

Father, Mother and Human Capital Investment in Children:

Empirical Evidence from 5 Big Cities of China*

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Abstract

Using data from 5 megalopolises in China, this study gives innovative evidence of how parents invest in their children under strict birth control and in a highly competitive educational system. We consider three forms of human capital investment on children: education expenditure, parental child care, and expenditure on child goods. The results indicate that every form of human capital investment is positively affected by parental education, but the influence of father's and mother's education is asymmetry. Compared with father's education, mother's education has stronger effect on education investment in children, especially on children's chances to accept extra training after school, which is very useful in improving children's opportunities to obtain better education in the future. But mother's education is not significant for care-time and child-good investment on children. On the other hand, a more educated father increases all forms of human capital investment in children. Therefore, the role of paternal education in human capital investment in children cannot be neglected. We do not detect significant sex bias against girls in monetary expenditures, while girls are found to be disadvantaged in receiving care from their mothers.

Keywords: Human Capital Investment; Education; Child Care; Intra-household Allocation; Birth Control; Social Norm

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I Introduction

Human capital investment is essential for both micro- and macro- level development. For individuals and households, investing in human capital is the major approach to increase future income, to promote employment and marriage opportunities, and to improve social status. At the same time, human capital investment is one of the main sources of regional or country-level economic growth.

It is manifest that in most cases the amount of human capital investment an individual receives is determined within family. Especially, the human capital investment decisions that affect the lifelong welfare of individuals and the quality of future labor force are usually made by parents in people's early age. Therefore, a thorough investigation into the effect of parents' individual characteristics on human capital investment in children is meaningful for improving development policies as well as better understanding family behavior.

There has been a considerable body of literature documenting the impact of parents' characteristics on children's human capital, particularly the strong impact of parental education (Mechanic and Hansell, 1987; Kodde and Ritzen, 1988; Burnhill, 1990; Thomas, 1996; Kassouf and Senauer, 1996; Altonji and Dunn, 1996; Tansel, 1997; Mukherjee and Das, 2008; Heard et al., 2008; Khanam, 2008). Some earlier studies discovered that maternal education plays a more important role than paternal education in determining children's human capital formation (Thomas et al., 1991; Behrman et al., 1999; Behrman and Skoufias, 2004; Brown, 2006; Kurosaki et al., 2006). Sex bias against girls in human capital investment in developing countries is reported by a number of empirical researches (Bian, 1996; Song, 1999; Aslam and Kingdon, 2008), but is rejected by some other researches (Deaton, 1989; Haddad and Reardon, 1993; Subramaniam, 1996). Nonetheless, there is evidence that mother's education has a bigger impact on daughters than on sons (Thomas, 1994; Lillard and Willis, 1994; Rubalcava and Contreras, 2000; Emerson and Souza, 2007).

Parental, or maternal, education may promote human capital investment through various channels. First, more educated parents have higher incomes, thus possess more economic resources available for non-necessary goods and have more accesses to credit. Second, more educated parents may have higher expectation of returns to human capital investment and stronger preferences for investing in children. Third, mothers are more focused on looking after children and other intra-family activities than fathers in accordance with the principle of efficiency. More educated mothers invest more money and more time on children, or are more effective in child care and home teaching. Forth, mothers are more concerned with their children's prosperity than fathers due to the difference in preferences; more educated mothers have greater say or bargaining power in intra-family decisions so they can allocate more family resources on children, particularly on girls.

The latter two kinds of effect of maternal education are difficult to be distinguished from each other by econometric analysis. However, the first effect of parental education, i.e., the income effect, can be excluded by controlling for parents' individual incomes, but relatively few empirical studies have done so because of data limitations.

In this paper, we re-explore the effect of parents' individual characteristics on human capital investment in children on the basis of data from 5 big Chinese cities. This study contributes to the literature in three ways. First, we examine the effects of more parents' individual characteristics. In addition to parental education, we add three groups of other variables: ages, individual incomes, and social communication of parents. Each of them reflects an important aspect of parental motive and/or constraint of investment on children. Also, the effect of parental education will be more clearly revealed with these factors being controlled for. Second, we use multiple variables representing various forms of human capital investment on children. Human capital investment takes many forms, among which education in school is most frequently studied. Besides, other activities that help to ameliorate individuals' potential economic returns, such as formal or informal training, medical treatment and health care, and migration, are generally regarded as human capital investment, too (Schultz, 1961). In this paper we consider three forms of human capital investment on children: education expenditure, parental child care, and expenditure on child goods, which is indirectly measured by expenditure on adult goods. The empirical results can provide more comprehensive information on the issue of our interest. Third, few relevant

researches have focused on advanced areas in developing countries. Being affected by social norms and public policies, parents' behavior pattern in intra-household resource allocation is changeable in the process of socioeconomic development. Using data from 5 megalopolises in China, this study gives innovative evidence of how parents invest in their children under strict birth control and in a highly competitive educational system.

The rest of this paper is organized as follows. Section II briefly describes the family planning policy and the primary and secondary education systems in urban China, especially in big cities. Section III explains the empirical strategy. Section IV introduces the data and gives some simple statistics. The empirical results and discussion on the results are presented in section V and section VI, respectively. At last, section VII concludes.

II Background

China has been adhering to the "one family, one child" family planning policy since 1979. The implementation of this policy, however, has been divergent between rural and urban areas, as well as between different provinces. Generally speaking, birth control is more stringent in urban area than in rural area, more rigid in economically advanced provinces than in backward provinces. It is well known that in rural area of China, a second child is permitted if the first child is a girl. In some urban areas, a second child is also permitted if the parents "are experiencing significant hardship" because they have only one child - the definition of "hardship" being left to the discretion of the local cadres (Attane, 2002). But in big cities, especially in the capital cities of provinces other than minority autonomous regions, the one-child policy has been strictly enforced. In such big cities, parents suffer a large fine if they have a second child. If a parent is a member of the Communist Party or a cadre, a second child would lead to disciplinary punishments, such as expulsion from the Party or deprive of administrative duties. Sometimes a parent loses job because of a second child if he or she has been working in the government, in a public institution or in a state-owned enterprise. Even so, the second child cannot be registered in the Hukou system, which means the child is not recognized as a resident of the city. Since Hukou is the prerequisite of getting many public services in cities, the direct consequence of not being registered in the Hukou system is higher costs in every step of the child's growth, such as receiving epidemic prevention, getting into kindergarten, going to school, etc. Due to these tough measures, the occurrence of

second children in big cities is much lower than the national average level. However, fetal sex detection and sex control before birth is prevailing in urban area because of boy preference.

The change in family structure as a result of family planning policy has greatly affected parents' behavior. In China, the only child in a family is often described as "little emperor", because parents and grandparents are always ready to try their best to satisfy any desire of the child. Typically, after a child is being born, a grandmother would live with the parents for several years to help the mother taking care of the child. Some families employ a nanny if the economic and dwelling conditions permit. Fathers take care of children, too, but in most cases fathers' care is subsidiary, concentrating on easy or not-so-boring tasks.

It is conceivable that in big Chinese cities parents pay great attention to children's education. In fact, children's education has become the major expenditure item for families in big cities. The Law on Nine-Year Compulsory Education which took effect on 1986 guarantees school-age children the right to receive at least 9 years of education - 6 years in primary school and 3 years in junior high school. However, owing to the deficiency of public educational expenditures, public primary and junior high schools had not stopped requiring tuition and fees until 2007. More important, parents hope their children to enter better schools so that they can be more competitive in the future college entrance examination. A widespread saying voices the aspiration of parents: "we cannot let our children lose at the starting line". To succeed in the college entrance examination, children should go to a "keypoint" senior high school; to go to a "keypoint" senior high school, children should first go to a "keypoint" junior high school and a good primary school. As a matter of fact, the effort of obtaining better educational opportunities for children has started since the pre-school stage. Theoretically, children should go to primary and junior high schools in their neighborhoods without choice. The junior high school entrance examination has been cancelled in all big and medium-sized cities since 1993. However, in order to enter a better junior high school, many primary school graduates take part in so-called "selecting-school" examinations, which is forbidden by formal rules and regulations but is in prevalence in a lot of cities. Moreover, many keypoint schools recruit a certain number of "unplanned" students, on the condition that the parents of those students give a big sum of "donations" to the school. After the 9-year compulsory education, children take a high school entrance examination and go to different senior high schools in their city according to their points. In recent years the high school entrance examination

is regarded by many parents to be more important and more severe than the college entrance examination. Senior high schools accept “unplanned” students and donations, too, but these donations have exceeded most urban families’ economic capacity. To help children enter a better junior or senior high school, many parents send their children to after-school classes, including tutorial classes, Mathematical Olympiad classes, and “interest classes”. Tutorial classes focus on strengthening the knowledge taught in school and improving exam skills; Mathematical Olympiad classes teach students special mathematical problem-solving skills to help them prepare for the International Mathematical Olympiad and different levels of domestic Mathematical Olympiad; “interest classes” give training in singing, dancing, instrumental playing, drawing, etc. Seemingly irrelevant with formal education, Mathematical Olympiad classes and “interest classes” are actually very useful for parents who hold high hopes for their children, because a student can get extra points in selecting-school examination and senior high school entrance examination if he or she has won a medal in Mathematical Olympiad or has passed an art test. More than this, some “interest classes” have special relationship with keypoint schools and promise to help parents send their children to a certain keypoint school, at least to lower the required “donation” for parents. Other possible education investment includes hiring private tutors, sending children to English summer camps, and so on. In brief, the education investment on children of urban families, especially families in big cities, may vary a lot depending on the decision of parents.

III Empirical Method

The basic econometric model used in this study is:

$$INV = \beta_0 + \beta_1 FATHER + \beta_2 MOTHER + \beta_3 KID \quad (1)$$

Where INV stands for a certain form of human capital investment on a child; FATHER and MOTHER are vectors representing the personal characteristics of father and mother, respectively; KID is a vector of children’s characteristics. The names and definitions of variables are given in table 2.

Subject to data availability, we adopt 6 measures of human capital investment, namely INV is translated into 6 dependent variables.

A straightforward indicator of parents’ investment in children’s human capital is the education expenditure on each child. This is the first INV variable we adopt (EDU_COST).

However, education expenditure consists of various parts that play different roles in children's human capital accumulation. In China's present education system in big cities, taking additional training is an important kind of investment that improves children's opportunity to obtain better education in the future. Therefore, we construct a dummy (IF_EXTRA) that indicates if a household spends more than what school requires on children's education. Since this variable represents a 0-1 choice, we use Probit model to estimate its relationship with the explanatory variables.

Besides education, time spent on taking care of children is a form of human capital investment in children that cannot be ignored (Donovan and Watts, 1990). In fact, as parents' non-monetary investment in children, childcare time is no less important than monetary investment in some sense. Sometimes parents can find or employ somebody else to take care of their children, but the care directly from parents has special meaning for children's growth and cannot be fully substituted by care from other people (Doherty, 1996). Furthermore, it is generally believed that for the sake of children's mental health and development of social skills, both father's care and mother's care are necessary (Pruett, 2000). Considering the miscellaneous activities contained in "taking care of children" and the difficulty of extracting "real" human capital investment from the total care time, we construct two dummy variables (FA_CARE and MO_CARE) showing whether or not children are regularly taken care of by father and by mother. For these two dependent variables, again, Probit model is used.

The last group of INV variables are household's annual expenditure on cigarettes and wines (CIG_WINE) and its share in total household expenditure (CG_SHARE). These two variables are indirect indicators of household resources allocated on children, because cigarettes and wines are typical adult goods crowding out expenditures on children. Since the observed values of these two variables are truncated at 0, we use Tobit model to avoid estimation bias.

On the right hand side of equation (1), FATHER and MOTHER are composed of 4 variables depicting parents' individual characteristics, respectively. Among them, FA_AGE and MO_AGE are parents' ages; FA_EDU and MO_EDU are parents' years of schooling; FA_INC and MO_INC are parents' annual labor incomes; FA_SC and MO_SC are parents' situations of social communication, proxied by the number of relatives and friends he or she contacted during the past year. By estimating β_1 and β_2 , the effect of parents' individual characteristics on human capital

investment in children will be quantified.

Of course, parents always take their children's features into account in making human capital investment decisions, since the returns, sometimes the costs of the investment are greatly affected by children's features. Therefore in equation (1) we introduce KID, which consists of 4 variables: number of children in the household (KID_NUM), ratio of boys in all children (KID_SEX), children's average age (KID_AGE) and its quadratic term (KID_AGESQ). It should be noted that for more than 95 percent observations in the sample, the "average" values of children's sex, age, education costs, etc., are actually the practical values of the only child in the family.

It is obvious that parents have to allocate resources within their budget constraint. Due to the different income- or wealth- elasticities of various demands, the resource allocated to each demand, including human capital investment in children, may differ when the budget constraint changes. As flows within short term, the two variables reflecting household incomes in equation (1) (FA_INC and MO_INC) probably are not accurate measure for household's economic resources. To test the robustness of the estimated results of equation (1), we introduce household wealth as a control variable:

$$INV = \beta_0 + \beta_1 FATHER + \beta_2 MOTHER + \beta_3 KID + \beta_4 HH \quad (2)$$

Where HH is a vector comprised of household wealth (WEALTH) and household size (HH_SIZE).

Another problem is that socioeconomic factors outside families influence parents' decision of human capital investment in children, too. On the cost side, the price level of investment inputs is exogenous to families. On the benefit side, the future return of human capital investment in children depends on many social factors. For instance, the probability of getting return from educating a daughter is restricted by the structure of labor market, marriage market, laws, and social norms. It goes without saying that most of these social factors are very difficult, if not impossible, to measure and analyze quantitatively. However, since the data used in this paper were collected in 5 big cities, each of which is located far from the other 4 cities and has its own distinct local culture, we can partly control for social factors by controlling for city fixed effects:

$$INV = \beta_0 + \beta_1 FATHER + \beta_2 MOTHER + \beta_3 KID + \beta_4 HH + \beta_5 CITY \quad (3)$$

Where CITY stands for city dummies.

Some previous studies found that human capital investment in children depends on both

parents' and children's genders. To test the difference between the effects of father's and mother's education on human capital investment in boys and girls, we introduce two interaction terms of parents' education and children's gender:

$$\begin{aligned} \text{EDU_COST} / \text{IF_EXTRA} = & \beta_0 + \beta_1\text{FATHER} + \beta_2\text{MOTHER} + \beta_3\text{KID} + \beta_4\text{HH} \\ & + \beta_5\text{FA_EDU}*\text{KID_SEX} + \beta_6\text{MO_EDU}*\text{KID_SEX} + \beta_7\text{CITY} \end{aligned} \quad (4)$$

Equation (4) will be estimated when education investments are assessed.

IV Data

The data used in this paper are drawn from China Urban Labor Survey (CULS) conducted by Chinese Academy of Social Sciences at the end of year 2001. This survey covered 3494 households in 5 big cities: Shanghai, Wuhan, Shenyang, Fuzhou, and Xi'an. As one of the four municipalities directly under the central government, Shanghai is the most modernized region in China. The other 4 cities, located respectively in middle region, northeast, southeast, and the west, are all provincial capitals, which are on the top level of economic development in each province. So we can say that this dataset reflects the situation of the most economically advanced part in urban China, while there are considerable disparities in income level and living standard between the 5 cities. A brief overview of the 5 cities is provided in table 1.

Table 1 Background Information on the 5 Cities in the Sample (Year 2000)

	Shanghai	Wuhan	Shenyang	Fuzhou	Xi'an	China
Province	-	Hubei	Liaoning	Fujian	Shaanxi	-
Location	East	Middle	Northeast	Southeast	West	-
GDP per capita ^a	40.6	16.21	16.43	31.46	9.48	7.08
Population ^b	14.78	7.49	4.85	6.39	6.88	1265.83
Natural Popu. growth rate	-0.3‰	1.95 ‰,	1.15‰	5.67‰	4.67‰	7.58‰

Notes: ^a in 1000 RMB Yuan.

^b in 1 million people.

Data sources: *China Statistical Yearbook, 2001*; China Provincial Statistical Yearbooks; city Statistical

Yearbooks.

For the purpose of this study, we exclude households without children under 18 years of age, one-parent families, and single-person families. At last, the effective sample size is 1352. The descriptive statistics of the sample are shown in table 2.

Table 2 Statistical Summary

Var. Name	Definition	Mean	S. D.	Min.	Max.
EDU_COST ^a	Average education expenditure per child in the past year	2.52	3.27	0	45.3
IF_EXTRA	=1, if there is extra education expenditure other than school-required; otherwise=0	.36	.38	0	1
FA_CARE	If father spends some time on taking care of children every day	.53	.50	0	1
MO_CARE	If mother spends some time on taking care of children every day	.71	.45	0	1
CIG_WINE ^a	Annual expenditure on cigarettes and wines	1.10	1.33	0	12
CW_SHARE ^b	Share of expenditure on cigarettes and wines in total household expenditure	7.43	7.62	0	45.35
KID_NUM	Number of children (under age 18) in the household	1.05	.22	1	3
KID_SEX	Ratio of boys in all children in the household	.52	.49	0	1
KID_AGE	Average age of all children in the household	11.44	4.96	0	18
KID_AGESQ	Square of children's average age	155.4	101.8	0	324
FA_AGE	Father's age	40.69	5.87	24	66
MO_AGE	Mother's age	38.28	5.95	20	61
FA_EDU	Father's year of schooling	11.37	3.01	0	20
MO_EDU	Mother's year of schooling	10.99	2.72	0	19
FA_INC ^a	Father's annual labor income	11.62	13.52	0	360

MO_INC ^a	Mother's annual labor income	7.57	7.39	0	84
FA_SC	Father's social communication, measured by the number of relatives and friends contacted during the past year	31.52	42.42	0	770
MO_SC	Mother's social communication	23.29	27.14	0	557
WEALTH ^a	Total estimated current value of consumer durable goods and productive assets	26.64	74.68	.01	1375
HHSIZE	Household size	3.44	.80	3	7
CITY	City dummies taking the values of 0 or 1				
Shanghai		.17	.38	0	1
Wuhan		.23	.42	0	1
Shenyang		.19	.39	0	1
Fuzhou		.23	.42	0	1
Xi'an		.18	.39	0	1

Notes: ^a the values of all monetary variables are divided by 1000.

^b multiplied by 100.

From simple statistics, we can get some important information on socioeconomic situation in developed urban area in China. As shown in table 3, women who have children under age 18 are more likely to have a job, although their average labor income is slightly lower than women who are employed but without children. However, *t*-test indicates that the disparity in average income between women with or without children is not statistically significant ($t = .68$). For men, the differences in employment rate and average income between those who have children and those who have no children are only marginal. Meanwhile, the income gap between working men and women are significant ($t = 9.62$).

Table 3 Adults' Current Employment Status

	Men		Women	
	Employment rate	Average Income ^b	Employment rate	Average Income ^b

Whole dataset (6959 adults ^a)	87.02%	12561.34	70.87 %	9554.44
Our Sample (2704 adults ^a)	91.64%	12682.82	88.46%	9376.01

Notes: ^a“adults” here refers to people aged from 19 to 66.

^b the average income of employed.

Despite the high employment rate of women in the sample, they bear much heavier burden of care giving and other housework than men. Table 4 compares the times spent on intra-household work of men and women in the sample.

Table 4 Time Spent on Child care, Care for Old Age, and Other Housework
(Hours per Day)

	Men	Women
Child care	1.23	2.51
Care for Old Age	.43	.57
Other Housework	1.34	2.99

There are signs of sex selection before birth in the sample. From table 5 we can see that the sex ratio of children in both one-child and two-child families are markedly higher than normal level, and two-child families show a stronger preference for boys.

Table 5 Sex Ratio of Children: Boys vs. Girls*

	One-child families	Two-child families
First child	1.07 (657:614)	1.10 (32:29)
Second child	-	1.18 (32:28)

Notes: * 20 Families with children above 18 years old who are not currently living at home are excluded from this table for lack of information on such children’s gender.

V Empirical Results

The regression results of equation (1), (2), (3) and (4) with education investment as dependent variables are presented in table 6. For education expenditure per child, the estimates of parental education and father's age are significantly positive, even when household wealth and city-fixed effect are controlled for; the coefficients of parental incomes are also positive, but mother's income loses significance once household wealth is add to the regression model; child's characteristics are not significant determinants of total education expenditure. On the contrary, child's age is highly significant for parents' decision of whether or not to invest in extra training after school. It can be calculated using the estimated coefficients of KID_AGE and KID_AGESQ that the probability of investing in extra training maximizes when the child is 10.4 years old. Given that most Chinese children graduate from primary school at the age of 11 or 12, it can be inferred that the primary goal of such extra spending is promoting children's competitiveness in the selecting-(junior high)school examinations. Again, parental education is significantly positive, but mother's education is remarkably more significant and has stronger effect on the dependent variable. Moreover, mother's income is significant, although the significance and magnitude of its estimated coefficient decrease when household and city variables are controlled for.

No significant sex bias or interaction between parents' education and children's gender is detected. However, consistent with earlier studies, the signs of the interaction terms show that father's education has larger effect on son's education investment, while mother's education has larger effect on daughter's education investment.

Household wealth has significant positive effect on education expenditure per child, while it is insignificant in promoting the probability of spending more money on children's education than school required. As for social factors affecting human investment in children, the estimation of city dummies show that households in Shanghai significantly invest more in children's education than households in other cities.

Table 6 Determinants of Education Investments

Dep. Variable	EDU_COST	IF_EXTRA
Reg. Model	OLS	Probit

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
KID_NUM	-.06 (-.15)	-.29 (-.69)	-.13 (-.32)	-.15 (-.37)	-.02 (-.12)	-.07 (-.38)	.02 (.09)	.01 (.06)
KID_SEX	.15 (.85)	.15 (.85)	.12 (.68)	-.03 (-.03)	.01 (.17)	.01 (.18)	.004 (.05)	-.49 (-1.36)
KID_AGE	.005 (.07)	.03 (.39)	.03 (.45)	.03 (.43)	.47*** (10.69)	.47*** (10.75)	.47*** (10.75)	.47*** (10.72)
KID_AGESQ	.004 (1.03)	.003 (.74)	.003 (.87)	.003 (.85)	-.02*** (-11.6)	-.02*** (-11.6)	-.02*** (-11.6)	-.02*** (-11.6)
FA_AGE	.08** (2.56)	.08*** (2.65)	.07** (2.11)	.07** (2.08)	.01 (.44)	.01 (.48)	.00 (.07)	.00 (.09)
MO_AGE	.02 (.59)	.02 (.67)	.01 (.19)	.01 (.26)	.02 (1.21)	.02 (1.25)	.01 (.95)	.015 (1.00)
FA_EDU	.07* (.185)	.07** (1.98)	.08** (2.26)	.03 (.56)	.03* (1.87)	.03* (1.92)	.03** (2.20)	.02 (.88)
MO_EDU	.10** (2.37)	.10** (2.36)	.10** (2.44)	.15** (2.53)	.06*** (3.31)	.06*** (3.30)	.06*** (3.42)	.05*** (2.13)
FA_EDU* KID_SEX	-	-	-	.01 (1.45)	-	-	-	.03 (.94)
MO_EDU* KID_SEX	-	-	-	-.09 (-1.19)	-	-	-	.015 (.43)
FA_INC	.02*** (3.10)	.01** (2.07)	.01* (1.75)	.01* (1.75)	.002 (.94)	.002 (.64)	.001 (.34)	.001 (.32)
MO_INC	.02* (1.71)	.02 (1.50)	.004 (.30)	.003 (.25)	.02*** (2.96)	.02*** (2.91)	.01* (1.87)	.01* (1.89)
FA_SC	.001 (.62)	.001 (.49)	.002 (.78)	.002 (.80)	.001 (1.05)	.001 (1.03)	.001 (1.38)	.001 (1.34)
MO_SC	-.001 (-.14)	.00 (.02)	.001 (.38)	.001 (.39)	-.00 (-.37)	-.00 (-.31)	-.00 (-.19)	-.00 (-.12)

WEALTH	-	.003** (2.30)	.003** (2.02)	.003** (2.01)	-	.00 (.56)	.00 (.27)	.00 (.29)
HHSIZE	-	.21* (1.74)	.08 (.69)	.08 (.71)	-	.04 (.76)	-.00 (.06)	-.00 (.08)
SHANGHAI	-	-	1.23*** (4.06)	1.25*** (4.10)	-	-	.57*** (4.25)	.57*** (4.26)
WUHAN	-	-	-.26 (-.96)	-.25 (-.94)	-	-	.14 (1.22)	.15 (1.23)
SHENYANG	-	-	-.10 (-.35)	-.10 (-.34)	-	-	.18 (1.46)	.18 (1.43)
FUZHOU	-	-	-.38 (-1.39)	-.37 (-1.34)	-	-	.04 (.34)	.04 (.31)
C	-4.4*** (-4.20)	-5.3*** (-4.62)	-3.9*** (-3.26)	-3.8*** (-3.07)	-4.4*** (-8.78)	-4.5*** (-8.47)	-3.7*** (-6.57)	-4.1*** (-6.97)
Adj./Pseudo R ²	.08	.09	.11	.11	.13	.13	.14	.14
Sample size	1352	1352	1352	1352	1352	1352	1352	1352

Notes: *t* or *z* statistics are given in parentheses.

*, **, *** stand for significance at .1, .05, .01 level, respectively.

Table 7 indicates the estimated results of determinants of whether or not father or mother regularly takes care of children. Both fathers and mothers are significantly more probable to spend some time every day in taking care of children when children are younger, but the effect of children's age on mother's care decision is more intense: for mothers, KID_AGESQ is significantly negative instead of KID_AGE. Father's education has significant favorable effect on both father's and mother's care decisions. In addition, fathers are more likely to take care of children when they are more active in social communication, or have lower incomes. The positive sign of KID_SEX indicates that both fathers and mothers tend to regularly take care of boys more than girls, albeit for fathers this variable does not reach the commonly required level of significance.

Household wealth is insignificant, while it has marginal influence on the estimation of other explanatory variables. Parents living in western region (Xi'an) are more inclined to take care of their children than parents in eastern and middle regions. This phenomenon might reflect effects of cultural factors as well as economic causes. Child care is time consuming therefore negatively affected by time costs, which is relatively lower in less developed region like the west.

Table 7 Determinants of Time Investments

Dep. Variable	FA_CARE			MO_CARE		
	Probit			Probit		
Reg. Model	(1)	(2)	(3)	(4)	(5)	(6)
KID_NUM	.30* (1.83)	.31* (1.74)	.28 (1.52)	.16 (.87)	.21 (1.07)	.20 (.99)
KID_SEX	.09 (1.24)	.09 (1.22)	.09 (1.21)	.18** (2.26)	.18** (2.24)	.17** (2.05)
KID_AGE	-.07** (-2.07)	-.08** (-2.22)	-.09** (-2.44)	-.01 (-.15)	-.01 (-.24)	-.03 (-.69)
KID_AGESQ	-.002 (-.95)	-.001 (-.78)	-.001 (-.75)	-.006*** (-3.26)	-.006*** (-3.19)	-.006*** (-3.17)
FA_AGE	-.01 (-.81)	-.01 (-.79)	-.01 (-.76)	-.02 (-1.57)	-.02 (-1.61)	-.01 (-.86)
MO_AGE	.02 (1.28)	.02 (1.24)	.02 (1.17)	.03* (1.95)	.03* (1.93)	.03* (1.82)
FA_EDU	.05*** (3.47)	.05*** (3.44)	.05*** (3.07)	.03* (1.98)	.03** (1.96)	.02* (1.69)
MO_EDU	.001 (.07)	.001 (.08)	-.01 (-.64)	.001 (.04)	.001 (.05)	-.02 (-.88)
FA_INC	-.02*** (-4.15)	-.02*** (-3.67)	-.01*** (-3.01)	-.004 (-1.28)	-.003 (-1.06)	.00 (.12)
MO_INC	.01	.01	.01	-.004	-.004	-.00

	(1.36)	(1.52)	(1.47)	(-.67)	(-.65)	(-.06)
FA_SC	.003** (2.16)	.003** (2.31)	.003** (2.34)	.001 (.81)	.001 (.80)	.001 (.94)
MO_SC	-.00 (-.04)	-.00 (-.12)	.00 (.28)	-.00 (.30)	-.00 (.34)	.00 (.13)
WEALTH	-	-.001 (-1.94)	-.001 (-1.6)	-	-.00 (-.37)	.00 (.15)
HHSIZE	-	-.01 (-.23)	-.04 (-.83)	-	-.04 (-.77)	-.09 (-1.59)
SHANGHAI	-	-	-.12 (-.92)	-	-	-.43*** (-2.96)
WUHAN	-	-	-.05 (-.39)	-	-	-.42*** (-3.17)
SHENYANG	-	-	-.31** (-2.55)	-	-	-.04 (-.27)
FUZHOU	-	-	-.54*** (-4.43)	-	-	-.93*** (-6.80)
C	-.05 (-.11)	.03 (.06)	.65 (.22)	.79 (1.56)	.95* (1.74)	1.63*** (2.72)
Adj./Pseudo R ²	.13	.13	.14	.15	.15	.19
Sample size	1352	1352	1352	1352	1352	1352

In table 8, we present the estimated results of determinants of expenditure on adult goods, which are proxied by cigarettes and wines. The significantly negative coefficients of KID_NUM in all the 6 columns imply that generally speaking, there does exist a trade-off between spending on child goods and spending on adult goods. Well-off families spend significantly more money on adult goods than worse-off families, but the expenditure share of adult goods is not significantly affected by family economic conditions. Similarly, father's social communication significantly affects the amount but not the share of expenditure on adult goods. It is conspicuous that the

estimated coefficient of father's education are significantly negative in all columns in table 8, which means that more educated fathers tend to not only spend more money, but also allocate larger share of family resources on children, *ceterus paribus*.

Table 8 Determinants of Expenditure on Cigarettes and Wines

Dep. Variable	CIG_WINE			CW_SHARE		
Reg. Model	Tobit			Tobit		
	(1)	(2)	(3)	(4)	(5)	(6)
KID_NUM	-.37** (-1.91)	-.74*** (-3.60)	-.65*** (-3.30)	-2.00* (-1.74)	-3.01** (-2.45)	-2.62** (-2.24)
KID_SEX	.03 (.34)	.03 (.30)	.04 (.48)	.42 (.83)	.40 (.80)	.53 (1.09)
KID_AGE	.01 (.30)	.04 (1.12)	.04 (.97)	.24 (1.05)	.29 (1.30)	.21 (1.03)
KID_AGESQ	.00 (.21)	-.00 (-.47)	-.00 (-.38)	-.002 (-.20)	-.004 (-.39)	-.003 (-.35)
FA_AGE	-.005 (-.33)	-.00 (-.02)	-.01 (-.75)	-.10 (-1.13)	-.09 (-.98)	-.13 (-1.52)
MO_AGE	-.01 (-.64)	-.01 (-.46)	-.01 (-.73)	-.02 (-.20)	-.01 (-.14)	-.02 (-.28)
FA_EDU	-.05*** (-2.78)	-.04** (-2.51)	-.04** (-2.44)	-.39*** (-3.77)	-.38*** (-3.67)	-.38*** (-2.55)
MO_EDU	-.01 (.66)	-.01 (.66)	-.01 (.63)	.04 (.30)	.04 (.31)	.06 (.38)
FA_INC	.02*** (5.03)	.01*** (3.61)	.01*** (3.31)	.01 (.77)	.02 (.99)	.02 (.94)
MO_INC	.03*** (4.31)	.02*** (4.02)	.01** (2.37)	.04 (1.19)	.04 (1.16)	-.01 (-.20)
FA_SC	.005***	.005***	.005***	-.001	-.00	.003

	(4.24)	(4.25)	(4.85)	(-.20)	(-.02)	(.46)
MO_SC	-.003* (-1.80)	-.003 (-1.50)	-.002 (-1.24)	-.01 (-1.06)	-.01 (-1.01)	-.01 (-.76)
WEALTH	-	.002*** (3.44)	.002*** (3.33)	-	-.002 (-.50)	-.002 (-.55)
HHSIZE	-	.31*** (5.48)	.23*** (4.11)	-	.81** (2.36)	.30 (.89)
SHANGHAI	-	-	.94*** (6.57)	-	-	4.98*** (5.86)
WUHAN	-	-	.62*** (4.97)	-	-	4.77*** (6.43)
SHENYANG	-	-	-.13 (-1.00)	-	-	-.60 (-.77)
FUZHOU	-	-	-.08 (-.60)	-	-	-1.19 (-1.53)
C	1.68*** (3.19)	.43 (.76)	1.07* (1.90)	14.79*** (4.77)	11.74*** (3.49)	14.25*** (4.04)
Adj./Pseudo R ²	.02	.03	.05	.01	.01	.02
Sample size	1352 (261 truncated)	1352 (261 truncated)	1352 (261 truncated)	1351 (261 truncated)	1351 (261 truncated)	1351 (261 truncated)

VI Discussion

The most prominent finding of this study is that parental education has significant positive effect on various forms of human capital investment in children, including education investment, parental child care, and expenditure on child goods. It can be confirmed that this positive effect is not indirectly induced by income, because in all regressions parental individual incomes and household wealth are controlled for. Furthermore, we find that human capital investment in children is differently affected by paternal and maternal education. Household education expenditure on children are strongly affected by mother's education (table 6), while the effect of

father's education is less significant and weaker. However, father's education is found to be important in determining other forms of investment in children, such as time input in child care (table 7) and spending on child goods (indirectly revealed in table 8). It appears that while mother's education has larger effect on education investment in children, father's education has greater general influence on intra-household resource allocation and might affect the time allocated and whole expenditure on children.

The different effect of parental education on human capital investment points to the possibility of intra-household bargain based on different preferences of men and women, which are neglected by unitary model but are taken into account by non-consensus models of intra-household resource allocation. Yet although education influences bargaining power (World Bank, 2001) and is occasionally used as a proxy of it in empirical researches, the asymmetry in the effect of parental education may well be a result of intra-household labor division between men and women aiming at household utility maximization. Intra-household labor division is determined by comparative efficiencies of men and women in various tasks, as well as by social norms. If decisions related to children's education is commonly considered to be the internal affairs of families and should be taken on directly by women rather than by men, then mothers would have stronger influence on children's education than fathers regardless of women's bargaining power. In this case mother's education would indicate larger effect than father's education even fathers and mothers are equally concerned with children's education. To test the validity of the unitary model, we need information on the bargaining power, or relative control over all the household resources of men and women. Unfortunately, such information is not available in our dataset.

Parents' incomes have ambiguous effects on human capital investment in children. On the one hand, higher incomes of parents imply higher time costs, which decreases the time invested in child care. For fathers, the negative association between income and child care is highly significant, but it is insignificant for mothers (table 7). This should be attributed to the inflexible responsibility of women in caring family members, especially children. On the other hand, higher labor incomes relax household budget constraint and favor more expenditure on children. But the increase of total resources of a household doesn't ensure more human capital investment on children. The net effect depends on income elasticities of various household demands given the

relative prices of different goods fixed. As we can see from tables 6 and 8, parental incomes do not always significantly correlated with investment on children in monetary form. Household wealth, which is in fact long-run or accumulated income, is not significant in most specifications, except for education expenditure on each child and the amount of expenditure on cigarettes and wines.

Moreover, it must be kept in mind that mother's employment status might be endogenous. Compared with other women, mothers who have children under 18 years old are more likely to have a job (table 3). From available information in the dataset, we cannot exclude the possibility that mothers participate in the labor force to earn money for human capital investment on children. So we should be cautious with the estimated coefficients of MO_INC.

As for parents' attitude towards boys and girls, we do not find significant sex bias against girls in monetary expenditures (tables 6 and 8). Although there's gender gap both on labor market and inside household, the traditional pro-boy bias in human capital investment might have faded to a great extent in economically advanced cities. For one thing, no matter a boy or a girl, the only child is the apple of eye of the parents in most families in big cities; for another, sex selection before birth eases sex preference in human capital investment on children. As Davies and Zhang (1997) pointed out, when gender control is exerted, boy preference raises the sex ratio and it is possible that sisters may, on average, consume no less than their more numerous brothers. Paradoxically, this discrimination against girls in prenatal stage makes parents to invest more equally in sons and daughters.

However, as shown in the right half of table 7, other conditions being equal, mothers are more probable to regularly taking care of sons than taking care of daughters, while fathers have the same but not significant inclination. But it cannot be concluded in haste that girls are discriminated against in parents' time investment. Both being cherished by their parents, boys and girls are not treated identically in families because of the influence of social norms. In comparison with boys, girls are more often to be trained to take care of themselves and others in order to meet the requirement of gender roles. We speculate that mothers' more frequently take care of boys because mother's care is usually more focused on activities of daily living, of which the effect on human capital accumulation is dubious. Nevertheless, this conjecture cannot be rigorously tested due to the constraint of data availability.

VII Conclusion

Using 2001 CULS data from 5 big Chinese cities, this paper examines the effect of parental individual characteristics on human capital investment on children. Human capital investment is broadly defined and embodied into 3 groups of variables: education investment, time investment, and expenditure on child goods. In the extended specifications, household wealth and city-fixed effects are controlled for.

We find clear evidence of intergenerational transmission of human capital: even with a rich set of individual, household and city factors being controlled for, parental education has significantly positive effect on every form of human capital investment on children. Yet father's and mother's education appears to affect children's human capital in different ways. Compared with father's education, mother's education has stronger effect on education investment in children, especially on children's chances to get extra training after school, which can improve children's opportunities to obtain better education in the future. But mother's education is not significant for care-time and child-good investment on children. On the other hand, a more educated father increases all forms of human capital investment in children. These findings build on the literature related to determinants of human capital investment in children and intra-household resource allocation.

The most important implication that can be drawn from this paper is that intergenerational transmission of human capital is fulfilled by both fathers and mothers. While the role of maternal education has been emphasized in previous studies, the role of paternal education has been relatively belittled. The main reason is that in most previous studies, human capital investment is narrowly defined, not taking into account parents' time investment and expenditures on items other than education and health care. More empirical work need to be done to confirm fathers' influence on children's human capital formation and encourage them to more actively participate in decisions on children's human capital investment.

We do not detect significant sex bias against girls in monetary expenditures, although there still exists gender disparity both inside and outside families. The reason might be the change in parents' attitude along with socioeconomic development, or the one-child policy, or both. Girls are disadvantaged in receiving care from their mothers, which in our opinion is the manifest of traditional social norm of gender roles rather than parents' discrimination against girls.

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