Early Poverty Exposure Predicts Young Adult Educational Outcomes in China

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ABSTRACT

Comparative research suggests that childhood poverty, and especially early childhood poverty, impedes educational attainment. With longitudinal data from China, we estimate hazard models of dropping out of school in young adulthood with two dynamic measures of childhood poverty: poverty spell indicators that distinguish poverty in early childhood, middle childhood, and adolescence; and poverty indices that measure the degree of poverty and distinguish chronic from transient poverty.

Four main results emerge: 1) Children who experience spells in poverty leave school at a higher rate, even after escaping poverty in later periods; 2) Transient poverty is more widespread, and shows a greater detrimental effect, than chronic poverty; 3) Early and middle-childhood poverty show greater detrimental effects than poverty in adolescence; and 4) Girls may be more susceptible than boys to early poverty, but among the never poor, girls may be educationally advantaged. We further test a possible mechanism: early nutrition poverty. We find that lower protein intake at an early stage of life is related to poorer educational outcomes in young adulthood.

JEL Classifications: I25, I32, O15

Key words: human capital, poverty, early childhood, middle childhood, gender, life cycle

1 INTRODUCTION

Household poverty has been linked to poorer educational access and attainment in many societies. For example, using asset indices developed from Demographic and Health Surveys from 35 countries, Filmer and Pritchett (1999) constructed a ranking of households within each country, and defined "poor" as the bottom 40 percent. Filmer and Pritchett found a prominent pattern in many countries in which the bulk of the deficit from universal basic education came from the poor. Huisman and Smits (2009) adopted the same approach for measuring wealth, but employed different cutoffs for designating poverty and analyzed enrollment at ages 8 to 11 in a combined sample of 222,853 in 30 countries from the Demographic and Health Surveys and the Pan Arab Project for Family Health of the League of Arab States. Huisman and Smits (2009) found that two indicators of socioeconomic status—parents' education and household wealth— remain strongly predictive even in specifications controlling for other family background and structural effects, along with district educational, demographic and economic characteristics. Mechanisms of the disadvantage may have to do with parental ability to pay for schooling, or the detrimental effect of poverty on the school functioning of children.

While cross-sectional associations between economic deprivation and educational outcomes are well-established, few studies in low and middle-income countries have sought to trace the implications of early poverty exposure to educational outcomes in young adulthood. Moreover, few studies in such contexts have sought to distinguish the impact of chronic versus transient poverty, and few have considered whether the timing of poverty matters, despite evidence from longitudinal research in developed countries suggesting that the timing and duration of poverty condition its impact on children's outcomes (Duncan and Magnuson 2013; Holmes and Kiernan 2013).

In this paper, using longitudinal data from China, we investigate links between early poverty exposure and later educational outcomes. Using a national poverty line adjusted for regional differences in prices, we adopt two approaches: 1) models that capture poverty spells, and 2) an analysis that distinguishes chronic from transient poverty. We define poverty measures for early childhood, middle childhood, and adolescence. We test these measures in hazard models of school leaving in young adulthood, and analyze their associations with the likelihood of completing compulsory school. In all analyses, we test whether poverty operates differently for girls and boys. The paper is organized as follows: the second section provides background of the research in poverty and child development; section three introduces poverty dynamics and its measurements; section four introduces data and sample selection; section five provides empirical analysis and main results; section six lists a few robustness checks and tests possible mechanisms; section seven concludes.

2 BACKGROUND

Poverty may directly affect enrollment status through lack of ability to afford school fees or other direct or opportunity costs, in which case we might expect to see that poverty exposure during the ages that coincide with higher-cost stages of education might be most detrimental to youth outcomes. Or, poverty might affect preparation and readiness for school. Research in the United States and in low and middle income countries has indicated that household poverty, variously measured, is a risk-factor for many outcomes for children that could hinder capacity to function in school, including physical health and language and cognitive development (Grantham-McGregor et al. 2007; Engle and Black 2008; Walker et al. 2011; Yoshikawa, Aber, and Beardslee 2012, 273). Multiple developmental risks associated with poverty are likely to co-occur (Grantham-McGregor et al. 2007; Walker et al. 2011). For example, among 12 and 15 year olds in Andhra Pradesh, India, child deprivation is higher for chronically poor households across multiple indicators of health, education, and quality of life (Singh and Sarkar 2014).

The potential impact of household poverty on school preparedness is also suggested in the comparative academic achievement literature. Using PISA reading score data from 15 year-olds in the United States and the 13 OECD countries that scored higher than the United States, Ladd (2012, 209) showed that reading achievement was strongly correlated with the Economic, Social and Cultural Status (ESCS) socioeconomic index in all 14 countries. Using books in the home as a proxy for household economic status, Hanushek and Woessmann (2011) concluded that the association of achievement with this indicator of economic status was robust across the board in countries analyzed in the TIMSS-95 and TIMSS-Repeat, net of controls for age, gender, family status, immigration and parent immigration status, and test cycle (Hanushek and Woessmann 2011:118, Figure 2.2). Chiu's (Chiu 2007, 515) analysis of science achievement in the PISA data also showed a significant coefficient for books.

Research suggests that the timing of impoverishment may also be important for children (Boyden and Cooper 2007). Exposure to poverty during early childhood, middle childhood, or late childhood has different implications on children's development, and possibly their later outcomes. For example, Hoddinott and Kinsey (2001) find that children aged 12-24 months lose growth in the aftermath of a drought in Zimbabwe, while older children were unaffected in growth. To the extent that ability to pay fees or forego opportunity costs is the main mechanism by which poverty impacts schooling, we might expect that in school systems where private costs tend to increase with stage of schooling and where children's potential contribution to the family coffers increases with age, that poverty exposure during middle or later childhood would be most detrimental.

At the same time, some cross-national evidence suggests that earlier poverty experiences can be more damaging than later ones for children's developmental outcomes (Bird 2007; Alderman 2011; Engle 2012), especially that poverty-induced growth faltering before 24 months is "irreversible" (Victora et al. 2008, 2010, Hoddinott et al. 2008). Although recent studies have found that some catch-up growth occurs after two years, still the first two years are very important (Crookston et al. 2013, Prentice et al. 2013, Schott et al. 2013). Assessing literature for the United States available through the middle of the 1990s, Brooks-Gunn and Duncan (1997) concluded that children who experience poverty during their preschool and early school years have lower rates of school completion than children and adolescents who experience poverty only in later years. Duncan and his colleagues (1998) analyzed data from the Panel Study of Income Dynamics and showed that family economic conditions in early childhood had the greatest impact on completed schooling. Guo's (1998) analysis using National Longitudinal Survey of Youth data from the United States distinguished development tests from achievement and showed that long-term poverty had substantial influences on both, but with different time patterns. The younger ages were a more crucial period for the development of cognitive ability than early adolescence, but poverty experienced in adolescence appeared more influential on adolescent achievement than poverty experienced earlier in life. One possible mechanism might be through nutrition. A randomly assigned early-life nutritional supplementation program finds that poor nutrition during early life does cause poor adult cognitive skills (Maluccio et al. 2009). Timing aside, the duration of poverty is also important. In the United Kingdom, persistently poor children have more disadvantageous developmental contexts than children in poverty for shorter periods, and they exhibit worse developmental outcomes (Holmes and Kiernan 2013).

To our knowledge, with some notable exceptions (e.g., van der Gaag, Pells, and Knowles 2012; Pells 2011), few studies in low and middle income countries have investigated the dynamic implications of childhood poverty exposure for outcomes in young adulthood. This gap in research also exists in China, despite the fact that China has experienced rapid economic growth during the last three decades such that many middle-aged adults experienced poverty during early childhood and poverty alleviation in later periods. This situation provides a valuable natural opportunity for researchers to study the relationship between early poverty exposure and later outcomes, and whether the impact is irreversible. In this paper, we use the case of China to address the question, how are poverty dynamics in childhood linked to subsequent educational outcomes in young adulthood? We distinguish long and short-term poverty, and address the question of whether there are critical periods for poverty impact on education. We also consider whether there are gender differences in the impact of childhood poverty on educational outcomes. Finally, we test a possible mechanism: undernutrition.

3 POVERTY DYNAMICS AND MEASUREMENTS

Poverty dynamics describe the movements into and out of poverty (Baulch and Hoddinott, 2000). It focuses on the temporal component of poverty, which is difficult to capture by a static measurement. A temporarily poor household suffering from a random negative income shock may not be permanently poor, and the impact of this poverty spell on children's development would be different from the one of the permanent poverty, which usually results in worse outcomes. Moreover, not only the length of the current poverty spell matters, but also the pattern and degree of poverty throughout childhood does: whether it consists of a series of intermittent spells of poverty, a single long spell of moderate poverty, or a short spell of extreme poverty (Bradbury, Jenkins and Micklewright, 2001). As said earlier, timing of poverty spells is also an important issue. It is important to capture all these different dimensions of poverty dynamics in the measurements.

Multiple conceptual approaches and measurement strategies have been applied to the study of poverty (for a review, see Grusky and Kanbur 2006; see also Christiaensen and Shorrocks 2012). Commonly, poverty is measured by comparing resources to needs, and families or individuals are considered poor if they fall below some threshold (J. E. Foster 1998, 335). Three steps are needed to quantify the scope of poverty (World Bank 2011; J. E. Foster 1998, 335): selecting welfare measures, constructing thresholds, and tallying the resulting data.

The first step is to define the relevant welfare measure (World Bank 2011). Income is a common choice, the use of which may be justified on the grounds that income is essential in societies with market economies (Borgeraas and Dahl 2010). Consumption is another common choice, dictated by the same logic; some have argued that consumption is a more appropriate longer-run measurement of household welfare than income because households can to a degree shift resources over time and smooth consumption more than income (Deaton 1997). A different approach, popularized by Sen and others, focuses on capabilities or endowments (Sen 1999; Sen 2006; Bourguignon 2006; Nussbaum 2006). The capabilities approach suggests that poverty should be defined in terms of individuals' capabilities to choose their own lives. This approach is associated with efforts to define poverty as failure to reach minimally acceptable levels in multiple dimensions—different monetary and non-monetary attributes necessary for functioning (for example, see Bourguignon and Chakravarty

2003; Thorbecke 2005; Bourguignon 2006; and Nussbaum 2006; Marlier and Atkinson 2010; for a critical discussion of child-focused multidimensional indicators of poverty, see Dercon 2012).

Second, one has to select a poverty line –a threshold below which a given household or individual will be classified as poor (World Bank 2011). This line can be defined in absolute, relative, or subjective terms. One of the earliest conceptualizations of poverty was that of absolute poverty, commonly defined as lacking the income necessary to acquire sufficient material resources to satisfy basic physiological needs (Borgeraas and Dahl 2010, 73). Often, absolute poverty thresholds are developed for some initial period based on the cost of a "nutritional basket" considered minimal for the healthy survival of a typical family, to which a provision is added for non-food needs (J. E. Foster 1998, 336; World Bank 2011). The threshold is then carried forward, with adjustments for inflation. In national settings where non-trivial shares of the population survive at the margins, much poverty estimation work continues to rely on an absolute definition (World Bank 2011; see also Brady 2003, in passing). [1]

Third, one has to select an index to tally results, to be used in reporting for either a whole population or a subpopulation (World Bank 2011). A common choice is a trio of measures quantifying the incidence, depth, and severity of poverty developed by Foster, Greer, and Thorbecke (1984), which are the poverty headcount index, poverty gap index, and squared poverty gap index (e.g., see Haughton and Khandker 2009).[2] The headcount index (P_0) measures the proportion of the population that is poor; the poverty gap index (P_1) measures the extent to which individuals fall below the poverty line (the poverty gaps) as a proportion of the poverty line; and the squared poverty gap index (also known as the poverty severity index, P2) averages the squares of the poverty gaps relative to the poverty line (Haughton and Khandker 2009, 67).

In this paper, we employ income as the primary welfare measure for defining poverty. This is a compromise as consumption is not measured in the CHNS. Household income was conceptualized as the sum of all sources of income and revenue minus production expenditures, and was constructed as the sum from nine potential sources -- business, farming, fishing, gardening, livestock, non-retirement wages, retirement income, subsidies, and other income. The income value in each wave was then inflated to 2009 Yuan current values. Per capita household income was calculated based on the inflated household income and the number of permanent residents in the household[3]. We adopted the absolute poverty

[1] Additional approaches have also emerged. For example, in contrast to poverty lines demarcating absolute deprivation, relative poverty lines are defined in relation to the overall distribution of income or consumption in a country (Brady 2003; World Bank 2011). In this framework, poverty is not just about absolute levels of deprivation, but about deprivation relative to prevailing norms of income or consumption (or, by extension, some other indicator). Another approach has been to conceptualize the cutoff subjectively, in terms of "the amount of income it takes to barely get by" or other related questions (Yoshikawa, Aber, and Beardslee 2012, 273).

[2] However, many other measures have been proposed (for example, see Brady 2003; Marlier and Atkinson 2010; Haughton and Khandker 2009).

[3] Although equivalence scale is desired in calculating income measurement for poverty definition, there are no

line developed by Ravallion and Chen (2007), which is 1200 RMB per capita for urban households, and 850 RMB per capita for rural households, at 2002 prices. We then adjusted this line by national urban- and rural- specific consumer price indices (CPI) and calculated poverty indices based on the adjusted lines for each survey wave.

We consider poverty across time points among individuals, rather than seeking to report indices at a given time point for a population. We do so by incorporating transient versus chronic poverty, and the timing of poverty, into our measurement approach. We adopt two general approaches to calculating poverty for individuals, across time. The first approach adopted in this paper is a simple indicator of exposure to spells of poverty (dropping to the poverty line or lower) during different stages of childhood. We constructed a series of binary variables indicating whether one's household's income was above the poverty line in each specific time spell. Therefore, the longitudinal poverty status of each household was described by a vector of dichotomous variables with 1 indicating that the income in a period was below the poverty line and 0 otherwise. Examining poverty spells allows us to identify whether there are critical periods for poverty associated with children's outcomes. However, this approach, especially with income as welfare measurement for defining poverty, is well known to suffer from measurement error, due both to the intrinsic difficulties in measuring all variables and the special problems posed by recall and imputing values for own production in the case of expenditure and of estimating costs and revenues for agricultural and non-farm enterprises in the case of income (Baulch and Hoddinott 2000).

This concern leads us to adopt a second approach, in which we distinguish chronic and transient poverty by calculating chronic and transient poverty indices (see Ravallion and Chen 2007). For individual i, the *chronic poverty index* (CP_i) measures the degree of long-term poverty by comparing long term average income ($\overline{y_i}$) against the poverty line (PL). Long-term average income is calculated as the total observed income for household i at each time t, divided by the total times observed T. Mathematically, it can be written as: $CP_i = \frac{1}{T}\sum_{t=1}^{T}\left[\left(1-\frac{\overline{y_i}}{PL}\right)_+\right]^2$, where $\overline{y_i} = \frac{1}{T}\sum_{t=1}^{T} y_{it}$ and $f_+ = \max(f, 0)$. If long term average income is greater than the poverty line, the index is 0. If long term average income is less than the poverty line, the index represents the average over time of the square of one minus the individual's income as a fraction of the poverty line. The index approaches 1 as an individual's income approaches 0.

The *transient poverty index* (TP_i), in contrast, measures the degree of transient poverty that is due to inter-temporal variability in income. Mathematically, it is the difference between the squared poverty gap (Foster, Greer, and Thorbecke 1984), $SPG_i = \frac{1}{T}\sum_{t=1}^{T}\Big[\Big(1 -$

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standard scale indices that apply to Chinese households except an attempt by Chen (2006). For this reason, we use the per capita income which may overestimate the extent of poverty as some households likely fall under poverty line by simply having a new-born baby. We incorporated this possibility by controlling for the number of children in the household in the later empirical estimations.

$\left.\frac{y_{it}}{PL}\right)_{+}\Big]^2$, and the chronic poverty index defined above: $TP_i = SPG_i - CP_i$. We consider overall exposure to transient poverty, and the timing of transient poverty during childhood.

Both of these approaches measure poverty dynamics. They are also complementary to each other as they measure poverty in different dimensions. The poverty spell approach emphasizes the timing of poverty, while the chronic and transient poverty approach measures both the degree and persistence of poverty. For example, if a household's income was observed to be below the poverty line in all waves, its chronic poverty index would be positive and the poverty spell vector would include all ones. But if a household fell under the poverty line in one of all waves observed, with long term average income above the poverty line, its chronic poverty index would be zero and transient poverty index would be positive, and it would have only one poverty spell indicating the period under poverty.

4 DATA AND SAMPLE SELECTION

4.1 DATA

The analyses in this study utilize data from the China Health and Nutrition Survey (CHNS) (see Popkin 1994). The CHNS is a longitudinal panel study designed to examine how the social and economic transformation of Chinese society is affecting the health and nutritional status of its population. The survey used a multistage, random cluster process to draw a sample of about 4400 households with a total of 26,000 individuals in nine provinces that vary substantially in geography, economic development, public resources, and health indicators. Detailed community data were also collected for food markets, health facilities, and other social policies. The study commenced in 1989, and revisited the panel every 2 to 4 years, in 1991, 1993, 1997, 2000, 2004, 2006, 2009 and 2011.

Although the CHNS is often criticized as not being representative of the Chinese population, its longitudinal features, especially the focus on health and nutrition, makes it unique in its application to this study. As many households were followed in multiple waves of the surveys, we are able to trace the whole growth periods of a small cohort of children into their young adulthood, with observations of their family economic status, school enrollment, education attainment. This is the feature that is only available in CHNS, among all the social and economic surveys from China, including the China Family Panel Studies (CFPS), Chinese Household Income Project (CHIP), and the Urban and Rural Household Surveys in China (UHS and RHS). Moreover, children's cohort data were not collected until recently (e.g., the China-Anhui Birth Cohort Study from 2008) or were established among children beyond the early childhood phase (e.g., the Gansu Survey of Children and Families, established in 2000). Thus, the CHNS is currently the only option to study this topic in China.

4.2 SAMPLE SELECTION

In order to model the poverty dynamics exposed by children, we would ideally need to observe the whole growth periods of a cohort of children. But this is impossible given the non-consecutive design of CHNS, and that the CHNS doesn't follow the same cohorts over periods. Individuals were observed at different age points, and therefore we have to find common spells in which most children were observed to secure a sufficiently large sample size. Therefore, we define our analytic sample as the one that consists of all individuals observed at least once during each of the four periods: fetus~ 3, 4~9, and 10~15, and 16+ years old. This may not coincide with the biological clock that marks different growing needs recognized by pediatricians, such as 0 to 2 years for infants/babies, 2 to 5 years for toddlers/preschoolers, 6 to 12 years for school age children, and 13-18 for adolescents/teenagers. But this is the best that we can do given the data structure. There are 1311 individuals who satisfy this criteria, among whom 1103 were observed with household income in each above period, and only 606 were observed with schooling information after 16 years of age. Furthermore, 544 individuals were observed with parents' education and other control variables. In addition, 41 individuals were observed dropping out of school before they reached 16 years old. We assume they never returned to formal schooling after dropping out, and also include them in our sample. Table 1 shows definitions and descriptive statistics for some basic variables used in the analysis. And for purpose of looking at sample selection issue, we compare this analytic sample against the data pool which include all children born in the same birth-year periods as those in the analytic sample (1985-1995), but who may not necessarily be observed in all those growth periods (see column 1 in Table 1). In the later robustness check, we also define an extended sample which include both analytic sample and additional 473 individuals who were observed during each of the growth periods before 16, but have missing education information beyond 16[4].

[4] 705 individuals were in the roster in each period without schooling information after 16 years old. 179 of them were no longer household members since last observed before 16 years old, and another 526 did not live in the household though they were still household members (235 went to school and lived away from home; 12 served in military; 266 sought employment elsewhere; 1 went abroad; and 12 left for other reasons). For all these people, we do not observe them dropping out of school when last observed before 16 years old; and when they were away from home, they didn't answer the Child/Adult survey so that no schooling information was updated. For 473 of these individuals, we can observe their previous education information (before 16 years old) as well as other variables and therefore include them in our robustness check analysis with the complete sample.

Table 1. Descriptive statistics of the analytic sample and comparisons with other samples

	(1) Data pool (n=2062)		p diff between (1) and (2)	(2) Analytic sample (n=585)		p diff between (2) and (3)	(3) Extended sample (n=473)	
	mean	s.d.		mean	s.d.		mean	s.d.
Male	0.53		0.05	0.57		0.02	0.51	
Urban	0.26		0.01	0.21		0.00	0.12	
Birthyear	1989.31		0	1988.25	(0.10)	0.03	1988.55	(0.10)
South	0.47		0	0.54		0.06	0.59	
Long term average income (yuan)	14106.3	(279.69)	0	16233.87	(461.76)	0.13	15212.69	(485.26)
Chronic poverty index				0.01	(0.03)	0.91	0.01	(0.00)
Transient poverty index				0.06	(0.09)	0.90	0.06	(0.00)
Mother's education (%)								
Illiterate	17.36		0.04	21.03		0.01	28.12	
Primary school	23.28		0.88	23.59		0.37	26	
Secondary school	37.97		0.51	39.49		0	31.08	
High school	15.03		0	15.9		0.62	14.8	
College	6.35		0	2.39		0.43	1.69	
Father's education (%)								
Illiterate	6.35		0.48	7.18		0.6	8.03	
Primary school	19.11		0.94	18.97		0.91	19.24	
Secondary school	46.12		0.76	46.84		0.7	47.99	
High school	19.84		0.5	27.01		0.4	24.74	
College	8.58		0	3.93		0.92	3.81	

Note: Data pool includes all children born between 1985 and 1995 with basic information on geography, income, and parents' education, but are not observed during each growth period as defined. Extended sample includes individuals with observations in each growth period, but missing education information beyond 16 years old.

The statistics show that the analytic sample differs from the data pool in various dimensions: the analytic sample is more male, older, more rural, and more southern, and has less educated parents, especially in terms of higher education. The households in the analytic sample also have higher long term average income than those in the data pool, which, however, may not have many observations to calculate long term average income. Compared to the extended sample, the analytic sample also includes more boys, but is less rural, is less from southern China, and has more educated mothers. However, these two samples don't differ significantly in long-term average income, or poverty indices, which alleviates concern about biased outcomes due to selectivity of the sample.

We further plot the survival curves of schooling for different samples: the analytic sample, the extended sample and the pool of children within the same birth periods (see Figure 1). In the analytic sample, over 97% children complete primary school (grade 6) and continue to secondary school, while over 90% of children complete compulsory school (grade 9), only 60% move forward to high school and only 25% of children enter higher education after completing high school (grade 12). The analytic sample has a higher dropout rate than the other two samples, especially at compulsory school and high school (grade 12). This partly could be explained by having more elder cohorts in the analytic sample. Moreover, all three samples show girls' advantage beyond compulsory school.

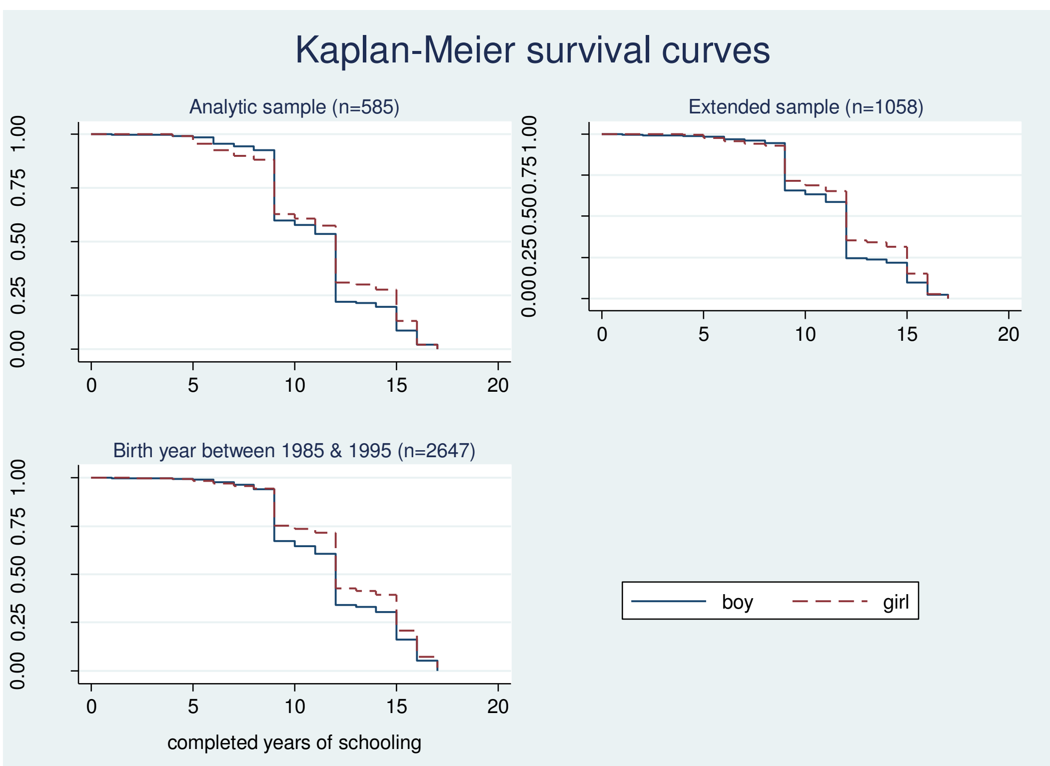

Figure 1. Kaplan-Meier survival curves of schooling for different samples, by gender. The extended sample in the right top panel includes both analytic sample and the "extended sample" in Table 1. And the bottom left panel includes both analytic sample and the "data pool" in Table 1.

Figure 2 shows the poverty dynamics during children's developmental periods in our analytic sample. The number in brackets denotes the number of observations in each scenario. The blue level stands for the infant and toddler stage (fetus-3 years old); the orange level stands for the child stage (4-9 years old); and the green level stands for the adolescent stage (10-15 years old). The chart shows among the analytic sample of 588 children, 280 were exposed to poverty before reaching four years of age. Out of these 280, 144 individuals continued to be under the poverty line during the child stage of 4-9 years old, while the other 136 children were out of poverty during the same age stage. Finally, only 65 of those who were poor at childhood stayed poor during the adolescent stage of 10-15 years old. And 35 of those 136 who were initially poor before 4 and moved out of poverty during 4-9 years old fell back into poverty during the adolescent stage of 10-15 years old. Overall, 61 children were exposed to chronic poverty (with positive chronic poverty index), while 391 were exposed to transient poverty by the definitions above.

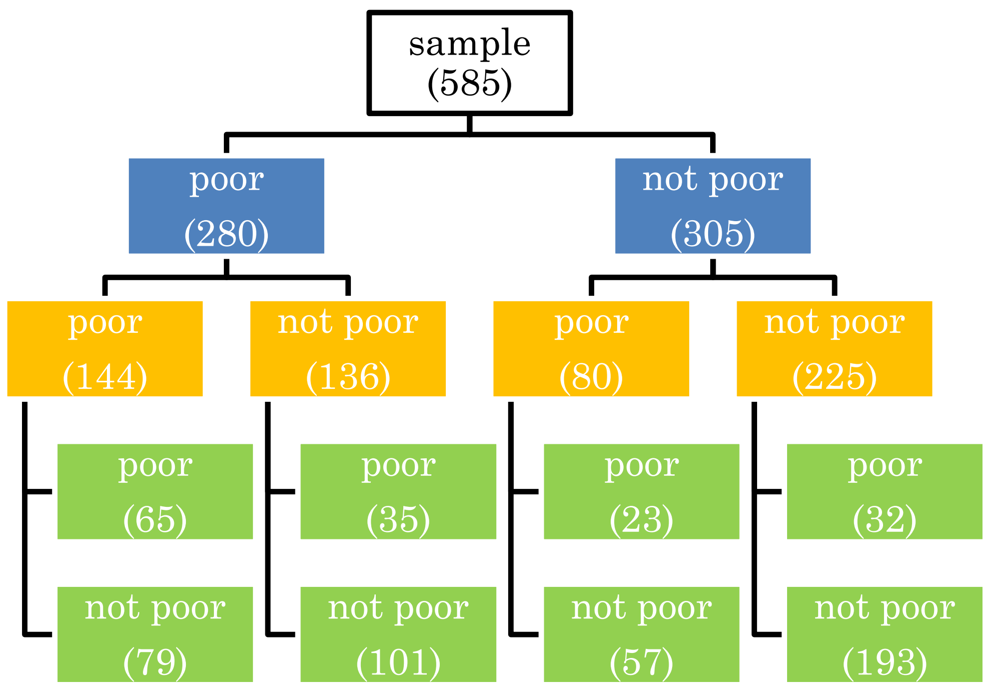

Figure 2. The poverty dynamics of the households for the sample children during growth periods. The blocks on each level (represented by different colors) show the distribution of the households under/above poverty line in each life-cycle stage. Blue level stands for infant and toddler stage (fetus-3 years old), orange level for child stage (4-9 years old), and green level for adolescent stage (10-15 years old).

These two types of poverty dynamics measurement are found consistent with each other. In our analytic sample, there are 65 children living under the poverty line during all three growth periods, while there are only 61 children who have a positive chronic poverty index calculated based on the long term average income. On the contrary, 392 children have ever experienced poverty during their childhood, and 391 have positive transient poverty index based on our calculation. Figure 3 displays the distributions of chronic and transient poverty indices, which clearly shows the prevalence of transient poverty relative to chronic poverty. Moreover, from the poverty dynamics diagram, we see that more children experienced poverty in early childhood than in later childhood. Although a minority of children fell into poverty in later childhood, many more escaped poverty in later childhood. This general movement is consistent with China's economic growth since 1980s. And that transient poverty is much more common than the chronic poverty is also consistent with this general trend.

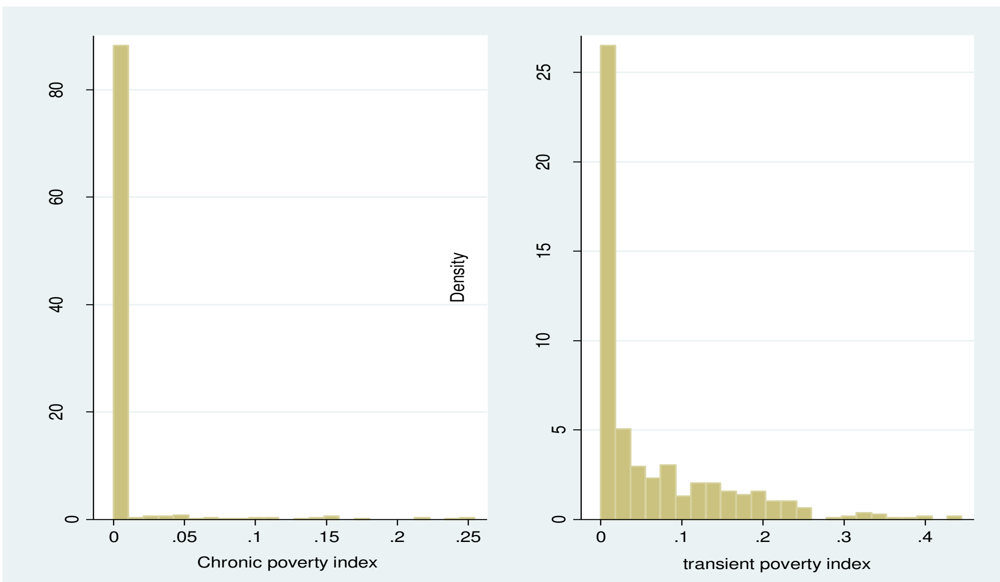

Figure 3. The distributions of chronic and transient poverty indices during childhood.

5 EMPIRICAL ANALYSIS AND MAIN RESULTS

5.1 EMPIRICAL METHODS

As some individuals did not finish schooling in the last wave observed in our data, attained education is a right censored variable. For this reason, a hazard duration model was used to address the censoring problem. More specifically, we adopted the Cox proportional hazard model and evaluated the association between the hazard of *dropping out of school* and poverty during childhood. We defined the outcome variable as the number of completed years of formal education in regular school. This outcome variable was measured at young adulthood, i.e., 16 years old or older, in the last observed survey. For those who haven't finished formal schooling in the last survey, the highest grade attained so far is used with a flag indicating still being in school. In all specifications, we control for child's gender, parents' education levels, a quadratic function of age at which the education outcome is measured, and the number of children in the households. In addition, to control for community effects that reflect the supply side of education, we also include an urbanization index[5] of the community during childhood, and the community education index. These two indices measure the extent of urbanization and the accessibility of public services and the average level of education in a community, with higher scores indicating higher degree of urbanization and better education, respectively. For each life-cycle stage, if one child was observed in more than one wave, we took the multi-wave averages of these two indices within the same stage. We defined the strata by province, urban/rural area and birth year, i.e. for each birth year cohort from the rural/urban part of same province, the baseline hazard is assumed to be the same. In order to distinguish different associations of poverty for boys and girls, we included interaction terms between poverty variables and gender in models. Long term average income was also included as a control variable in some specifications with poverty spells. By doing so, we are able to compare the education outcomes of children who have the same long term average income during childhood, but were exposed to poverty at different time spells. This strategy intends to identify critical periods of children's development associated with poverty, without being confounded by income effects.

5.2 POVERTY SPELLS

Table 2 shows models of school-leaving with poverty spells and long-term income. Model 1 shows a specification with only long-term income and gender, and shows a significant protective effect of long-term income. It shows that if there were 10% increase in long term average income, children would be 2.88% less likely to drop out of school. This is a relatively "pure" household income effect, as the community urbanization index and education index were both controlled. Overall, there is no significant difference between boys and girls.

Model 2 shows results for poverty spells alone. Here, poverty exposure at ages 4 to 9 is associated with greater likelihood of leaving school. Poverty exposure at ages 10 to 15, when children would be making the transition to more expensive levels of education, shows no effect, net of earlier poverty. Model 3 contains both long-term income and poverty spells. Net of long-term income, no poverty exposure at any period is significant. Models 4 and 5 test gender interactions with poverty exposure, without and with long-term income, respectively. Early childhood poverty exposure is associated with significant increases in the risk of school-leaving for girls, but not for boys, while middle-childhood poverty exposure is

[5] There are 12 components defining the urbanization index: population density, economic activity, traditional markets, modern markets, transportation infrastructure, sanitation, communications, housing, education, density, health infrastructure, and social services (see Jones-Smith and Popkin 2010).

associated with increases in the risk of dropping out of school for both girls and boys, although the associations with boys are smaller

Table 2. Poverty spells and education attainment at adulthood (n=585)

Dependent variables: hazard ratio of dropping out of formal schooling					
	(1)	(2)	(3)	(4)	(5)
(log) long time income mean	-0.292***		-0.275*		-0.264*
	(0.112)		(0.151)		(0.153)
poor at age<4[a]		0.0848	0.0314	0.345**	0.294*
		(0.107)	(0.115)	(0.154)	(0.164)
poor at age [4,10)[b]		0.264**	0.188	0.339*	0.267
		(0.110)	(0.117)	(0.177)	(0.186)
poor at age [10,16)[c]		-0.00695	-0.13	-0.162	-0.256
		(0.124)	(0.139)	(0.175)	(0.181)
male * poor at age<4[d]				-0.428**	-0.427**
				(0.205)	(0.209)
male * poor at age [4,10)[e]				-0.111	-0.113
				(0.221)	(0.226)
male * poor at age [10,16)[f]				0.252	0.211
				(0.232)	(0.239)
Male	0.0488	0.056	0.0519	0.276	0.286
	(0.100)	(0.102)	(0.102)	(0.187)	(0.186)
Prob > F test of (a + d=0)				0.063	0.111
Prob > F test of (b + e=0)				0.045	0.228
Prob > F test of (c + f=0)				0.539	0.365
Log pseudolikelihood	-577.083	-576.936	-575.919	-575.317	-574.392

Note: The table shows the survival analysis on finished schooling in adulthood by fitting Cox proportional hazard model with censoring. The hazards are stratified by province, urban/rural area and birth years. All specifications control for parents' education level dummies, quadratic function of age, number of children under 16 in the household, urbanization index of the community during the whole childhood, and urbanization index for education. Superscripts **a**, **b**,…, **j** stand for the coefficients of each above poverty indices and interaction terms between poverty indices and gender. Robust standard errors clustered at community level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

5.3 CHRONIC AND TRANSIENT POVERTY

Table 3 shows results for analyses of school leaving using chronic and transient poverty measures. Model 1 shows a baseline specification that includes only gender and chronic and transient poverty measures, along with other controls stated in the table note. In this specification, transient poverty, but not chronic poverty, shows a significant effect for the subsequent hazard of school leaving. Model 2 adds a gender interaction to the model, and shows that the significant effect of transient poverty is less pronounced for males than for females. In other words, girls are particularly vulnerable to transient poverty, although both males and females were more likely to drop out of school if facing transient poverty.

Model 3 allows the transient poverty index value to vary by age, and shows that transient poverty at ages 0 to 3 and 4 to 9 are highly significant. For a 0.1 increase in the transient poverty index during early childhood, the hazard of dropping out of school increases by 5.54%[6], while for a 0.1 increase in the transient poverty index during middle childhood, the hazard of dropping out of school increases by 4.99%. Finally, model 4 tests the interaction between age-specific transient poverty and gender. In this specification, transient poverty is most detrimental at the earliest period of childhood, and the detrimental effect is much stronger amongst girls than boys. All specifications show a male disadvantage among the non poor, although this disadvantage is not statistically significant.

[6] The hazard ratio is the exponential of the coefficient in hazard model. 5.54% = (exp(0.1*0.539)-1)*100%.

Table 3. Poverty persistence and education attainment at adulthood (n=585)

Dependent variables: hazard ratio of dropping out of formal schooling				
	(1)	(2)	(3)	(4)
Chronic poverty index[a]	-1.19	-4.75	-1.541	-5.171
	(1.908)	(5.613)	(1.921)	(5.627)
Transient poverty index[b]	2.196***	3.134***		
	(0.598)	(0.777)		
Chronic poverty* male[c]		4.72		4.682
		(5.978)		(5.938)
Transient poverty * male[d]		-1.828**		
		(0.904)		
Transient poverty index at age [0,4)[e]			0.539**	1.394***
			(0.211)	(0.329)
Transient poverty index at age [4,10)[f]			0.487**	0.129
			(0.210)	(0.354)
Transient poverty index at age [10,16)[g]			0.218	0.601*
			(0.214)	(0.336)
Transient poverty index at age [0,4) * male[h]				-1.367***
				(0.393)
Transient poverty index at age [4,10) * male[i]				0.666
				(0.439)
Transient poverty index at age [10,16) * male[j]				-0.492
				(0.469)
Male	0.0545	0.168	0.0439	0.192
	(0.100)	(0.138)	(0.101)	(0.145)
Prob > F test of (a+c=0)		0.700		0.639
Prob > F test of (b+d=0)		0.000		
Prob > F test of (e+h=0)				0.000
Prob > F test of (f+i=0)				0.008
Prob > F test of (g+j=0)				0.183
Log pseudolikelihood	-575.195dis	-574.188	-575.644	-571.126

Note: The table shows the survival analysis on finished schooling in adulthood by fitting Cox proportional hazard model with censoring. The hazards are stratified by province, urban/rural area and birth years. All specifications control for parents' education level dummies, quadratic function of age, number of children under 16 in the household at each growth stage, urbanization index of the community during the whole childhood, and urbanization index for education. Superscripts **a**, **b**,…, **j** stand for the coefficients of each above poverty indices and interaction terms between poverty indices and gender. Robust standard errors clustered at community level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

6 ROBUSTNESS CHECK

6.1 COMPULSORY SCHOOL COMPLETION

Although survival analysis shows early childhood poverty exposure is negatively associated with children's future education attainment, it doesn't tell us about the probability of completing compulsory school, which may be more related with poverty and more relevant for poverty alleviation policies. In this section, we check whether the patterns we find in the early section remain in models with compulsory school completion as an outcome variable. The probit estimation results are listed in Table 4a and 4b, separately. Column (3) in Table 4a implies that those who were exposed to early childhood poverty are 4.74% less likely to complete compulsory school, compared to those who had the same long term average income during childhood, but were not exposed to poverty before 4 years old. Long-term average income is not significantly associated with compulsory school completion, which indirectly indicates the effectiveness of compulsory school enforcement in China. A similar pattern exists for a poverty persistence specification, as shown in Table 4b. Transient poverty at early childhood appears detrimental to girls' chances of completing compulsory school, but not to boys. Again, chronic poverty doesn't seem to predict lower chances of completing compulsory school.

Table 4a. Poverty spells and compulsory school completion (n=573)

Probit model on the probability of completing compulsory school					
	(1)	(2)	(3)	(4)	(5)
(Log) long time income mean	-0.079		0.001		-0.015
	(0.171)		(0.224)		(0.228)
Poor at age<4[a]		-0.374**	-0.374**	-0.668***	-0.671***
		(0.183)	(0.180)	(0.252)	(0.254)
Poor at age [4,10)[b]		0.03	0.03	0.08	0.08
		(0.198)	(0.204)	(0.269)	(0.279)
Poor at age [10,16)[c]		0.430**	0.430*	0.44	0.44
		(0.193)	(0.235)	(0.287)	(0.296)
Male * poor at age<4[d]				0.57	0.57
				(0.353)	(0.355)
Male * poor at age [4,10)[e]				-0.07	-0.07
				(0.342)	(0.342)
Male * poor at age [10,16)[f]				-0.04	-0.04
				(0.406)	(0.415)
Male	0.354**	0.357**	0.357**	0.044	0.043
	(0.161)	(0.167)	(0.169)	(0.294)	(0.295)
Prob > F test of (a + d=0)				0.029	0.028
Prob > F test of (b + e=0)				0.955	0.962
Prob > F test of (c + f=0)				0.093	0.200
Log pseudolikelihood	-136.042	-132.646	-132.646	-131.583	-131.581

Note: All models include the same control variables as in Table 2, plus province and urban/rural sector dummies and birth year. *** p<0.01, ** p<0.05, * p<0.1.

Table 4b. Poverty persistence and compulsory school completion (n=573)

	Probit model on the probability of completing compulsory school			
	(1)	(2)	(3)	(4)
Chronic poverty index[a]	3.317	1.807	3.145	0.797
	(2.08)	(4.56)	(2.11)	(4.48)
Transient poverty index[b]	-0.0249	-0.749		
	(0.99)	(1.36)		
Chronic poverty* male[c]		1.522		2.22
		(5.09)		(5.24)
Transient poverty * male[d]		1.632		
		(1.98)		
Transient poverty index at age [0,4)[e]			-0.051	-1.053**
			(0.32)	(0.48)
Transient poverty index at age [4,10)[f]			-0.0415	0.563
			(0.40)	(0.61)
Transient poverty index at age [10,16)[g]			0.104	0.016
			(0.37)	(0.60)
Transient poverty index at age [0,4) * male[h]				2.274***
				(0.64)
Transient poverty index at age [4,10) * male[i]				-1.042
				(0.73)
Transient poverty index at age [10,16) * male[j]				0.2
				(0.78)
Male	0.335**	0.211	0.338**	0.151
	(0.162)	(0.211)	(0.163)	(0.217)
Prob > F test of (a+c=0)		0.280		0.495
Prob > F test of (b+d=0)		0.712		
Prob > F test of (e+h=0)				0.001
Prob > F test of (f+i=0)				0.347
Prob > F test of (g+j=0)				0.894
Log pseudolikelihood	-140.799	-140.399	-140.752	-136.093

Note: All models include the same control variables as in Table 2, plus province and urban/rural sector dummies and birth year. *** p<0.01, ** p<0.05, * p<0.1.

6.2 SAMPLE ATTRITION

The above analysis was conducted based on the analytic sample in which all individuals were observed and had education information from infant and toddler stage (0-3) through adult period (16+). This definition, however, raises an issue of sample attrition in that we ruled out those individuals who were not observed through adulthood. To check whether our analysis was biased by a selective sample, we checked robustness of analysis on a larger sample, consisting of the original sample and another 473 cases who were included in the roster in each analysis period and observed with their education information only before 16 years old, as well as other control variables (see footnote 3). We tested both specifications with this larger sample, and the results are in Appendix Table A1 and Table A2. Although the two groups were distinct in many dimensions as shown in Table 1, and the excluded group in the original analysis left home at earlier age, the quality and quantity of the empirical results didn't change much by including the second group. Poverty exposure in early childhood still has adverse effects on one's schooling. The only significant difference is that non-poor boys disadvantage in education attainment becomes significant in the last two models of both specifications.

6.3 POSSIBLE MECHANISM

As mentioned in the background section, poverty influences education through different channels: nutrition, and family environment such as books and other stimulation that may affect children's preparedness and readiness in school; and the ability to pay for tuition. The CHNS is uniquely suited to investigating one potential mechanism: early nutrition. In the CHNS, nutrition intake is measured by a 3-day food diary of the household. Food diary items have been translated into three broad nutrition categories: carbohydrates, protein and fat, which can be used to calculate total calorie intake. Individual intake is calculated by the recalled proportion of each food taken. To make the measures comparable across different age groups, we standardize the nutrition intakes by removing the age trend. We here run the hazard model of dropping out of school with each category of nutrition intake during each growth period, with or without controlling for income. The other control variables remain the same as noted earlier. The main results are summarized in Table 5.

Among three macro nutrition intakes, protein intakes in early childhood and adolescence are negatively associated with the hazard of dropping out of school, while carbohydrates intake during the middle childhood (between 4 and 9) are positively associated with the hazard of dropping out of school. One may argue these associations are simply reflecting the associations with income, as richer households are more likely to consume protein rich foods and less carbohydrates. This concern can be alleviated by controlling for incomes in the model (see the lower panel of Table 5). Including incomes in the model reduces the coefficients on nutrition, suggesting nutrition partly captures the income effect. But the associations of protein intake remain significantly negative even after controlling for income. Moreover, we can also argue that the above associations are likely to be causal, as fat intake, which is highly associated with income in the sample ($p<0.05$ for all growth periods), does not show any associations with schooling duration in either panel. We find no significant differences between boys and girls in the associations with nutrition. These results suggest a possible mechanism that early poverty is associated with later educational outcomes through early undernutrition.

Table 5. Three macro nutrition intakes during growth periods and education attainment at adulthood (n=490)

	protein		carbohydrates		fat	
age<4a	-0.263**	-0.288*	-0.226*	-0.269	0.00541	-0.028
	(0.113)	(0.148)	(0.128)	(0.170)	(0.073)	(0.120)
age[4,10)[b]	0.137	0.128	0.257**	0.346*	0.073	-0.0385
	(0.132)	(0.217)	(0.121)	(0.180)	(0.095)	(0.136)
age[10,16)[c]	-0.301**	-0.165	-0.199	-0.0447	-0.0776	-0.0223
	(0.147)	(0.289)	(0.150)	(0.173)	(0.072)	(0.138)
male*age<4d		0.0611		0.0759		0.0536
		(0.225)		(0.218)		(0.129)
male*age[4,10)[e]		0.00186		-0.164		0.184
		(0.254)		(0.186)		(0.144)
male*age[10,16)[f]		-0.204		-0.353		-0.079
		(0.320)		(0.274)		(0.179)
control for income at each period	no	no	no	no	no	no
Prob > F test of (a + d=0)		0.065		0.182		0.909
Prob > F test of (b + e=0)		0.624		0.109		0.268
Prob > F test of (c + f=0)		0.058		0.215		0.529

	protein		carbohydrates		fat	
age<4a	-0.246**	-0.292**	-0.211*	-0.24	0.0306	0.00173
	(0.113)	(0.146)	(0.125)	(0.174)	(0.073)	(0.120)
age[4,10)[b]	0.134	0.0955	0.239*	0.317*	0.127	0.00662
	(0.133)	(0.219)	(0.122)	(0.180)	(0.093)	(0.140)
age[10,16)[c]	-0.253*	-0.157	-0.21	-0.0727	-0.0677	-0.0356
	(0.146)	(0.289)	(0.156)	(0.185)	(0.069)	(0.144)
male*age<4d		0.0991		0.0483		0.044
		(0.224)		(0.221)		(0.135)
male*age[4,10)[e]		0.0425		-0.144		0.196
		(0.249)		(0.184)		(0.144)
male*age[10,16)[f]		-0.142		-0.316		-0.0418
		(0.327)		(0.273)		(0.184)
control for income at each period	yes	yes	yes	yes	yes	yes
Prob > F test of (a + d=0)		0.076		0.227		0.868
Prob > F test of (b + e=0)		0.643		0.154		0.098
Prob > F test of (c + f=0)		0.153		0.222		0.61

Note: The table shows the survival analysis on finished schooling in adulthood by fitting Cox proportional hazard model with censoring. The hazards are stratified by province, urban/rural area and birthyears. Macro nutrition intake are standardized against age by taking the residuals after fitting polynomial trend function of age. All specifications control for parents' education level dummies, quadratic function of age, number of children under 16 in the household at each growth stage, urbanization index of the community during the whole childhood, and urbanization index for education. Robust standard errors clustered at community level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

7 SUMMARY AND CONCLUSIONS

In summary, results show that long-term income significantly predicts educational outcomes in adulthood, but even net of long-term income, spells in poverty shape educational trajectories. Transient poverty, as measured here, shows greater detrimental impact on children's educational attainment than chronic poverty[7]. Moreover, early and middle-childhood poverty exposure appears more detrimental to outcomes than does poverty exposure in the 10 to 16 age range. Further, there is some suggestion that girls' education may be more susceptible than boys' to early poverty exposure, but among the never poor, girls may be advantaged. These latter findings are consistent with some prior work in China suggesting that girls' education has been vulnerable to household or community poverty (Emily Hannum 2003; Cherng and Hannum 2013), but showing an emerging gender parity and even female advantage at some stages in education, in China (Cherng and Hannum 2013; Davis et al. 2007; Emily Hannum 2003; Wu and Zhang 2010) and around the world (Grant and Behrman 2010). Finally, protein intake in early childhood and adolescence is linked to educational outcomes in young adulthood, suggesting a possible mechanism of impact.

By focusing on children's outcomes in young adulthood, this paper adds a life-cycle perspective to a literature that considers differences in nature of transient and chronic poverty in middle and low-income countries (Bayudan-Dacuycuy and Lim 2014; Adepoju 2012), and adds a new case study to the literature on the longitudinal implications of childhood poverty. Two main insights emerge. First, while underscoring the importance of long-term economic status for children's human capital acquisition, this study also highlights that transient poverty—which may be more unexpected than chronic poverty--also matters. In the income and poverty spell models, even net of long-term income, spells in poverty shape educational trajectories. Moreover, in the chronic and transient poverty models, transient poverty, as measured here, showed greater detrimental impact on children's educational attainment than chronic poverty. It is likely that families adapt differently to expected, long-

[7] One shouldn't over-interpret the insignificant chronic poverty coefficients, as the variation in chronic poverty index is much smaller than the variation in the transient poverty index. The chronic poverty index is dominated by zeros as only 61 out of 585 sample children were exposed to chronic poverty before they reached 16 years old. Moreover, this study has one drawback with the data that we use to measure chronic poverty - the nonconsecutive time series of CHNS does not allow measurement of household income every year. As an outcome, the transient poverty may actually capture some part of chronic poverty as one wave change of income actually reflects changes over a few years.

term economic deprivation then to the kinds of shocks that might cause sudden poverty spells, such as job loss, catastrophic health care costs, or sudden crop loss. Children's education bears the marks of these short-term shocks. This finding is not unique from our study. Scott also finds that transitory shocks can have long term consequences in Chile (Scott, 2000).

Second, the estimates suggest that the timing of poverty matters: early and middle-childhood poverty exposure appears more detrimental to outcomes than does poverty exposure in the 10 to 16 age range. This finding is somewhat surprising in the China context, if one assumes that ability to pay is the primary mechanism, given that the costs of schooling have typically been considerably higher at the middle and high school levels for families. Instead, the patterning of impact of childhood poverty exposure suggests that a mechanism other than just family ability to pay may be at work, and is more consistent with the theory that economic deprivation in early childhood creates disparities in school readiness (e.g., Duncan and Magnuson 2013). Our further analysis that shows an effect of early nutrition intake, mainly protein, on later educational outcomes suggest a possible mechanism. This finding seems consistent with early child development theory that emphasizes the importance of in-utero and within 2 years environment on future development (Royer 2009. Barreca 2010, Black et al. 2007) Education is a cumulative process, and children who experience resource deprivation early may be at a substantial disadvantage. In the United States, Gershoff and her colleagues (2007) analyzed a national sample of 21,255 kindergarteners from the Early Childhood Longitudinal Study, and as income increased, parental investments and resources for the child increased, which enhanced academic skills. At the same time, higher income was associated with reduced material hardship and stress, and fewer child behavior problems. Cross-national research indicates a robust relationship between indicators of household economic status and achievement (e.g., Ladd 2012; Hanushek and Woessmann 2011; Chiu 2007).

This paper has several limitations. First, the estimated relationship between poverty and education attainment reflects association, not causality. Although taking care of the endogeneity of income is not impossible by examining the unexpected shocks of income, it is not easy with the current data set to get a meaningful sample size. Moreover, we believe the associations can still be interesting, especially with the findings about the timing of poverty. As far as we know, this paper is the first one focusing on the relationship between early childhood poverty and later outcomes in China. Though methodologically weak, it may provoke more research in this area. The second limitation in this study is in sample attrition. The analysis sample used in this paper can be quite selective by the requirement of households staying in the study for over 16 years. However, this is a common problem with any longitudinal studies, especially the ones covering the long life span of subjects. Several studies of some other prospective birth cohort data sets have found that such attrition in terms of observed characteristics did not affect substantially multivariate estimates (Behrman et al. 2009, Hoddinott et al. 2008, Maluccio et al. 2009). Off course, one needs to be cautious in interpreting the estimation results. Third, poverty indices are not calculated perfectly as data collection is not continuous in years and therefore transitory poverty index may be overestimated. Moreover, consumption data is not available in CHNS, which is widely accepted as better measurement for poverty than income itself as households smooth consumption based on their income flow.

This study, nevertheless, has considerable strengths in using longitudinal data that trace some individuals from early childhood to early adulthood, and can shed some light on the increasing educational inequality in present-day China. In China, the poorest children face multiple challenges that are likely to place them at a competitive disadvantage in the schooling process. For example, in Northwest China, China's poorest region, the poorest children were at elevated risk of being chronically undernourished, living in food insecure households, and lacking access to vision correction (Emily Hannum, Liu, and Frongillo 2012; Emily Hannum and Zhang 2012; Yu and Hannum 2007). Children reported lacking essential school materials and supplies, and fretted constantly about how to get them; they lacked adults at home who had the educational experience to assist them with homework or school problems; and they worried about money and the burden of their school costs on their parents (E. Hannum and Adams 2008). Lack of access to early childhood education for poor rural children also places them at a disadvantage relative to many urban children (Luo et al. 2012). The disproportionate impact of poverty in early and middle childhood on children's long-term educational prospects highlights the potential value of compensatory educational programs targeting early childhood education and the beginning school transition.

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APPENDIX

Table A.1. Poverty spell and education attainment at adulthood (n=1,058)

Dependent variables: hazard ratio of dropping out of formal schooling					
	(1)	(2)	(3)	(4)	(5)
(Log) long time income mean	-0.336***		-0.335**		-0.336**
	(0.111)		(0.151)		(0.154)
Poor at age<4[a]		0.11	0.0446	0.353**	0.291*
		(0.107)	(0.114)	(0.155)	(0.164)
Poor at age [4,10)[b]		0.287***	0.194*	0.368**	0.28
		(0.109)	(0.115)	(0.174)	(0.184)
Poor at age [10,16)[c]		-0.029	-0.177	-0.14	-0.261
		(0.123)	(0.139)	(0.172)	(0.180)
Male * poor at age<4[d]				-0.397**	-0.399**
				(0.196)	(0.202)
Male * poor at age [4,10)[e]				-0.117	-0.127
				(0.213)	(0.222)
Male * poor at age [10,16)[f]				0.172	0.125
				(0.227)	(0.234)
Male	0.0922	0.0988	0.0943	0.332*	0.348*
	(0.098)	(0.100)	(0.100)	(0.183)	(0.183)
Prob > F test of (a + d=0)				0.063	0.124
Prob > F test of (b + e=0)				0.023	0.198
Prob > F test of (c + f=0)				0.691	0.310
Log pseudolikelihood	-599.242	-599.256	-597.698	-597.891	-596.343

Note: The table shows the survival analysis on finished schooling in adulthood by fitting Cox proportional hazard model with censoring. The hazards are stratified by province, urban/rural area and birth year. All specifications control for parents' education level dummies, quadratic function of age**,** number of children under 16 in the household at each growth period, urbanization index of the community during the whole childhood, and urbanization index for education. Robust standard errors clustered at the community level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.2. Poverty persistence and education attainment at adulthood (n=1,058)

Dependent variables: hazard ratio of dropping out of formal schooling				
	(1)	(2)	(3)	(4)
Chronic poverty index[a]	-1.276	-3.99	-1.599	-4.274
	(1.893)	(5.647)	(1.893)	(5.650)
Transient poverty index[b]	2.408***	3.297***		
	(0.597)	(0.767)		
Chronic poverty* male[c]		3.675		3.584
		(6.033)		(5.961)
Transient poverty * male[d]		-1.738*		
		(0.889)		
Transient poverty index at age [0,4)[e]			0.529**	1.388***
			(0.212)	(0.301)
Transient poverty index at age [4,10)[f]			0.557***	0.14
			(0.204)	(0.347)
Transient poverty index at age [10,16)[g]			0.225	0.615*
			(0.211)	(0.327)
Transient poverty index at age [0,4) * male[h]				-1.386***
				(0.360)
Transient poverty index at age [4,10) * male[i]				0.748*
				(0.436)
Transient poverty index at age [10,16) * male[j]				-0.521
				(0.458)
Male	0.0946	0.208	0.0852	0.231*
	(0.098)	(0.133)	(0.099)	(0.140)
Prob > F test of (a+c=0)		0.770		0.707
Prob > F test of (b+d=0)		0.000		
Prob > F test of (e+h=0)				0.000
Prob > F test of (f+i=0)				0.002
Prob > F test of (g+j=0)				0.158
Log pseudolikelihood	- 597.127	- 596.266	- 597.940	- 593.061

Note: The table shows the survival analysis on finished schooling in adulthood by fitting Cox proportional hazard model with censoring. The hazards are stratified by province, urban/rural area and birthyears. All specifications control for parents' education level dummies, quadratic function of age, number of children under 16 in the households during each growth period, urbanization index of the community during the whole childhood, and urbanization index for education. Robust standard errors clustered at community level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1