Applied Economics, 2005, **37**, 2067–2076

Routledge
Taylor & Francis Group

Parental childcare and children's educational attainment: evidence from China

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This paper examines the determinants of child educational attainment. In addition to those examined in previous studies, it is found that maternal childcare is another important determinant of child educational attainment. The results are robust after controlling for endogeneity. The IV estimates show that once childcare time is controlled for, child health does not have an effect on school enrolment age. This finding suggests that omitting the childcare time may have biased the estimated effect of child health on school enrolment in previous studies.

I. Introduction

Child educational attainment in developing countries has attracted a lot of attention among economists. It is estimated that 46% of people in developing countries are illiterate, 25% of children aged six to twelve do not receive primary education and 80% of children aged thirteen to eighteen do not receive secondary education (Todaro, 2000). Children who receive a poor education may have low labour productivity in adult life, end up in poverty (Behrman, 1990; Bedi and Gaston, 1997), and in turn drag down a country's growth (Webber, 2002). Understanding the determinants of child educational attainment is the key to designing well-functioning policies for improving child education. The aim of this paper is to test the impact of one of the determinants of child educational attainment in China, i.e. the time spent on pre-school parental childcare.

Several factors have been identified as the determinants of child educational attainment in developing countries. Among them, mother's education is found to be particularly important (Blau and Grossberg, 1992; Desai and Alva, 1998; Brown and Park, 2002). Educated mothers not only educate their own children better at home, but also provide higher family income, which helps children receive better formal education. Child health is another important determinant of child educational attainment (Glewwe and Jacoby, 1995; Behrman and Lavy, 1997; Alderman *et al*., 2001; Glewwe *et al*., 2001). Parents tend to invest more in the education of healthier children; they are sent to school at an earlier age and are found to perform better in school. Poverty, combined with credit constraint, is another important cause of poor education. Credit-constrained parents are unable to invest in education even if returns from it are high (Brown and Park, 2002).

The existing literature has largely overlooked another important determinant of child educational attainment – parental, especially maternal, childcare. When parents spend more time at home, they can

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Applied Economics ISSN 0003–6846 print/ISSN 1466–4283 online © 2005 Taylor & Francis
http://www.tandf.co.uk/journals
DOI: 10.1080/00036840500293391

prepare better food for their children in terms of both nutrition and taste, and they can contribute more to the children's education (Jaquith, 1996). Parental time spent at home can also reduce the chances of children getting ill, and help ill children to recover (Glick and Sahn, 1998). Many pediatricians claim that more time spent by mothers taking care of children during their early years tends to make the children more confident (Belsky, 1988; Melhuish, 1991). Maternal childcare time, especially in the child's early years, is an important factor in the development of the child's psychology and character, which may also help in cognitive development. Although no systematic empirical analysis is available, anecdotal evidence suggests that the time spent in pre-school parental childcare does indeed improve child educational attainment (Jaquith, 1996). The main reason for the lack of empirical research on the impact of parental childcare on child educational attainment is the lack of data. It is rare to find a data set that includes all the information needed to estimate a fully specified child educational attainment production function, such as parental childcare time, child health and other socioeconomic variables.

Omitting parental childcare time in the estimation of child educational attainment equation could cause omitted variable bias. Take the case in which we wish to estimate the effect of pre-school child health on educational attainment; the childcare time could well be correlated both with the child's health status and his/her educational attainment, and thus to omit it could cause spurious correlation in the estimation (Behrman and Lavy, 1997; Glewwe and Jacoby, 1995; Alderman *et al*., 2001). Some researchers have sought to remedy the omission by using parental labour supply as a proxy for parental childcare time (Desai *et al*., 1989; Blau and Grossberg, 1992). Although parental labour supply is negatively associated with parental childcare time (Chevalier and Viitamen, 2002), it is not a perfect measure for parental childcare time because the non-work time of parents also includes leisure time. Moreover, labour supply also has the income effect. Working mothers have larger income, which may allow them to provide better education for their children. To the best of our knowledge, only Datcher-Loury (1988) uses maternal time spent in household activities to measure childcare time. However, maternal time in household activities is still not a perfect proxy for childcare time since many household activities are not related to children.

The purpose of this paper is to find the determinants of child educational attainment in China, and to test empirically whether, in addition to the determinants found by previous researchers, the pre-school maternal childcare time is another important determinant of child educational attainment. Our dataset, which draws on the China Health and Nutrition Survey (CHNS), is unique because it includes not only the basic socioeconomic variables of the households and communities, but also the nutrition and health information of these households. Moreover, it includes the pre-school childcare time spent by parents. This, as far as we are aware, is the best dataset available for studying the effect of pre-school parental childcare time on child educational attainment in a developing country.

The ordered probit and instrumental variable (IV) estimation results show that maternal childcare is indeed an important determinant of child educational attainment. Following the literature studying child educational attainment in developing countries (Glewwe and Jacoby, 1995; Alderman *et al*., 2001; Glewwe *et al*., 2001), we use the child school enrolment age as the dependent variable in these regressions. As argued by Glewwe and Jacoby (1995), delay in school enrolment is very common in developing countries and this delay is associated with a huge loss of life-time wealth.[1] Our IV method shows that, once we control the pre-school childcare time, child health does not have an effect on school enrolment age. This finding suggests that omitting the childcare time may indeed bias the estimated effect of the child's health on school enrolment as suspected by Glewwe and Jacoby (1995), Behrman and Lavy (1997) and Alderman *et al*. (2001).

The rest of this paper is organized as follows. Section II reviews the literature and specifies the empirical strategy. Section III describes the data. Section IV reports the empirical results for the determinants of child educational attainment. Section V provides some estimations and Section VI concludes.

II. Prior Literature and Econometric Specification

The aim of this paper is to examine the determinants of child educational attainment. In particular, we want to test whether parental childcare improves child education. Prior research has used two variables to measure child education: academic performance

[1] Many authors have used other educational attainment measures such as school performance (Rainey and Murova, 2004) or years of schooling for adults (Peraita and Sanchez, 1998).

(Brown and Park, 2002) and school enrolment age (Glewwe and Jacoby, 1995; Alderman *et al*., 2001; Glewwe *et al*., 2001). We use the school enrolment age in this paper because information on academic performance is not available in the data. School enrolment age is a good indicator of child cognitive development or education because a child with better cognitive development or with home education at a younger age may go to school earlier. It is also argued by Glewwe and Jacoby (1995) that children who enter school earlier are more likely to perform better in school and to enter the labour force earlier, so that they have a larger lifetime income. Thus school enrolment age is critical in determining the academic achievement of the child.

Child educational attainment is determined by a number of household inputs at the earlier stages of the child's development. Prior research finds that pre-school child health is very important in determining the school enrolment age of a child, and healthier children tend to enter school earlier (Alderman *et al*., 2001). Blau and Grossberg (1992) and Glewwe and Jacoby (1995) show that children with more educated mothers enter school earlier and perform better at school. Using Chinese data, Brown and Park (2002) find that wealth and credit are important in constraining parents in developing countries from investing in the education of their children.

Although the pre-school childcare time is believed to be another very important determinant of child educational attainment (Belsky, 1998; Melhuish, 1991; Jaquity, 1996; Glick and Sahn, 1998), due to the limited data, little research has been conducted to test the effect of parental childcare time on children's academic performance directly. However, the impact has been tested indirectly by using the parental labour supply to proximate parental childcare time. Desai *et al*. (1989) and Blau and Grossberg (1992) find that maternal employment during early years of a child's life has a negative impact on the child's performance in the Peabody Picture Vocabulary Test (PPVT) scores. Datcher-Loury (1988) suggests that when mothers spend more time at home when their children are young, the child's years of schooling increase significantly.

To estimate the effects of pre-school childcare time, we follow the approaches similar to Behrman (1990), Glewwe and Jacoby (1995), Alderman *et al*. (2001), and Brown and Park (2002). We estimate the following equation:

$$S_i = b_0 + b_1 H_i + b_2 T_i + b_3 E_i + \boldsymbol{X_i} b_4 + \varepsilon_i \qquad (1)$$

The dependent variable S_i is the child's school enrolment age. The independent variables are as follows. H_i is an indicator of the pre-school child health. Following Glewwe and Jacoby (1995), Alderman *et al*. (2001) and Glewwe *et al*. (2001), we use the height for age z-score to measure child health. The height for age z-score measures the number of standard deviations of a child's height above or below the average height for that age and sex. T_i is the pre-school childcare time in hours per week spent by mothers and/or fathers. E_i is the education of mothers and fathers. Following Peraita and Sanchez (1998) and Rainey and Murova (2004), we control an array of child and household variables contained in the vector $\boldsymbol{X_i}$ including the sex and age of the child, the number of children in a household, per capita income and an urban indicator.[2] ε_i is the error term.

We estimate Equation 1 by the ordered probit model because the school enrolment age is an ordered discrete variable. We hypothesize that the child's z-score, the childcare time and education of parents, especially those of mothers, have a negative effect on the child's school enrolment age. That is, we hypothesize that $b_1 < 0$, $b_2 < 0$ and $b_3 < 0$.

Estimating Equation 1 by simple ordered probit could be biased because the child health and the parental childcare time are endogenous. Since child health, parental childcare time and the child's school enrolment age are all household decisions affected by common unobserved factors, the estimates of the impact of child health and childcare time on the child's school enrolment age by the simple ordered probit model may be biased.

To solve the endogeneity problem, we employ the instrumental variable (IV) ordered probit method. The key to using the IV method is to find valid IVs. A good IV should be correlated with child health and the parental childcare time, but should not affect the school enrolment age except through the effects of child health and parental childcare time.

Following Alderman *et al*. (2001), we use the pre-school price shock of some commonly consumed foods and the pre-school shock of community-level daily wage as IVs. In this paper, we use the pre-school (year 1989) child health and parental childcare time to explain the child age of school enrolment, which

[2] Brown and Park (2002) have wealth, credit constraint and school quality measures as independent variables. Our income variable is similar to their wealth variable, but the credit constraint and school quality measures are not available in our dataset.

happened between 1991 and 1997. Our IVs, the price (wage) shocks are defined as the prices (wage) in the pre-school year minus the permanent prices (wage), where the permanent prices (wage) are defined as the average prices (wage) over the sample period (1989 to 1997).[3] These variables are good IVs because they satisfy two criteria. First, the pre-school price and wage shocks are correlated with the cost of investing in child health and the value of parental time, and thus the pre-school child health and parental childcare time. Results of the first stage regressions indeed show that the childcare time is negatively associated with pre-school price and wage shocks (Table A1).

Second, the pre-school price shocks can be excluded from the second stage regressions if the permanent prices are controlled (Alderman *et al*., 2001). School enrolment, which is a long-term decision, should be more likely to be sensitive to the permanent prices than to short-term price and wage shocks. In particular, once we control the permanent prices and wage, the school enrolment decision should not be sensitive to the pre-school price and wage shocks which happened a few years earlier. According to Alderman *et al*. (2001), it is the permanent prices or prices at a subsequent age, when school enrolment decisions are made, that affect the household decision on school enrolment. Hence, once the permanent prices are controlled, pre-school prices can be excluded from the second stage regressions.

Thus, we use the pre-school price and wage shocks as IVs, and control the permanent prices in the second stage regression. To implement our IV method, the school enrolment age equation is specified as

$$S_i = c_0 + c_1 H_i + c_2 T_i + c_3 E_i + c_4 P_i + \boldsymbol{X_i} c_5 + \varepsilon_i \quad (2)$$

where P_i is a set of permanent commodity prices and wage, measured by the average prices and wage in the sample period. We treat H and T as endogenous variables and use the pre-school price and wage shocks as identifying instruments in estimating the ordered probit model.

III. Data

This paper uses the China Health and Nutrition Survey (CHNS) data collected by the Carolina Population Center (CPC) at the University of North Carolina at Chapel Hill, the Institute of Nutrition and Food Hygiene, and the Chinese Academy of Preventive Medicine. The survey was conducted in 1989, 1991, 1993 and 1997 by an international team of researchers whose backgrounds cover nutrition, public health, economics, sociology, Chinese studies, and demography. The CPC invested a lot of effort in staff training and quality control to ensure that the data is of high quality.

The survey contains information on the health and education of children, the education and income of parents, and childcare time spent by parents. It also includes detailed information on household and community characteristics. In estimating the child's school enrolment age, we use a sample of pre-school children under the age of six in 1989, the pre-school year. We use the information for 1989, such as pre-school health and parental childcare time, to explain the age of school enrolment, which happens between 1989 and 1997.

In total, there are 1 187 pre-school children under the age of six in the 1989 sample: 80% of these are from rural areas, 20% are from urban areas. The sample households had an average per capita income of 869 Yuan in 1989, about 27% lower than the national average of 1 189 Yuan. The summary statistics of variables are reported in Table 1.

On a preliminary examination of the data, we find that mothers assumed major responsibility in taking care of children. On average, mothers spent 16.74 h per week taking care of their children, three times the time spent by fathers. However, as more women were working, about one-fifth of the mothers spent no time on childcare. In these households, children may have been taken care of by other household members such as grandparents, or by caregivers in the childcare centres.

We also find that fathers received more education than mothers. Mothers on average received 6.61 years of schooling; fathers received 1.36 years more than that. The higher levels of education among men probably reflect the patrilineality that exists in Chinese society. This patrilineality, and the resulting gender difference in education, may affect the intra-household bargaining power of men and women (Brown and Park, 2002). As we will show later, this bargaining power is reflected in the fact that men's education is more important in determining the child's educational attainment, in contrast with the findings for other developing countries.

The average age of school enrolment is 6.38, which is a little older than the official school enrolment age of six in China. On average, children in rural areas enrolled at the age of 6.43, about three months later

[3] As introduced in the next section, our data cover four years (1989, 1991, 1993 and 1997) over a nine-year period.

Table 1. Summary statistics of variables (number of children under six = 1187)

Variables	Mean	Standard deviation	Min	Max
Children's characteristics				
Sex (male = 1; female = 0)	0.54	0.5	0	1
Age	3.13	1.62	0	6
School enrolment age	6.38	1.3	4	14
Height for age z-score	−1.65	0.63	−3.38	0.24
Parents' characteristics				
Mother's schooling (years)	6.61	3.8	0	12
Father's schooling (years)	7.97	3.03	0	12
Maternal childcare time (hour/week)	16.74	22.98	0	98.2
Paternal childcare time (hour/week)	4.99	13.1	0	90
Pre-school price shocks (Yuan)				
Rice	0.03	0.21	−0.93	0.50
Pork	−1.49	1.09	−4.8	1.00
Eggs	0.12	0.67	−2.02	1.80
Daily wage	−0.75	17.19	−30	103.5
Permanent prices (Yuan)				
Rice	0.72	0.19	0.40	1.67
Pork	5.17	1.37	2.50	9.00
Eggs	2.91	0.57	1.59	4.15
Daily wage	10.35	14.83	1	111.5
Other variables				
Number of children	1.99	0.93	1	6
Per-capita income (in thousand Yuan)	0.87	1.14	0	17.33
Urban indicator	0.20	0.40	0	1

than children in urban areas, who enrolled at the age of 6.16. About 62% of children enrolled in school at or before the age of six, while the rest enrolled at a later age. About 59% of children in rural areas enrolled at or before the age of six; the figure is 15% age points higher in urban areas.

We use prices of three commonly consumed commodities, i.e. rice, pork and eggs, as well as wage as instrumental variables. While the pre-school (1989) shocks of these variables serve as IVs, we also control the long-run price of each commodity, as well as the wage rate at the community level,[4] in the school enrolment age equation.

IV. Empirical Results

In this section, we present the results of ordered probit and IV estimates of the determinants of the child's school enrolment age. We also test whether child health, parental education and other variables have an effect on the child's school enrolment age.

Ordered probit regressions

We first report the ordered probit estimation results in Table 2. The dependent variable is the school enrolment age of a child. Independent variables include the health measure or the height for age *z*-score, the pre-school maternal and paternal childcare time, mother's education, father's education, the sex and age of the child, the number of children in the household, per capita income, and an urban indicator. We employ maximum likelihood estimations for all regression models.

In the first column of Table 2, we report the results of a regression that does not include the childcare variables. Consistent with the findings of Glewwe *et al.* (2001), the pre-school height-for-age *z*-score has a negative and significant effect on the age of school enrolment. As the *z*-score is an indicator of the health or nutrition status of a child, a negative coefficient on the *z*-score means that a healthier child enters school earlier. A little unlike the evidence from other developing countries (Alderman *et al.*, 2001; Glewwe and Jacoby, 1995), we find that, although

[4] A community means a village for rural areas and a neighborhood for urban areas.

Table 2. Ordered probit estimations of the effect of childcare time on child school enrolment age in China

Independent variables	Dependent variable: child school enrolment age					
	(1)	(2)	(3)	(4)	(5)	(6)
Pre-school height	−0.131***	−0.125***	−0.133***	−0.127***	−0.128***	−0.122***
For age z-score	(−3.85)	(−3.67)	(−3.91)	(−3.74)	(−3.80)	(−3.57)
Pre-school maternal childcare time		−0.004** (−2.32)		−0.004** (−2.13)	−0.004** (−2.16)	−0.010** (−2.22)
Pre-school paternal childcare time			−0.008** (−2.49)	−0.008** (−2.17)	−0.008** (−2.24)	−0.009*** (−2.61)
Mother's schooling	−0.018	−0.017	−0.016	−0.014	−0.019	−0.007
	(−1.36)	(−1.25)	(−1.17)	(−1.08)	(−1.49)	(−0.42)
Father's schooling	−0.082***	−0.083***	−0.083***	−0.084***	−0.082***	−0.106***
	(−5.02)	(−5.06)	(−5.06)	(−5.09)	(−5.03)	(−5.26)
*Mother's schooling * childcare time*						−0.001* (−1.94)
*Father's schooling * childcare time*						0.002*** (2.85)
Sex	−0.138	−0.135	−0.120	−0.1184	−0.088	−0.076
	(−1.08)	(−1.05)	(−0.93)	(−0.91)	(−0.70)	(−0.60)
Age of the child	0.043*	0.040	0.041*	0.038	0.041*	0.038
	(1.74)	(1.61)	(1.66)	(1.54)	(1.68)	(1.55)
Number of children	0.063	0.067	0.065	0.068		
	(1.33)	(1.40)	(1.36)	(1.43)		
Per capita income	0.018	0.022	0.024	0.028		
	(0.49)	(0.58)	(0.77)	(0.85)		
Urban indicator	−0.135	−0.149	−0.134	−0.147	−0.152	−0.165
	(−1.13)	(−1.25)	(−1.13)	(−1.24)	(−1.30)	(−1.41)
Observation	540	540	540	540	550	550
Wald chi-squares	85.68***	90.04***	94.98***	95.45***	91.82***	100.86***

Notes: Numbers in parentheses are *t*-statistics.
Significance levels at 0.1, 0.05 and 0.01 are noted by *, **, and ***.

the education of both parents has negative coefficients, only that on the father's education is significant. This probably reflects the patrilineality that exists within Chinese society, where fathers make major household decisions, including child education.[5] Another significant variable is age, with older children entering school at an older age. This could be due to the improvement in the education system in China over time. The coefficient on the number of children in a household is positive but not significant. Like Brown and Park (2002), we find that income does not have a significant effect on child education attainment. However, due to a lack of information, we are not able to test their finding that the credit constraint has a significant effect.

In columns (2) and (3) of Table 2, we report the results of the regressions with the parental childcare time measures included as independent variables. Regression results show that both maternal and paternal childcare time help the child to enrol in school at a younger age. The coefficients on both variables are negative and significant. An increase of the maternal childcare time by 22.98 hours per week (one standard deviation) will help the child enrol in school 1.1 months (22.98×0.004 years $\times$ 12) 12) earlier, which is a rather small number, and an increase of the paternal childcare time by the same amount of time will help the child enrol in school 2.2 months earlier. After adding the childcare time variables, the coefficients of other variables do not change much.

In column (4), we put both maternal and paternal childcare time into the regression. The results show that both variables have the same coefficients as before, and they are both significant at the 5% level. Column (5) reports the results of a regression excluding two variables: income and the number of children in a household. We exclude these two variables because they are household decision variables that might be endogenous.[6] Comparing column

[5] This is consistent with the findings of Brown and Park (2002).
[6] As argued by Brown and Park (2002), income is determined by labour supply, which in turn is determined by the number of children in the household and whether they are in school.

(5) to column (4), we see that dropping these two variables does not affect the estimated effects of child health and maternal and paternal childcare time.

According to Blau and Grossberg (1992), better educated parents produce better children for the same time spent with children. To test this hypothesis, we add two interaction terms of maternal and paternal childcare time with their education in column (6).[7] If childcare time is more effective when the parents are better educated, the interaction terms should be negative. The test results are mixed. The interaction term for the mother's schooling and childcare time is negative and significant, but that for the father is positive and significant. This means that mothers' education makes their childcare time more effective in enhancing child educational attainment, but fathers' education makes their childcare time less effective. This could be due to the higher opportunity cost of educated fathers. An educated father staying at home for childcare reduces the family income more than an educated mother because of sex discrimination in the Chinese labour market.

V. Estimations

The simple ordered probit estimates may be biased, due to the endogeneity of the pre-school *z*-score and parental childcare time. To solve the endogeneity problem, we employ the instrumental variable ordered probit estimations. We use the pre-school shocks to prices of some commonly consumed food, including rice, pork and egg, as well wage shocks as IVs. Assuming that pre-school market price and wage shocks do not affect the child's school enrolment age, except through the pre-school child health and parental childcare time, these IVs can identify the effects of child health and parental childcare time. To make sure this assumption holds, we control the permanent prices of the same commodities and permanent wage in the second stage regression. To make our estimations clean, we also drop other potentially endogenous variables including the number of children and income.

The first stage regression shows that these IVs indeed have explaining power for childcare time and child health. The four IVs are jointly significant in all three first stage regressions reported in Table A1. Price and wage shocks have negative effect on both maternal and paternal childcare time, probably because an increase of prices and wages may increase the opportunity cost of parental time and thus reduce childcare time. Price shocks also have a negative effect on child health, but wage shock has the expected positive effect on child health.[8]

IV estimates are reported in Table 3, in which the *t*-statistics in parentheses are calculated using bootstrapped standard errors with 200 replications. The IV estimation results still support the hypothesis that the school enrolment age of a child decreases with the pre-school maternal childcare time. The estimated coefficient on maternal childcare time is negative and significant in all three cases where the variable is included as an independent variable. Moreover, the magnitude of the impact is much larger than that of the non-IV estimate (-0.122 vs -0.004). If a mother spends 22.98 h more each week in taking care of her child, the child will enter school more than two years earlier. In contrast with the finding for non-IV estimates, the IV results show that the paternal childcare time does not have a significant effect on the school enrolment age of a child.

One interesting difference with the IV estimation compared to non-IV estimation is that the effect of pre-school health becomes insignificant after controlling the pre-school maternal childcare time. When we have the *z*-score as an independent variable without controlling childcare time variables, the *z*-score has a significant effect. However, once we control the pre-school maternal childcare time, it becomes insignificant and its coefficient becomes much smaller. The fact that the actual impact of the z-score becomes zero when we control for childcare time and endogeneity of these choice variables shows that omitting the childcare time variables may indeed have biased

[7] We also estimate a version of model (6) by including the number of children and per capita income as independent variables. The results regarding the child health and childcare time variables do not change much.

[8] To test if the set of instrument variables can be excluded from the school enrolment equation, we estimate a two-stage least squares model. For this linear model, we could conduct a Hausman over-identification restriction test (Hausman, 1983). The chi-square distributed test statistics with $k–j$ degrees of freedom is N times R-squared, where k is the number of instruments, j is the number of endogenous variables, and N is the number of observations, and R-squared is the measure of goodness of fit of the regression of the residuals from the school enrolment equations on the variables, which are exogenous to the system. The test statistics for all regressions are smaller than the critical values 5.99. These test statistics indicate that the null hypothesis that there is no correlation between the exogenous instruments, and the disturbance term from the school enrolment equation cannot be rejected.

Table 3. Instrumental variable ordered probit estimations of the effect of childcare time on child school enrolment age in China

	Dependent variable: child school enrolment age				
Independent variables	(1)	(2)	(3)	(4)	(5)
Pre-school height for age z-score	−0.641* (−1.54)				−0.527 (−1.27)
Pre-school maternal childcare time		−0.061*** (−2.51)		−0.063*** (−2.51)	−0.056** (−2.31)
Pre-school paternal childcare time			0.002 (0.04)	−0.026 (−0.56)	
Mother's schooling	−0.025 (−0.93)	−0.015 (−0.56)	−0.050** (−2.25)	−0.008 (−0.26)	0.002 (0.07)
Father's schooling	−0.052** (−2.03)	−0.068*** (−2.96)	−0.065*** (−2.73)	−0.076*** (−2.67)	−0.056*** (−2.30)
Sex	0.010 (0.05)	−0.183 (−1.13)	−0.148 (−0.85)	−0.168 (−1.06)	−0.051 (−0.25)
Age of the child	−0.018 (−0.29)	0.005 (0.13)	0.067* (1.84)	−0.010 (−0.21)	−0.060 (−0.91)
Long-run price of rice	−0.503 (−1.50)	−0.874*** (−2.58)	−0.585* (−1.67)	−0.971*** (−2.64)	−0.781** (−2.48)
Long-run price of pork	0.281*** (3.64)	0.164** (3.60)	0.177*** (3.35)	0.166** (3.26)	0.251*** (3.10)
Long-run price of eggs	−0.529* (−1.64)	0.153 (1.10)	−0.078 (−0.53)	0.230 (1.18)	−0.240 (−0.71)
Long-run wage	0.003 (0.29)	−0.026*** (−2.48)	−0.010 (−1.13)	−0.027*** (−2.54)	−0.015 (−1.09)
Urban indicator	0.455 (1.29)	−0.904** (−2.06)	−0.015 (−0.09)	−0.029 (−0.17)	0.349 (0.96)
Observation	336	336	336	336	336
Wald chi-squares	53.89***	58.01***	46.38***	58.16***	63.32***

Notes: Numbers in parentheses are t-statistics.
Significance levels at 0.1, 0.05 and 0.01 are noted by *, **, and ***.

the effect of child health on school enrolment downward in previous studies.

The coefficients of other variables are very similar to those from non-IV estimates. The mother's education has a negative coefficient, but is significant in only one case. Although the paternal childcare time is not significant, the father's education remains significant in the IV estimation. The magnitude of its impact is about the same as in the non-IV estimates.

VI. Conclusions

In this paper, we examine the determinants of child educational attainment. In addition to the determinants found by previous studies, we find that maternal childcare is another important determinant of child educational attainment. Our results are robust after controlling for endogeneity. To the best of our knowledge, we are the first to use the actual maternal childcare time in estimating the determinants of child educational attainment. In contrast with studies drawing on data from other developing countries, but consistent with Brown and Park (2002), which draws on a different Chinese dataset, we find that maternal education and income do not have positive effects on child education. Interestingly, our IV method shows that once we control the childcare time, child health does not have an effect on school enrolment age. This finding suggests that omitting the childcare time may indeed bias the estimated effect of child health on school enrolment.

Since maternal childcare is an important determinant of child health and educational attainment, the government may consider policies that encourage more maternal childcare in the early stages of children's life. For example, the government could consider developing policies or laws that encourage women to take more maternal leave, and to provide more job security for women taking such leave.

Acknowledgements

The authors acknowledge partial financial support from the National Natural Science Foundation of China.

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Table A1. Ordinary least squares regressions on the determinants of childcare time in China (the first stage regression of the IV estimation)

	Dependent variable		
Independent variables	Maternal childcare time (1)	Paternal childcare time (2)	Height for age *z*-score (3)
Rice price shock	−3.099	−7.894**	−0.846**
	(−0.60)	(−2.07)	(−2.07)
Pork price shock	−1.793	0.532	−0.034
	(−1.57)	(0.65)	(−0.39)
Egg price shock	−0.252	−0.665	−0.156
	(−0.18)	(−0.78)	(−1.18)
Wage shock	−0.106***	−0.010	0.009**
	(−4.29)	(−0.58)	(2.06)
Mother's schooling	0.637***	0.164	0.039**
	(2.83)	(1.43)	(2.18)
Father's schooling	−0.160	−0.244	0.021
	(−0.58)	(−1.62)	(0.96)
Sex of the child	−0.375	0.680	0.293
	(−0.23)	(0.78)	(1.54)
Age of the child	−1.174***	−0.440*	−0.144***
	(−2.73)	(−1.93)	(−4.00)
Long-run price of rice	−7.277	−8.128***	−0.303
	(−1.52)	(−2.64)	(−0.64)
Long-run price of pork	−0.811	0.743	0.201***
	(−0.80)	(1.17)	(2.63)
Long-run price of eggs	2.592	1.845	−0.814***
	(1.43)	(1.55)	(−5.15)
Urban indicator	−0.242	0.753	0.782***
	(−0.13)	(0.64)	(4.70)
Joint significance tests of IVs			
F-statistics	6.94***	2.01*	2.32**
p-value	0.00	0.07	0.04
Observation	892	892	441
Model *F*-statistics	4.24***	4.13***	9.76***

Notes: Numbers in parentheses are *t*-statistics.
Significance levels at 0.1, 0.05 and 0.01 are noted by *, **, and ***.