children. Transfers are the major source of income for the elderly as the amount of transfers can be as high as two-thirds of household income per capita. The likelihood of receiving transfers is found to be negatively correlated with elderly pre-transfer income in both provinces, which is consistent with transfer theory in the literature.

Significant differences on transfer patterns between the two provinces are also found. For example, a higher percentage of households in Gansu received transfers from adult children. Also, a higher percentage of elderly in Gansu are living with adult children. These differences appear to come from tradition. With a lower degree of economic development and lesser contact with Western culture, people in Gansu are very likely to hold tradition more strictly than people in Zhejiang. Questions in CHARLS asked about respondent's opinion on living arrangement and old-age support for elderly. Results showed that people in Gansu view the children as the best source for providing support for elderly while people in Zhejiang depend more on themselves. These results further support the role of tradition in shaping the differences in transfer pattern.

Considering the rapidly increasing old-age population in China and a large portion of old-age income coming from children's transfers, the benefits of having appropriate

public old-age policy would be substantial in both financial terms and number of people affected. For areas similar to Gansu, appropriate old-age policy will be very important as intergenerational transfers are vital for people in those areas. A thorough understanding of intergenerational transfers in China and its determinants is much need. This paper aims to fill this gap in the literature.

1.2 Literature

1.2.1 Literature on Intergenerational Transfers

Understanding intergenerational transfers is important for policy makers. Economists are particularly interested in the motives behind making intergenerational transfers. This interest follows from the observation that different transfer motives elicit varied responses from the transferors in response to public policy. Broadly speaking, two main competing theories generate more interests among economists: the altruistic motive and the exchange motive. A negative correlation between transfer amounts and the recipient's income is consistent with both the exchange model and the altruistic model. On the other hand, a positive correlation is only consistent with the exchange model (see discussion below). This difference allows economists to test the transfer motive empirically. This is very important for public policy because the effect of public transfer can be neutralized by private transfers depending on the transfer motive. If altruism is the motive, a public transfer to the recipient will raise her income and thus decrease the private transfer from the donor. In that case, public transfer would crowd out private transfer and the recipient could be worse off. If exchange motive is true, public transfer may increase the amount of private transfer. In that case, public transfer can further improve the well-being of the recipient.

Becker (1974) first proposed altruistic behavior within a household. Altruistic behavior occurs when it is assumed that the utility of household member d (the

donor) depends positively on the well-being of another household member r (the recipient). The basic prediction of the altruistic motive model is that the probability and amount of transfers are both positively correlated with the income gap between donor and recipient. It is easy to show that if the donor's income increases, the probability of the donor transferring money to the recipient will increase. Also, given the transfer between the donor and recipient occurs, an increase in the donor's income will raise the amount of the transfer. On the other hand, the model predicts that if the recipient's income increases, the probability of the donor transferring money to recipient will decrease, and given the transfer occurs, the amount will also decrease.

Cox (1987) proposed the exchange motive to model transfer behavior. Under the exchange motive, donor's money transfers are payments for services provided by the recipient. One of the main predictions of an exchange motive model is on how the recipient's income affects the amount of money transferred. Under the exchange model, an increase in donor's income will still increase both the probability and the amount of money transfer as in the altruistic model. This is because the donor is willing to pay a higher price for the services, assuming the donor views the services as normal goods. An increase in the recipient's income still lowers the probability of the transfer as it does in the altruistic model. However, it also raises the recipient's opportunity cost of providing the services. She will demand the donor to pay a higher price for the services. Given the transfer does occur, the amount of the transfer could either increase or decrease depending on the elasticity of the donor's demand for the services. If the donor's demand for the services is elastic, she will use a cheaper substitute for the recipient's services and will reduce the transfer amount to the recipient. If the donor's demand for the services is inelastic, she will make a larger transfer to the recipient because of the higher price charged for the services. In this case, a positive correlation between the recipient's income and transfer amount will be observed.

Many past studies have tested transfer motives empirically. Nonetheless, the evidence on transfer motives is mixed. Cox (1987) and Cox and Rank (1992) found positive correlation between transfer amounts and recipient's income using household data of the United States. Cox, Eser and Jimenez (1998), using data of Peru, also found a positive correlation between the two variables of interest. The results from these three studies were all significant and thus provided evidence to support exchange motive. On the contrary, McGarry and Schoeni (1995) found a negative and significant relationship between transfer amounts and the recipient's income using the Health and Retirement Study, a U.S. dataset. Their study is the only one so far to find a strong evidence to support pure altruistic motive. Some other studies failed to find significant results to support either of the two motives. For example, Knowles and Anker (1981) studied remittances by migrants in Kenya. They were unable to find any significant correlation between the remittances and the recipient's income. Lucas and Stark (1985) examined transfers in Botswana and found a positive correlation between the transfers and recipient's income; their result seemed to reject the altruistic motive but it was not significant. A study by Altonji, Hayashi and Kotlikoff (1997) using U.S. data found that richer recipients received lower transfers, which was consistent with the altruistic motive. However, they also claimed that their result rejected a pure altruistic motive because the relationship between the two variables was not one to one while a pure altruistic motive should produce a one to one relationship. They also claimed that they could not find any evidence to support the exchange motive.

1.2.2 China's Intergenerational Transfers

Due to scarcity of high quality household data in China, empirical studies on Chinese's intergenerational transfers are very rare. Secondi (1997) used data from rural sample of a Chinese household survey. The data from the survey referred to the year of

1988 drawn from 28 of China's 30 provinces. The author used the data to test the validity of the altruistic and exchange motives. He claimed that the concept of filial piety is the core value of Chinese family for a very long time and this family value should lead to widespread altruistic behaviors. In contrast, the exchange motive would occur only if the parents can provide service to their children. One of the possible services is taking care of grandchildren. The survey used in Secondi's study contained information on inter vivos transfers but not bequests. Income remitted or brought by non-coresident family members is the main variable of interest. By definition, this variable can include the remittances made by young males migrating to urban areas to their wives and dependents in rural areas. Results showed that a quarter of the families received transfers are headed by lone females. At the same time, most of these women are in their thirties and forties. The author claimed that those transfers are more likely to be intragenerational. Without other in depth information of the remittances, Secondi's study was unable to differentiate between intergenerational transfers and intragenerational transfers. The main finding of his study is a positive correlation between transfer amount and recipient's income. The author claimed that the altruistic motive alone cannot explain transfers and the exchange motive must also be involved in some transfers. However, we should view his result with caution. It is quite possible that the motives underlying intragenerational transfers are different from the motives underlying intergenerational transfers. Most of the intragenerational transfers are thought to be between husbands who migrate to urban areas and wives who stay in rural home. Altruistic model (Becker, 1981) and bargaining models (Manser and Brown, 1980; McElroy and Horney, 1981) are examples of economic models on marriage. Intragenerational transfers can obviously be motivated by altruism while it would be harder to understand how exchange motive can exist within a marriage. Thus, the inclusion of intragenerational transfer may actually bias the result in Secondi's study.

Liu and Reilly (2004) used a 1995 survey on male migrant workers in Shandong province. They examined the determinants of remittances made by the migrant workers to rural households. They found that the recipient's income was not a significant factor on remittances. They claimed that the result seemed to reject altruistic motive and at the same time did not support exchange motive. Some limitations of their study should be noticed. All the information in the survey was provided by the male migrant workers including the income of the recipients. The authors mentioned that the information on the rural households may not be very accurate because some of the migrants have moved out for quite a long time. We should also note that a significant portion of remittances made by the migrants to rural households may be intragenerational in nature. This inclusion would bias the result as in the study by Secondi (1997). Liu and Reilly noticed the possible inclusion of intragenerational transfer. They further did an analysis on non-married migrant in an attempt to partially exclude intragenerational transfer. They yet again failed to find any significant correlation between the recipient's income and remittances.

Cai, Giles and Meng (2006) used the China Urban Labor Survey conducted in 2001 and 2002 to test how private transfers to retired workers respond to the workers' pre-transfer income. The survey was conducted in five large cities, including Shanghai, Wuhan, Shenyang, Fuzhou, and Xian. They used two estimation methods for their analysis. The first method is a conditional least squares threshold model used by Cox, Hansen and Jimenez (2004). This method allows the relationship between transfer amount and pre-transfer income to change if income is above a threshold. They found that the transfers were 0.52 to 0.68 yuan per capita higher for each yuan reduction in income if the recipient's income is below the threshold. This figure dropped to zero if income is over the threshold. The second method they used is a semi-parametric partial linear model (Yatchew, 1998, 2003). This method allows the relationship between transfer amount and pre-transfer income to change smoothly

along the income level. With this method, they found that the transfer were 0.2 to 0.26 yuan per capita higher for each yuan reduction in income for income levels below half the average urban poverty line. This figure dropped to 0.1 to 0.16 yuan around the level of poverty line. The figure further dropped to close to zero at income level twice the poverty line. They claimed that at a low enough income level, their results were consistent with the altruistic motive. Their study had the same limitation as other Chinese transfer studies. The transfer variables they used are gifts given to or received from friends and relatives. This definition of transfer again may include intragenerational transfer. Also, transfers from friends should not be included in the analysis as this type of transfer has an underlying rationale different from transfer made by children.

Apart from studies by economists, sociologists have also studied Chinese intergenerational transfers. For example, Lee, Parish and Willis (1994) studied intergenerational support from adult children in Taiwan. They found that most married children provided financial support to their parents. They also found that elderly parents with higher levels of needs received more support from children. Another study by Lee and Xiao (1998) examined financial support by children in urban and rural China. They also found that children provided more financial support to parents with more needs.

1.3 Theoretical Model

The analysis of this paper follows the model proposed by Cox, Eser and Jimenez (1998). In the model, utility interdependence is assumed. Parents care about their children and children also care about their parents. When children's income is very low, parents will transfer some money to the children. This situation may exist, for example, when the children just enter labor force. Similarly, when parents' income

is very low, children will transfer some money to parents. This situation is likely to occur when the parents are in the retiring age. The following is the formal set up of the model. Parent's utility is as follows:

$$U = U(C_p, V) \tag{1.1}$$

where U denotes the parent's utility. Parent's utility depends on two factors: parent's own consumption, C_p, and child's utility, V. Utility interdependence is assumed, child's utility is as follows:

$$V = V(C_k, U) \tag{1.2}$$

where V denotes the child's utility[12]. Child's utility depends on two factors: child's own consumption, C_k, and parent's utility, U.

The existence of imperfect capital markets is assumed. This assumption allows no asset accumulation or borrowing in the model[13]. A person's consumption comes from two sources: the person's own income and net transfer received. Thus, we have the following budget constraint:

$$C_i = E_i + T_i, i = p, k \tag{1.3}$$

where E_i is pre-transfer income and T_i denotes net transfer received, i.e. transfers received minus transfers given. By definition, T_i can be negative depending on the endowment of the pre-transfer income.

Parent and child are assumed to coexist for two periods. Analysis of the model is on these two periods alone. Because of the existence of imperfect capital market,

[12]Cox et al. (1998) assumed that the reduced forms of equations (1.1) and (1.2), expressed in terms of consumption, are well-behaved. One person must value own consumption more than the other person's consumption (Becker, 1974, pp. 1080-1081, fn. 30).

[13]Altig and Davis (1989) and Cox (1990) have detailed analysis of the connection between inter-vivo transfers and liquidity constraints.

the transfer analysis for each period is independent of each other[14]. It is assumed that the transfer decision is made at the beginning of each period. The endowment of pre-transfer income is assumed to be the following: in the first period, child's income is low and parent's income is high; in the second period, child's income is high and parent's income is low. Under this setting, the parent would transfer money to the child in the first period and the child would make a transfer to the parent in the second period.

Under the altruistic motive, an increase in the recipient's pre-transfer income always triggers a decrease in the amount of the transfer. The term transfer derivative is used to indicate this relationship. In this model, we have the following two transfer derivatives: $\frac{\partial T_k}{\partial E_{k1}} < 0$ and $\frac{\partial T_p}{\partial E_{p2}} < 0$. Here is the elaboration on the second transfer derivative. In the second period, the child makes a transfer to the parent. Parents with a higher pre-transfer income, E_{p2}, need a smaller net transfer received, T_p, to achieve the same level of consumption. That level of consumption is optimal from the child's perspective and thus the transfer derivative is negative. The transfer derivative can be written as follow:

$$\frac{\partial T_p}{\partial E_{p2}} = -1 + \frac{\partial T_p}{\partial E_{k2}} \tag{1.4}$$

The negative one in the equation means that with second-period family income ($E_{k2} + E_{p2}$) held constant, an increase in the parent's pre-transfer income will be met with a dollar-for-dollar decrease in parent's net transfer received. Yet, the increase in parent's income also raises total family income. Thus, the decrease in transfer will be less than dollar-for-dollar if the second term on the right hand side is positive[15]. The logic is the same for the first period ($\frac{\partial T_k}{\partial E_{k1}} < 0$), in which the parent makes a transfer

[14]Cox et al. (1998) noted that the assumption of imperfect capital markets is critical for the results predicted by the model. If capital market was perfect, the timing of transfers would be indeterminate. For more details, see Cox (1990) and Cox et al. (1998).

[15]The magnitude of transfer derivative can be large. Cox et al. (1998) mentioned that a Cobb-Douglas utility function with equal weighting on parent and child utility would give us a fifty cents decrease in transfer for a dollar increase in income.

to the child[16].

Apart from the amount of the transfer, the decision of making a transfer is also affected by the pre-transfer income level. Under the altruistic motive, it has been proved in past literature that the same qualitative comparative statics govern the transfer decision and transfer amount (Cox, 1987). For example, in the second period, child determines whether to make a transfer or not by comparing the marginal utility of her consumption and the marginal utility of parent's consumption. The level of marginal utility is determined by the income of both parent and child before making any transfer. A rise in parent's income will lower the marginal utility of parent's consumption. It will lower the child's likelihood of making a transfer to the parent. The logic is the same for the first period, in which the donor-recipient roles are reversed. It is always the case that if the recipient is richer, she will be less likely to receive a transfer.

1.4 Empirical Approach

1.4.1 Data

The data set used in this study is the pilot survey of the China Health and Retirement Longitudinal Study (CHARLS). CHARLS is a broad-purposed social science and health survey of the elderly in China. It is designed in a similar way as the Health and Retirement Study in the US. It tries to provide micro-data with comprehensive coverage and high accuracy for research on aging problem in China. Existing datasets in China are too specialized, without enough depth of variables. Comparing to them, CHARLS covers extensive dimensions of the elderly, with detailed variables on health measures and indicators of the socio-economic status[17].

[16]The detailed derivation of the transfer derivatives is presented in Appendix A.1.

[17]See Zhao et al. (2009) for detailed description of the data.

In order to get the extremes within China, the pilot survey of CHARLS focused on two provinces: Gansu, a poor inland province, and Zhejiang, a rich coastal province[18]. In terms of economic development, Gansu is far less developed than Zhejiang. Several key statistics from the China Statistical Yearbook (2009) are summarized in Table 1, which shows how different are these two provinces. Gansu is located in the less developed western inland region. It has been one of the poorest provinces in China with GDP per capita less than one-third of Zhejiang. Gansu is also one of the most rural provinces in China with two-thirds of population living in rural areas. In contrast, Zhejiang is one of the most urbanized provinces in China with nearly 60 percent of its population living in urban areas. Due to the geographical location and less developed economy, international trade does not contribute to a big portion of Gansu's GDP. The total import and export value is only 13 percent of its GDP. On the contrary, Zhejiang has become a major center of export with several commercial ports such as Ningbo and Wenzhou because of its close proximity to Shanghai and high degree of commercial activities. The total value of foreign import and export in Zhejiang is 68 percent of its GDP.

Apart from significant differences in their economies, Gansu and Zhejiang also have noteworthy dissimilarity in terms of demographics. Gansu has a far higher percentage of illiterate population than Zhejiang. As Gansu is less developed, people are less likely to get education because of economic hardship. Also, people with higher education are more likely to migrate to other provinces in search of job opportunities. Gansu also has a lower life expectancy (67 years) than both Zhejiang (74 years) and the national average (71 years). It is obvious that the degree of economic development plays a big role on life expectancy. Because of the lower life expectancy, Gansu has a slightly lower old-aged dependency ratio than Zhejiang. Family size also shows a big difference between the two provinces. The average family size in Gansu is 3.6 persons

[18]The full CHARLS will be a national survey and is targeted to be conducted in 2011.

while the same figure is 2.8 in Zhejiang. This shows that big families with several generations are still more widespread in Gansu than in Zhejiang.

Households with members aged 45 years or above are included in the sample. The pilot survey gathered socioeconomic information for a sample of 2,685 individuals living in 1,570 households. The individuals included the main respondents aged 45 and above from each household and the spouse if there was one[19]. Information of 4391 children of the respondents has been collected in the survey. The unit of observation for the analysis in this paper is each pair of child and parent. I exclude the child-parent pair if the child is under 16 or the child is a full-time student. I further exclude any child-parent pair if the child lives with the parent because this study focuses on private transfer from children not living with their parents. With all these exclusions, the sample size falls to 3020 child-parent pairs in 1205 households, with 1557 pairs in 608 households in Gansu and 1463 pairs in 597 households in Zhejiang.

Considering the vast differences between Gansu and Zhejiang in terms of economic development and demographics, the pattern of intergenerational transfers in these two provinces is very likely to vary. Preliminary evidence suggests that households in Gansu have a higher degree of dependence on transfers from children. To reflect the importance of transfers to the households, transfers as a percentage of household income per capita is used. In Gansu, the figure is 67 percent for households that received transfers while the figure is 59 percent in Zhejiang. Because of the dissimilarity between the two provinces, the analysis in this paper was done separately on the two provinces in order to contrast them[20].

1.4.2 The Determinants of Intergenerational Transfers

The theoretical model showed that pre-transfer income of the recipients would affect both the transfer decision and the amount of the transfer received. The household pre-

[19]Spouses can be under 45 years old.

[20]The analysis for the combined sample of both provinces is presented in Appendix A.2.

transfer income per capita entered the analysis as the main determinant. Apart from the pre-transfer income of recipients, donor's income also affects both the transfer decision and the transfer amount. Theories developed by Cox (1987) show that both the probability of making a transfer and the transfer amount will increase with a raise in donor's income. Since CHARLS does not provide direct information on the children's income, other variables on child's characteristics are included in the analysis instead. These variables include the age of child, whether the child is a male, dummies variables on child's education level, number of children the child has, whether the child lives in urban area, whether the child is working, whether the child lives in a different province than the parents. Cai et al. (2006) also used some similar variables to capture the effect of donor's income on private transfers in China[21]. Variables that simulate the effect of donor's income are expected to be positively correlated with transfer decision and transfer amount.

Several demographic variables of the parents are also included as determinants of transfer occurrence and transfer amounts. The age of the household head is included to control the life-cycle effects of the recipients. Household wealth per capita is also included to capture possible wealth effect on transfers. Dummies variables on education level of the household head are also included to control the human capital effect. Gender and marital status of the household head are included since both may affect the need for financial support from the children. Past studies (Cox, 1987; Kaufmann and Lindauer, 1986; Lucas and Stark, 1985) found that transfers are more likely targeted to female head of household. Several variables are included to control for health status of the household head. The variables include a self-reported health status, whether the person has any chronic disease, and whether the person has any physical disability. It is expected that household head with poor health or long

[21]Cai et al. (2006) claimed that those variables are used to control the size and quality of the transfer network. The variables included number of living adult children, average education of adult children, average age of adult children, and number of living siblings.

term illness will be more likely to receive transfers from the children. The dummy variable indicating the existence of coresiding adult children are also included as parents are expected to receive less transfer if some of the adult children coreside with them. Other children may be less likely to make transfer to the parent because some of their siblings take up the responsibility to support the parents. The total number of children and household size are also included. One final variable included in the analysis is whether the elderly take care of their grandchildren. Taking care of grandchildren can be seen as the services provided by the elder parents. It is expected that the parents are more likely to receive transfer in exchange of this service provided for their children.

Descriptive statistics for all the aforementioned determining variables are reported in Tables 2, 3, 4 and 5. Summary statistics of parent characteristics and children characteristics are reported separately. Table 2 shows the summary statistics of parent characteristics for each province separated by transfer recipients and non-recipients. Table 3 shows the summary statistics of children characteristics for each province separated by transfer donors and non-donors. Table 4 and table 5 show the summary statistics for all households in each province[22].

1.4.3 Econometric Methodology

The analysis can be divided into two parts. First, I focus on the transfer decision and study how the determinants affect the household's probability of receiving a transfer from adult children. Second, given that a transfer is received, I examine how the determinants affect the amount of transfer.

To study the transfer decision, the corresponding equation is defined as follows:

$$d_i^* = b_0 + b_1 E_i + \mathbf{b_2 X_i^1} + \mu_i \tag{1.5}$$

[22]The summary statistics for the combined sample of both provinces are presented in Appendix A.3.

and

$$d_i = \begin{cases} 1 \Leftrightarrow d_i^* > 0 \\ 0 \text{ otherwise} \end{cases} \tag{1.6}$$

where households are indexed by i. The latent variable that determines the transfer receipt is denoted by d_i^*, where $d_i^* > 0$ if and only if the household reports receiving a positive transfer from the children ($d_i = 1$). If the household does not report receiving transfer ($d_i = 0$), the latent variable is negative or zero. The variable E_i denotes household's pre-transfer income. According to the theory, altruistic motive predicts a negative relationship between recipient's income and the transfer decision. The expected sign for the income coefficient b_1 in this equation is negative. The vector $\mathbf{X_i^1}$ includes all other determining variables described in previous section, and μ_i is a normally distributed error term with mean zero. As in regular model with binary dependent variable, equation (1.5) is estimated by a probit model.

The next equation to be estimated is the one for transfer amount. The amount of transfer received is the dependent variable and the equation is defined as follows:

$$T_i^* = c_0 + c_1 E_i + \mathbf{c_2 X_i^2} + \epsilon_i \tag{1.7}$$

and

$$T_i = \begin{cases} T_i^* \text{ if } d_i = 1 \text{ and } T_i^* > 0 \\ 0 \text{ if } d_i = 0 \end{cases} \tag{1.8}$$

where T_i^* is the unobserved latent variable and ϵ_i is the error term. The actual observed amount of net transfer received (T_i) equals the unobserved latent variable only when the household reports receiving net positive transfers ($d_i = 1$ and $T_i^* > 0$). Otherwise, transfer received is zero. The vector $\mathbf{X_i^2}$ includes the determining variables similar to those of the vector $\mathbf{X_i^1}$ with some minor difference which will be discussed below. Other variables are defined as in (1.5). The main focus of equation (1.7) is

the transfer derivative, which is denoted by the coefficient c_1.

The censored nature of the transfer amount should be taken into account carefully when the equation is estimated. One should notice the fact that not all the households receive transfers from adult children. It is very unlikely that households are randomly chosen to receive transfers. Using ordinary least squares to estimate the transfer amount equation on only households who receive transfer may result in biased estimation. The tobit model (Tobin, 1958) can be used in order to deal with the censored nature of the problem. However, the tobit model has its limitation. Using the tobit model, the estimated coefficients in the transfer decision equation and those in the transfer amount are proportional. For any given determinant, tobit model forces it to have the same direction of effect on both the transfer decision and the amount of transfers. This limitation makes the tobit model a less than ideal estimation method in the context of transfer behavior.

Instead of the tobit model, the Heckman (1979) two-step procedure should be used. The transfer decision and the decision on transfer amount were assumed to be made separately. Estimation using Heckman procedure has a greater flexibility in the sense that it allows the effect of a given determinant on the transfer decision and its effect on the transfer amount to be different. In this paper, Heckman two-step procedure is applied with a probit to model the transfer decision in the first step and a corrected ordinary least squares to model the transfer amount in the second step. A major drawback of using Heckman model is the identification issue. An exclusion restriction is the usual method to obtain identification in a Heckman procedure in order to have valid results. In particular, an exclusion restriction means that at least one extra variable should be included and contribute a significant effect in first step probit but not in the second step corrected ordinary least squares.

Apart from exclusion restrictions, identification can also be obtained by functional form. For example, in Heckman (1979) model, identification can be obtained

by parameterization of the joint distribution of the error terms in both equations. Escanciano, Jacho-Chavez and Lewbel (2010) showed that identification based on function form can be achieved under a semiparametric setting without exclusion restrictions[23]. They claimed that an extra variable in the first stage of Heckman model is not necessary. In order to achieve identification, one should find some variables that affect the first stage selection process nonlinearly and affect the second stage outcome linearly.

To apply the idea of Escanciano et al. (2010), I include the squared term of child's age in the first stage probit of my estimation. Child's age can capture the life-cycle effects of the child. In particular, people are more likely to face a credit constraint during young age and during retiring age. With possible binding financial constraints at both stages, children are less likely to transfer money to their parents. Thus, the relationship between transfer probability and children's age are very likely to be nonlinear. Nonetheless, if they can make a transfer without any financial constraints, the amount of transfer will be determined by factors other than the children's age, such as recipient's income. To check this assertion, I used locally weighted regression (lowess) to estimate the non-parametric relationship between transfer probability and child's age. It can be seen that the probability-child's age relationship is an inverted U-shaped (Figure 1) while a close to flat relationship between transfer amount and child's age is found using lowess (Figure 2). Thus, both theory and data show some evidence in supporting child's age as the key to obtain identification in my analysis.

1.4.4 Empirical Results

Using CHARLS, I found that intergenerational transfers from children to parents are widespread in China, at least in Gansu and Zhejiang. Nearly half of the households received positive net transfers from adult children. Another key finding is that trans-

[23]See Escanciano et al. (2010) for detailed proof and empirical application.

fers contribute a significant portion of household income of the elderly. Data showed that the amount of net transfer received can be as much as two-thirds of household income per capita. I also found that the pre-transfer income is negatively correlated with the probability of receiving transfers. This relationship indicates that intergenerational transfers in China are targeted to the needy elderly parents. Concerning about the transfer derivative, pre-transfer income does not have any significant effect on the transfer amount received.

Apart from intergenerational transfers, the children's decision of living with the elderly parents is also analyzed. I found that transfer recipients are less likely to live with their adult children. It may indicate that money transfers and time-related care are substitutes from the view of the children. I also found the division of labor between siblings for parent's living arrangement. If one of the siblings already took the responsibility of living with the parents, the other children are less likely to live with them.

Intergenerational transfers are widespread in the two provinces and the transfers contribute a significant amount of recipient's household income. It seems to indicate that children are the major source of old-age support in China. Table 6 summarized some of the statistics from CHARLS. For the whole sample, 44.5 percent of households received transfers from adult children. The figures are 40.1 percent in Gansu and 49 percent in Zhejiang. Focusing on the households that received positive net transfers, the average amount of net transfer is 2135 yuan in Gansu and 4298 yuan in Zhejiang. The figure is smaller in Gansu, but this is the result of a much lower GDP per-capita. Transfers as a percentage of household income per capita would better reflect the importance of transfers to the households. In Gansu, transfers as a percentage of household income per capita is 67 percent for households that received transfers. In Zhejiang, transfers as a percentage of household income per capita is 59 percent for households received transfers. It seems to suggest that people in Gansu have a higher

degree of dependence on transfers from children.

The probit results showed that the pre-transfer income is negatively correlated with the probability of receiving transfers. Probit estimates on net transfer receipts are presented in Table 7. The coefficients of pre-transfer income on the transfer probability are significant in both provinces. This negative correlation reveals that intergenerational transfers in China are targeted to the needy elderly parents. Apart from the parent's pre-transfer income, some of their characteristics are also significant in affecting the probability of getting transfers. Age of household head is found to be negatively correlated with the transfer probability in both provinces. One possible explanation is that older parents need more time-related care instead of money transfer. At the same time, time-related care and money transfers appear to be substitutes from the view of adult children (See the analysis on children's decision of living with the elderly parents). Larger household size also reduced the probability of receiving a transfer. This may reflect the fact that some children choose to live with the parents and take up the responsibility of supporting them. This allows other children to take a lesser role to support their aging parents and they are less likely to make a transfer as a result. Parents with elementary school or middle school as the highest level of education are more likely to receive transfers in Zhejiang. Parents who are widowed or separated are less likely to receive transfers in Gansu. Again, those parents may need more time-related care instead of money transfers. Finally, parents having chronic diseases are more likely to receive transfers in Gansu. This shows that transfers from adult children target more to the needy parents.

Child characteristics also have significant effect on the probability of transfer. Results showed that child's age and its squared terms have significant effect in both Gansu and Zhejiang. Child's age increases the probability of transfer occurrences, but at a decreasing rate. Child's education level also has significant effects on the probability of transfer. In Gansu, children with elementary school or above are all

significantly more likely to make a transfer to the parents than children who are illiterate. In Zhejiang, children whose highest level of education is elementary school and those whose highest level of education is high school or above are significantly more likely to make a transfer to the parents than children who are illiterate. A few more variables about children's characteristics are significant in affecting the probability of transfer. In Gansu's samples, children who are not living in the same province as the parents are more likely to make a transfer to the parents than those who live in Gansu. This may indicate that some transfers are remittances from children working in prosperous provinces to the parents in the less wealthy Gansu. In Zhejiang, children who are working are more like to make a transfer to the parents than those who are not.

Next, I focus on the estimation of transfer amount received by the households. The dependent variable for the following analysis is the amount of net transfer from a particular child to the parents who received transfer. Table 8 presents the estimates separated by province. For each province, two sets of estimation are reported. The first set of estimation is Heckman procedure applying the idea of Escanciano et al. (2010). The second set of estimation is OLS with all variables included for comparison purpose. Some differences in magnitude can be found among the two sets of estimates but they generally have the same direction.

The main focus of the result is the transfer derivative. It indicates how much the transfer amount changes in response to a dollar increase in pre-transfer income. For Gansu, all estimated transfer derivatives are negative but not significant. For Zhejiang, the estimated transfer derivatives are positive but not significant. For the purpose of testing the transfer motive, the result does not seem to support either the altruistic motive or the exchange motive. However, one should note that these results need to be considered thoroughly due to the limitation of CHARLS. Similar to some previous studies, the dataset does not have information on donor's income, which is

the child's income in this study. According to the transfer theories, donor's income is positively correlated with transfer amount. If children's income and parent's income are positively correlated as found in previous literature[24], omitting children's income from the analysis will cause some degrees of positive bias on the parent's income coefficients. This may explain why the estimations of income coefficients are not significant in the second stage regression because the bias may make it less negative or even positive.

Significant effect on the transfer amount was also found in a few variables. For example, sons give a significant higher amount of transfer than daughters by around 550 yuan in Gansu. This may reflect the patrilineal tendency in Gansu in which sons, more so than daughters, are viewed as the major source of old age support. Adult children having one extra of their own child transfer around 370 yuan less to their parents in Gansu. It seems that having their own children may constrain adult children's support to their parent. Education level of both parents and children also affect the transfer amount in Gansu. Children with less than elementary school education transfer about 1500 yuan less to the parents than children who are illiterate. Parents with elementary school education receive about 1000 yuan less than parents who are illiterate. In Zhejiang, children with high school or above education level give around 2500 yuan more to the parents than children who are illiterate. Also, children who are working give about 800 yuan more to the parents than children who are not. Household size has a significant negative effect on the transfer amount for Zhejiang with a coefficient of around 200 yuan. Again, children living with parents allow other siblings to take a lesser role to support their aging parents and transfer less money to them. The household head being a female is negatively correlated with the transfer amount for Zhejiang. This contradicts the findings of previous literature. One possible explanation is that female household head is very likely a widow. A

[24]For example, Solon (1992) and Zimmerman (1992) found that intergeneration income correlation in the U.S. was at least 0.4.

single elderly needs adult children to live with her and take care of her more than money transfers.

It is very common in China that some adult children choose to live with the parents in order to provide time-related care. For example, half of the sampled households in CHARLS have at least one adult child living with the elderly parents. Apart from money transfers, time-related care is a big demand of elderly parents. As discussed above, it is possible that money transfers and time-related care are substitutes from the view of the children. The following analysis on time-related care can shed some light on money transfers.

It seems that money transfer and time-related transfer are substitutes in some sense. By separating the households according to whether they received net money transfers from the children, I found that transfer recipients are less likely to live with their adult children (Table 9). Only 40 percent of transfer recipients are living with at least one adult child. The percentage is 57 percent for non-recipients. More parents living with adult children also result in a larger household size (Row 2 of Table 9). One possible explanation is that having less adult children may constrain the kind of transfers the elderly receive. Thus, elderly either lives with adult children or receive money transfer from them if the parents do not have enough adult children who are capable to provide both. This seems to be the case in CHARLS as non-recipients households have an average of 3 children while transfer recipients households have 3.4 children.

Table 9 also shows some differences on the likelihood of adult children living with their elderly parents between the two provinces. For both transfer recipients and non-recipients, a higher percentage of households in Gansu have adult children as household members than that in Zhejiang. Households in Gansu also have a larger household size and more children. Traditionally, people in China expect sons instead of daughters to provide old-age support. Having more children may guarantee at least

one of them is a son and the old-age support from the child. By having more children, a higher percentage of households in Gansu have at least one son than households in Zhejiang.

The probit estimates on adult children's living arrangement are presented in Table 10. The dependent variable of this analysis is whether the child lives with the parent. Children who are 16 or above and not full-time students are included in the analysis. A similar set of determining variables is used as in the transfer regressions. Several variables have been found to have a significant effect on adult children's likelihood of living with parents. One factor that has a large significant effect is whether other siblings live with the parents. If other siblings choose to live with the parents, the adult child will be less likely to live with them. The marginal effects are -0.21 in Gansu and -0.15 in Zhejiang. It shows that a division of labor exists between siblings. Data also showed that sons are more likely to live with the parents as daughter is more likely to follow husband's family rather than staying with her own parents. Young children are also found to be more likely to live with the parents. The reason is that older siblings are more likely to have their own families and choose to live away from the parents. Parent's need is also a significant factor as those who are widowed or separated are more likely to live with adult children.

1.5 Discussion

The uniqueness of CHALRS pilot dataset enables us to analyze a two-province case study for China. In this section, the differences between the two provinces and the source of these differences are discussed. I will also discuss several theoretical hypotheses on the transfer motives.

Results revealed differences in the transfer pattern between Gansu and Zhejiang. A possible source of these differences is tradition. In Chinese tradition, supporting

parents is always viewed as the responsibility of the children. This responsibility is more likely to fall on sons because of patrilineal ideal (Lee, Parish and Willis, 1994). Patrilineal ideal in Chinese families means that daughters leave their origin family to become part of the husband's family at the time of marriage. The right to the daughters' labor and reproduction also transfers to the husband's family at the same time. Literature suggested that patrilineal ideal tends to fade with economic development (Lee et al., 1994; Lillard and Willis, 1997). Gansu is a poor inland province in China, while Zhejiang is a rich coastal province. Besides, as reflected by the international trade as percentage of GDP in both provinces, Gansu has less interaction with the Western world compared to Zhejiang. We should expect that Gansu's people are less affected by Western culture than their counterparts in Zhejiang. Combining the lower level of economic development and fewer contact of Western culture, people in Gansu are expected to hold Chinese tradition such as patrilineal ideal more strictly than people in Zhejiang.

Three hypothetical questions in CHARLS show how different the two provinces are in terms of traditional family value. Respondents were asked about their opinion on living arrangement and old-age support for elderly people. Table 11 presents the results on these questions. A substantial difference between the two provinces can be seen on the opinion on whether living with children is the best arrangement for elderly people. Similar result is also found on whether the respondent thinks that she can rely on her children for old-age support[25]. People in Gansu view their children as the best option of living arrangement and old-age support while people in Zhejiang depend more on themselves. These results, to a certain extent, show that people in Gansu are more traditional than people in Zhejiang.

Empirical results are consistent with the argument of tradition differences. For example, households in Gansu have a higher degree of dependence on parental sup-

[25]Statistical tests on the equality of proportions show significant difference between Gansu and Zhejiang.

port. Data showed that transfers as a percentage of household income per capita is 67 percent for households received transfers in Gansu while the figure is 59 percent in Zhejiang. In terms of living arrangement, CHARLS showed that a higher percentage of elderly in Gansu are living with adult children than those in Zhejiang. A larger degree of patrilineal tendency is also found in Gansu. Data showed that the size of transfers given by sons is significantly larger than daughters in Gansu. Also, the percentage of households with at least one son is higher in Gansu than in Zhejiang. Thus, an ample amount of evidence has been found in support of tradition as one of the forces behind intergenerational transfers in China.

Results showed that households with less income are more likely to receive transfers from their children in both provinces. It indicates that intergenerational transfers in China are targeted to poorer households. The reason is that people care about the well-being of their elderly parents. If the income of the parents is low, the children will be more likely to transfer money to the parents in order for them to achieve a certain level of consumption, which is optimal from the children's view. According to the theories of transfer motives, both altruism and exchange models predict a negative correlation between recipient's income and the probability of receiving a transfer. Only the sign of transfer derivative in the second stage regression of transfer amount can indicate whether the motive is altruism or exchange. Nonetheless, all estimated transfer derivatives in the second stage regression are not significant. It seems that there is not enough evidence to support only one motive.

Apart from altruistic motive and exchange motive, other hypotheses have been proposed. One of the alternative theories is "parental repayment hypothesis" (Lillard and Willis, 1997). Under this hypothesis, individuals have difficulties to borrow against their future income due to the existence of borrowing constraints. Instead, financing goes through an implicit family capital market. In particular, parents provide support for children's education through both grant and loan when the children are

young[26]. When the parents approach retiring age, the children repay the loan to the parents through providing old-age support. According to this hypothesis, a positive relationship is expected between the children's level of education and the transfers they give to their parents. Evidence supporting parental repayment hypothesis is also found in the data. Results showed that children with higher education level are more likely to give transfers to parents compare to children who are illiterate. Also, in Zhejiang province, children who are high school graduates or above give larger transfer to the parents than children who are illiterate. The results provide some evidence to support the parental repayment hypothesis.

1.6 Conclusion

The main objective of this study is to investigate how the income of elderly and other factors affect the intergenerational transfers from adult children in China. Due to the lack of high quality datasets, previous studies on China's private transfer cannot differentiate intragenerational transfers from intergenerational transfers. Using the pilot survey of CHARLS, this paper is the first to solely focus on intergenerational transfers from children to parents in China.

A number of key findings have been obtained in this paper. First, intergenerational transfers from children to parents are very widespread in China, at least in the two provinces I focus on. Around half of the households received positive net transfer from the children. Second, children are the major source of old-age support in China. Data showed that the amount of net transfer received is at most two-thirds of household income per capita. Third, parental support is responsive to the income level of the elderly as households with lower income are more likely to receive transfers from the children.

[26]There exists some evidence of education investment paid by parents. For example, Brown and Park (2002) found that children from poor and credit constrained families are more likely to drop out of school.

Significant differences between the two provinces on transfer patterns are also found. Results showed that people in Gansu have a higher degree of dependence on adult children. Data and people's opinion both suggested that Gansu's people are more likely to view the adult children as the major source of providing old-age support and living arrangement.

The findings of this paper have important policy implications. Considering the rapidly increasing old-age population in China and the significant contribution of intergenerational transfers in old-age support, providing parental support will be a massive burden for future generation in China. Appropriate public old-age policy would provide sustainable old-age support for the elderly and lessen the burden for young adults. This policy is especially crucial for poor and traditional provinces like Gansu since elderly in those area have a higher degree of dependence on intergenerational transfers.

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Tables and Figures

Table 1.1: Key Statistics of China and the two provinces in the year of 2008

	China	Gansu	Zhejiang
GDP per capita (yuan)	22698	12085.65	41966.64
Population (10000 persons)	132802	2628	5120
GDP (billion yuan)	30067	317.61	2148.69
Total import and export as % of GDP	59.21%	13.33%	68.24%
Urban population (10000 persons)	60667	845	2949
Urban proportion	45.68%	32.15%	57.60%
Rural population (10000 persons)	72135	1783	2171
Rural proportion	54.32%	67.85%	42.40%
Percentage of illiterate population total aged 15 and over[b]	7.77%	17.77%	9.38%
Population life expectancy in 2000[c]	71.4	67.47	74.7
Old-aged dependency ratio (aged 65 and over)	13.04%	11.47%	14.14%
Average Family size	3.16	3.6	2.81

[a] Source: China Statistical Yearbook (2009)

[b] Illiterate population in this table refers to the population aged 15 and over who are unable or have difficulty in reading.

[c] Life expectancy in 2000 by region is calculated from the death data of 2000's National Population Census, further adjusted by the mortality rates from the annual national sample surveys on population changes since 1990.

Table 1.2: Summary statistics of parent characteristics

	Gansu		Zhejiang	
	Recipients	Non-Recipients	Recipients	Non-Recipients
Net transfer received per child	878.8 (1775.76)	—	1950.47 (4532.76)	—
Total net transfer received	2135.59 (4436.39)	—	4298.64 (9482.92)	—
Avg. household income (000's yuan)	3.195 (5.341)	4.411 (10.466)	7.227 (12.338)	12.877 (35.716)
Avg. household wealth (000's yuan)	24.274 (94.353)	21.847 (94.968)	93.342 (217.495)	78.118(199.391)
Age	63.03 (9.33)	62.15 (10.06)	66.86 (9.51)	63.26 (10.39)
Female household head	0.5574 (0.4978)	0.5 (0.5007)	0.611 (0.4884)	0.5494 (0.4984)
Number of children	3.56 (1.44)	3.18 (1.47)	3.34 (1.5)	2.79 (1.45)
At least 1 adult child lives with parents	0.455 (0.499)	0.6044 (0.4897)	0.355 (0.4794)	0.5362 (0.4996)
Illiterate	0.5656 (0.4968)	0.5303 (0.4998)	0.4471 (0.4981)	0.4573 (0.499)
Less than elementary school	0.1271 (0.3338)	0.1402 (0.3476)	0.2663 (0.4428)	0.2764 (0.448)
Elementary school	0.1025 (0.3039)	0.1429 (0.3505)	0.1775 (0.3828)	0.1382 (0.3457)
Middle school	0.1271 (0.3338)	0.0935 (0.2915)	0.0751 (0.264)	0.0823 (0.2752)
High school of above	0.0779 (0.2686)	0.0935 (0.2915)	0.0342 (0.1819)	0.0461 (0.21)
Household head is married	0.6886 (0.4641)	0.7391 (0.4398)	0.669 (0.4714)	0.75 (0.4338)
Poor health	0.5164 (0.5008)	0.511 (0.5006)	0.2902 (0.4546)	0.25 (0.4338)
Disability	0.1927 (0.3952)	0.1869 (0.3903)	0.0956 (0.2945)	0.0889 (0.285)
Chronic diseases	0.7664 (0.424)	0.6759 (0.4688)	0.6451 (0.4794)	0.5658 (0.4965)
Household size	3.25 (1.64)	3.65 (1.74)	2.49 (1.36)	2.99 (1.53)
Take care of grandchildren	0.2746 (0.4473)	0.1347 (0.3418)	0.1741 (0.3799)	0.1415 (0.3491)
Number of households	244	364	293	304

[a] Source: Author's calculation from CHARLS
[b] Standard deviations are reported in parentheses.

Table 1.3: Summary statistics of children characteristics

	Gansu		Zhejiang	
	Donors	Non-Donors	Donors	Non-Donors
Net transfer given	1249.54 (3268.87)	—	1988.82 (6072.88)	—
Male	0.5303 (0.4997)	0.4153 (0.493)	0.4867 (0.5003)	0.4457 (0.4974)
Age	36.26 (9.32)	36.74 (9.86)	41.25 (9.31)	39.29 (10.11)
Illiterate	0.1 (0.3004)	0.2219 (0.4157)	0.0914 (0.2884)	0.1293 (0.3357)
Less than elementary school	0.0559 (0.2299)	0.1012 (0.3017)	0.0882 (0.2838)	0.087 (0.282)
Elementary school	0.2163 (0.4122)	0.1979 (0.3986)	0.2851 (0.4518)	0.2513 (0.434)
Middle school	0.3396 (0.4742)	0.2627 (0.4403)	0.2898 (0.4541)	0.3261 (0.4691)
High school of above	0.2884 (0.4536)	0.2166 (0.4121)	0.2457 (0.4309)	0.2066 (0.4051)
Living in urban area	0.3954 (0.4895)	0.2884 (0.4533)	0.3008 (0.459)	0.3298 (0.4704)
Is working	0.8419 (0.3653)	0.8492 (0.3581)	0.8221 (0.3828)	0.767 (0.4231)
Num. of children the child has	1.46 (1.09)	1.68 (1.15)	1.35 (0.83)	1.32 (0.9)
Live in a diff. province	0.2535 (0.4356)	0.1775 (0.3823)	0.0693 (0.2542)	0.0882 (0.2838)
Parents provided childcare	0.128 (0.3344)	0.0728 (0.2599)	0.0835 (0.2769)	0.081 (0.2729)
Number of observations	430	1227	635	828

[a] Source: Author's calculation from CHARLS
[b] Standard deviations are reported in parentheses.

Table 1.4: Summary statistics of parent characteristics: all households

	Gansu	Zhejiang
Net transfer received per child	352.68 (1203.42)	957.27 (3319.41)
Total net transfer received	857.05 (2996.11)	2109.72 (6977.34)
Percentage of recipients	0.4014 (0.4906)	0.4908 (0.5004)
Avg. household income (000's yuan)	3.9233 (8.7912)	10.1044 (27.0394)
Avg. household wealth (000's yuan)	22.8216 (94.6514)	85.5901 (208.4372)
Age	62.5 (9.78)	65.03 (10.12)
Female household head	0.5231 (0.4999)	0.5796 (0.4941)
Number of children	3.33 (1.47)	3.06 (1.5)
At least 1 adult child lives with parents	0.5445 (0.4985)	0.4473 (0.4977)
Illiterate	0.5445 (0.4985)	0.4523 (0.4982)
Less than elementary school	0.1349 (0.3419)	0.2714 (0.4451)
Elementary school	0.1267 (0.3329)	0.1575 (0.3646)
Middle school	0.107 (0.3093)	0.0788 (0.2696)
High school of above	0.0872 (0.2824)	0.0403 (0.1966)
Household head is married	0.7188 (0.45)	0.7103 (0.4541)
Poor health	0.5132 (0.5003)	0.2697 (0.4442)
Disability	0.1892 (0.392)	0.0922 (0.2895)
Chronic diseases	0.7122 (0.4532)	0.6047 (0.4894)
Household size	3.49 (1.71)	2.75 (1.47)
Take care of grandchildren	0.1908 (0.3933)	0.1575 (0.3646)
Number of households	608	597

[a] Source: Author's calculation from CHARLS
[b] Standard deviations are reported in parentheses.

Table 1.5: Summary statistics of children characteristics: all households

	Gansu	Zhejiang
Net transfer given	345.09 (1805.1)	863.23 (4118.9)
Percentage of donors	0.2762 (0.4473)	0.4341 (0.4958)
Male	0.4471 (0.4974)	0.4635 (0.4989)
Age	36.6 (9.72)	40.14 (9.82)
Illiterate	0.1882 (0.391)	0.1128 (0.3165)
Less than elementary school	0.0887 (0.2844)	0.0875 (0.2827)
Elementary school	0.203 (0.4024)	0.2659 (0.442)
Middle school	0.2839 (0.4511)	0.3104 (0.4628)
High school of above	0.2364 (0.425)	0.2236 (0.4168)
Living in urban area	0.318 (0.4659)	0.3172 (0.4656)
Is working	0.8472 (0.36)	0.7909 (0.4069)
Num. of children the child has	1.62 (1.14)	1.33 (0.87)
Live in a diff. province	0.1985 (0.399)	0.08 (0.2714)
Parents provided childcare	0.088 (0.2834)	0.0821 (0.2745)
Number of observations	1557	1463

[a] Source: Author's calculation from CHARLS
[b] Standard deviations are reported in parentheses.

Table 1.6: Key statistics of intergenerational transfers in CHARLS

	All households			Household who received transfers		
	Both provinces	Gansu	Zhejiang	Both provinces	Gansu	Zhejiang
% of transfer recipients	44.57%	40.14%	49.08%	—	—	—
Total net transfer received	1477.66	857.05	2109.72	3315.8	2135.59	4298.64
Pre-transfer household income per capita	6985.5	3923.3	10104.4	5395.2	3195.4	7227.2
% of net transfer as household income per capita	21.15%	21.84%	20.87%	61.45%	66.83%	59.47%

[a] Source: Author's calculation from CHARLS

Table 1.7: Probit estimates of net transfer receipts from children to parents

	Gansu	Zhejiang
Income		
Avg. household income (000's yuan)	-0.0047 (0.0025)*	-0.0059 (0.0018)***
Parents' characteristics		
Avg. household wealth (000's yuan)	0.0003 (0.0001)**	0.0002 (0.0001)*
Age	-0.0054 (0.0025)**	-0.0101 (0.0037)***
Female household head	-0.0349 (0.0338)	0.0114 (0.0476)
Number of children	0.0011 (0.0114)	0.0174 (0.0175)
At least 1 adult child lives with parents	-0.0434 (0.042)	-0.0019 (0.0611)
Less than elementary school	-0.0395 (0.0452)	0.0469 (0.0531)
Elementary school	-0.0197 (0.0529)	0.1081 (0.0661)
Middle school	0.017 (0.0514)	0.1747 (0.0952)*
High school or above	-0.0119 (0.0639)	0.072 (0.1249)
Household head is married	0.0749 (0.034)**	0.0364 (0.0515)
Poor health	0.0107 (0.0311)	-0.0192 (0.0493)
Disability	0.0297 (0.0401)	0.0286 (0.0782)
Chronic diseases	0.0621 (0.0334)*	0.0401 (0.043)
Household size	-0.0243 (0.0126)*	-0.0368 (0.022)*
Take care of grandchildren	0.0731 (0.0472)	0.0214 (0.0575)
Child's characteristics		
Male	0.0275 (0.0251)	-0.023 (0.0328)
Age	0.0298 (0.0092)***	0.0441 (0.0137)***
Age squared	-0.0003 (0.0001)**	-0.0004 (0.0002)**
Less than elementary school	0.0038 (0.0535)	0.0811 (0.0766)
Elementary school	0.1433 (0.051)***	0.1225 (0.0642)*
Middle school	0.1543 (0.0526)***	0.0732 (0.0708)
High school or above	0.1621 (0.0562)***	0.1639 (0.077)**
Living in urban area	0.0307 (0.0343)	-0.0233 (0.0391)
Is working	-0.0231 (0.0404)	0.09 (0.0398)**
Num. of children the child has	-0.0132 (0.0168)	-0.0124 (0.024)
Live in a diff. province	0.0798 (0.0368)**	-0.0066 (0.056)
Number of Observations	1557	1463

[a] Robust standard errors (standard errors are clustered by household to correct possible correlation among residuals) are reported in parentheses.
[b] Marginal effects instead of the coefficients are reported.
[c] ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Table 1.8: Regression estimates of net transfer amount received from children to parents

	Gansu		Zhejiang	
	Heckman	OLS	Heckman	OLS
Income				
Avg. household income (000's yuan)	-7.94 (21.51)	-10.3 (22.31)	19.69 (28.94)	18.67 (29.24)
Parents' characteristics				
Avg. household assets (000's yuan)	1.58 (1.23)	1.71 (1.34)	2.02 (1.27)	2.03 (1.29)
Age	-17.09 (29.35)	-20.44 (27.9)	-70.93 (44.5)	-81.18 (53.02)
Female household head	-285.6 (322.23)	-305.04 (311.25)	-1498.61 (823.58)*	-1492.8 (836.39)*
Number of children	-111.68 (90.57)	-110.48 (91.8)	-10.79 (154.8)	0.26 (160.7)
At least 1 adult child lives with parents	-126.15 (262.72)	-149.85 (267.23)	374.13 (543.37)	365.29 (558.21)
Less than elementary school	330.75 (504.76)	304.15 (539.41)	919.6 (613.91)	899.07 (595.62)
Elementary school	-1041.22 (321.98)***	-1058.76 (359.73)***	-107.7 (779.53)	-108.2 (811.23)
Middle school	-738.5 (399.07)*	-736.58 (417.43)*	-1652 (985.13)*	-1533.29 (955.08)
High school or above	81.5 (548.72)	68.36 (587.4)	-2758.18 (1405.98)*	-2798.54 (1484.14)*
Household head is married	496.48 (411.72)	532.47 (435.12)	598.2 (442.42)	609.01 (454.89)
Poor health	144.44 (338.64)	148.88 (350.63)	11.32 (348.59)	37.17 (358.77)
Disability	-363.57 (348.26)	-352.07 (358)	-503.26 (462.11)	-485.95 (460.67)
Chronic diseases	97.5 (321.58)	124.4 (332.29)	-1072.35 (640.47)*	-1085.02 (669.69)
Household size	26.22 (65.34)	13.69 (74.08)	-234.31 (139.25)*	-261.64 (144.9)*
Take care of grandchildren	544.43 (571.51)	565.05 (591.76)	-1307.28 (909.54)	-1306.43 (931.31)
Child's characteristics				
Male	550.33 (248.88)**	561.62 (260.23)**	790.84 (591.22)	767.69 (584.19)
Age	12.85 (30.19)	45.26 (135.62)	10.36 (24.05)	125.28 (198.79)
Age squared	—	-0.36 (1.65)	—	-1.26 (2.1)
Less than elementary school	-1502.49 (581.72)**	-1514.01 (634.31)**	-103.27 (456.39)	-75.85 (463.71)
Elementary school	-730.52 (543.3)	-668.72 (558.91)	-215.46 (364.06)	-189.11 (364.75)
Middle school	-320.22 (517.24)	-257.49 (539.6)	-276.07 (484.14)	-250.35 (491.67)
High school or above	-376.79 (648.91)	-310.72 (665.63)	2463.63 (1026.75)**	2552.65 (1134.27)**
Living in urban area	234.85 (307.27)	251.43 (333.42)	42.03 (690.49)	55.22 (682.34)
Is working	-347.19 (380.32)	-368.94 (382.28)	778.57 (346.64)**	783.92 (351.58)**
Num. of children the child has	-369.39 (165.28)**	-382.59 (188.85)**	225.19 (426.76)	228.52 (444.06)
Live in a diff. province	394.76 (474.75)	442.49 (552.7)	485.4 (712.53)	496.86 (728)
Number of Observations	430	430	635	635

[a] Robust standard errors (standard errors are clustered by household to correct possible correlation among residuals) are reported in parentheses.

[b] ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Table 1.9: Key statistics of children living with elderly parents in CHARLS

	Non-recipients			Money transfers recipients		
	Both provinces	Gansu	Zhejiang	Both provinces	Gansu	Zhejiang
% of households with at least 1 adult child living with parents	57.33%	60.44%	53.62%	40.03%	45.50%	35.50%
Household size	3.34	3.64	2.99	2.84	3.25	2.49
Number of children	2.99	3.17	2.79	3.44	3.56	3.34
% of households with at least 1 son	90.7%	92.85%	88.15%	92.73%	97.13%	89.07%

[a] Source: Author's calculation from CHARLS

Table 1.10: Probit estimates of children living with parents

	Gansu	Zhejiang
Income		
Avg. household income (000's yuan)	-0.0021 (0.0015)	0.0011 (0.0005)**
Parents' characteristics		
Avg. household assets (000's yuan)	-0.000009 (0.0001)	0.000049 (0.000041)
Age	0.0029 (0.0016)*	0.0034 (0.0023)
Female household head	-0.0224 (0.0197)	-0.0064 (0.0242)
Number of children	-0.026 (0.0062)***	-0.0307 (0.0121)**
Other siblings live with parents	-0.2134 (0.0262)***	-0.1517 (0.0313)***
Less than elementary school	-0.0181 (0.0247)	0.026 (0.0322)
Elementary school	0.0252 (0.0309)	0.0108 (0.0319)
Middle school	-0.0323 (0.0276)	-0.046 (0.0383)
High school or above	0.0923 (0.0525)**	0.0035 (0.0556)
Household head is married	-0.1559 (0.0259)***	-0.2007 (0.034)***
Poor health	-0.0295 (0.0181)*	0.0168 (0.0289)
Disability	0.017 (0.0216)	0.0097 (0.0499)
Chronic diseases	0.008 (0.0203)	-0.0078 (0.0227)
Household size	0.099 (0.0067)***	0.1196 (0.0089)***
Take care of grandchildren	0.1201 (0.036)***	0.179 (0.0403)***
Child's characteristics		
Male	0.1903 (0.0195)***	0.1972 (0.0251)***
Age	-0.0233 (0.0063)***	-0.0581 (0.0081)***
Age squared	0.0002 (0.0001)**	0.0006 (0.0001)***
Less than elementary school	-0.0164 (0.0294)	-0.0269 (0.0578)
Elementary school	0.0059 (0.0307)	-0.0773 (0.0428)*
Middle school	0.0002 (0.0274)	-0.0634 (0.0424)
High school or above	-0.0094 (0.0285)	-0.1015 (0.0396)**
Is working	-0.1299 (0.0323)***	-0.0364 (0.0273)
Num. of children the child has	-0.066 (0.012)***	-0.0358 (0.0185)*
Number of Observations	2014	1927

[a] Robust standard errors (standard errors are clustered by household to correct possible correlation among residuals) are reported in parentheses.
[b] Marginal effects instead of the coefficients are reported.
[c] ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Table 1.11: Opinions on living arrangement and old-age support for elderly people

	Gansu	Zhejiang
Question 1: Suppose an elderly person has a spouse and children. What do you think is the best living arrangement for the elderly person?		
(a) Alone or with spouse	46.97%	61.77%
(b) Live with adult children	48.62%	35.75%
(c) Live in a nursing house	3.67%	1.95%
(d) Other	0.73%	0.53%
Question 2: Suppose an elderly person has no spouse but has children. What do you think is the best living arrangement for the elderly person?		
(a) Alone or with spouse	18.93%	39.26%
(b) Live with adult children	74.08%	55.63%
(c) Live in a nursing house	6.07%	4.23%
(d) Other	0.92%	0.88%
Question 3: Whom do you think you can rely on for old-age support?		
(a) Children	81.94%	76.90%
(b) Savings	3.91%	5.82%
(c) Pension and retirement salary	10.61%	14.11%
(d) Commercial pension insurance	0%	0.18%
(e) Others	3.54%	3.00%

[a] Source: Author's calculation from CHARLS

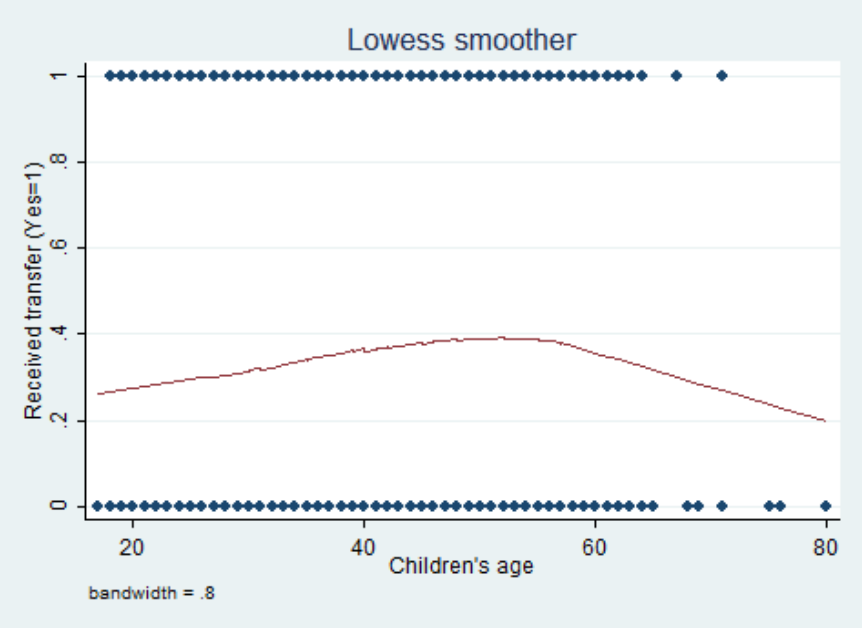

Figure 1.1: The event of receiving transfers as a function of children's age.

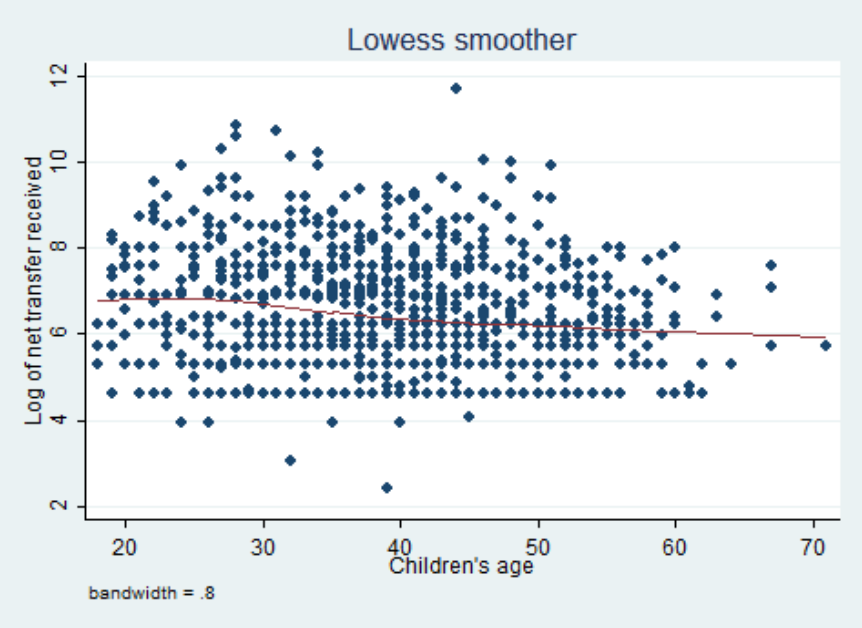

Figure 1.2: Net amount of transfer received as a function of children's age.

1.A Appendix

1.A.1 Comparative Statics Result

The model has the parent's utility function as follows:

$$U = U(C_p, V) \tag{1.A.1.1}$$

and child's utility function as follows:

$$V = V(C_k, U) \tag{1.A.1.2}$$

together with the following budget constraint:

$$C_i = E_i + T_i, i = p, k \tag{1.A.1.3}$$

The analysis focuses on the second period where the kid makes the transfer to the parent. Thus, the model becomes the child's maximization problem. A final constraint must be introduced into the maximization problem. By being linked to the child, change in parent's utility must be nonnegative. This nonnegativity constraint is as follows:

$$U(C_p, V) \geq U_0(E_p, V) \tag{1.A.1.4}$$

where U_0 denotes the parent's "threat point" utility level. By substituting the budget constraint into utility function, the Lagrangian for the child's maximization problem is as follows:

$$L = V(E_k - T_p, U(E_p - T_p, \bar{V})) + \lambda[U(E_p + T_p, \bar{V}) - U_0(E_p, \bar{V})] \tag{1.A.1.5}$$

The child's problem is to choose the transfer to parent (T_p) to maximize (1.A.1.5). The Kuhn-Tucker conditions are the following:

$$\frac{\partial L}{\partial T_p} = -V_c + V_u U_c + \lambda U_c \leq 0, T_p \frac{\partial L}{\partial T_p} = 0 \tag{1.A.1.6}$$

$$\frac{\partial L}{\partial \lambda} = U(E_p + T_p, \bar{V}) - U_0(E_p, \bar{V}) \geq 0, \lambda \frac{\partial L}{\partial \lambda} = 0 \tag{1.A.1.7}$$

Assume there exists interior solutions for T_p and the utility gain for the parent is strictly positive, the condition (1.A.1.7) is not binding, meaning $\lambda = 0$. Thus, transfers are used to equate the child's marginal utility of consumption (V_c) with the parent's marginal utility of consumption from the child's point of view ($V_u U_c$). Condition (1.A.1.6) becomes the following:

$$\frac{\partial L}{\partial T_p} = -V_c + V_u U_c = 0 \tag{1.A.1.8}$$

Differentiation of condition (1.A.1.8) results the following:

$$A dT_p = B \tag{1.A.1.9}$$

where

$$A = V_{cc} - V_{uc} U_c + V_{uu} U_c^2 + V_u U_{cc} \tag{1.A.1.10}$$

$$B = V_{cc} dE_k + V_{uc} U_c dE_p - V_{uu} U_c^2 dE_p - V_u U_{cc} dE_p \tag{1.A.1.11}$$

We can then obtain the following:

$$\begin{aligned} \frac{dT_p}{dE_k} &= \frac{V_{cc} + V_{uc} U_c \frac{dE_p}{dE_k} - V_{uu} U_c^2 \frac{dE_p}{dE_k} - V_u U_{cc} \frac{dE_p}{dE_k}}{V_{cc} - V_{uc} U_c + V_{uu} U_c^2 + V_u U_{cc}} \\ &= \frac{V_{cc}}{V_{cc} - V_{uc} U_c + V_{uu} U_c^2 + V_u U_{cc}} \end{aligned} \tag{1.A.1.12}$$

$$\begin{aligned}\frac{dT_p}{dE_p} &= \frac{V_{cc}\frac{dE_k}{dE_p} + V_{uc}U_c - V_{uu}U_c^2 - V_uU_{cc}}{V_{cc} - V_{uc}U_c + V_{uu}U_c^2 + V_uU_{cc}} \\ &= \frac{V_{uc}U_c - V_{uu}U_c^2 - V_uU_{cc}}{V_{cc} - V_{uc}U_c + V_{uu}U_c^2 + V_uU_{cc}}\end{aligned} \tag{1.A.1.13}$$

The following equality can be obtained:

$$\begin{aligned}\frac{dT_p}{dE_p} - \frac{dT_p}{dE_k} &= \frac{V_{uc}U_c - V_{uu}U_c^2 - V_uU_{cc}}{V_{cc} - V_{uc}U_c + V_{uu}U_c^2 + V_uU_{cc}} - \frac{V_{cc}}{V_{cc} - V_{uc}U_c + V_{uu}U_c^2 + V_uU_{cc}} \\ &= -1\end{aligned} \tag{1.A.1.14}$$

1.A.2 Estimation Results for the combined sample of both provinces

Table 1.A.2.1: Probit estimates of net transfer receipts from children to parents

Income	
Avg. household income (000's yuan)	-0.0048 (0.0013)***
Parents' characteristics	
Avg. household wealth (000's yuan)	0.0002 (0.0001)***
Age	-0.0055 (0.0021)***
Female household head	0.0014 (0.0296)
Number of children	0.0039 (0.0101)
At least 1 adult child lives with parents	-0.0219 (0.0357)
Less than elementary school	0.0197 (0.0366)
Elementary school	0.045 (0.0436)
Middle school	0.0731 (0.0512)
High school or above	0.0181 (0.0612)
Household head is married	0.0623 (0.0304)**
Poor health	-0.0222 (0.0282)
Disability	0.0095 (0.0382)
Chronic diseases	0.0475 (0.028)*
Household size	-0.0428 (0.0113)***
Take care of grandchildren	0.0643 (0.0374)*
Child's characteristics	
Male	0.0006 (0.0209)
Age	0.0335 (0.0081)***
Age squared	-0.0003 (0.0001)***
Less than elementary school	0.0525 (0.0486)
Elementary school	0.1503 (0.041)***
Middle school	0.1224 (0.0434)***
High school or above	0.1446 (0.0471)***
Living in urban area	-0.0038 (0.0265)
Is working	0.0322 (0.0286)
Num. of children the child has	-0.0376 (0.0148)**
Live in a diff. province	0.0404 (0.0313)
Number of Observations	3020

[a] Robust standard errors (standard errors are clustered by household to correct possible correlation among residuals) are reported in parentheses.
[b] Marginal effects instead of the coefficients are reported.
[c] ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Table 1.A.2.2: Regression estimates of net transfer amount received from children to parents

	Heckman	OLS
Income		
Avg. household income (000's yuan)	17.71 (21.91)	16.35 (21.68)
Parents' characteristics		
Avg. household assets (000's yuan)	1.97 (1.17)*	2 .00(1.19)*
Age	-32.33 (24.87)	-37.18 (27.41)
Female household head	-831.44 (439.26)*	-837.4 (449.28)*
Number of children	-118.87 (99.81)	-114.86 (101.25)
At least 1 adult child lives with parents	147.6 (343.13)	136.47 (348.05)
Less than elementary school	792.2 (501.67)	774.48 (494.98)
Elementary school	-303.62 (514.68)	-316.91 (535.39)
Middle school	-1210.43 (494.24)**	-1188.48 (491.63)**
High school or above	-1277.83 (740.67)*	-1293.8 (766.62)*
Household head is married	482.41 (305.9)	500.14 (314.33)
Poor health	-46.46 (245.11)	-41.47 (250.12)
Disability	-429.34 (231.79)*	-427.71 (235.73)*
Chronic diseases	-684.96 (410.63)*	-687.45 (421.13)
Household size	-134.05 (89.11)	-155.11 (98.02)
Take care of grandchildren	-260.78 (493.52)	-260.83 (502.68)
Child's characteristics		
Male	690.98 (336.82)**	688.22 (339.11)**
Age	16.5 (18.57)	75.26 (94.57)
Age squared	—	-0.66 (0.98)
Less than elementary school	-473.83 (354.59)	-476.55 (361.9)
Elementary school	-276.26 (283.66)	-255.88 (287.89)
Middle school	-50.85 (324.21)	-37.07 (327.77)
High school or above	1332.06 (639.76)**	1356.07 (650.47)**
Living in urban area	248.23 (370.21)	254.18 (371.71)
Is working	256.75 (225.91)	252.54 (225.46)
Num. of children the child has	-86.23 (205.71)	-106.29 (196.65)
Live in a diff. province	453.68 (430.09)	493.5 (451.92)
Number of Observations	1065	1065

[a] Robust standard errors (standard errors are clustered by household to correct possible correlation among residuals) are reported in parentheses.

[b] ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

1.A.3 Summary statistics for the combined sample of both provinces

Table 1.A.3.1: Summary statistics of parent characteristics

	All households	Recipients	Non-Recipients
Net transfer received per child	652.21 (2505.18)	1463.53 (3592.74)	—
Total net transfer received	1477.67 (5386.77)	3315.8 (7685.98)	—
Percentage of recipients	0.4457 (0.4973)	—	—
Avg. household income (000's yuan)	6.9856 (20.2594)	5.3952 (9.9955)	8.2642 (25.6306)
Avg. household wealth (000's yuan)	53.9193 (164.3438)	61.9595 (176.0431)	47.4558 (154.1276)
Age	63.75 (10.03)	65.12 (9.61)	62.66 (10.22)
Female household head	0.5511 (0.4976)	0.5866 (0.493)	0.5225 (0.4999)
Number of children	3.2 (1.49)	3.44 (1.47)	3 (1.47)
At least 1 adult child lives with parents	0.4963 (0.5002)	0.4004 (0.4905)	0.5734 (0.495)
Illiterate	0.4988 (0.5003)	0.501 (0.5005)	0.4971 (0.5004)
Less than elementary school	0.2025 (0.4021)	0.203 (0.4026)	0.2021 (0.4019)
Elementary school	0.142 (0.3492)	0.1434 (0.3508)	0.1408 (0.348)
Middle school	0.093 (0.2905)	0.0987 (0.2986)	0.0884 (0.284)
High school or above	0.064 (0.2447)	0.0541 (0.2263)	0.0719 (0.2585)
Household head is married	0.7146 (0.4519)	0.6779 (0.4678)	0.7441 (0.4368)
Poor health	0.3926 (0.4886)	0.393 (0.4889)	0.3923 (0.4887)
Disability	0.1411 (0.3483)	0.1397 (0.347)	0.1423 (0.3496)
Chronic diseases	0.659 (0.4743)	0.7002 (0.4587)	0.6258 (0.4843)
Household size	3.12 (1.64)	2.84 (1.54)	3.35 (1.68)
Take care of grandchildren	0.1743 (0.3796)	0.2198 (0.4145)	0.1378 (0.3449)
Number of households	1205	537	668

[a] Source: Author's calculation from CHARLS
[b] Standard deviations are reported in parentheses.

Table 1.A.3.2: Summary statistics of children characteristics

	All households	Donors	Non-Donors
Net transfer given	596.1 (3156.3)	1690.34 (5139.6)	—
Percentage of donors	0.3527 (0.4779)	—	—
Male	0.455 (0.4981)	0.5043 (0.5003)	0.4282 (0.495)
Age	38.32 (9.92)	39.24 (9.63)	37.82 (10.04)
Illiterate	0.1517 (0.3588)	0.0949 (0.2932)	0.1827 (0.3865)
Less than elementary school	0.0881 (0.2835)	0.0752 (0.2638)	0.0952 (0.2935)
Elementary school	0.2335 (0.4231)	0.2573 (0.4374)	0.2205 (0.4147)
Middle school	0.2967 (0.4569)	0.3099 (0.4627)	0.2896 (0.4537)
High school or above	0.2302 (0.421)	0.263 (0.4405)	0.2123 (0.4091)
Living in urban area	0.3176 (0.4657)	0.339 (0.4736)	0.3059 (0.4609)
Is working	0.8199 (0.3844)	0.8301 (0.3758)	0.8144 (0.389)
Num. of children the child has	1.48 (1.03)	1.4 (0.94)	1.53 (1.07)
Live in a diff. province	0.1411 (0.3482)	0.1437 (0.351)	0.1397 (0.3468)
Parents provided childcare	0.0851 (0.2791)	0.1015 (0.3021)	0.0763 (0.2655)
Number of observations	3020	1065	1955

[a] Source: Author's calculation from CHARLS
[b] Standard deviations are reported in parentheses.

Chapter 2

The Effect of Social Fathers on the Well-Being of Out-of-Wedlock Children

2.1 Introduction

Social fathers, stepfathers or unrelated cohabiting romantic partners of biological mothers, become more widespread as a result of the increasing out-of-wedlock childbearing. How the presence of social fathers affects the unrelated children, especially the young children, is not thoroughly studied. The main objective of this study is to examine whether the presence of social fathers has any negative effect on the well-being of young out-of-wedlock children. The presence of social fathers is defined as either the mother marrying to a new partner or the mother cohabiting with a new partner. In order to identify the effect of social father on the children, I compare out-of-wedlock children in family with biological mother and social father to out-of-wedlock children in family only with biological mother.

The proportion of children born to unmarried parents has increased considerably in the past forty years. In 1970, only 12 percent of newborns occurred outside marriage (Sigle-Rushton and McLanahan, 2002). In 2010, the figure increased to about 40 percent (Hamilton, Martin and Ventura, 2011)[1]. Delays and declines in marriages

[1]The rate of non-marital births seemed to have stabilized from 2007 to 2010 at around 40 percent.

raise the number of women who may be more likely to have non-marital births. The decrease in shotgun marriage[2] has also been associated with the increase in non-marital births (Carlson, McLanahan and England, 2004). Non-marital births are usually associated with socioeconomic disadvantages and family instability. This raises the interest of researchers to study non-marital births and other related issues.

The increasing out-of-wedlock childbearing contributes to the prevalence of social fathers. Estimation in the 90s showed that a quarter of children would live with a stepparent at some point during childhood (Bumpass, Raley and Sweet, 1995)[3]. The reason behind that trend is that children born to unmarried parents have a higher chance to experience the union dissolution of the biological parents. The parents are more likely to form romantic relationship with new partners. Many single mothers choose to cohabit with new partner or remarry (Osborne and McLanahan, 2007). Children would have to live with mother's new partners following their mothers' decision.

The presence of social fathers has been shown to have some degree of negative effect on children. Children living in families with biological mothers and stepfathers do not fare better than those living with single mothers (Coleman, Ganong and Fine, 2000). Children and adolescents living with a social father and the biological mother are more likely to demonstrate inferior outcome compared to those living with two biological parents (Brown, 2004; Coleman, Ganong and Fine, 2000; Hofferth, 2006; Manning and Lamb, 2003; Thomson, Hanson and McLanahan, 1994), though these results may due to the benefit of having both biological parents in the family rather than the negative effect of social fathers.

The effect of social father on the well-being of younger children has not been thoroughly studied. The aforementioned research focused more on how social fathers

[2]Shotgun marriage means the marriage due to an unplanned pregnancy.

[3]The percentage is very likely to be higher because of larger number of non-marital birth at present.

affect older children and adolescents. Most of the children and adolescents may have gone through divorce and remarriage of the biological parents. For children born to unmarried parents, the presence of social fathers may occur very early in the children's life. It is also less common for those children to experience the divorce of biological parents. According to Bzostek (2008), younger children may show less resistance towards social fathers because they may not be mature enough to understand the difference between biological fathers and social fathers. In contrast, older children and adolescents are mature enough to know the difference. They may show larger resistance towards the existence of social fathers. Because of the different degree of resistance, younger children and older children could show quite different response to the existence of social fathers. It would be interesting to examine whether social fathers have any beneficial or detrimental effect on the well-being of young children.

This study examines whether the presence of social fathers has any negative effect on young out-of-wedlock children's well-being. I used data from the Fragile Families and Child Wellbeing Study (FFCWS), a representative sample of non-marital births in 20 U.S. cities. The FFCWS provides detailed information on marriage, fertility, socioeconomic status of the biological mothers of the children. I focus on the effect of social father on the cognitive ability of the out-of-wedlock children. Cognitive ability is measured at age 3 using the score from the Peabody Picture Vocabulary Test(PPVT) (Dunn and Dunn, 1997). The PPVT is widely used to measure verbal ability and receptive hearing in children and adults. It is a very good assessment of children's language development. Researchers also found significant correlation between PPVT score and scores from other achievement test and intelligence test[4]. Apart from the PPVT score, the effect of social father on children's heath and behavioral outcomes is also examined.

This study also addresses the selection issue. Children are not randomly assigned

[4]See Childers and Durham (1994); Smith, Smith and Dobbs (1991) for details.

to have social fathers. It is more likely to be the case of a self-selection of the mothers. The presence of social fathers may be correlated with the characteristics of the mothers, such as education level, employment status, and income level. The outcome difference between children with social fathers and children without social fathers may be caused by those characteristics of the mothers regardless of the presence of social fathers. Simple comparison of the well-being of these two groups of children may lead to biased results. To address the selection issue, I use the propensity score matching method[5] to estimate the effect of social fathers on children's well-being. The method estimates the average treatment effect by constructing a setting similar to an experiment in which the treatment (the presence of social fathers in this study) is randomly assigned.

This paper extends previous research on the effect of social fathers to younger children born to unmarried parents. Using the propensity score matching method, I found that the presence of social fathers have a negative effect on children's cognitive ability. Children aged three living in families with social fathers score around three points lower on the PPVT than those living only with their biological mothers. This result may only reflect part of the problem faced by children with social fathers. Because of the widespread of non-martial births, social fathers would still be a common phenomenon in the future. Any negative effect caused by the social fathers will affect a large portion of child population[6].

[5]See Rosenbaum and Rubin (1983); Heckman, Ichimura and Todd (1998); Imbens (2004) for details of the propensity score matching method.

[6]Around 4.2 million children under age 18 in the United States were living with biological mother and a social father, as showed by data from the 2004 Survey of Income and Program Participation (Sweeney, 2010).

2.2 Literature

2.2.1 Literature on the Well-Being of Out-of-Wedlock Children

The availability of the FFCWS boosted a new wave of research on non-marital births. In the past, the lack of data similar to the FFCWS has limited the research on the well-being of children born to unmarried parents. The FFCWS contains detailed information on the developmental and health outcomes of the children. Research on the well-being of out-of-wedlock children using the FFCWS mainly focused on three broad areas: Child's Cognitive Development, Child's Behavior Problems and Child's Health. Those research mainly focused on examining how factors, such as family structure and family stability, affect the well-being of out-of-wedlock children. Nonetheless, the effect of social fathers on the well-being of out-of-wedlock children is not well-studied.

Craigie (2008) examined the effect of family structure and family stability on child cognitive development. The PPVT score at age three of the child is the variable of interest. For family structure, she distinguished between two-parent families and single-mother families. For family stability, she distinguished between stable families and unstable families. She found that family structure does not have any negative effect on the PPVT score as there was no significant difference in the score between children in stable two-parent families and stable single-mother families. Yet, she found that family instability had an adverse effect on the PPVT score as children in unstable families scored significantly lower in PPVT than children in stable single-mother families.

Cooper, Osborne, Beck and McLanahan (2011) studied how mother's partnership instability affects the cognitive development of the child. The PPVT score at age five of the child is used to evaluate the child's cognitive development. Partnership

instability was found to have detrimental effect on child's cognitive development as there was a negative relationship between child's PPVT score and the number of partnership transitions experienced by the mother after the child's birth.

Liu and Heiland (2012) investigated how the marriage of biological parents affects the cognitive performance of out-of-wedlock children. They used the propensity score matching method to address for the selection issue and identify the casual effect of marriage. They compared two groups of children with similar characteristics and parental characteristics. The only difference between the two groups is whether the parents marry or not after the child was born. They found that the marriage of the biological parents significantly increased the child's cognitive performance in terms of the PPVT score at age three.

Ryan, Kalil and Leininger (2009) studied the relationship between material support for the mothers and children's behavioral problems. They focused on mothers who were unmarried at child's birth and were living at 200 percent of poverty line or below. They defined material support using some measures on availability of loans from relatives and friends, availability of bank loans, emergency child care and emergency accommodation provided by relatives and friends. Children's behavioral problems are measured by the Child Behavior Checklist (Achenbach, 1991, 1992). Internalizing behaviors like depressed and anxiety as well as externalizing behaviors like aggressive behavior are both measured. They found that mothers with more material support have a positive effect on reducing children's behavioral problems.

Osborne and McLanahan (2007) examined how mother's partnership changes affect children's behavior. Similar to the study by Ryan et al. (2009), the Child Behavior Checklist (Achenbach, 1992) is used to evaluate the child's behavioral problems. They found that the number of mother's partnership transition increased the mother's stress level and lowered the quality of mothering. These two forces led to children's elevated behavioral problems.

Cooper et al. (2011) also studied how mother's partnership instability affects children's behavior. Again, they used the Child Behavior Checklist (Achenbach, 1991) at age five to evaluate child's behavioral problems. They found a positive relationship between the number of partnership transitions and children's behavioral problems. This means that partnership instability has a harmful effect on children's behavior.

Bzostek and Beck (2011) examined how family structure and family instability affect children's health outcome. They used several measures of children's health outcome such as whether the child is overweight and whether the child has asthma. They found that children living with single mothers fared worse than children born to married parents, with the former group having higher chances of obesity and having asthma. However, they failed to find consistent results to support that family stability had any harmful effect on children's health.

Harknett (2009) focused on the effect of family structure on children's risk of having asthma. She found that children living with single mothers have the highest chance of asthma, comparing to those living with married parents and those living with mothers and cohabiting partners.

Guterman et al. (2009) investigated the risk of maternal physical child abuse using FFCWS. They found that the marriage between biological parents did not have any positive effect on reducing the probability of maternal child abuse. Instead, some other factors such as father's education and father's positive involvement in parenting have a beneficial effect on reducing the chance of mother penalizing the child.

2.2.2 Social Fathers and Child Well-Being

Before the FFCWS, research on stepparents mostly focused on children who experienced the divorce of biological parents and the remarriage of the parents who lived with them. The research on the effect of stepparent on child well-being was boosted by the availability of better datasets and improved methodology after 1990s (Cole-

man, Ganong and Fine, 2000)[7]. Manning and Lamb (2003) examined the well-being of adolescents in families with cohabiting stepparent. They found that children living in families with cohabiting stepparent fare worse than children living in families with both biological parents. On the other hand, they had similar outcomes compared to children living with single unmarried mothers. Brown (2004) investigated how family structure affects child well-being. No significant difference was found between adolescents in stepfamilies and adolescents with single mothers. Yuan and Hamilton (2006) examined the effect of stepfathers on the health of adolescents. They found that stepfathers in general have a positive effect on adolescents' health. This positive relationship was further boosted if the stepfathers have a non-conflicting relationship with the children or the relationship has existed for a long period of time. Hofferth (2006) also studied the effect of the family structure on behavior problems of children aged 3 to 12. They found similar result as stepchildren fare less well than children in families with married biological parents.

With the FFCWS, the effect of divorce can be separated from the effect of stepparents' presence. Researchers can focus only on the effect of stepparents on out-of-wedlock children. For example, Bzostek (2008) tested whether the cohabiting social fathers have the same positive effect on children's well-being as cohabiting biological fathers. Children's well-being is evaluated by behavioral outcomes and an overall measure of health. The involvement of fathers was measured by the number of days in a week that the fathers involved in some activities with the children. Bzostek found that the social fathers are as beneficial for children's well-being as biological fathers. Berger, Paxson and Waldfogel (2009) examined whether children faced higher risk of maltreatment in families with social fathers. The risk of maltreatment is evaluated by whether the families have been contacted by Child Protective Services (CPS). They found that the presence of social fathers increased the probability of being contacted

[7]Detailed review of related research in that decade after 1990 can refer to Coleman et al. (2000).

by CPS, compared to families with a cohabiting or married biological father.

2.3 Empirical Approach

2.3.1 Data

The data set used in this study is the Fragile Families and Child Wellbeing Study (FFCWS). The FFCWS follows a cohort of 4,898 children born between 1998 and 2000 in 20 U.S. cities[8]. Around 3,700 of them were born to unmarried parents as the study over-sampled out-of-wedlock children. A baseline interview was conducted at the time of childbirth. Both biological parents were interviewed at baseline interview[9]. They were re-interviewed when the child was 1 and 3 years old. Information about the characteristics of the parents, relationship between the parents, parent-child relationship, socioeconomic activities, and child development were collected.

A supplementary survey, called the "36-Month In-Home Longitudinal Study of Pre-School Aged Children", was used to assess the children at age 3. This supplementary survey collected information from a random subsample[10] of the baseline respondents. Details such as child's behavior and living environment were recorded by the interviewers. The Peabody Picture Vocabulary Test(PPVT) (Dunn and Dunn, 1997) is administered by the interviewers at the children's residence as part of the supplementary survey.

This study involves two groups of children. One group is out-of-wedlock children in family with biological mother and social father and the other group is out-of-wedlock children in family only with biological mother. The sample used in this study is selected with the following exclusions. PPVT scores are only available for

[8]See Reichman, Teitler, Garfinkel and McLanahan (2001) for detailed description of the sample and design of the FFCWS.

[9]Not all biological fathers are available for interviews.

[10]2,368 children and their mothers participated in the supplementary survey.

those who participated in the supplementary survey. Those who are not in that random subsample are excluded (2,530 cases). Twin births are excluded from the sample since we want to focus on single child (51 cases). Children who did not live with the mothers most of the time are excluded since that may induce a negative effect on child's well-being (49 cases). This study focused on the well-being of out-of-wedlock children. Children were dropped if their biological parents were married at baseline (495 cases). In order to limit the influence of the biological father on the children, children whose biological parents were married at year 1 were dropped (127 cases). Biological fathers who were married to the mothers or living with the children at year 3 were also dropped (542 cases). Some more cases (242 cases) were excluded because of missing information on the dependent or independent variables. With all the exclusions, a sample of 862 children remained. Using the propensity score matching method, treatment is defined as the child living with biological mother and social father. I estimate the propensity score for which observations in the sample are selected into treatment. Observations with a propensity score falling outside the region of common support were dropped (29 cases). A final sample of 833 children was analyzed.

2.3.2 Descriptive Statistics

The standardized PPVT score[11] of the child is the main variable of interest to measure the well-being of the child. The sample has a mean score of 83.9. Children with the presence of social fathers apparently have a lower score than those without social fathers (82 vs. 84.4)[12].

The presence of social fathers enters the analysis as the main determining variable. If the mother was married to a new partner or the mother was cohabiting with a new

[11]Standardized PPVT score is used because it is adjusted for the mental age of the child.

[12]The difference in PPVT score has some predictive power in future's outcome. For example, Liu and Heiland (2012) found that a four-point positive difference in the PPVT score at age 3 may raise the odds of high school graduation by 2 percentage point.

partner, we count these as the presence of social fathers. Among the sample of 833 children, 19.5 percent of them (163 children) were living under the presence of social fathers. The remaining 670 children are all living with the mothers without the presence of social fathers in the household.

Variables on child characteristics are included in the analysis to control their effects on both the well-being of children and the presence of social fathers. The child's gender is included as it was found to have an effect on the involvement of biological fathers[13]. This may then affect the presence of social fathers. Medical and psychological research found consistent and rich evidence on the negative effect of low birth weight on cognitive performance[14]. Thus, whether the child is a low-birth-weight baby[15] is included in the analysis. Also, whether the child is his/her mother's first birth is also included as having other children before the focal child may increase the need of having a father figure in the household.

Characteristics of mother are expected to influence both the well-being of the child and the decision of having a social father. Demographics like age, race, education level, income, labor market participation, poverty level and religion are all included. Behaviors of the mothers may also have effect on the child's well-being. The number of days per week that mother reads story to the child, Mother's PPVT score and whether the mother meets depression criteria are included in the analysis. Prenatal smoking and prenatal alcoholic consumption are included as they may have negative effects on child's cognitive abilities .

Factors affecting the presence of social fathers have to be included. One of those factors is how close is the relationship between the biological father and the family, including the biological mother and the child. Variables such as whether the biological parents are in romantic relationship at childbirth, whether the child uses biological

[13]Read Lundberg, McLanahan and Rose (2007) for more details.
[14]For example, read Hack, Klein and Taylor (1995) for more details.
[15]Low-birth-weight baby is defined as baby weighing less than 5 lbs 8 ounces at birth.

father's last name, whether biological father's name is on the birth certificate and whether paternity is officially established are all included in the analysis.

Descriptive statistics for all the aforementioned variables are reported in Table 1. Summary statistics are reported for the whole sample in the first column. Summary statistics are also reported separately for children with social fathers and children without social fathers in second column and third column respectively.

2.3.3 Methodology

To study the relationship between the presence of social fathers and the well-being of the child, the following model is defined:

$$Y_i = b_0 + b_1 F_i + \mathbf{b_2 X_i} + \epsilon_i \tag{2.3.3.1}$$

$$F_i = I(c_0 + \mathbf{c_1 X_i} + \mu_i > 0) \tag{2.3.3.2}$$

where household is indexed by i. The variable indicating the well-being of the child is denoted by Y_i. The variable F_i denotes the presence of social fathers. A value of one for F_i indicates a social father is living in the household. He can be a cohabiting partner of the mother or he has married the mother. A value of zero for F_i means a social father does not exist in the household. The vector $\mathbf{X_i}$ includes all other determining variables such as household characteristics. Both ϵ_i and μ_i are normally distributed error terms with mean zero. The coefficient b_1 captures the relationship between the presence of social fathers and the well-being of the child.

Selection issue happens because the presence of social father is not randomly assigned to the children. It is very likely that mothers who choose to be single are different from mothers who choose to cohabit with or marry to new partners. Some factors cause the mothers to remain single or accept a new partner. At the same time, these factors may also affect the well-being of the child. This will create the

correlation between ϵ_i and μ_i. In the presence of correlation between ϵ_i and μ_i, using ordinary least squares to estimate the coefficient b_1 may result in biased estimation. Ordinary least squares cannot identify the pure effect of social fathers on the well-being of child. Other factors affecting the presence of social fathers in the first place also have their effects on the well-being of child. The ordinary least squares estimate will be a combination of the effect of social fathers and the effect of those factors.

I use the propensity score matching method to identify the pure effect of having a social father on child's well-being. Under the context of propensity score matching method, having a social father is viewed as having a treatment. In an ordinary randomized experiment, outcomes between the treatment group and the control group can be compared directly. In a nonrandomized experiment, the treatment group and the control group differ systematically because the treatment is the process of self-selection rather than a random assignment. A direct comparison of the average outcomes between the two groups cannot reveal the casual effect of the treatment on the outcome. Rather, the propensity score matching method uses the propensity score to match observations from the control group with observations from the treatment group. Observations are matched between the two groups in order to make the distribution of variables from the treatment group as similar as the distribution of variables from the control group. Matching is done by finding the match from the opposite group with similar propensity score. With the matching, the counterfactual outcome, in the form of the treated without treatment, is built. The counterfactual outcome is then used to compare with the outcome of the treatment group to identify the pure of treatment.

In my model, treatment is the presence of social fathers, denoted by F_i. The household with social fathers ($F_i = 1$) is the treatment group while the household without social fathers ($F_i = 0$) is the control group. The potential outcome of the child in household i if the child is under treatment is denoted by $Y_i(1)$. If the same

child is not under treatment, the potential outcome is denoted by $Y_i(0)$. Only one of the potential outcomes, $Y_i(1)$ or $Y_i(0)$ can be observed for each child. Ordinary least squares estimates give us the simple average outcome difference between the treatment group and the control group: $b_{1OLS} = E[Y_i(1)|F_i = 1] - E[Y_i(0)|F_i = 0]$, which is the average treatment effect (ATE). As the treatment status is the result of self-selection rather than a random assignment, average treatment effect (ATE) is not able to assign the pure effect of treatment. Instead, we need to estimate the average treatment effect on the treated (ATET):

$$b_{1ATET} = E[Y_i(1)|F_i = 1] - E[Y_i(0)|F_i = 1] \tag{2.3.3.3}$$

for which is the difference between expected outcome of the child with the treatment and the expected outcome of the same child if the child receives no treatment.

In order to estimate the average treatment effect on the treated, we need both terms in equation (2.3.3.3). The first term can be observed directly from the data. The second term cannot be observed directly from the data. Instead, the outcome of the control group is used to estimate expected outcome of the child in the treatment group if the child receives no treatment. Using the propensity score matching method, a match from the control group is found for every observation in the treatment group.

In order to estimate the average treatment effect, one needs the assumption that the treatment satisfies some form of exogeneity (Caliendo and Kopeinig, 2008). Different versions of the assumption are referred to as unconfoundedness (Rosenbaum and Rubin, 1983), selection on observables (Heckman and Robb, 1985) or conditional independence assumption (CIA) (Lechner, 1999). Unconfoundedness can be written as

$$Y(0), Y(1) \coprod F|\mathbf{X} \tag{2.3.3.4}$$

where $\coprod$ denotes independence. It means that conditional on a set of observable

covariates $\mathbf{X}$, all potential outcomes $(Y(0), Y(1))$ are independent of the treatment status. Heckman et al. (1998) showed that the assumption of unconfoundedness is overly strong. Lechner (1999) proposed the conditional independence assumption (CIA), which is a weaker assumption than unconfoundedness. Conditional independence assumption (CIA) can be written as

$$Y(0) \coprod F|\mathbf{X} \tag{2.3.3.5}$$

Conditional independence assumption (CIA) means that conditional on a set of observable covariates $\mathbf{X}$, the potential outcomes in the absence of treatment $Y(0)$ are independent of the treatment status. In other words, the outcome of the control group is what the outcome of the treatment group would have been if the treatment group did not receive the treatment. Caliendo and Kopeinig (2008) stated that for estimating the average treatment effect on the treated (ATET), we only need conditional independence assumption instead of unconfoundedness[16].

Caliendo and Kopeinig (2008) mentioned that there is a dimensionality problem for the matching procedure. Increasing the number of observable covariates will increase the number of possible matches exponentially. Rosenbaum and Rubin (1983) showed that if unconfoundedness holds for a set of observable covariates $\mathbf{X}$, unconfoundedness will also hold for some functions of $\mathbf{X}$. Propensity score, the probability of selection into treatment, is one of the possible functions of $\mathbf{X}$. Propensity score can thus reduce the dimensionality of matching procedure from a high dimension to a scalar in the form of probability. allowing the use of the propensity score matching method.

The conditional independence assumption (CIA) indicates that the covariates affecting the potential outcome and treatment status simultaneously must be observ-

[16]Caliendo and Kopeinig (2008) used the name unconfoundedness for controls to indicate conditional independence assumption (CIA).

able. The conditional independence assumption (CIA) is non-testable. The richness of the data enables us to reduce selection bias generated by the unobservables and justify the use of propensity score matching method. The FFCWS contains detailed information of the out-of-wedlock children including characteristics of the biological parents, relationship between the parents, parent-child relationship, socioeconomic activities, and child development. Many important determinants of presence of social fathers are accounted for by the richness of the FFCWS. This provides some justifications of using the propensity score matching method. Apart from that, other studies rely on sensitivity analysis to assess whether the point estimates of the treatment effect are robust. The sensitivity analysis also provides some justifications on the assumption[17].

With the propensity score, the matching algorithm used in my analysis is the kernel matching. Kernel matching is a nonparametric matching estimator that uses a weighted average of almost all observations in the control group to create the counterfactual outcomes for the observations in the treatment group. The weights depend on the choice of the kernel. Smith and Todd (2005) stated that the weights depend on the propensity score distance between the observations in the control group and the targeted observation in the treatment group for which the counterfactual outcome is estimated. A symmetric, nonnegative, unimodal kernel gives higher weight to individuals with propensity scores closer to that of the targeted observation in the treatment group. At the same time, it gives lower weight to individuals with propensity scores further away to that of the targeted observation in the treatment group.

For the propensity score matching method, several choices of kernel are used in this paper, including *Gaussian kernel*, *Epanechnikov kernel* and *uniform kernel*. Different kernels are used because this can show the robustness of the results. Apart from the choice of kernel, results may also be sensitive to the choice of bandwidth. According

[17]The details of sensitivity analysis in this study is in next section.

to Caliendo and Kopeinig (2008), a trade-off would arise depending on the choice of bandwidth. A high bandwidth gives an estimate with higher bias but lower variance while a low bandwidth gives an estimate with lower bias but higher variance. Two bandwidths were used for each kernel respectively. On the other hand, the matching method with replacement is used because of the small sample size. Caliendo and Kopeinig (2008) stated that matching with replacement lead to estimate with lower bias and higher variance.

2.4 Empirical Results

2.4.1 Effects of social father on child's PPVT score

The first step of the analysis is to estimate the propensity scores for having a social father in the households for the sample. A probit model is used to estimate the propensity score, defined as the probability of having a social father in the household. All the aforementioned variables are included in the probit estimation.

A condition of common support is needed for using the propensity score matching method. This can guarantee the observations in the treatment group and those in the control group are comparable with sufficient overlap in their propensity scores. Observations having propensity scores outside the common support region are excluded from the analysis. The common support region has a lower bound and upper bound. The upper bound is defined as the highest propensity score obtained by the observations in the control group. The lower bound is defined as the lowest propensity score obtained by the observations in the treatment group[18]. Using this method, the common support region is $[0.0299251, 0.6773368]$. A total of 833 observations have propensity scores falling within this region.

[18]This method of defining a common support region of propensity score is also used in a study by Liu and Heiland (2012).

Table 2 summarized the results from the probit estimation. The probit estimates showed that several factors have significant effects on the presence of social fathers. For example, social father is less likely to be present if the child is his/her mother's first birth. The reason is because having other children before the focal child may increase the financial need of having a new partner in the household. Also, the child is less likely to have a social father if the biological parents were in a romantic relationship at childbirth. This is consistent with usual behavior as people need time to accept a new partner after just ending a romantic relationship.

The second step of the analysis is to find the estimated effect of having a social father in the household on the well-being of the child. The standardized PPVT score of the child is used as a measure of the child's cognitive development. Table 3 summarized the results on the estimated effect of social fathers on child's PPVT score. Column 1 of the table shows the ordinary least squares estimate for comparison purpose[19]. Column 2 to 7 shows the propensity score matching estimates using *Gaussian kernel*, *Epanechnikov kernel* and *uniform kernel*, each with two different bandwidths.

Using the propensity score matching method, I found that the PPVT scores of children in the household with social fathers are on average significantly lower than those of children in the household without social fathers by 2.7 to 3.7 points[20]. The OLS estimates also showed similar results, though the magnitude of the estimate is generally smaller than that of the propensity score matching estimates[21].

Several factors can explain the negative effect of social fathers on child's PPVT scores. PPVT score is a measure of cognitive abilities. Decreasing maternal time with the child has been found to have harmful effect on child's cognitive abilities (Ruhm,

[19]The detailed ordinary least squares estimate of all other variables on child's PPVT score are presented in Appendix A.1.

[20]Liu and Heiland (2012) found that the marriage of biological parents after childbirth increased the PPVT score of the child by 3.5 to 4.4 points compared to the case if the biological parents had remained unmarried.

[21]The results became insignificant when the definition of social fathers changed by including those who are romantic partners of biological mothers but not living with them. Details on those results are available upon request.

2004). Maternal time with the child is controlled in the analysis by the number of days per week that the mother reads story to child. However, the presence of social father might affect the quality of maternal time with the child. Mothers with new partners may shift some of the focus on the romantic relationship instead of focusing on the only child. Thus, the quality of mother-child time may be worse than before. This can explain the drop in PPVT score for child with social father.

Another possible explanation is the parent's incentive to allocate resources toward the child. Hofferth and Anderson (2003) found that stepparents tend to be less involved with the child compared to biological parents. For single mothers, they focus on their own child and put all the resources on the child. For mothers with new partners, they may plan or already have new child with the new partners. The resources putting on the original child would decrease because of new competition.

2.4.2 Sensitivity analysis

In this section, I checked the robustness of the results using a sensitivity analysis. The purpose of this analysis is to evaluate the change in the results under which the conditional independence assumption (CIA) did not hold. The analysis is not a test but it can provide some justifications of using the propensity score matching method. I followed the work of Ichino, Mealli and Nannicini (2008), who proposed a method to evaluate the sensitivity of the estimates of propensity score matching method. They created different possible situations in which CIA did not hold. They further derived the point estimates under those situations. If the estimates didn't change by much under different situations, the estimates are robust and it justifies the use of propensity score matching method.

The proposed method by Ichino, Mealli and Nannicini (2008) first assumed that the unobservables in the model can be summarized by a binary variable. They further assumed that the unobserved binary covariate U is related to both the treatment

and the outcome for which is a deviation from CIA. The distribution of U is then characterized by specifying some parameters. With the parameters, a predicted value of U is given for each observation, including those in the treatment group and those in the control group. Lastly, the treatment effect is re-estimated using the propensity score matching method by including the binary covariate U in the set of the independent variables. This method allows us to check the robustness of the estimate under different assumption of U.

In the sensitivity analysis, it is assumed that conditional independence assumption (CIA) does not hold. Yet, the CIA holds given the observables $\mathbf{X}$ and the binary covariate U:

$$Y(0) \coprod F|\mathbf{X}, U. \tag{2.4.2.1}$$

In order to characterize the distribution of U, the parameters need to be specified are the probability that $U = 1$ in each of the four groups defined by the outcome value and treatment status. The parameters are the following:

$$Pr(U = 1|F = i, Y^* = j, \mathbf{X}) = Pr(U = 1|F = i, Y^* = j) \equiv p_{ij} \tag{2.4.2.2}$$

with $i, j \in 0, 1$. When the outcome is a continuous variable, a binary transformation of the outcome is needed in which $Y^* = 1$ if the outcome is above the mean. By choosing the four parameters p_{ij}, one can specify the binary covariate U to have a negative effect on the outcome of the control group ($p_{01} - p_{00} < 1$)[22] and have a positive effect on the selection into the treatment group ($p_{1.} - p_{0.} > 0$). This specification of U might influence the estimates of average treatment effect on the treated (ATET) [23]. According to Ichino et al. (2008), the sensitivity analysis included the estimation

[22] I focused on the negative effect on the outcome of the control group because the results showed that the presence of social fathers have a negative effect on the PPVT score.

[23] I followed the work of Ichino et al. (2008) and defined the following: $d = p_{01} - p_{00}$ is the measure of the effect of U on the outcome of the control group; $s = p_{1.} - p_{0.}$ is the measure of the effect of U on the selection into the treatment group.

of the odds ratio of U in the logit model of $Pr(Y^* = 1|F = 0, U, \mathbf{X})$, defined as Γ, to indicate the "outcome effect" of U. Similarly, the odds ratio of U in the logit model of $Pr(F = 1|U, \mathbf{X})$ is estimated, defined as Λ, to indicate the "treatment effect."

After specifying the binary covariate U, the effect of social father on PPVT score is re-estimated using the propensity score matching method with U as an additional independent variable. Table 4 shows the results of the sensitivity analysis. For comparison purpose, the baseline estimate without the covariate U is -2.962. For small treatment effect ($s = 0.1$), the estimate is still significant for very large outcome effect ($d = -0.5$). Similarly, for small outcome effect ($d = -0.1$), the magnitude of the estimates only becomes insignificant for very large treatment effect ($s = 0.5$). Both cases seem not very plausible according to Ichino et al. (2008). Also, the estimate is still significant for a combination of moderate treatment effect ($s = 0.2$) and moderate outcome effect ($d = -0.2$). Thus, the sensitivity analysis showed that the estimates using the propensity score matching method are quite robust under some reasonable deviations of the CIA.

2.4.3 Effects of social father on child's health and behavioral outcomes

I found that the presence of social fathers did not have any significant effect on child's health and behavioral outcomes. Whether the child has asthma is used to indicate the child's health problem[24]. Child is classified as having asthma if the mother was informed by a doctor or health professional that the child has asthma. Child's behavioral outcomes are evaluated by several measures. Items from the Age 2-3 Child Behavior Checklist(CBCL) by Achenbach (1992) were asked in the FFCWS. Mothers responded to each item with the following: 0 = not true of my child; 1 =

[24]Asthma was often used as a measure of child's health outcome (Bzostek and Beck, 2011; Harknett, 2009). Asthma is chosen as a measure of child's health outcome in this paper for the purpose of comparing to past literature.

sometimes / somewhat true; 2 = very/often true. The scores from the items were summed up to calculate Anxious/Depressed and Withdrawn (internalizing behavior) as well as Aggressive and Destructive (externalizing behavior) subscales. A measure to assess child's positive behavior was also included in the survey. Items from the Express subscale of the Adaptive Social Behavior Inventory(ASBI) by Hogan, Scott and Bauer (1992) were asked in the FFCWS. The ASBI subscale can measure children's social competence and prosocial skills with peers and adults. The Cronbach's alphas[25] were calculated for each measure and the numbers showed that the items used in each measure are reliable in the sample[26]. Table 5 presents the summary statistics of health and behavioral outcomes. Summary statistics are reported for the whole sample in the first column. Summary statistics are also reported separately for the sample with social fathers and for the sample without social fathers in second column and third column respectively.

Similar to the analysis on child's PPVT score, the propensity score matching method is used to estimate the effect of social fathers on child's health and behavioral outcomes. Table 6 presents the results of the analysis. I found that the presence of social fathers do not have any significant effect on child's health and behavioral outcomes. The result is unsurprising considering even the presence of biological fathers do not have significant effect on child's health and behavioral outcomes. Liu and Heiland (2012) found that the marriage of biological parents after childbirth did not have any significant effect on child's health and behavioral outcomes at age three. As I have mentioned previously, it is not unusual that the relationship between social father and the child is not as close as the one between biological parent and the child (Hofferth and Anderson, 2003). Thus, the addition of a social father to the household of a single mother may not be beneficial to the child in terms of health and behavioral outcomes.

[25]The Cronbach's alpha examines the internal consistency of a psychometric test score of a sample.
[26]The detailed list of items for each measure is presented in Appendix A.2.

2.5 Conclusion

The study aims to show how the presence of social fathers affects the well-being of out-of-wedlock children. Previous studies focused more on the effect of stepparents on older children or adolescents. This study extends on examining the effect of social fathers to children born to unmarried parents by using a large representative sample of out-of-wedlock children. For these children, the occurrence of social fathers happens early in their life without going through the divorce or separate of the biological parents. This can identify the pure effect of social father's presence independent of the change of family structure or the effect of divorce.

The presence of social fathers is the result of self-selection. To address the selection issue, I used the propensity score matching method for the analysis. I found that the presence of social father has a significant negative effect on child's cognitive abilities, measured by the child's PPVT score. At the same time, the presence of social father has no significant effect on child's health and behavioral outcomes.

The result found in this study may only reflect part of the problem faced by children with social fathers. Because of the widespread of non-marital births, the occurrence of young children living with social fathers would become more common in the future. Any negative effect caused by the social fathers will affect a large portion of the children population. Future research using a wider range of child's outcomes would provide a clearer picture on the effects of social fathers on the well-being of children.

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Tables and Figures

Table 2.1: Summary statistics of the sample

	Sample Mean	With Social Father	Without Social Father
PPVT score of the child	83.91 (15.44)	82.01 (16.63)	84.38 (15.12)
Presence of social father	0.1957 (0.397)	—	—
Child is of low birth weight	0.1092 (0.3121)	0.0982 (0.2984)	0.1119 (0.3155)
Child is a boy	0.533 (0.4992)	0.5521 (0.4988)	0.5284 (0.4996)
Child is mother's first birth	0.4034 (0.4909)	0.3865 (0.4884)	0.4075 (0.4917)
Mother's age	23 (5.03)	21.93 (4.38)	23.26 (5.15)
Mother's age squared	554.2 (264.82)	500.13 (221.19)	567.36 (272.91)
Mother is white	0.1056 (0.3076)	0.1411 (0.3492)	0.097 (0.2962)
Mother is Hispanic	0.1657 (0.372)	0.1411 (0.3492)	0.1716 (0.3774)
Mother is black	0.7095 (0.4543)	0.6871 (0.4651)	0.7149 (0.4518)
Mother is of other race	0.0192 (0.1373)	0.0307 (0.173)	0.0164 (0.1272)
Mother's education: less than HS	0.4406 (0.4968)	0.4847 (0.5013)	0.4299 (0.4954)
Mother's education: HS	0.3169 (0.4656)	0.3252 (0.4699)	0.3149 (0.4648)
Mother's education: some college	0.2185 (0.4135)	0.1534 (0.3615)	0.2343 (0.4239)
Mother's education: college	0.024 (0.1532)	0.0368 (0.1889)	0.0209 (0.1431)
PPVT score of the mother	87.16 (11.19)	87.5 (10.85)	87.07 (11.27)
Mother is working	0.5522 (0.4976)	0.5215 (0.5011)	0.5597 (0.4968)
Prenatal smoking by mother	0.2485 (0.4324)	0.2883 (0.4544)	0.2388 (0.4267)
Prenatal drinking by mother	0.1044 (0.306)	0.1043 (0.3066)	0.1045 (0.3061)
Mother is foreign born	0.036 (0.1864)	0.0368 (0.1889)	0.0358 (0.186)
Mother is Catholic	0.1753 (0.3804)	0.1595 (0.3673)	0.1791 (0.3837)
Mother is Protestant	0.4358 (0.4962)	0.4049 (0.4924)	0.4433 (0.4971)
Mother is of other religion	0.1801 (0.3845)	0.2025 (0.4031)	0.1746 (0.3799)
Mother has no religion	0.2089 (0.4068)	0.2331 (0.4241)	0.203 (0.4025)
Mother attends religious activity	0.5558 (0.4972)	0.5583 (0.4981)	0.5552 (0.4973)
Household income ($<= \$10,000$)	0.3914 (0.4883)	0.362 (0.482)	0.3985 (0.49)
HH's inc. ($\$10,000 - \$25,000$)	0.3601 (0.4803)	0.3374 (0.4743)	0.3657 (0.482)
HH's inc. ($> \$25,000$)	0.2485 (0.4324)	0.3006 (0.4599)	0.2358 (0.4248)
HH's Poverty ratio ($0 - 49\%$)	0.3565 (0.4793)	0.362 (0.482)	0.3552 (0.4789)
HH's Poverty ratio ($50 - 99\%$)	0.2437 (0.4296)	0.2209 (0.4161)	0.2493 (0.4329)
HH's Poverty ratio ($100 - 199\%$)	0.2425 (0.4289)	0.2393 (0.4279)	0.2433 (0.4294)
HH's Poverty ratio ($>= 200\%$)	0.1573 (0.3643)	0.1779 (0.3836)	0.1522 (0.3595)
Days in a week mother reads story	5.2005 (2.1263)	5.3129 (2.1301)	5.1731 (2.126)
No. of adults in household	1.7899 (0.9696)	2.0859 (0.6885)	1.7179 (1.0139)
No. of kids in household	2.4202 (1.4087)	2.4049 (1.3592)	2.4239 (1.4214)
Mother meets depression criteria	0.2533 (0.4352)	0.2209 (0.4161)	0.2612 (0.4396)
Parents in romantic relationship at childbirth	0.7587 (0.4281)	0.6564 (0.4764)	0.7836 (0.4121)
Child uses father's last name	0.7503 (0.4331)	0.7239 (0.4484)	0.7567 (0.4294)
Father's name on birth cert.	0.8451 (0.362)	0.7975 (0.4031)	0.8567 (0.3506)
Paternity established	0.605 (0.4891)	0.5276 (0.5008)	0.6239 (0.4848)
Number of Observations	833	163	670

[a] Source: Author's calculation from Fragile Families and Child Wellbeing Study(FFCWS).
[b] Standard deviations are reported in parentheses.

Table 2.2: Probit estimates of propensity score

Child is of low birth weight	-0.0202 (0.0424)
Child is a boy	-0.0034 (0.0275)
Child is mother's first birth	-0.1013 (0.0345)***
Mother's age	-0.0147 (0.0245)
Mother's age squared	0.0001 (0.0005)
Mother's race (Ref: Other race)	
White	-0.0449 (0.0886)
Hispanic	-0.1232 (0.0658)
Black	-0.1216 (0.1114)
Mother's education (Ref: College)	
Less than High School	-0.1019 (0.0883)
High School	-0.0918 (0.0781)
Some College	-0.1294 (0.0619)*
PPVT score of the mother	0.0004 (0.0014)
Mother is working	-0.0126 (0.0308)
Prenatal smoking by mother	0.0383 (0.036)
Prenatal drinking by mother	-0.0015 (0.0477)
Mother is foreign born	-0.0449 (0.0646)
Mother's religion (Ref: No Religion)	
Catholic	-0.066 (0.0433)
Protestant	-0.0344 (0.0375)
Other religion	0.0115 (0.0452)
Mother attends religious activity	0.009 (0.0291)
Child's Household Income (Ref: $> \$25,000$*)*	
$<= \$10,000$	0.0851 (0.068)
$\$10,000 - \$25,000$	0.1168 (0.1034)
Child's Household Poverty Ratio (Ref: $>= 200\%$*)*	
$0 - 49\%$	0.0988 (0.0657)
$50 - 99\%$	0.0076 (0.0499)
$100 - 199\%$	0.036 (0.0795)
Days in a week mother reads story	0.0061 (0.0066)
No. of adults in household	0.0624 (0.0156)***
No. of kids in household	-0.0111 (0.0122)
Mother meets depression criteria	-0.0473 (0.0301)
Parents in romantic relationship at childbirth	-0.1243 (0.0403)***
Child uses father's last name	0.0306 (0.0376)
Father's name on birth cert.	-0.0242 (0.049)
Paternity established	-0.0444 (0.0316)

[a] ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.
[b] Marginal effects instead of the coefficients are reported.
[c] Standard errors are reported in parentheses.

Table 2.3: Estimated Effect of Social Father on Child PPVT Score

	OLS	*Gaussian*		*Epanechnikov*		*Uniform*	
		0.1	0.01	0.1	0.01	0.1	0.01
Estimate	-2.955**	-2.755*	-3.299*	-3.043*	-3.398*	-3.008**	-3.782**
Standard Error	1.406	1.461	1.699	1.579	1.794	1.492	1.744
No. of Observations treated	163	163	163	163	162	163	162
No. of Observations control	670	670	670	670	666	670	666
% Matched treated	—	100	100	100	99	100	99

[a] ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level. *Denotes statistical significance at the 10% level.
[b] Source: Author's calculation from Fragile Families and Child Wellbeing Study(FFCWS).
[c] Robust standard error is reported for the OLS estimates.
[d] Bootstrap standard errors based on 100 replications are reported for the propensity score matching estimates.

Table 2.4: Sensitivity Analysis on Estimated Effect of Social Father on Child PPVT Score

	s=0.1 $\Lambda \in [1.4, 2]$	s=0.2 $\Lambda \in [2.3, 2.9]$	s=0.3 $\Lambda \in [3.9, 4.7]$	s=0.4 $\Lambda \in [7.2, 9.6]$	s=0.5 $\Lambda \in [18.4, 25.3]$
d=-0.1 $\Gamma \in [0.58, 0.7]$	-2.865**	-2.582**	-2.303*	-2.085*	-1.911*
	(1.608)	(1.426)	(1.647)	(1.404)	(1.343)
d=-0.2 $\Gamma \in [0.37, 0.43]$	-2.633**	-2.212**	-1.707	-1.357	-0.827
	(1.264)	(1.246)	(1.511)	(1.418)	(1.594)
d=-0.3 $\Gamma \in [0.24, 0.28]$	-2.377*	-1.847	-1.038	-0.665	-0.148
	(1.596)	(1.444)	(1.457)	(1.536)	(1.526)
d=-0.4 $\Gamma \in [0.14, 0.17]$	-2.379*	-1.505	-0.591	0.214	1.635
	(1.266)	(1.364)	(1.365)	(1.335)	(1.52)
d=-0.5 $\Gamma \in [0.08, 0.09]$	-1.71	-0.971	0.114	1.565	2.346
	(1.615)	(1.382)	(1.653)	(1.397)	(1.575)

[a] ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level. *Denotes statistical significance at the 10% level.
[b] Source: Author's calculation from Fragile Families and Child Wellbeing Study(FFCWS).
[c] Bootstrap standard errors are reported for estimates.

Table 2.5: Summary statistics on Health outcome and Behavioral outcomes

	Sample Mean	With Social Father	Without Social Father
Asthma	0.2469 (0.4314)	0.2547 (0.4371)	0.2451 (0.4304)
CBCL Internalizing Behaviors	10.66 (6.16)	10.59 (5.66)	10.68 (6.28)
CBCL Externalizing Behaviors	14.97 (8.20)	15.71 (7.93)	14.81 (8.26)
ASBI	15.09 (2.71)	15.11 (2.65)	14.81 (2.72)

[a] Source: Author's calculation from Fragile Families and Child Wellbeing Study (FFCWS).
[b] Standard deviations are reported in parentheses.

Table 2.6: Estimated Effect of Social Father on Child Health and Behavioral Outcomes

	OLS	*Gaussian*		*Epanechnikov*		*Uniform*	
		0.1	0.01	0.1	0.01	0.1	0.01
Asthma							
Estimate	0.0187	0.0119	0.0028	0.0129	0.0026	0.0106	0.0052
Standard Error	0.0401	0.0418	0.0448	0.0433	0.0514	0.0439	0.0499
No. of Observations treated	157	157	157	157	155	157	155
No. of Observations control	661	661	661	661	656	661	656
% Matched treated	—	100	100	100	99	100	99
Internalizing Behavior							
Estimate	-0.5089	-0.4097	-0.3778	-0.5269	-0.3122	-0.5013	-0.3944
Standard Error	0.5659	0.5532	0.7402	0.5719	0.7446	0.6742	0.6653
No. of Observations treated	137	137	137	137	133	137	133
No. of Observations control	598	598	598	598	585	598	585
% Matched treated	—	100	100	100	97	100	97
Externalizing Behavior							
Estimate	0.2815	0.5007	-0.1063	0.3006	-0.1065	0.3221	-0.2347
Standard Error	0.7633	0.7601	0.9964	0.8599	1.046	0.7516	0.9298
No. of Observations treated	134	134	134	134	130	134	130
No. of Observations control	599	599	599	599	587	599	587
% Matched treated	—	100	100	100	97	100	97
ASBI							
Estimate	0.053	0.0716	0.0638	0.0859	0.0933	0.0762	0.0485
Standard Error	0.2676	0.2935	0.3262	0.3035	0.2955	0.2848	0.3104
No. of Observations treated	137	137	137	137	135	137	135
No. of Observations control	605	605	605	605	593	605	593
% Matched treated	—	100	100	100	98	100	98

[a] ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level. *Denotes statistical significance at the 10% level.
[b] Source: Author's calculation from Fragile Families and Child Wellbeing Study(FFCWS).
[c] Robust standard error is reported for the OLS estimates.
[d] Bootstrap standard errors based on 100 replications are reported for the propensity score matching estimates.

2.A Appendix

2.A.1 Detailed Ordinary Least Squares Estimates

Table 2.A.1.1: Ordinary least squares estimates on Child PPVT Score

Social Father is present	-2.9552 (1.406)**
Child is of low birth weight	-4.9895 (1.8008)***
Child is a boy	-1.3836 (1.0442)
Child is mother's first birth	0.1192 (1.3329)
Mother's age	0.9364 (0.9976)
Mother's age squared	-0.0178 (0.0189)
Mother's race (Ref: Other race)	
White	2.7553 (4.1588)
Hispanic	-1.5228 (4.0066)
Black	-1.9058 (3.8356)
Mother's education (Ref: College)	
Less than High School	-4.8764 (3.492)
High School	-4.1371 (3.4011)
Some College	-2.1751 (3.3597)
PPVT score of the mother	0.2712 (0.0591)***
Mother is working	0.263 (1.1785)
Prenatal smoking by mother	-0.2494 (1.3546)
Prenatal drinking by mother	4.073 (1.7195)**
Mother is foreign born	-2.0534 (2.9588)
Mother's religion (Ref: No Religion)	
Catholic	-0.6139 (1.7717)
Protestant	-1.4468 (1.3829)
Other religion	0.5418 (1.7054)
Mother attends religious activity	-0.5531 (1.0921)
Child's Household Income (Ref: $> \$25,000$*)*	
$<= \$10,000$	6.1661 (3.3044)*
$\$10,000 - \$25,000$	4.0105 (2.2599)*
Child's Household Poverty Ratio (Ref: $>= 200\%$*)*	
0-49%	-6.4024 (3.865)*
50-99%	-6.3143 (3.2176)**
100-199%	-1.0021 (2.4602)
Days in a week mother reads story	0.6642 (0.255)***
No. of adults in household	1.1317 (0.5698)**
No. of kids in household	-0.2171 (0.4485)
Mother meets depression criteria	-1.498 (1.246)
Parents in romantic relationship at childbirth	0.0429 (1.2824)
Child uses father's last name	0.517 (1.4784)
Father's name on birth cert.	0.7306 (1.665)
Paternity established	-0.3435 (1.1755)

[a] ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.
[b] Robust standard errors are reported in parentheses.

Table 2.A.1.2: Ordinary least squares estimates on Asthma

Social Father is present	0.0187 (0.0401)
Child is of low birth weight	0.0689 (0.0533)
Child is a boy	0.1232 (0.0301)***
Child is mother's first birth	-0.0555 (0.0436)
Mother's age	0.0124 (0.0254)
Mother's age squared	-0.0003 (0.0005)
Mother's race (Ref: Other race)	
White	0.049 (0.0806)
Hispanic	0.1772 (0.0768)**
Black	0.1659 (0.0718)**
Mother's education (Ref: College)	
Less than High School	-0.0832 (0.104)
High School	-0.0397 (0.1009)
Some College	-0.0926 (0.0961)
PPVT score of the mother	-0.0007 (0.0017)
Mother is working	-0.0351 (0.0329)
Prenatal smoking by mother	0.0326 (0.0398)
Prenatal drinking by mother	-0.0538 (0.0498)
Mother is foreign born	-0.1092 (0.068)
Mother's religion (Ref: No Religion)	
Catholic	0.0142 (0.0548)
Protestant	-0.0279 (0.0442)
Other religion	-0.0038 (0.0522)
Mother attends religious activity	0.0585 (0.032)*
Child's Household Income (Ref: $> \$25,000$*)*	
$<= \$10,000$	0.1717 (0.0905)*
$\$10,000 - \$25,000$	0.0763 (0.0565)
Child's Household Poverty Ratio (Ref: $>= 200\%$*)*	
0-49%	-0.1284 (0.1004)
50-99%	-0.0664 (0.0756)
100-199%	-0.0287 (0.0534)
Days in a week mother reads story	0.008 (0.0072)
No. of adults in household	-0.019 (0.016)
No. of kids in household	0.0098 (0.0132)
Mother meets depression criteria	0.0179 (0.0356)
Parents in romantic relationship at childbirth	0.0033 (0.0388)
Child uses father's last name	-0.0288 (0.044)
Father's name on birth cert.	0.0557 (0.0521)
Paternity established	0.0021 (0.0346)

[a] ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.
[b] Robust standard errors are reported in parentheses.

Table 2.A.1.3: Ordinary least squares estimates on Internalizing Behavior

Social Father is present	-0.5089 (0.566)
Child is of low birth weight	1.1093 (0.7005)
Child is a boy	0.3997 (0.4273)
Child is mother's first birth	-0.0221 (0.6129)
Mother's age	-0.2705 (0.3567)
Mother's age squared	0.0044 (0.0064)
Mother's race (Ref: Other race)	
White	-1.2235 (1.7008)
Hispanic	-1.4204 (1.6675)
Black	-2.4779 (1.5862)
Mother's education (Ref: College)	
Less than High School	3.716 (0.9574)***
High School	2.5347 (0.8535)***
Some College	1.3776 (0.8219)*
PPVT score of the mother	-0.1385 (0.0269)***
Mother is working	-0.7482 (0.4634)
Prenatal smoking by mother	-0.3221 (0.5223)
Prenatal drinking by mother	0.4462 (0.7031)
Mother is foreign born	-2.0638 (1.0415)**
Mother's religion (Ref: No Religion)	
Catholic	-0.2247 (0.8287)
Protestant	0.1238 (0.6305)
Other religion	-0.5901 (0.6752)
Mother attends religious activity	-0.5093 (0.4606)
Child's Household Income (Ref: $> \$25,000$*)*	
$<= \$10,000$	-1.7769 (1.2622)
$\$10,000 - \$25,000$	-1.7389 (0.7943)**
Child's Household Poverty Ratio (Ref: $>= 200\%$*)*	
0-49%	1.5867 (1.3826)
50-99%	0.8516 (1.0586)
100-199%	-0.4525 (0.7897)
Days in a week mother reads story	-0.0941 (0.1105)
No. of adults in household	0.0834 (0.237)
No. of kids in household	-0.0456 (0.204)
Mother meets depression criteria	1.3807 (0.5297)***
Parents in romantic relationship at childbirth	-1.0387 (0.5847)*
Child uses father's last name	-1.4896 (0.6396)**
Father's name on birth cert.	0.5018 (0.8632)
Paternity established	0.3689 (0.4983)

[a] ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.
[b] Robust standard errors are reported in parentheses.

Table 2.A.1.4: Ordinary least squares estimates on Externalizing Behavior

Social Father is present	0.2816 (0.7634)
Child is of low birth weight	1.8349 (1.0099)*
Child is a boy	1.0418 (0.5948)*
Child is mother's first birth	-1.3323 (0.7872)*
Mother's age	-0.0066 (0.5216)
Mother's age squared	-0.0029 (0.0096)
Mother's race (Ref: Other race)	
White	-3.1107 (2.0363)
Hispanic	-2.3013 (1.979)
Black	-3.2684 (1.8755)*
Mother's education (Ref: College)	
Less than High School	2.1082 (2.059)
High School	2.246 (1.9809)
Some College	1.152 (1.9382)
PPVT score of the mother	-0.0739 (0.0338)**
Mother is working	-1.0711 (0.6919)
Prenatal smoking by mother	0.3595 (0.7148)
Prenatal drinking by mother	-0.0719 (1.0347)
Mother is foreign born	-2.0518 (1.8376)
Mother's religion (Ref: No Religion)	
Catholic	0.0101 (1.1148)
Protestant	-0.3208 (0.8396)
Other religion	-0.4414 (0.9747)
Mother attends religious activity	-0.8333 (0.6385)
Child's Household Income (Ref: $> \$25,000$*)*	
$<= \$10,000$	0.6094 (1.7089)
$\$10,000 - \$25,000$	-0.6725 (1.0935)
Child's Household Poverty Ratio (Ref: $>= 200\%$*)*	
0-49%	-1.3617 (1.9528)
50-99%	-0.7485 (1.4991)
100-199%	-1.441 (1.1241)
Days in a week mother reads story	-0.4442 (0.1504)***
No. of adults in household	0.5629 (0.3538)
No. of kids in household	-0.0177 (0.281)
Mother meets depression criteria	1.9663 (0.7219)***
Parents in romantic relationship at childbirth	-1.4974 (0.7868)*
Child uses father's last name	-2.7939 (0.8796)***
Father's name on birth cert.	1.9139 (1.1297)*
Paternity established	0.3238 (0.669)

[a] ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.
[b] Robust standard errors are reported in parentheses.

Table 2.A.1.5: Ordinary least squares estimates on ASBI

Social Father is present	0.053 (0.2677)
Child is of low birth weight	-0.1122 (0.2861)
Child is a boy	-0.4903 (0.19)***
Child is mother's first birth	-0.1361 (0.2615)
Mother's age	-0.4119 (0.1545)***
Mother's age squared	0.007 (0.0028)**
Mother's race (Ref: Other race)	
White	1.1574 (0.7814)
Hispanic	0.71 (0.7603)
Black	0.6371 (0.7395)
Mother's education (Ref: College)	
Less than High School	-1.1243 (0.6499)*
High School	-0.9332 (0.6192)
Some College	-0.6539 (0.6096)
PPVT score of the mother	0.0466 (0.0109)***
Mother is working	0.0406 (0.2068)
Prenatal smoking by mother	0.0014 (0.2379)
Prenatal drinking by mother	0.082 (0.3176)
Mother is foreign born	-0.0049 (0.6313)
Mother's religion (Ref: No Religion)	
Catholic	-0.3083 (0.3581)
Protestant	0.0847 (0.2722)
Other religion	0.6004 (0.2916)**
Mother attends religious activity	-0.0601 (0.196)
Child's Household Income (Ref: $> \$25,000$*)*	
$<= \$10,000$	0.1053 (0.6137)
$\$10,000 - \$25,000$	0.2376 (0.341)
Child's Household Poverty Ratio (Ref: $>= 200\%$*)*	
0-49%	-0.7391 (0.6675)
50-99%	-0.2095 (0.4555)
100-199%	0.0768 (0.3256)
Days in a week mother reads story	-0.0055 (0.0435)
No. of adults in household	-0.107 (0.1042)
No. of kids in household	-0.0248 (0.0919)
Mother meets depression criteria	-0.3195 (0.2265)
Parents in romantic relationship at childbirth	0.2227 (0.2705)
Child uses father's last name	0.3226 (0.2652)
Father's name on birth cert.	-0.3173 (0.3471)
Paternity established	0.3695 (0.2356)

[a] ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.
[b] Robust standard errors are reported in parentheses.

2.A.2 Detailed Description for Items used in Behavior Outcomes

Table 2.A.2.1: Detailed Description for Items used in Behavior Outcomes

	Item Description
Internalizing Behavior ($\alpha = 0.822$)	Clings to adults or is too dependent
	Feelings are easily hurt
	Gets too upset when separated from parents
	Looks unhappy without good reason
	Nervous, high strung, or tense
	Overtired
	Self-conscious or easily embarrassed
	Too shy or timid
	Too fearful or anxious
	Unhappy, sad, depressed
	Wants a lot of attention
	Acts too young for age
	Avoids looking others in the eye
	Doesn't answer when people talk to (him/her)
	Doesn't get along with other children
	Doesn't know how to have fun, or acts like little adult
	Doesn't seem to feel guilty after misbehaving
	Refuses to play games
	Seems unresponsive to affection
	Shows little affection toward people
	Shows little interest in things around (him/her)
	Stubborn, sullen, or irritable
	Uncooperative
	Under active, slow moving, or lacks energy
	Withdrawn -does not get involved with others
	(Continued on next page)

(Continued from previous page)	Item Description
Externalizing Behavior ($\alpha = 0.890$)	Defiant
	Demands must be met immediately
	Disobedient
	Easily frustrated
	Easily jealous
	Gets in many fights
	Hits others
	Has angry moods
	Punishment doesn't change (his/her) behavior
	Screams a lot
	Selfish or won't share
	Has sudden changes in mood or feelings
	Has temper tantrums or hot temper
	Unusually loud
	Whiny
	Can't concentrate, can't pay attention for long
	Cruel to animals
	Destroys his/her own things
	Destroys things belonging to his family or other children
	Gets into everything
	Hurts animals or people without meaning to
	Quickly shifts from one activity to another
ASBI ($\alpha = 0.726$)	Understands others' feelings
	Sympathetic to other children's distress
	Open and direct about what (he/she) wants
	Will join a group of children playing
	Plays games and talks with other children
	Confident with other people
	Tends to be proud of things (he/she) does
	Interested in many and different things

(Continued on next page)

(Continued from previous page)	Item Description
	Enjoys talking with you

Chapter 3

Is Late Parenting Associated with Late Retirement?

3.1 Introduction

The norms for parenthood have drastic changes in recent years. In particular, people are more likely to have children in later ages. Delayed parenthood has been documented in recent literature (Lesthaeghe and Neidert, 2006). The mean age of mother at first birth has risen from 21.8 in 1975 to 25.4 in 2010. Also, the birth rate for women aged 30-34 rose from 52.3 births per 1000 women in 1975 to 96.5 births per 1000 women in 2010. During the same period, the birth rate for women aged 20-24 went down from 113 births to 90 births per 1000 women. The birth rate for women aged 15-19 also went down from 55.6 births to 34.2 births per 1000 women in the same period (Mathews and Hamilton, 2002; Martin et al., 2012). More people will enter the retiring age while their first child is still in college. For example, in Health and Retirement Study(HRS), one out of five children of the respondents lived with their parents. In this group of children, 30% of them were under 18 years of age (McGarry and Schoeni, 1995). With the increasing trend of delayed parenthood, it is interesting to examine how this trend is associated with other major family and individual decisions.

The relationship between timing of parenthood and timing of retirement is not

well understood. With more people facing retirement in the near future, their retirement decisions would have significant impact on the economy. Detailed understanding of how people make their retirement decision is important for policy makers and economists. Factors such as pensions, social security benefits, respondents' characteristics including education level, health status, and wealth level are the most studied determinants in traditional economics studies on retirement decision. Nonetheless, the timing of parenthood and its possible effect on retirement are often neglected. In some of the studies, the timing of parenthood may be more likely to be one of the control variables. It would be of minor interest and no details would be explored about its relationship with the timing of retirement. Another possibility is that the timing of parenthood is completely omitted from the studies. However, if the association between the timing of parenthood and retirement decision significantly exists, its omission may bias the other estimates.

Research on the relationship between timing of parenthood and timing of retirement is lacking. A closely related topic in the relationship between women career outcome and fertility decision has long been investigated by economists[1]. However, not much has been worked specifically on the relationship between the timing of parenthood and retirement decision. Only a few studies on the effect of childlessness on retirement decision was found. In Szinovacz, DeViney, and Davey (2001), the likelihood of retiring for American aged 55-75 were studied. Childlessness is one of the factors investigated in their study. Mixed results were found in their study. The effect of childlessness on the likelihood was different by gender and marital status, which seems to suggest the effect is subgroup-specific. For example, childless nonmarried men were more likely to postpone their retirement because of their lack of family ties. Also, married childless women were relatively less likely to retire.

[1]Examples of this line of research included Mincer (1962), Hofferth (1984), Heckman and MaCurdy (1980), MaCurdy (1981), Hotz and Miller (1988), Bronars and Grogger (1994), Jacobsen, Pearce, and Rosenbloom (1999), Angrist and Evans (1998), Hotz, McElroy, and Sanders (2005), Angrist and Evans (1999), Goldin and Katz (2002), Bailey (2006).

Hank (2004) also analyzed the relationship between childbearing and retirement in Western Germany. The sample consisted of 50-69 women in Western Germany. The major focus of Hank's study was about women's reproductive history. Several variables were used as the indicators of reproductive history including a binary variable of whether the respondent ever had a child, a measure of the number of children, and a binary variable of the timing of fertility for which Hank used age 24 at first birth as the separator between early and late fertility. Hank found that women having children tend to delay their retirement. On the other hand, delayed fertility was also found to lead to delayed retirement for women.

Pienta (1999) also studied the relationship between early childbearing decisions and labor force participation in later life. Women aged 55-64 are the sample in her study. Two major measures of early childbearing decisions were used. The first measure is the number of children ever born to the woman. The other one is the timing of first birth for which age 30 were used as the separator. She found that women who delayed childbearing were more likely to delay their retirement as well. On the other hand, childless women tended to retire earlier relatively.

The purpose of this study is to find the association between the timing of parenthood and the timing of retirement. It is very likely that there exists the possible joint determination of parenthood timing and retirement timing. Without effective method to address this problem, I won't be able to identify the casual effect of parenthood timing on the timing of retirement. Instead of finding the casual effect, the simple association between parenthood timing and retirement timing will be identified.

Using the Health and Retirement Study (HRS), I found that parents who have their first child before or at age 30 retired earlier than parents who have their first child after age 30. The positive association between early parenthood and early retirement still exists for different sub-groups such as college degree holder, non-college degree holder, high net worth group and low net worth group. I also found the association

between late retirement and giving children financial help. The association between late parenting and late retirement still exists but becomes weaker after conditional on giving the children financial help. It seems that part but not all association between late parenting and late retirement is related to giving financial help to the children during retiring age.

Although this study is not able to identify the casual effect between late parenthood and late retirement, a positive association between them is found. It is possible that the timing of parenthood has casual effect on the timing of retirement. With more people delaying their parenthood and a large group of people entering their retiring age, it is very important for policy makers and economists to understand how late parenthood would affect the timing of retirement. Further research is needed to fill this gap.

3.2 Data

The Health and Retirement Study (HRS) is the main data set to be used in this paper. The HRS is a longitudinal survey of households and individuals. The HRS is conducted every two years, and ten waves of the data are now available. The first wave is collected in 1992, containing information on 12,652 individuals from 7,607 households. The whole survey contains detailed information of the individuals such as demographics, family structure and transfers, income and net worth, housing, health and other characteristics related to retirement.

The paper focuses on the association between the timing of parenthood and the timing of retirement. In this paper, early parents are defined as the people who have their first child before or at age 30. Late parents are defined as the people who have their first children after age 30. This definition is used throughout the whole paper. In order to compare the difference between early parents and late parents, a list of

variables will be presented in the result[2].

3.3 Empirical Results

3.3.1 Whole sample

Simple statistics suggest that the age of having the first child have some relationship with the retiring age and the age to claim social security. Individuals who have their first child before the age of 30 tend to retire earlier (61.95) than the people who have their first child after 30 (62.95). Moreover, early parents are more likely to have claimed their social security benefit at age 62 (41.3%) than late parents (32.7%)[3]. Difference in demographics between early parents and late parents is also found. For example, only 18% of early parents have college degree while 30% of late parents have college degree. Table 1 summarizes the difference in characteristics between early parents and late parents.

There are also differences between early parents and late parents on the perceptions of work and retirement. HRS contains questions addressing those issues. In the first wave of HRS, individuals were asked the following two questions about their thoughts on retirement: "Thinking about work generally and not just your present job, what do you think are the chances that you will be working full-time after you reach age 62?"; "And what about the chances that you will be working full-time after you reach age 65?" The respondents give a value ranging from zero to ten, in which zero indicates absolutely no chance and ten indicates absolutely certain. The results of these two questions are displayed in Table 1. For early parents, the average values they gave are 4.78 and 2.58 respectively. Both values are significantly lower than that of late parents which are 5.75 and 3.75 respectively. There is another question asking

[2]Details of the variables are displayed in the tables.

[3]Statistical tests showed that the difference between early parents and late parents are significant. Please refer to the table.

about the perception of health. "What about the chances that your health will limit your work activity during the next 10 years?" Again, the respondents give a value ranging from zero (absolutely no chance) to ten (absolutely certain). The average value of early parents is 4.00 while late parents have an average of 4.02. Both groups have very similar perception of health. Their perception of health does not contribute to the difference in perception of work. Based on the results, it is reasonable to claim that early parents feel that working is less enjoyable than late parents when they approach their retiring age.

A significant portion of children of late parents may still be in college or just graduated from college when their parents are approaching retiring age. Thus, they are more likely to be in need of financial assistance from their parents than the children of early parents. Early parents are on average 12 years younger than late parents when they have the first child. They are also 8 years younger than late parents when they have the last child. Statistics from HRS also showed that late parents are more likely than early parents to give children financial assistance in the past year, about 17 percentage points' difference. Also, the average amount of financial assistance among late parents is significantly larger than that among early parents. Moreover, a question about the chance of giving financial help in the future is asked. "What do you think are the chances that you [or your (husband/wife/partner)] will have to give major financial help to family members during the next 10 years?" Again, respondents gave a value ranging from zero (absolutely no chance) to ten (absolutely certain). The average value that late parents gave (4.79) is significantly higher than that of early parents (4.08).

3.3.2 Conditional on individual's financial situation

The statistics above showed that early parents and late parents have significant differences in the likelihood of giving financial assistance and the amount of financial

assistance to their children. In this section, I take a deeper look on how the timing of retirement associates with individual's financial situation. I first focus on whether the person gives children financial assistance in the past year.

By comparing people who gave children financial assistance in the past year to people who didn't give children financial assistance in the past year, I found that the former retired later (62.01) than the latter (61.48). The difference is statistically significant. Table 2 summarizes the difference in characteristics between these two groups of people. Apart from the timing of retirement, some other differences between these two groups of people can be noticed. One significance difference is the timing of having child. The people who didn't give children financial assistance in the past year are significantly younger (22.28, 29.47) than the other group (23.7, 30.47) when they have the first and last child.

The people who gave children financial assistance in the past year have significant better health than the people who didn't give children financial assistance. The former group has a higher score on average in self-defined health index (0.858 vs. 0.727). They also perceived a lower chance of having limit work activity by bad health in the near future (3.84 vs. 4.09). Similar results were found when they were asked about their chance of living after age 75 and age 85. In sum, having better health is associated with a higher chance to give children financial assistance.

Another difference between the two groups is their earnings and net worth. People who gave children financial assistance have a significantly higher earnings and net worth than the other group. This is consistent with the economic theory as higher earnings and wealth should associate with a higher chance to give the children financial help.

Next, I compare the difference between early parents and late parents conditional on whether they gave children financial help in the past year. Table 3 summarizes the difference in characteristics between early parents and late parents for people

who didn't give their children financial help in the past year. Table 4 summarizes the difference in characteristics between early parents and late parents for people who gave their children financial help in the past year. Data again showed that early parents retired earlier than late parents, though it is no longer statistically significant. They also have a higher chance to claim social security benefit at age 62, which is only significant for people who gave children financial help. One key difference between early parents and late parents after conditional on giving children financial help is that late parents (4.012, 5.361) expected a higher chance to give financial help to family members, compared to early parents (3.263, 4.91).

The association between late parenting and late retirement still exists but is weaker after conditional on giving the children financial help. It seems that part of the association between late parenting and late retirement is related to giving the children financial help during retiring age. When people have the first child at older age, the parents may have a higher chance to give the children financial help when the parents entering their retiring age. In order to be able to meet the financial need of the child, a direct way for the parents is to delay their retirement. This may explain the weaker association between late parenting and late retirement after conditional on giving the children financial help.

The ability of giving out financial assistance may depend on how much the net worth the person has. I further compare the difference between early parents and late parents conditional on their net worth. I divide the sample into two groups. One group has net worth of $100,000 or less while the other group has net worth above $100,000. Table 5 summarizes the difference in characteristics between early parents and late parents for the low net worth group. Table 6 summarizes the difference in characteristics between early parents and late parents for the high net worth group. Again, early parents retired earlier than late parents according to their self-reported retiring age after conditioning on their net worth. Also, a higher percentage of early

parents claimed social security at age 62 than that of late parents for the high net worth group.

Conditional on the net worth, there is also difference between early parents and late parents on the perceptions of work and retirement. For the low net worth group, the average values for the questions on working full-time at age 62 and 65 are 5.11 and 2.81 respectively for early parents. Both values are significantly lower than that of late parents which are 5.9 and 3.87. For the high net worth group, the average values are 4.50 and 2.38 respectively for early parents. Both values are significantly lower than that of late parents which are 5.61 and 3.64. For the question about the perception on health, no difference is found between early parents and late parents for both the low net worth group and the high net worth group. Thus, the perception of health does not contribute to the difference in perception of work. Conditional on the net worth, early parents and late parents have different feeling on working and retirement.

Similar to the whole sample, a significant portion of children of late parents may still be in college or just graduated from college when their parents are approaching retiring age. For the low net worth group, early parents are on average 12 years younger than late parents when they have the first child. They are also 8 years younger than late parents when they have the last child. For the high net worth group, early parents are on average 11 years younger than late parents when they have the first child. They are also 7 years younger than late parents when they have the last child.

Conditional on the net worth, late parents are more likely than early parents to give children financial assistance in the past year, about 16 percentage points' difference for low net worth group and 17 percentage points' difference for high net worth group. Moreover, for the question about the chance of giving financial help in the future, the values for late parents (4.6, 4.9) are significantly higher than those of

early parents (3.9, 4.3).

3.3.3 College degree holder and non-college degree holder

As mentioned above, a significant higher percentage of late parents have a college degree than early parents. Zhivan (2009) suggested that college graduates have less physically demanding job and enjoy working more than non-college graduates. Because of that, non-college graduates will tend to retire earlier than college graduates. In order to focus on the association between timing of parenthood and timing of retirement, I compare the difference between early parents and late parents conditional on whether the individuals have a college degree. Table 7 summarizes the difference in characteristics between early parents and late parents for college graduates. Table 8 summarizes the difference in characteristics between early parents and late parents for non-college graduates.

Consistent with the finding by Zhivan (2009), non-college graduates tend to retire earlier than college graduates according to their self-reported retiring age. Also, non-college graduates are more likely to claim social security at age 62 than college graduates. However, conditional on whether the individual has a college degree, there is also a significant difference in retirement timing between early parents and late parents. For college graduates, a significantly higher percentage of early parents claims social security at age 62 than late parents. For non-college graduates, early parents retire earlier than late parents according to their self-reported retiring age. Also, a significant higher percentage of early parents claims social security at age 62 than late parents.

Similar to the whole sample, there is also difference between early parents and late parents on the perception of work and retirement conditional on the holding a college degree. For the group of college degree holder, the average values for the questions on working full-time at age 62 and 65 are 5.09 and 2.94 respectively for early

parents. Both values are significantly lower than that of late parents which are 6.05 and 4.18. For the group of non-college degree holder, the average values are 4.7 and 2.48 respectively for early parents. Both values are significantly lower than that of late parents which are 5.57 and 3.49. For the question about the perception on health, no difference is found between early parents and late parents for both the group of college degree holder and the group of non-college degree holder. Thus, the perception of health does not contribute to the difference in perception of work. Again, whether the individual is a degree holder or not cannot explain all the difference between early parents and late parents. Even conditional on the status of degree holder, early parents and late parents have different feeling on working and retirement. This difference may be a reason why there exists a difference in retiring timing between these two types of parents.

Similar to the whole sample, a significant portion of children of late parents may still be in college or just graduated from college when their parents are approaching retiring age, no matter whether the parents have college degree or not. For college degree holder, early parents are on average 10 years younger than late parents when they have the first child. They are also 6 years younger than late parents when they have the last child. For non-college degree holder, early parents are on average 12 years younger than late parents when they have the first child. They are also 8 years younger than late parents when they have the last child.

For both the group of college degree holder and the group of non-college degree holder, late parents are more likely than early parents to give children financial assistance in the past year, about 19 percentage points' difference for college degree holder and 10 percentage points' difference for non-college degree holder. Also, the average amount of financial assistance among late parents is significantly larger than that among early parents, no matter whether the individual has college degree or not. Moreover, for the question about the chance of giving financial help in the future, the

values for late parents (5.1, 4.6) are significantly higher than those of early parents (4.4, 3.9).

3.3.4 Conditional on gender

Conditional on gender, there is also significant difference between early parents and late parents. Table 9 summarizes the difference in characteristics between early parents and late parents for male. Table 10 summarizes the difference in characteristics between early parents and late parents for female. It can be seen that a higher percentage of early parents claimed social security at age 62 than that of late parents for both male and female. Early parents also retired earlier than late parents according to their self-reported retiring age for male.

Similar to the whole sample, there is also difference between early parents and late parents on the perception of work and retirement conditional on gender. For male, the average values for the questions on working full-time at age 62 and 65 are 5.25 and 2.94 respectively for early parents. Both values are significantly lower than that of late parents which are 6.06 and 3.99. For female, the average values are 4.32 and 2.20 respectively for early parents. Both values are significantly lower than that of late parents which are 4.81 and 2.97. For the question about the perception on health, no difference is found between early parents and late parents for both male and female. Thus, the perception of health does not contribute to the difference in perception of work. Again, conditional on gender, early parents and late parents have different feeling on working and retirement.

For male, early parents are on average 11 years younger than late parents when they have the first child. They are also 7 years younger than late parents when they have the last child. For female, early parents are on average 12 years younger than late parents when they have the first child. They are also 6 years younger than late parents when they have the last child. A significant portion of children of late

parents may still be in college or just graduated from college when their parents are approaching retiring age for both male and female. Thus, late parents are more likely than early parents to give children financial assistance in the past year, about 14 percentage points' difference for male and 16 percentage points' difference female. Also, the average amount of financial assistance among late parents is significantly larger than that among early parents, for both groups of male and female. Moreover, for the question about the chance of giving financial help in the future, the values for late parents (4.7, 4.7) are significantly higher than those of early parents (4.0, 4.3).

3.3.5 Conditional on individual's timing of having the last child

Apart from having different timing of having the first child, early parents and late parents also differ significantly in their timing of having the last child. In previous section, I found that late retirement is associated with giving the children financial help. The last child is the youngest among all children such that that child may have a higher chance than other children of needing financial help from the parents. Thus, the timing of having the last child may also associate with the timing of retirement.

In this section, I compare people who have their last child before or at age 35 to people who have their last children after age 35. I found that the former retired earlier (61.81) than the latter (62.87). The difference is statistically significant. Moreover, the former is more likely to have claimed their social security benefit at age 62 (41.9%) than the latter (35%). The difference again is statistically significant. The results are very similar to the case when I compare early parents and late parents according to the timing of having the first child. Table 11 summarizes the difference in characteristics between these two groups of people. In sum, the difference between early and late parents defined by the timing of having the last child is very similar to the difference between early and late parents defined by the timing of having the first child.

Next, I compare the difference between early parents and late parents conditional on whether the parents have the last child after age 35. Table 12 summarizes the difference in characteristics between early parents and late parents for people who have the last child after age 35. Table 13 summarizes the difference in characteristics between early parents and late parents for people who have the last child before or at age 35. Data again showed that early parents (62.66, 61.79) retired earlier than late parents (63.33, 62.29) and the difference is statistically significant for people who have the last child after age 35. Early parents (0.37, 0.422) also have a higher chance to claim social security benefit at age 62 than late parents (0.309, 0.362) and the difference is statistically significant. Results showed that the association between late parenting, defined by the timing of having the first child, and late retirement still exists even after conditional on the timing of having the last child.

3.4 Future Direction

This study only finds a positive association between late parenthood and late retirement but is not able to find the casual relationship between the two. Methods used in related research may shed light on future research.

A closely related topic in the relationship between women career outcome and fertility decision has long been investigated by economists. Mincer (1962) was the first of them to examine the relationship and found a negative correlation between fertility and women labor supply. Since then, many studies have investigated the effect of childbearing on all kinds of labor market outcome. Some studies work under a simplified assumption that fertility timing is exogenous both in cross-sectional data (Hofferth, 1984) and panel data (e.g. Heckman and MaCurdy, 1980; MaCurdy, 1981). However, this assumption of exogeneity is too simple and may not be too realistic.

The possible joint determination of fertility and labor market decisions compli-

cates the identification of causality between fertility and labor market outcomes. The simplifying assumption of exogenous fertility timing fails to address the possibility of joint determination. To solve this problem, some studies build parametric structural model of labor supply and fertility and estimate the model using simultaneous equations (e.g. Moffitt, 1984; Hotz and Miller, 1988).

Instrumental variables (IV) method has also been widely used to identify the causal effect of fertility on labor supply. Biological fertility event is one of the instrument candidates. Bronars and Grogger (1994) used the event of having a twin birth as instrument to estimate the effect of unexpected second child on labor force participation for unwed women. Jacobsen, Pearce, and Rosenbloom (1999) applied the same strategy in the model using married women as sample. Angrist and Evans (1998) used the sex composition of the first two children as instrument. Their rationale behind sex composition is that parents favor a mix of sexes. Thus, parents with two same sex children would be more likely to have the third child than those with one boy and one girl. Biological shocks such as miscarriages are also used as instrument (Hotz, McElroy, and Sanders, 2005).

Legislative changes have also been used as instruments in several studies. Angrist and Evans (1999) used 1970 state abortion reforms as instrument to find the effect of fertility on labor force participation. Goldin and Katz (2002) studied the relationship between fertility and labor market participation in an indirect way. They claimed that law changes promoted the freedom of using birth control pill and this freedom enabled women to delay their marriage and invest more in professional occupations. Bailey (2006) used similar strategy as Goldin and Katz (2002). She found that pill use delayed women's motherhood timing and increased women's participation in labor force.

The methods mentioned above, such as instrumental variable method, can be used in the future to estimate the casual relationship between the timing of parenthood

and the timing of retirement. Given a rich data set, information and variables needed for using the instrumental variable method may be available.

3.5 Conclusion

The main objective of this study is to find the association between the timing of parenthood and the timing of retirement. Not many past studies worked specifically on the relationship between the timing of parenthood and timing of retirement. This paper identified the simple association between parenthood timing and retirement timing, rather than identified the casual effect of parenthood timing on the timing of retirement.

The key finding of this study is that early parents tend to retire earlier than late parents. The positive association between early parenthood and early retirement still holds conditional on whether the person has a college degree or not. The positive relationship also holds conditional on the person's net worth. Although part of the association between late parenting and late retirement is related to giving the children financial help during retiring age, the general picture is that late parenting and late retirement is positively correlated.

The positive association between late parenthood and late retirement has important policy implications. This study raises the possibility that the timing of parenthood may have casual effect on the timing of retirement. With a large group of people entering their retiring age and a significant portion of people delaying the parenthood, it is very important for policy makers and economists to understand how the timing of parenthood associates with the timing of retirement. Further research is necessary to fill this gap.

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Tables and Figures

Table 3.1: Individuals' characteristics by timing of parenthood

	Early Parents	Late Parents
Self Reported Retiring Age***	61.95 (5.610)	62.95 (5.694)
Claim Social Security Benefit at 62***	0.413 (0.492)	0.327 (0.469)
Age observed in wave 1 of HRS***	56.22 (4.092)	58.09 (5.752)
College Degree***	0.184 (0.387)	0.302 (0.459)
Male***	0.471 (0.499)	0.746 (0.436)
Age of having first child***	22.94 (3.446)	34.81 (4.066)
Age of having last child***	30.51 (5.869)	38.17 (5.137)
Number of children***	3.338 (1.739)	2.089 (1.247)
Expect to work full time at 62***	4.786 (3.958)	5.751 (3.859)
Expect to work full time at 65***	2.582 (3.391)	3.751 (3.775)
Health is good	0.794 (0.404)	0.782 (0.413)
Mental health is good	0.832 (0.374)	0.828 (0.3778)
Limit work activity by health in next 10 years	4.006 (2.814)	4.025 (2.663)
Chance will live > 75**	6.503 (2.930)	6.735 (2.861)
Chance will live > 85	4.321 (3.194)	4.422 (3.184)
Earnings (in thousand)***	35.41 (37.50)	41.14 (51.19)
Networth (in thousand)***	234.2 (489.6)	281.1 (620.9)
Give child financial assistance in past year***	0.367 (0.482)	0.525 (0.500)
Financial assistance (in thousand)***	1.841 (7.967)	3.613 (10.52)
Give major financial help to family members in next 10 years***	4.079 (3.129)	4.782 (3.410)

[a] Source: Author's calculation from the Health and Retirement Study (HRS).
[b] Standard deviations are reported in parentheses.
[c] Statistical tests on the equality of proportions/mean between early parents and late parents: ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Table 3.2: Individuals' characteristics by whether the parents gave child financial assistance in past year

	Gave financial assistance	Didn't give financial assistance
Self Reported Retiring Age***	62.01 (5.43)	61.48 (5.59)
Claim Social Security Benefit at 62	0.406 (0.491)	0.414 (0.493)
Age observed in wave 1 of HRS***	55.19 (3.5)	55.76 (3.47)
College Degree***	0.256 (0.437)	0.1 (0.3)
Male	0.097 (0.296)	0.089 (0.285)
Age of having first child***	23.7 (4.79)	22.28 (4.32)
Age of having last child***	30.47 (5.45)	29.47 (5.76)
Number of children***	3.094 (1.61)	3.384 (1.936)
Expect to work full time at 62	4.452 (3.869)	4.403 (3.956)
Expect to work full time at 65	2.305 (3.232)	2.349 (3.303)
Health is good***	0.858 (0.349)	0.727 (0.446)
Mental health is good***	0.848 (0.359)	0.777 (0.416)
Limit work activity by health in next 10 years**	3.844 (2.717)	4.092 (2.871)
Chance will live > 75***	7.003 (2.722)	6.331 (3.009)
Chance will live > 85***	4.892 (3.145)	4.335 (3.24)
Earnings (in thousand)***	43.63 (46.01)	23.36 (25.23)
Networth (in thousand) ***	281.7 (537.22)	169.43 (414.09)
Give child financial assistance in past year	1 (0)	0 (0)
Financial assistance (in thousand)	5.19 (12.63)	0 (0)
Give major financial help to family members in next 10 years***	4.953 (3.087)	3.307 (3.078)

[a] Source: Author's calculation from the Health and Retirement Study (HRS).
[b] Standard deviations are reported in parentheses.
[c] Statistical tests on the equality of proportions/mean between early parents and late parents: ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Table 3.3: Individuals' characteristics by timing of parenthood for parents who didn't give child financial assistance in past year

	Early Parents	Late Parents
Self Reported Retiring Age	61.49 (5.6)	61.81 (5.29)
Claim Social Security Benefit at 62	0.416 (0.493)	0.397 (0.491)
Age observed in wave 1 of HRS	55.76 (3.47)	55.94 (3.63)
College Degree*	0.099 (0.299)	0.138 (0.346)
Male***	0.083 (0.276)	0.218 (0.414)
Age of having first child***	21.59 (3.27)	34.07 (3.02)
Age of having last child***	29.04 (5.59)	36.32 (3.73)
Number of children***	3.418 (1.865)	1.753 (0.932)
Expect to work full time at 62	4.417 (3.955)	4.384 (3.917)
Expect to work full time at 65	2.331 (3.298)	2.786 (3.417)
Health is good**	0.735 (0.441)	0.667 (0.473)
Mental health is good	0.779 (0.415)	0.776 (0.418)
Limit work activity by health in next 10 years	4.064 (2.873)	4.327 (2.776)
Chance will live > 75	6.329 (2.979)	6.257 (3.318)
Chance will live > 85	4.346 (3.229)	4.054 (3.228)
Earnings (in thousand)	23.54 (25.19)	24.94 (28.23)
Networth (in thousand)	173.32 (408.8)	124.34 (408.17)
Give child financial assistance in past year	0 (0)	0 (0)
Financial assistance (in thousand)	0 (0)	0 (0)
Give major financial help to family members in next 10 years***	3.263 (3.035)	4.012 (3.595)

[a] Source: Author's calculation from the Health and Retirement Study (HRS).
[b] Standard deviations are reported in parentheses.
[c] Statistical tests on the equality of proportions/mean between early parents and late parents: ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Table 3.4: Individuals' characteristics by timing of parenthood for parents who gave child financial assistance in past year

	Early Parents	Late Parents
Self Reported Retiring Age	61.96 (5.43)	62.51 (5.38)
Claim Social Security Benefit at 62*	0.414 (0.493)	0.345 (0.477)
Age observed in wave 1 of HRS***	55.12 (3.49)	55.89 (3.61)
College Degree***	0.239 (0.426)	0.411 (0.493)
Male***	0.085 (0.279)	0.208 (0.407)
Age of having first child***	22.58 (3.42)	33.81 (3.26)
Age of having last child***	29.87 (5.25)	36.02 (3.71)
Number of children***	3.229 (1.582)	1.792 (1.206)
Expect to work full time at 62*	4.389 (3.868)	5.023 (3.844)
Expect to work full time at 65**	2.245 (3.208)	2.941 (3.438)
Health is good	0.859 (0.349)	0.849 (0.359)
Mental health is good	0.851 (0.356)	0.844 (0.364)
Limit work activity by health in next 10 years	3.81 (2.738)	4.045 (2.483)
Chance will live > 75	7.013 (2.711)	7.006 (2.752)
Chance will live > 85	4.864 (3.134)	5.161 (3.208)
Earnings (in thousand)	43.23 (42.84)	47.89 (68.93)
Networth (in thousand)	281.09 (524.62)	301.22 (655.37)
Give child financial assistance in past year	1 (0)	1 (0)
Financial assistance (in thousand)**	5.02 (12.54)	6.89 (13.75)
Give major financial help to family members in next 10 years**	4.91 (3.048)	5.361 (3.373)

[a] Source: Author's calculation from the Health and Retirement Study (HRS).
[b] Standard deviations are reported in parentheses.
[c] Statistical tests on the equality of proportions/mean between early parents and late parents: ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Table 3.5: Individuals' characteristics by timing of parenthood for low net worth group

	Early Parents	Late Parents
Self Reported Retiring Age**	61.85 (5.616)	62.51 (5.473)
Claim Social Security Benefit at 62	0.377 (0.485)	0.355 (0.479)
Age observed in wave 1 of HRS***	55.91 (4.039)	57.77 (5.793)
College Degree***	0.095 (0.294)	0.168 (0.374)
Male***	0.446 (0.498)	0.719 (0.451)
Age of having first child***	22.42 (3.562)	35.18 (4.291)
Age of having last child***	30.88 (6.359)	38.67 (5.456)
Number of children***	3.631 (1.979)	2.153 (1.406)
Expect to work full time at 62***	5.11 (3.952)	5.908 (3.815)
Expect to work full time at 65***	2.814 (3.514)	3.877 (3.746)
Health is good	0.703 (0.458)	0.692 (0.463)
Mental health is good	0.763 (0.426)	0.771 (0.422)
Limit work activity by health in next 10 years	4.374 (2.855)	4.324 (2.711)
Chance will live > 75	6.107 (3.154)	6.322 (3.145)
Chance will live > 85	4.054 (3.32)	4.213 (3.361)
Earnings (in thousand)**	24.49 (22.52)	26.82 (27.13)
Networth (in thousand)	37.13 (37.66)	34.73 (48.2)
Give child financial assistance in past year***	0.274 (0.447)	0.436 (0.498)
Financial assistance (in thousand)	0.997 (6.285)	1.498 (2.849)
Give major financial help to family members in next 10 years***	3.867 (3.309)	4.638 (3.592)

[a] Source: Author's calculation from the Health and Retirement Study (HRS).
[b] Standard deviations are reported in parentheses.
[c] Statistical tests on the equality of proportions/mean between early parents and late parents: ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Table 3.6: Individuals' characteristics by timing of parenthood for high net worth group

	Early Parents	Late Parents
Self Reported Retiring Age***	62.04 (5.606)	63.34 (5.861)
Claim Social Security Benefit at 62***	0.444 (0.497)	0.306 (0.461)
Age observed in wave 1 of HRS***	56.51 (4.121)	58.39 (5.704)
College Degree***	0.267 (0.443)	0.427 (0.496)
Male***	0.496 (0.501)	0.771 (0.421)
Age of having first child***	23.43 (3.262)	34.48 (3.82)
Age of having last child***	30.17 (5.35)	37.71 (4.783)
Number of children***	3.066 (1.428)	2.031 (1.078)
Expect to work full time at 62***	4.502 (3.942)	5.614 (3.899)
Expect to work full time at 65***	2.381 (3.269)	3.647 (3.8)
Health is good	0.881 (0.325)	0.866 (0.342)
Mental health is good	0.898 (0.303)	0.881 (0.325)
Limit work activity by health in next 10 years	3.692 (2.742)	3.788 (2.604)
Chance will live > 75**	6.87 (2.655)	7.113 (2.519)
Chance will live > 85	4.568 (3.054)	4.613 (3.005)
Earnings (in thousand)***	45.76 (45.16)	54.53 (63.36)
Networth (in thousand)***	421.2 (627.7)	511.4 (796.5)
Give child financial assistance in past year***	0.471 (0.5)	0.644 (0.481)
Financial assistance (in thousand)***	2.782 (9.411)	6.428 (15.31)
Give major financial help to family members in next 10 years***	4.276 (2.938)	4.915 (3.233)

[a] Source: Author's calculation from the Health and Retirement Study (HRS).
[b] Standard deviations are reported in parentheses.
[c] Statistical tests on the equality of proportions/mean between early parents and late parents: ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Table 3.7: Individuals' characteristics by timing of parenthood for degree holder

	Early Parents	Late Parents
Self Reported Retiring Age	62.75 (5.612)	63.35 (5.403)
Claim Social Security Benefit at 62***	0.332 (0.471)	0.245 (0.431)
Age observed in wave 1 of HRS***	56.15 (4.05)	57.33 (5.064)
College Degree	1 (0)	1 (0)
Male***	0.57 (0.495)	0.757 (0.429)
Age of having first child***	24.64 (3.036)	34.4 (3.874)
Age of having last child***	31.03 (5.4)	37.89 (4.806)
Number of children***	2.935 (1.344)	2.096 (1.208)
Expect to work full time at 62***	5.096 (3.851)	6.059 (3.656)
Expect to work full time at 65***	2.945 (3.435)	4.185 (3.684)
Health is good	0.929 (0.257)	0.918 (0.275)
Mental health is good**	0.929 (0.257)	0.895 (0.307)
Limit work activity by health in next 10 years	3.691 (2.608)	3.639 (2.559)
Chance will live > 75	7.118 (2.375)	7.252 (2.253)
Chance will live > 85	4.942 (2.903)	5.092 (2.901)
Earnings (in thousand)*	58.88 (50.69)	64.58 (64.44)
Networth (in thousand)	389.8 (605.6)	444.8 (743.9)
Give child financial assistance in past year***	0.583 (0.493)	0.77 (0.425)
Financial assistance (in thousand)**	4.17 (15.54)	7.507 (18.2)
Give major financial help to family members in next 10 years***	4.48 (3)	5.172 (3.125)

[a] Source: Author's calculation from the Health and Retirement Study (HRS).
[b] Standard deviations are reported in parentheses.
[c] Statistical tests on the equality of proportions/mean between early parents and late parents: ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Table 3.8: Individuals' characteristics by timing of parenthood for non degree holder

	Early Parents	Late Parents
Self Reported Retiring Age***	61.76 (5.594)	62.77 (5.814)
Claim Social Security Benefit at 62***	0.434 (0.496)	0.369 (0.483)
Age observed in wave 1 of HRS***	56.23 (4.102)	58.43 (6)
College Degree	0 (0)	0 (0)
Male***	0.449 (0.497)	0.741 (0.439)
Age of having first child***	22.56 (3.418)	34.99 (4.136)
Age of having last child***	30.4 (5.964)	38.28 (5.273)
Number of children***	3.429 (1.804)	2.086 (1.264)
Expect to work full time at 62***	4.7 (3.983)	5.575 (3.963)
Expect to work full time at 65***	2.481 (3.373)	3.497 (3.808)
Health is good**	0.764 (0.425)	0.723 (0.448)
Mental health is good	0.811 (0.392)	0.799 (0.401)
Limit work activity by health in next 10 years	4.095 (2.864)	4.251 (2.699)
Chance will live > 75	6.362 (3.026)	6.506 (3.066)
Chance will live > 85	4.178 (3.241)	4.123 (3.26)
Earnings (in thousand)	30.13 (31.51)	30.92 (40.15)
Networth (in thousand)	199.2 (452.2)	209.7 (544.2)
Give child financial assistance in past year***	0.328 (0.47)	0.43 (0.496)
Financial assistance (in thousand)*	1.429 (5.56)	2.089 (4.124)
Give major financial help to family members in next 10 years***	3.987 (3.151)	4.611 (3.516)

[a] Source: Author's calculation from the Health and Retirement Study (HRS).
[b] Standard deviations are reported in parentheses.
[c] Statistical tests on the equality of proportions/mean between early parents and late parents: ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Table 3.9: Individuals' characteristics by timing of parenthood for male

	Early Parents	Late Parents
Self Reported Retiring Age***	62.15 (5.707)	63.14 (5.809)
Claim Social Security Benefit at 62***	0.41 (0.492)	0.328 (0.47)
Age observed in wave 1 of HRS ***	57 (4.533)	58.84 (6.104)
College Degree***	0.222 (0.416)	0.307 (0.461)
Male	1 (0)	1 (0)
Age of having first child ***	24.25 (3.116)	35.18 (4.337)
Age of having last child***	32.05 (6.086)	38.93 (5.394)
Number of children***	3.305 (1.693)	2.219 (1.342)
Expect to work full time at 62***	5.252 (3.988)	6.069 (3.791)
Expect to work full time at 65***	2.949 (3.559)	3.998 (3.838)
Health is good	0.801 (0.4)	0.789 (0.408)
Mental health is good*	0.854 (0.353)	0.832 (0.374)
Limit work activity by health in next 10 years	4.066 (2.837)	4.009 (2.682)
Chance will live > 75***	6.341 (3.002)	6.767 (2.798)
Chance will live > 85***	3.963 (3.174)	4.343 (3.173)
Earnings (in thousand)*	39.65 (39.83)	42.63 (53.01)
Networth (in thousand)**	247.46 (510.1)	296.8 (628.9)
Give child financial assistance in past year**	0.372 (0.484)	0.513 (0.503)
Financial assistance (in thousand)**	1.496 (4.478)	2.609 (4.97)
Give major financial help to family members in next 10 years***	4.35 (3.122)	4.778 (3.362)

[a] Source: Author's calculation from the Health and Retirement Study (HRS).
[b] Standard deviations are reported in parentheses.
[c] Statistical tests on the equality of proportions/mean between early parents and late parents: ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Table 3.10: Individuals' characteristics by timing of parenthood for female

	Early Parents	Late Parents
Self Reported Retiring Age	61.76 (5.514)	62.37 (5.311)
Claim Social Security Benefit at 62***	0.416 (4.93)	0.342 (0.469)
Age observed in wave 1 of HRS*	55.52 (3.513)	55.91 (3.818)
College Degree***	0.149 (0.357)	0.288 (0.454)
Male	0 (0)	0 (0)
Age of having first child ***	21.77 (3.304)	33.75 (2.894)
Age of having last child***	29.14 (5.305)	35.91 (3.422)
Number of children***	3.368 (1.779)	1.708 (0.8)
Expect to work full time at 62*	4.329 (3.874)	4.814 (3.916)
Expect to work full time at 65***	2.203 (3.166)	2.978 (3.467)
Health is good	0.789 (0.408)	0.76 (0.428)
Mental health is good	0.813 (0.39)	0.816 (0.388)
Limit work activity by health in next 10 years	3.943 (2.789)	4.079 (2.607)
Chance will live > 75	6.638 (2.862)	6.647 (3.03)
Chance will live > 85	4.62 (3.18)	4.634 (3.208)
Earnings (in thousand)**	31.58 (34.82)	36.69 (45.11)
Networth (in thousand)	222.3 (470.1)	234.2 (595.1)
Give child financial assistance in past year***	0.366 (0.482)	0.528 (0.5)
Financial assistance (in thousand) ***	1.872 (8.213)	3.885 (11.57)
Give major financial help to family members in next 10 years***	3.854 (3.117)	4.793 (3.543)

[a] Source: Author's calculation from the Health and Retirement Study (HRS).
[b] Standard deviations are reported in parentheses.
[c] Statistical tests on the equality of proportions/mean between early parents and late parents: ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Table 3.11: Individuals' characteristics by timing of having the last child

	Have the last child at/before age 35	Have the last child after age 35
Self Reported Retiring Age***	61.81 (5.6)	62.87 (5.66)
Claim Social Security Benefit at 62***	0.419 (0.493)	0.35 (0.477)
Age observed in wave 1 of HRS***	55.97 (3.97)	57.95 (5.17)
College Degree**	0.192 (0.394)	0.212 (0.409)
Male***	0.444 (0.497)	0.685 (0.465)
Age of having first child***	23.27 (3.97)	27.99 (6.96)
Age of having last child***	28.74 (3.99)	40.13 (4.26)
Number of children***	2.953 (1.487)	4.044 (2.274)
Expect to work full time at 62***	4.694 (3.94)	5.629 (3.949)
Expect to work full time at 65***	2.51 (3.353)	3.459 (3.723)
Health is good***	0.802 (0.399)	0.755 (0.43)
Mental health is good***	0.837 (0.37)	0.81 (0.393)
Limit work activity by health in next 10 years	4.005 (2.778)	4.057 (2.868)
Chance will live > 75	6.528 (2.911)	6.526 (2.985)
Chance will live > 85	4.318 (3.184)	4.391 (3.25)
Earnings (in thousand)***	36.79 (38.58)	33.1 (41.62)
Networth (in thousand)**	244.29 (499.12)	219.96 (534.25)
Give child financial assistance in past year	0.371 (0.483)	0.392 (0.489)
Financial assistance (in thousand)	1.9 (8.23)	2.16 (7.6)
Give major financial help to family members in next 10 years***	4.04 (3.091)	4.554 (3.411)

[a] Source: Author's calculation from the Health and Retirement Study (HRS).
[b] Standard deviations are reported in parentheses.
[c] Statistical tests on the equality of proportions/mean between early parents and late parents: ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Table 3.12: Individuals' characteristics by timing of parenthood for people who have the last child after age 35

	Early Parents	Late Parents
Self Reported Retiring Age**	62.66 (5.64)	63.33 (5.65)
Claim Social Security Benefit at 62***	0.37 (0.483)	0.309 (0.462)
Age observed in wave 1 of HRS***	57.55 (4.66)	58.76 (6.03)
College Degree***	0.173 (0.379)	0.299 (0.458)
Male***	0.634 (0.482)	0.802 (0.399)
Age of having first child***	23.88 (3.53)	36.19 (4.39)
Age of having last child***	39.76 (4.12)	40.83 (4.43)
Number of children***	4.81 (2.134)	2.424 (1.374)
Expect to work full time at 62***	5.347 (4.051)	6.159 (3.691)
Expect to work full time at 65***	3.123 (3.642)	4.086 (3.79)
Health is good	0.751 (0.433)	0.771 (0.421)
Mental health is good	0.808 (0.394)	0.817 (0.387)
Limit work activity by health in next 10 years	4.078 (2.963)	4.021 (2.681)
Chance will live > 75**	6.422 (3.046)	6.74 (2.839)
Chance will live > 85	4.339 (3.293)	4.492 (3.15)
Earnings (in thousand)***	30.33 (36.49)	39.47 (50.17)
Networth (in thousand)***	180.14 (428.28)	299.22 (676.64)
Give child financial assistance in past year***	0.372 (0.484)	0.495 (0.501)
Financial assistance (in thousand)***	1.7 (4.53)	3.96 (13.6)
Give major financial help to family members in next 10 years***	4.394 (3.387)	4.921 (3.428)

[a] Source: Author's calculation from the Health and Retirement Study (HRS).
[b] Standard deviations are reported in parentheses.
[c] Statistical tests on the equality of proportions/mean between early parents and late parents: ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Table 3.13: Individuals' characteristics by timing of parenthood for people who have the last child at/before age 35

	Early Parents	Late Parents
Self Reported Retiring Age	61.79 (5.59)	62.29 (5.71)
Claim Social Security Benefit at 62**	0.422 (0.494)	0.362 (0.481)
Age observed in wave 1 of HRS***	55.93 (3.9)	56.87 (4.99)
College Degree***	0.186 (0.389)	0.308 (0.462)
Male***	0.435 (0.496)	0.642 (0.48)
Age of having first child***	22.73 (3.39)	32.28 (1.23)
Age of having last child***	28.48 (3.93)	33.27 (1.37)
Number of children***	3.016 (1.453)	1.474 (0.6)
Expect to work full time at 62*	4.68 (3.931)	5.107 (4.034)
Expect to work full time at 65***	2.475 (3.33)	3.21 (3.693)
Health is good	0.804 (0.397)	0.802 (0.399)
Mental health is good	0.838 (0.369)	0.847 (0.36)
Limit work activity by health in next 10 years	3.992 (2.784)	4.032 (2.639)
Chance will live > 75	6.521 (2.904)	6.725 (2.904)
Chance will live > 85	4.317 (3.173)	4.299 (3.243)
Earnings (in thousand)***	36.52 (37.63)	44.23 (52.94)
Networth (in thousand)	246.09 (501.32)	247.75 (501.42)
Give child financial assistance in past year***	0.366 (0.482)	0.557 (0.498)
Financial assistance (in thousand)**	1.86 (8.38)	3.24 (5.55)
Give major financial help to family members in next 10 years***	4.011 (3.067)	4.534 (3.367)

[a] Source: Author's calculation from the Health and Retirement Study (HRS).
[b] Standard deviations are reported in parentheses.
[c] Statistical tests on the equality of proportions/mean between early parents and late parents: ***Denotes statistical significance at the 1% level. **Denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.