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Parental education and child health:

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Parental education and child health:
Evidence from an education reform in China

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Parental education and child health:

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Abstract

This paper investigates the impact of parental education on child health, exploiting a compulsory schooling law implemented in China in 1986 that extended schooling from 6 to 9 years. It finds that it is maternal, rather than paternal, education that matters most for child health. There are also important differences in the effect according to child gender. An additional year of mother's education raises boys height-for-age by 0.163 standard deviations, whilst there is no statistically significant effect on girls height. Parental education appears to have little effect on weight-for-age of children. Estimated effects on height are driven by the rural sample, where an additional year of mother's education raises boys height for age by 0.228 standard deviations and lowers the probability of a boy being classified as stunted by 6.6 percentage points. Results therefore suggest that - at least in rural areas - son preference in China has additional impacts beyond the sex-ratio at birth.

JEL Classifications: C21; I12; I21

Keywords: Intergenerational Mobility; Health; China

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1 Introduction

Health is an important component of well-being (Deaton, 2008) and is correlated with economic status (Smith, 1999). Such is the belief that health goes some way to determining a society's potential for economic advancement that both the World Health Organisation (WHO) and the European Commission (EC) have argued that governments should increase spending on health in order to induce economic growth (Swift, 2011).

Despite recent advancements in the health of children in developing countries, with reductions in mortality (Liu et al., 2012) and anthropometric failure (De Onis et al., 2013), stunting (height $<$ 2 s.d. below the reference mean) is still a major issue; in 2010 an estimated 167 million children in developing countries were classified as stunted (De Onis et al., 2012). In 2012, the WHO adopted a resolution to address malnutrition which included a target to reduce by 40% the number of children under the age of 5 who were classified as stunted by 2025 (De Onis et al., 2013). In China, stunting rates have declined in recent years but there are large disparities between both urban and rural areas and coastal and inland provinces (Chunming, 2000; Jiang et al., 2014); recent estimates suggest a stunting rate in rural inland provinces of around 30% (Wang et al., 2009).

A large body of work investigates intergenerational relationships between the socioeconomic status (SES) and/or health of parents and children (see Black and Devereux, 2011, for a comprehensive survey), stressing the importance of parental education, income, and health for child outcomes. Income gradients in health begin in childhood and increase with child age (Case et al., 2002), and there is overwhelming evidence concerning a positive relationship between childhood health and adult health and SES (e.g. Case et al., 2005). Thus, the study of how parental socioeconomic status affects child outcomes is of interest if we are concerned with ensuring equality of opportunity.

One motivation for focusing on child health is that we may be interested in the distribution of health and - in particular - how inequalities in health relate to inequalities in other contexts. Currie (2009) argues that low parental education may impact the future education and labour market outcomes of their children through it's impact on child health. In other words, health may mediate the intergenerational transmission of education. Parents with low levels of education may be less able to invest in the health of their children, and this may have long-reaching implications for the adult outcomes of the child (Cunha and Heckman, 2007; Almond and Currie, 2011). Thus, disparities in parental education have further reaching implications than one might first think.

Mechanisms through which parental education may impact on health are numerous (Lindeboom et al., 2009); parental education may enter the child health production function directly (e.g. through increased knowledge and associated increased efficiency in health investments) and indirectly (e.g. through increased income resulting in increased spending on health inputs).[1] Much of the existing literature studying the impact of parental education on child health focuses on mothers rather than fathers (Chen and Li, 2009). Arguments for doing so are that mothers - as primary caregivers - may have more of a direct influence on child health than fathers (Aslam and Kingdon, 2012), and that efficiency gains in health production from increased education are larger for mothers than fathers (Amin et al., 2014).

Improved education of girls has been a development policy focus for several decades (Monkman and Hoffman, 2013). Two of the Millenium Development Goals (MDG) explicitly focus on increasing the level of girls education; in response to this, there have been several high profile initiatives to raise education of girls such as the United Nations Girls Education Initiative (UNGEI) and The World Bank's Education Strategy 2020. The latter explicitly discusses improving access to education for girls and other disadvantaged groups. Traditional arguments for a policy focus on girls education fall in the realms of justice-based arguments (equality and human rights), utility arguments (improving girls schooling will e.g. reduce poverty and raise well-being), and empowerment arguments (education as facilitating female empowerment) (Monkman and Hoffman, 2013). Alongside this, it is increasingly being recognised by policymakers that there may be second order effects to raising girls education. Improvements in girls education may have intergenerational effects for their future offspring; the World Bank has argued that improving female education 'yields enormous intergenerational gains' (Tembon and Fort, 2008, p. xvii).

A particular issue in the context of China concerns son preference, arising from the traditional patriachal Confucian system in which girls and women are marginalised in society (Attané, 2006). This occurs for several reasons; China is historically an agrarian society in which sons have higher earning potential, continue the family lineage, and are generally the recipients of inheritance, whilst women are absorbed into their husbands lineage upon marriage (Das Gupta et al., 2003; Attané, 2006; Hesketh and Xing, 2006). Since son preference is historically entrenched in society and culture, it has persisted despite economic change (Das Gupta et al., 2003; Murphy et al., 2011); female wages continue to be lower than comparable males (Rozelle et al., 2002) so that there are additional economic incentive to invest in sons at the expense of daughters other than those described above.

It has been argued that son preference affects the household status and bargaining power of mothers whose first born is a son rather than a daughter (Li and Wu, 2011). Evidence on gender differences in investments in health in the Chinese context are scarce, though one study found that daughters in China were breastfed for less time than sons (Graham et al., 1998), and another found that daughters with older sisters were less likely to be immunised (Li, 2004). It may well be the case, therefore, that son preference is such that the aforementioned intergenerational

[1] See Lindeboom et al. (2009) for a more complete discussion.

gains from improved female education may not necessarily benefit boys and girls equally.

Estimation of the causal relationship between parental education and child human capital outcomes such as health or education is complicated by various sources of endogeneity. For example, unobserved time preferences of parents may be such that those who discount the future less heavily are both more likely to invest in their own education and in the human capital of their children. The solution in the literature has been to isolate *exogenous* changes in parental education, either through the use of data on twins or adoptees, or through instrumental variables (IV) methods (Holmlund et al., 2011).

Chen and Li (2009) investigate the impact of maternal education on child health in China using the 1992 Chinese Children Survey data, and analyse determinants of the health of adoptees. They find that an additional year of education raises child height-for-age by 0.022 standard deviations, although they do acknowledge that some of their control variables may be endogenous, which may make their results problematic. Studies using twin data have focused on the intergenerational impact of parental education on child education and have tended to find a role for father's education but not mothers (Amin et al., 2014). However, many of these twin studies investigate the impact of parental health without knowing the zygosity of the twins; i.e whether they are identical or not; Amin et al. (2014) find that failure to account for zygosity of twins can substantially lower the estimated impact.

A popular IV methodology has been to use *educational reforms* to identify exogenous changes in parental education; typically these educational reforms involve changes to compulsory schooling laws, and typically they focus on developed economies. This identification strategy has been used to estimate the impact of education on e.g. own earnings (Harmon and Walker, 1995; Meghir and Palme, 2005; Pischke and von Wachter, 2008), child education (Black et al., 2005; Holmlund et al., 2011; Chevalier, 2004; Dickson et al., 2013; Oreopoulos et al., 2006), and child health (Lindeboom et al., 2009; Chou et al., 2010; Lundborg et al., 2014). These latter papers are of particular interest for the analysis in this paper.

Lindeboom et al. (2009) investigate the impact of both maternal and paternal education on child health, using a rise in the compulsory school-leaving age in the UK in 1947. They find no evidence of an impact of parental education on child health, and argue that this may be because they also find no impact of the increased education on inputs to child health production such as prenatal or child care. Chou et al. (2010) investigate the impact of an increase in compulsory schooling from 6 - 9 years in Taiwan and find that an additional year of maternal education lowered infant mortality at the county level by 0.774 deaths per thousand, whilst the impact of father's education is smaller, at 0.602 deaths per thousand. Lundborg et al. (2014) exploit a compulsory schooling law in Sweden to estimate the impact of parental education on a range of outcomes including cognitive and non-cognitive skills, and a variety of measures of health. They find no effects of father's education, but for mothers they estimate that an additional year of education raises offspring adult height by 0.089 standard deviations.

This paper identifies the impact of parental education on child health using a schooling reform in China in 1986 which extended compulsory schooling from 6 to 9 years (primary to junior secondary). I estimate the relationship separately for boys and girls so as to investigate whether there is evidence of differential parental investments according to child gender. Since son preference is much more prevelant in rural areas, I also estimate seperately by urban and rural location. It is one of only a handful of studies employing this methodology to investigate impacts of parental education on child health and the first to look at this question in China. It also contributes to evidence concerning the importance of son preference in China for child outcomes.

I find that it is maternal, rather than paternal, education which matters for child health, consistent with the evidence found in Lundborg et al. (2014), and more generally in the intergenerational literature that uses IV methodologies to estimate the impact of parental education on child outcomes (Amin et al., 2014). In addition, maternal education seems to matter only for boys, and not girls. Estimates suggest that an increase of maternal education by one year raises boys height-for-age by 0.163 standard deviations. In contrast, effects on girls height are statistically insignificant. This offers evidence of differential parental investments, with son preference continuing to disadvantage girls in China. When I further investigate by rural and urban status, I find that results are driven primarily by the rural sample; estimated effects of an additional year of mother's education on rural boys height for age is 0.154 standard deviations whilst there is no statistically significant effects in the urban sample. This may be because pre-reform education levels were quite high in urban areas so that there was less scope for the reform to have an impact, affecting the strength of my instrument. I further investigate the effect of mother's education on stunting amongst rural children, and find that an additional year of education lowers the probability that a boy is stunted by 6.6 percentage points.

The rest of the paper is organised as follows. Section 2 briefly outlines the reform, section 3 describes the data, section 4 describes the methodology, section 5 outlines results, and section 6 concludes.

2 Reform of China's Education Structure, 1986

2.1 The historical context: Chinese schooling pre-1986 reform

Historically, the Confuican tradition in education was one of *elite-orientated* rather than widespread education (Lewin et al., 1994). As such, the education system pre-1949 was underdeveloped with 80% of the population being illiterate. The post-1949 period saw a huge expansion in education with an increase in the number of primary (secondary) schools from 346,800 (4,000) in 1949 to 547,300 (11,100) in 1957 (Hannum, 1999). However, the great famine of 1959-61 led to a large drop in enrollment in schools (Hannum, 1999). This was further compounded by the cultural revolution starting in 1966 which saw the forced closure of many schools (Lee, 2006), a shortage of teachers at all levels of education (Ning, 1992) and a lowering of educational quality due to an emphasis on political loyalty over academic achievement in determining progress through school (Hannum, 1999).

In the early 1980s several problematic areas in education were identified. These included: low quality elementary education; vocation and technical education were underdeveloped; a poor match existed between higher education studies and ultimate jobs performed by graduates; education development had failed to keep pace with other technological, social and economic change; and education administration was too rigid (Lewin et al., 1994; Hawkins, 2000). As part of a strategy to ensure education would facilitate economic development and in response to these perceived failures in the education system, the *Reform of China's Education Structure* was designed at a national conference on education in 1985 (Ning, 1992).

2.2 Reform of China's Education Structure

The structure of China's education system is as follows. Pre-school or kindergarten is available from ages 3-6, after which children enter grade 1 of primary school. This lasts for 6 years so that at age 12 they enter junior secondary school and enrol in grade 7. After three years of junior secondary education a student may enter either academic or vocational senior secondary school at the age of 15 (grade 10). Entry into higher education is at age 18.

The *Reform of China's Education Structure* consisted of a package of reforms which aimed to address the identified problems in the Chinese education system outlined above. The reform decentralised educational finance (Hawkins, 2000), promoted vocation and technical education, and gave more thought into correctly matching higher education enrollment to the skill set of graduates needed by employers (Lewin et al., 1994). The *Law on Nine-Year Compulsory Education* was introduced; this consisted of the extension of compulsory education from the primary cycle of education (six years) to junior secondary education (nine years).

2.3 The Law on Nine-Year Compulsory Education

The *Law on Nine-Year Compulsory Education* was implemented from 1st July 1986; its ultimate aim was to implement a nine year cycle of compulsory education. However, it was recognized that there existed inherent differences between the level of economic development in different regions and between urban and rural areas, so that the nine-year cycle was to be implemented at varying rates according to the level of development of an area (Hannum, 1999). Cities and economically developed areas in coastal provinces and some select interior provinces that had high levels of enrollment in junior secondary education were expected to make it universal by 1990; these areas contained around 25% of the population (Song et al., 2006). Townships and villages that were classified as economically semi-developed (around 50% of the population) were required to focus on securing universal primary education and to expand enrollment in junior secondary schooling, with universal enrollment targeted by 1995. Finally, economically underdeveloped areas were expected to expand primary and junior secondary education, but with no target for universal enrollment (Lewin et al., 1994). Thus, although the requirements varied across areas, there was an emphasis on raising the years of schooling at the lower end of the education distribution in all areas.

3 Data and Descriptive Statistics

3.1 Data

I use the China Health and Nutrition Survey (CHNS).[2] This is an ongoing open cohort study; the first round was collected in 1989 and drew a sample of about 4400 households, with a total of 26,000 individuals, in nine provinces: Guangxi, Guizhou, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Liaoning, and Shandong, whose population in 1990 accounted for around a third of China's population (Entwisle and Chen, 2002). These provinces differ in geography, economic development, public resources, and health indicators. Eight additional panels were collected in 1991, 1993, 1997, 2000, 2004, 2006, 2009 and 2011 with new households added to the data after 1993. In 2011, three province level municipalities were added to the sample: Beijing, Shanghai, and Chongqing. Figure 1 shows the provinces used in the analysis. One drawback from using the CHNS is that it is not a representative sample of the whole of China; however, it has been argued that characteristics of the CHNS households and individuals are comparable to those from national samples (Chen et al., 2015).

Information in each survey round was collected on demographic and socioeconomic characteristics, individual health, diet, income, time use, child care, fertility and birth histories, and health care availability and use. Since the reform occurred in 1985, I use only the 1997-2011 survey waves so as to ensure that parents are old enough to have completed their schooling. I focus the analysis on children aged 0-10 at the time of the survey.

[2] See http://www.cpc.unc.edu/projects/china for information on and access to the data.

3.2 Descriptives

3.2.1 Education pre- and post-reform

The reform expanded education from primary to junior secondary level; since the school year in China starts on September 1st, individuals who were born between September 1973 - August 1974 would have been in grade 6 (the final year of primary school) and were due to enter grade 7 (the first year of junior secondary schooling) when the reform was implemented. These are the first primary schooling cohort affected by the reform. The cohort born between September 1971 - August 1973 are classified as 'partially treated' as they were due to enter grades 8 or 9 of junior secondary. Thus, they may have already dropped out of school (untreated) or they were in school at the time of the reform but in the absence of the reform may have otherwise dropped out and not completed junior secondary education (treated). Individuals born before this belonged to cohorts that would have already graduated junior secondary schooling at the time of the reform's implementation and would have been unaffected by the reform.[3] A summary of treatment status is given in table I below.

Table I: Cohort Reform Status

Date of birth	Grade entry point at 1st September 1986	Reform Status
Aug 1971 or before	>9 (Post Junior Secondary)	Not Treated
Sept 1971 - Aug 1973	8 or 9 (Years 2 or 3 of Junior Secondary)	Partially Treated
Sept 1973 or later	≤7 (Year 1 of Junior Secondary or below)	Treated

To investigate differences in education over time (before and after the reform) and spatially (across province), I use the latest wave available (2011) and focus on the 5 schooling cohorts immediately prior to the reform (born Sept 1966 - Aug 1971), and the first 5 fully treated cohorts after the reform (born Sept 1973 - Aug 1988), since these are the cohorts used in the main analysis (discussed in section 4 below).[4]

Figure 2 shows average education for the pre- and post- reform cohorts, seperately for women and men, with a dotted horizontal line indicating 9 years of education. For women schooled in the post-reform period, a distinct rise in education above nine years is apparent; prior to the reform education had been more or less stagnant and this was some motivation for the reform itself. For men, pre-reform education averaged around nine years, so that the reform had less scope for impact, though a rise in average education is observed for the post 1973/74 cohort. For both men and women, the observed rise above 9 years is due to a shift in

[3] Of course, this does not take into account individuals who dropped out and re-entered the schooling system, or who had to resit a grade. Since I cannot identify these individuals I assume they do not constitute a large fraction of the sample.

[4] In all the analysis, I drop individuals who report currently being in school (1.20% women and 0.57% of men in the sample).

the distribution of education to the right, as shown in histograms of education for the five pre- and post-reform cohorts (Figure 3).

Disparities in the level of development across different geographical units of analysis in China exist. In particular, inequality at the urban/rural and inter-provincial level have been highlighted, with much of the recent focus on urban/rural inequalities (Tsui, 1993; Herrmann-Pillath et al., 2002). In the 2011 wave of the CHNS data, average education in the urban sub-sample is 11.36 (10.57) for men (women) whilst in rural areas it is 9.15 (8.22) years.[5] Provincial differences in education levels are also apparent; average education of men (women) varies across provinces from 8.34 (7.53) in Guizhou to 12.87 (12.57) years in Beijing (figure 4). These means also mask variation in the distribution of education, shown in figure 4; e.g. in Liaoning women tend to have either 6 (primary), 9 (junior secondary) or 12 (senior secondary) years of education, whilst in Guizhao women tend to have either no education (0 years) or 9 years of education. Given these geographical inequalities in education levels, I also investigate trends by urban and rural location.

The urban/rural splits confirm that scope for the reform to have an impact was larger in least developed areas (i.e. rural vs. urban) of areas; effects were particularly pronounced for women, who experienced the largest 'jump' in education levels between the pre- and post-reform cohorts (Figure 5). In urban areas, average education is above 9 years for the pre-reform cohorts, but gains in average education were still made, which is to be expected given a rightward shift in the distribution which raises the mean.

3.2.2 Summary Statistics

Table 1 shows summary statistics for the sample used in the analysis i.e. the waves 1997-2011, children aged 0-10 years old, and parents of the five pre- and post-reform cohorts. Average height-for-age and weight-for-age of children is negative, suggesting on average Chinese children are shorter and weigh less than their US counterparts, though there is significant variation around the mean. Average education of mothers in the sample is 8.282, and of fathers it is 9.105. There is significant variation in household income, with some negative net incomes reported; this is because household income is calculated as the net of all income and business expenditure so that it is possible to record losses.[6] As we might expect in the Chinese context, there are more male children in the sample than female children, with 56.5% of children being male.

There is significant variation in height, weight, and parental education across the provinces (Figure 6). In most areas, average height- and weight-for-age z-scores are negative, though

[5] As a reminder, these statistics pertain to the 5 pre- and 5 post-reform cohorts.

[6] Some discussion of this issue is given in the documentation for the household income variable construction, available at the CHNS website: `http://www.cpc.unc.edu/projects/china/data/datasets/data/datasets/convar`.

there are some provinces (Liaoning and Shandong) and province level municipalities (Beijing and Shanghai) in which average z-scores are greater than zero. There is also significant variation in child health by education level. Figures 7 and 8 plot the distribution of child height and weight by education level of the mother and father. The distributions of height and weight shift rightward with increased parental education, though the distributions for no or primary education are very similar; it appears that advantages to having educated parents become more apparent once the threshold of secondary education has been crossed. In fact, the distributions for children of parents who are educated to secondary (higher) education are centred at (above) zero, suggesting that their health is comparable to children in the US.

4 Methodology

The empirical model is summarised by the following two equations:

$$H_{ijt} = \beta_0 + \beta_1 E^p_{ijt} + \beta_2 X_{ipjt} + \beta_3 \gamma_j + \beta_4 YOB_{ipjt} + \beta_5 YOB_{ipjt}\gamma_j + \beta_6 \psi_t + \varepsilon_{ijt} \quad (1)$$

$$E^p_{ijt} = \alpha_0 + \alpha_1 Z_{pjt} + \alpha_2 X_{ipjt} + \alpha_3 \gamma_j + \alpha_4 YOB_{ipjt} + \alpha_5 YOB_{ipjt}\gamma_j + \alpha_6 \psi_t + \eta_{ijt} \quad (2)$$

The outcome of interest H_{ijt} is either the (gender-specific) i) height-for-age z-score or ii) weight-for-age z-score, for a child i living in province j at time t.[7] E^p_{ijt} is the education of child i's parent, where $p = m$ (mother) or $= f$ (father), so that the coefficient of interest is β_1. I restrict the analysis to children who are living in the same household as their parent. X_{ipjt} is a vector of child, parent and household control variables: household income per capita, child's age, number of children < 18 living in the household, and indicators for Han ethnicity, urban status, and living in a coastal province.[8] For regressions of mother's education, X_{ipjt} also includes the mother's age at birth. I also include province specific fixed effects (γ_j), trends for both parent and child year of birth (YOB_{ipjt}), province-specific trends for both the year of birth of the parent and of the child ($YOB_{ipjt}\gamma_j$), and survey wave fixed effects ψ_t. The panel of children is unbalanced and children are observed in different waves; I pool all waves together in my analysis.[9] I calculate robust standard errors that are clustered at the province level. I estimate equation 1 for children aged 0-10 at the time of the survey. Given its history of son preference and the resulting poorer health and education outcomes for female infants and children (e.g. Chen et al., 2007; Hannum et al., 2009; Ren et al., 2014), it is of interest to

[7]These z-scores of height are calculated using the Stata command -zanthro- which uses the 2000 US CDC Growth Standards.

[8]An indicator for coastal province is included since there is significant inequality in education and health between eastern, coastal, provinces and inland provinces (Hao and Wei, 2010; Zhang and Kanbur, 2005).

[9]Note that since the variable of interest, parental education (E^p_{ijt}), is constant over time, it is not possible to identify its effect using fixed effects regression methods. Results are robust to a specification in which variables are averaged over the child so that there is just one observation per child; results available on request.

investigate whether improvements in parental education disproportionately improve the health of one gender relative to another. I therefore estimate equation 1 separately for boys and girls.

I first estimate equation 1 by OLS. Since parental education E^p_{ijt} is likely to be endogenous I then estimate using 2SLS, and instrument E^p_{ijt} with the instrument set Z_{pjt}, with equation 2 as the first stage. I investigate two different instruments. First,

$$Z_{pjt} = Post_{pjt}$$

where $Post_{pjt}$ is a dummy variable indicating that parent p belongs to the post-reform cohort. I focus on the 5 cohorts preceding the reform, and the 5 cohorts following the reform, not including those who were partially affected and who are omitted from the analysis.[10,11] Thus $Post_{ijt}$ equals 1 if the parent belongs to the 'treatment' cohorts, and 0 if the individual belongs to the 'control' cohorts, described in Table II below. This is a straightforward difference in difference strategy in which parents exposed to the reform are compared to parents unexposed to the reform, taking into account the year in which the parent and child are observed, ψ_t, observable characteristics X_{ipjt}, province of birth γ_j, and when allowing for differential trends by province $YOB_{ipjt}\gamma_j$.

Table II: Cohorts used in the analysis

Date of birth	Treatment Status
1st September 1966 - 31st August 1971	Control
1st September 1973 - 31st August 1978	Treatment

An identifying assumption of the IV strategy used is that the reform would not have affected child health in any way other than through it's impact on parental education. It is important to consider whether this is valid, given that the extension of compulsory education to nine years was part of a package of reforms. To recap, other aspects of the *Reform of China's Education Structure* were: decentralisation of educational finance; reforms to enrollment planning of higher education to give more control to HE institutes over enrollment policies; and the promotion of vocational and technical education. Of these it is plausible to assume that the former two aspects of the reform would not directly affect child health 20 years or so later. The focus on promotion of vocational and technical schooling is probably the largest threat to identification, since it may be the case that this affected school quality. However, although this policy led to the opening of technical and vocational schools, in reality these were often simply pre-existing schools which had been renamed with the same staff who were not given additional training

[10] Results are robust to instead using as the treatment group the first 5 cohorts following the reform, including those classified as partially affected. Results available on request.

[11] Given the different waves, parents are aged between 21-43 years. As discussed earlier, I omit from the analysis individuals still in school at the time of the survey; this is only around 1% of these cohorts.

(Lewin and Hui, 1989). In addition, explicit objectives targeting the quality of education did not occur until the late 1990s (Tiedao et al., 2004).

There are two drawbacks to using reform status as an instrument. The first is that the equation is exactly identified, so that it is not possible to test for validity of the instrument. The second is that when using a national compulsory schooling reform as an instrument, it can be difficult to disentangle cohort effects from the reform unless there is some geographical variation in the way in which the reform is implemented (Holmlund et al., 2011). There is little specific information available on the implementation of the reform in different areas. However, given that - as outlined in section 2 - the pace of the implementation of the nine-year cycle at a local level was determined by the level of development of the area, I investigate the use of a variable proxying the level of educational development prior to the reform.

The second instrument set is:

$$Z_{pjt} = Post_{pjt}, \quad E_j^p, \quad Post_{pijt} \cdot E_j^p$$

where E_j^p is the average education (in years) of the last two cohorts unaffected by the reform (individuals born 1969/71; see Table II above) for a parent p living in province j.[12]. This average is calculated at the provincial level, separately for urban and rural areas, to account for inherent differences in educational development between urban and non-urban locations, as discussed in section 3. I also include its interaction with the indicator for being of the post-reform cohort, $Post_{pijt}E_j^p$. The motivation for using E_j^p is that this will proxy for pre-reform differences in the level of education in different areas which may have affected i) the pace of reform, and ii) the potential scope of the reform for raising education levels.

A final issue is whether to investigate mothers and fathers education together or in isolation. Holmlund et al. (2011) argue that it is not clear whether spousal education should be included as an additional (endogenous) explanatory variable in IV regressions; either spousal education is omitted - so that resulting estimates partially reflect assortative matching - or it is included as an additional endogenous regressor, instrumented with an indicator for if the spouse was affected by the reform. This can be problematic if spouses are close in age so that there is little variation in reform status within spouses, resulting in imprecise estimates. The choice is therefore to either omit spousal education and accept that the estimates partially reflect assortative mating, or instrument both parents' education in the same analysis and potentially face a weak instruments problem. I choose the former, estimating equation 1 separately for mothers and fathers.[13]

[12] I use the last two cohorts since cell sizes for just one cohort can be quite small. Results are robust to instead using education of the last pre-reform cohort (1970/71) calculated from 1990 census data, in which cell sizes are significantly larger. I do not use this in my main analysis for two reasons; firstly, rural/urban location is not defined clearly in the census and secondly, years of education is not reported so that instead I have to use the indicators for the proportion of individuals who reported completing secondary level education.

[13] As a robustness check, I included both parents in the analysis; as expected the instruments were very weak

5 Results

5.1 Mothers Education

Tables 2 and 3 show results when investigating the impact of mothers' education on the height-for-age and weight-for-age of children. In each specification I first estimate without X_{ipjt} before adding in these controls. OLS estimates indicate that maternal education has a statistically significant positive effect on health (columns (I) and (II)) but, as already outlined, are likely invalid due to endogeneity concerns.

The two stage least squares estimates (columns (III) - (VI)) show that the impact of maternal education varies across the gender of the child. Specifically, I find education has a protective influence on height only for boys. Using just the post-reform indicator $Post_{pijt}$ (instrument set 1, Columns (III) and (IV)), weak instruments are a problem. This is to be expected given that $Post_{pijt}$ does not allow for any geographical variation in the implementation of the reform. In addition, because these IV regressions are exactly identified, it is not possible to test for validity of the instruments. Using the pre-reform education level instrument set (columns (V) and (VI)), the instruments are valid and appear to be strong (i.e. the F-statistic from the first stage are $>$ 10). The test of validity is passed in all specifications.

My estimates suggest that an additional year of maternal education raises boys height by 0.163 standard deviations (Panel A, column (VI), table 2); this is twice the (statistically insignificant) effect found for girls. This is particularly interesting given the history of son preference in China, and suggests that, when investigating a long-term measure of health, boys predominantly benefit from improvements to maternal education or income.

For weight-for-age, the effect of maternal education is insignificant in most specifications. In one specification for boys (Instrument set II, Panel A, column (V), table 3) an additional year of maternal education raises boys weight by 0.153 standard deviations, but this effect is statistically insignificant once X_{ijt} controls are added. An additional year of maternal education raises the weight-for-age of girls by 0.120 standard deviations (Panel B, column (VI), table 3), but this is only significant at the 10% level.

5.2 Fathers Education

Turning our attention to fathers now (Tables 4 and 5), again, OLS estimates indicate that education has a statistically significant positive effect on health (Columns (I) and (II)). However, once we investigate using 2SLS, father education becomes statistically insignificant in almost all the specifications for child height. These results are consistent with discussion in section 1 above; mother's education may matter more due to their status as primary care givers. For

and therefore not particularly informative. Results available on request.

weight-for-age, I find no effects on either boys or girls; for boys, the specification does not pass the test for validity. Given the weak effects found for father's education on height-for-age, and concerns about the specification used for the weight-for-age analysis, in further extensions I focus only on mother's education.

5.3 Urban-rural estimates

Given the observed differences in education between urban and rural areas documented in section 3, I estimate separately by household urban status. Results suggest that effects are driven largely by the rural sample (Table 6), with no statistically significant effects for children in urban areas (Table 7).[14]

For rural boys, in my preferred specification (Column (VI)), a one standard deviation increase in mother's education raises height-for-age by 0.228 standard deviations (Table 6). I again do not find any statistically significant effect on boys' weight-for-age.

5.4 The impact of maternal education on stunting

Results so far suggest that maternal education has a protective influence on child health, as measured by height-for-age, and that these effects are driven by the rural sample. Given that stunting (height-for-age $<$ 2 s.d. below mean) is a significant problem in China, particularly in rural areas (as discussed in section 1 above), I therefore extend the analysis to estimate the impact of maternal health on stunting, for the rural sample only.[15]

Once again, estimates suggest that maternal education has a protective influence on boys' health but not girls. An additional year of education lowers the probability of being stunted by 6.6 percentage points (Table 8). The incidence of stunting in the rural boys sample is 15.5%, so that this is large relative to the mean.

6 Conclusion

This paper investigates the impact of parental education on child health, exploiting a compulsory schooling law to identify exogenous effects. It is one of the first few papers to study this in the context of an emerging economy and the first paper to study this question in China. Results suggest that, once household and individual characteristics are controlled for, it is maternal education that matters for child health, rather than paternal education. Furthermore, improvements

[14]Note that for space considerations, I no longer show the first stage estimates. These are similar to the first stage results shown in Tables 2 and 3. Results available on request.

[15]As a check, I also estimated the impact of mother education on stunting in the urban sample; as expected, I found no statistically significant effect. Results available on request.

in maternal education raise boys' education but not girls'. Estimates suggest that an additional year of schooling raises boys height-for-age by 0.163 standard deviations.

The effect on height-for-age is driven by the sample of rural children for whom an additional year of education raises boys height-for-age by 0.228 standard deviations. Stunting is a significant problem in rural areas in China (Wang et al., 2009), and I find that an additional year of mother's education lowers the probability of rural boys being stunted by 6.6 percentage points. Once again, I find no statistically significant effect on girls.

The implications of these results are two-fold; first, they contribute to existing arguments that it is maternal rather than paternal education that matters for child health (Amin et al., 2014), lending further support for policies that focus on improving girls education. Second, it highlights concerns that son preference in China has persisted despite sweeping economic and social change in the last 25 years, and suggests that the benefits of any improvements in maternal education may not be equally distributed according to gender.

References

Almond, D., Currie, J., 2011. Human capital development before age five. In: Handbook of Labour Economics, Vol. 4B. Elsevier, pp. 1315–1486.

Amin, V., Lundborg, P., Rooth, D.-O., 2014. The intergenerational transmission of schooling–are mothers really less important than fathers? Linnaeus University Centre for Labour Market and Discrimination Studies, Working Paper 2014:8.

Aslam, M., Kingdon, G. G., 2012. Parental education and child health: Understanding the pathways of impact in pakistan. World Development 40 (10), 2014–2032.

Attané, I., 2006. The demographic impact of a female deficit in China, 2000–2050. Population and Development Review 32 (4), 755–770.

Black, S., Devereux, P., Salvanes, K., 2005. Why the apple doesnt fall far: Understanding intergenerational transmission of human capital. American Economic Review 95 (1), 409–439.

Black, S. E., Devereux, P. J., 2011. Recent developments in intergenerational mobility. Handbook of labor economics 4, 1487–1541.

Case, A., Fertig, A., Paxson, C., 2005. The lasting impact of childhood health and circumstance. Journal Of Health Economics 24 (2), 365–389.

Case, A., Lubotsky, D., Paxson, C., 2002. Economic status and health in childhood: The origins of the gradient. The American Economic Review 92 (5), 1308–1334.

Chen, F., Liu, H., Vikram, K., Guo, Y., 2015. For better or worse: The health implications of marriage separation due to migration in rural China. Demography, 1–23.

Chen, J., Xie, Z., Liu, H., 2007. Son preference, use of maternal health care, and infant mortality in rural China, 1989–2000. Population studies 61 (2), 161–183.

Chen, Y., Li, H., 2009. Mothers education and child health: Is there a nurturing effect? Journal of Health Economics 28 (2), 413 – 426.
URL `http://www.sciencedirect.com/science/article/pii/S0167629608001537`

Chevalier, A., 2004. Parental education and child's education: A natural experiment. IZA Discussion Papers 1153, Institute for the Study of Labor (IZA).

Chou, S., Liu, J., Grossman, M., Joyce, T., 2010. Parental education and child health: Evidence from a natural experiment in Taiwan. American Economic Journal: Applied Economics 2 (1), 3361.

Chunming, C., 2000. Fat intake and nutritional status of children in China. The American journal of clinical nutrition 72 (5), 1368s–1372s.

Cunha, F., Heckman, J., 2007. The technology of skill formation. American Economic Review 97 (2), 31–47.

Currie, J., 2009. Healthy, wealthy, and wise: Socioeconomic status, poor health in childhood, and human capital development. Journal of Economic Literature 47 (1), 87–122.

Das Gupta, M., Zhenghua, J., Bohua, L., Zhenming, X., Chung, W., Hwa-Ok, B., 2003. Why is son preference so persistent in East and South Asia? a cross-country study of China, India and the Republic of Korea. The Journal of Development Studies 40 (2), 153–187.

De Onis, M., Blössner, M., Borghi, E., 2012. Prevalence and trends of stunting among pre-school children, 1990–2020. Public Health Nutrition 15 (01), 142–148.

De Onis, M., Dewey, K., Borghi, E., Onyango, A., Blössner, M., Daelmans, B., Piwoz, E., Branca, F., 2013. The world health organization's global target for reducing childhood stunting by 2025: rationale and proposed actions. Maternal & child nutrition 9 (S2), 6–26.

Deaton, A., 2008. Income, health and wellbeing around the world: Evidence from the Gallup world poll. The journal of economic perspectives: a journal of the American Economic Association 22 (2), 53.

Dickson, M., Gregg, P., Robinson, H., 2013. Early, late or never? when does parental education impact child outcomes? IZA Discussion Papers 7123, Institute for the Study of Labor (IZA).

Entwisle, B., Chen, F., 2002. Work patterns following a birth in urban and rural China: A longitudinal study. European Journal of Population/Revue européenne de Démographie 18 (2), 99–119.

Graham, M. J., Larsen, U., Xiping, X., 1998. Son preference in Anhui province, China. International Family Planning Perspectives 24 (2), 72–77.

Hannum, E., 1999. Political change and the urban-rural gap in basic education in China, 1949-1990. Comparative education review, 193–211.

Hannum, E., Kong, P., Zhang, Y., 2009. Family sources of educational gender inequality in rural China: A critical assessment. International journal of educational development 29 (5), 474–486.

Hao, R., Wei, Z., 2010. Fundamental causes of inland–coastal income inequality in post-reform China. The annals of regional science 45 (1), 181–206.

Harmon, C., Walker, I., 1995. Estimates of the economic return to schooling for the United Kingdom. The American Economic Review 85 (5), 1278–1286.

Hawkins, J. N., 2000. Centralization, decentralization, recentralization-educational reform in China. Journal of Educational Administration 38 (5), 442–455.

Herrmann-Pillath, C., Kirchert, D., Jiancheng, P., 2002. Prefecture-level statistics as a source of data for research into China's regional development. The China Quarterly 172, 956–985.

Hesketh, T., Xing, Z. W., 2006. Abnormal sex ratios in human populations: causes and consequences. Proceedings of the National Academy of Sciences 103 (36), 13271–13275.

Holmlund, H., Lindahl, M., Plug, E., 2011. The causal effect of parents' schooling on children's schooling: A comparison of estimation methods. Journal of Economic Literature 49 (3), 615–51.

Jiang, Y., Su, X., Wang, C., Zhang, L., Zhang, X., Wang, L., Cui, Y., 2014. Prevalence and risk factors for stunting and severe stunting among children under three years old in mid-western rural areas of China. Child: Care, Health and Development, n/a–n/a.
URL http://dx.doi.org/10.1111/cch.12148

Lee, M.-D. P., 2006. Widening gap of educational opportunity. World Institute for Development Economics Research, United Nations University.

Lewin, K., Hui, X., 1989. Rethinking revolution; reflections on China's 1985 educational reforms. Comparative Education 25 (1), 7–17.

Lewin, K., Little, A., Hui, X., Jiwei, Z., 1994. Educational Innovation in China: Tracing the impact of the 1985 reforms. Longman Group.

Li, J., 2004. Gender inequality, family planning, and maternal and child care in a rural chinese county. Social Science & Medicine 59 (4), 695–708.

Li, L., Wu, X., 2011. Gender of children, bargaining power, and intrahousehold resource allocation in China. Journal of Human Resources 46 (2), 295–316.

Lindeboom, M., Llena-Nozal, A., van der Klaauw, B., 2009. Parental education and child health: Evidence from a schooling reform. Journal of Health Economics 28, 109–131.

Liu, L., Johnson, H. L., Cousens, S., Perin, J., Scott, S., Lawn, J. E., Rudan, I., Campbell, H., Cibulskis, R., Li, M., et al., 2012. Global, regional, and national causes of child mortality: an updated systematic analysis for 2010 with time trends since 2000. The Lancet 379 (9832), 2151–2161.

Lundborg, P., Nilsson, A., Rooth, D.-O., 2014. Parental education and offspring outcomes: Evidence from the swedish compulsory school reform. American Economic Journal: Applied Economics 6 (1), 253–278.

Meghir, C., Palme, M., 2005. Educational reform, ability, and family background. The American Economic Review 95 (1), 414–424.

Monkman, K., Hoffman, L., 2013. Girls education: The power of policy discourse. Theory and Research in Education 11 (1), 63–84.

Murphy, R., Tao, R., Lu, X., 2011. Son preference in rural China: Patrilineal families and socioeconomic change. Population and development review 37 (4), 665–690.

Ning, Z., 1992. A conflict of interests: current problems in educational reform. Psychology Press.

Oreopoulos, P., Page, M., Stevens, A., 2006. The intergenerational effects of compulsory schooling. Journal of Labor Economics 24 (4), 729–760.

Pischke, J., von Wachter, T., 2008. Zero returns to compulsory schooling in Germany: Evidence and interpretation. The Review of Economics and Statistics 90 (3), 592598.

Ren, W., Rammohan, A., Wu, Y., 2014. Is there a gender gap in child nutritional outcomes in rural China? China Economic Review 31, 145–155.

Rozelle, S., Dong, X.-y., Zhang, L., Mason, A., 2002. Gender wage gaps in post-reform rural China. Pacific Economic Review 7 (1), 157–179.

Smith, J., 1999. Healthy bodies and thick wallets: the dual relation between health and economic status. Journal of Economics Perspectives 13 (2), 145 – 166.

Song, L., Appleton, S., Knight, J., 2006. Why do girls in rural China have lower school enrollment? World Development 34 (9), 1639–1653.

Swift, R., 2011. The relationship between health and gdp in oecd countries in the very long run. Health economics 20 (3), 306–322.

Tembon, M., Fort, L., 2008. Girls' education in the 21st century: gender equality, empowerment, and economic growth. Washington, DC: World Bank.

Tiedao, Z., Minxia, Z., Xueqin, Z., Xi, Z., Yan, W., 2004. Universalizing nine-year compulsory education for poverty reduction in rural China. World Bank.

Tsui, K., 1993. Decomposition of China's regional inequalities. Journal of Comparative Economics 17 (3), 600–627.

Wang, X., Höjer, B., Guo, S., Luo, S., Zhou, W., Wang, Y., 2009. Stunting and overweightin the who child growth standards–malnutrition among children in a poor area of China. Public health nutrition 12 (11), 1991–1998.

Zhang, X., Kanbur, R., 2005. Spatial inequality in education and health care in China. China economic review 16 (2), 189–204.

Tables and Figures

Table 1: Summary Statistics

Variable	Mean	Std. Dev.	Min	Max
Z-score height	-0.544	1.351	-4.988	4.365
Z-score weight	-0.417	1.334	-4.891	4.644
Mother's education (years)	8.282	3.232	0	18
Father's education (years)	9.105	2.932	0	18
Household p.c. income (2011 Yuan)	7077.331	8501.123	-3953.832	172525.7
Coastal	0.4011	0.490	0	1
Urban	0.295	0.456	0	1
Han	0.865	0.342	0	1
Child is male	0.565	0.496	0	1
Child age	5.337	3.076	0	10
Mother's age at birth	26.030	4.042	12	43
Number of children in household	1.593	0.728	1	5
Postreform indicator (Mother)	0.452	0.498	0	1
Postreform indicator (Father)	0.418	0.493	0	1

Source: Author's own calculations. Summary statistics for children aged 0-10 in waves 1997-2011, born to mothers or fathers who were of the five pre- and post-reform cohorts. Parents who reported being in school, or for whom this information was missing, are excluded. 'Coastal', 'Urban' and 'Han' are indicators for whether the child lives in a coastal province, urban area, or is of Han ethnicity, respectively.

Table 2: The impact of mother education on height-for-age

	(I) OLS	(II) OLS	(III) 2SLS	(IV) 2SLS	(V) 2SLS	(VI) 2SLS
A: Boys						
Mother's Education	0.058***	0.051**	0.302*	0.282*	0.195***	0.163***
	(0.018)	(0.022)	(0.183)	(0.154)	(0.048)	(0.062)
First stage						
Post			1.791**	1.878*	4.045	4.907*
			(0.779)	(0.870)	(2.441)	(2.264)
*Post**Pre-reform education					-0.285	-0.354
					(0.237)	(0.214)
Pre-reform education					0.907***	0.891***
					(0.202)	(0.161)
Hansen J P-stat					0.326	0.319
F-stat first stage			5.290	4.657	16.189	21.985
Observations	1502	1476	1502	1476	1502	1476
B: Girls						
Mother's Education	0.081***	0.072***	3.033	3.550	0.091**	0.086
	(0.017)	(0.017)	(6.845)	(10.012)	(0.036)	(0.069)
First stage						
Post			0.137	0.111	3.003**	2.427*
			(0.349)	(0.342)	(1.362)	(1.335)
*Post**Pre-reform education					-0.316*	-0.252
					(0.146)	(0.155)
Pre-reform education					1.166***	0.990***
					(0.174)	(0.160)
Hansen J P-stat					0.278	0.317
F-stat first stage			0.154	0.106	16.909	23.678
Observations	1204	1194	1204	1194	1204	1194
Province and Wave FE	Y	Y	Y	Y	Y	Y
Province Trends	Y	Y	Y	Y	Y	Y
X controls	N	Y	N	Y	N	Y

Standard errors are clustered at the province level and are shown in brackets. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. X controls include household income per capita, child age, number of children in the household, mother's age at birth, and indicators for urban location, han ethnicity, and coastal province.

Table 3: The impact of mother education on weight-for-age

	(I) OLS	(II) OLS	(III) 2SLS	(IV) 2SLS	(V) 2SLS	(VI) 2SLS
A: Boys						
Mother's Education	0.043*	0.032	0.158	0.156	0.153**	0.098
	(0.022)	(0.023)	(0.157)	(0.143)	(0.068)	(0.065)
First stage						
Post			1.560*	1.678*	3.763	4.501*
			(0.738)	(0.804)	(2.467)	(2.157)
Post *Pre-reform education					-0.276	-0.330
					(0.252)	(0.213)
Pre-reform education					0.921***	0.933***
					(0.220)	(0.167)
Hansen J P-stat					0.138	0.113
F-stat first stage			4.472	4.354	19.287	24.881
Observations	1541	1513	1541	1513	1541	1513
B: Girls						
Mother's Education	0.066***	0.049**	4.559	4.048	0.122***	0.120*
	(0.015)	(0.021)	(18.979)	(11.734)	(0.039)	(0.067)
First stage						
Post			0.085	0.099	3.319**	2.765*
			(0.394)	(0.287)	(1.405)	(1.349)
*Post**Pre-reform education					-0.354**	-0.294*
					(0.150)	(0.162)
Pre-reform education					1.153***	0.996***
					(0.175)	(0.163)
Hansen J P-stat					0.118	0.126
F-stat first stage			0.046	0.119	15.765	17.790
Observations	1245	1235	1245	1235	1245	1235
Province and Wave FE	Y	Y	Y	Y	Y	Y
Province Trends	Y	Y	Y	Y	Y	Y
X controls	N	Y	N	Y	N	Y

Standard errors are clustered at the province level and are shown in brackets. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. X controls include household income per capita, child age, number of children in the household, mother's age at birth, and indicators for urban location, han ethnicity, and coastal province.

Table 4: The impact of father's education on height-for-age

	(I) OLS	(II) OLS	(III) 2SLS	(IV) 2SLS	(V) 2SLS	(VI) 2SLS
A: Boys						
Father's Education	0.065***	0.055***	-0.259	-0.116	0.095	-0.041
	(0.012)	(0.011)	(0.344)	(0.173)	(0.058)	(0.085)
First stage						
Post			-0.659	-0.933**	2.361	1.719
			(0.451)	(0.401)	(2.643)	(2.526)
Post *Pre-reform education					-0.352	-0.291
					(0.268)	(0.259)
Pre-reform education					0.956***	0.794***
					(0.077)	(0.074)
Hansen J P-stat					0.076	0.221
F-stat first stage			2.132	5.427	213.268	129.078
Observations	1427	1407	1427	1407	1427	1407
B: Girls						
Father's Education	0.040*	0.026	0.323	0.358	0.078	0.032
	(0.020)	(0.022)	(0.506)	(0.392)	(0.056)	(0.093)
First stage						
Post			0.604	0.775	3.412	3.732
			(0.527)	(0.447)	(2.590)	(2.135)
Post *Pre-reform education					-0.311	-0.330
					(0.284)	(0.234)
Pre-reform education					0.917***	0.586**
					(0.120)	(0.197)
Hansen J P-stat					0.263	0.391
F-stat first stage			1.313	3.010	31.475	5.477
Observations	1056	1047	1056	1047	1056	1047
Province and Wave FE	Y	Y	Y	Y	Y	Y
Province Trends	Y	Y	Y	Y	Y	Y
X controls	N	Y	N	Y	N	Y

Standard errors are clustered at the province level and are shown in brackets. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. X controls include household income per capita, child age, number of children in the household, and indicators for urban location, han ethnicity, and coastal province.

Table 5: The impact of father education on weight-for-age

	(I) OLS	(II) OLS	(III) 2SLS	(IV) 2SLS	(V) 2SLS	(VI) 2SLS
A: Boys						
Father's Education	0.056***	0.042***	0.651	0.494*	0.170***	0.087
	(0.011)	(0.010)	(0.446)	(0.263)	(0.056)	(0.074)
First stage						
Post			-0.573	-0.782*	2.541	1.795
			(0.470)	(0.419)	(2.556)	(2.385)
*Post**Pre-reform education					-0.362	-0.283
					(0.257)	(0.247)
Pre-reform education					0.943***	0.738***
					(0.070)	(0.087)
Hansen J P-stat					0.037	0.065
F-stat first stage			1.482	3.483	287.572	86.589
Observations	1475	1453	1475	1453	1475	1453
B: Girls						
Father's Education	0.028	0.015	0.153	0.214	0.124**	0.186
	(0.022)	(0.028)	(0.450)	(0.351)	(0.057)	(0.125)
First stage						
Post			0.635	0.828*	4.090	4.388*
			(0.528)	(0.457)	(2.663)	(2.248)
*Post**Pre-reform education					-0.385	-0.401
					(0.292)	(0.245)
Pre-reform education					0.941***	0.608***
					(0.109)	(0.186)
Hansen J P-stat					0.862	0.602
F-stat first stage			1.446	3.281	40.379	6.493
Observations	1091	1082	1091	1082	1091	1082
Province and Wave FE	Y	Y	Y	Y	Y	Y
Province Trends	Y	Y	Y	Y	Y	Y
X controls	N	Y	N	Y	N	Y

Standard errors are clustered at the province level and are shown in brackets. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. X controls include household income per capita, child age, number of children in the household, and indicators for urban location, han ethnicity, and coastal province.

Table 6: The impact of mother's education on height- and weight-for-age: rural sample

	(I) OLS	(II) OLS	(III) 2SLS	(IV) 2SLS	(V) 2SLS	(VI) 2SLS
Height-for-age						
A: Rural Boys						
Mother's Education	0.059**	0.061**	0.281*	0.267**	0.244**	0.228**
	(0.026)	(0.027)	(0.153)	(0.135)	(0.113)	(0.105)
Hansen J P-stat					0.562	0.390
F-stat first stage			3.656	3.903	2.286	2.165
Observations	1130	1116	1130	1116	1130	1116
B: Rural Girls						
Mother's Education	0.098***	0.088***	1.508	6.132	0.291**	0.245
	(0.026)	(0.022)	(2.539)	(33.707)	(0.140)	(0.180)
Hansen J P-stat					0.151	0.118
F-stat first stage			0.253	0.028	6.769	9.035
Observations	782	778	782	778	782	778
Weight-for-age						
A: Rural Boys						
Mother's Education	0.047	0.046	0.211	0.219	0.113	0.147
	(0.028)	(0.028)	(0.170)	(0.167)	(0.106)	(0.137)
Hansen J P-stat					0.134	0.166
F-stat first stage			3.540	3.779	2.235	2.123
Observations	1158	1143	1158	1143	1158	1143
B: Rural Girls						
Mother's Education	0.051**	0.037	1.668	5.413	0.475***	0.469
	(0.023)	(0.023)	(2.805)	(21.677)	(0.184)	(0.287)
Hansen J P-stat					0.177	0.150
F-stat first stage			0.219	0.048	4.510	2.375
Observations	809	805	809	805	809	805
Province and Wave FE	Y	Y	Y	Y	Y	Y
Province Trends	Y	Y	Y	Y	Y	Y
X controls	N	Y	N	Y	N	Y

Standard errors are clustered at the province level and are shown in brackets. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. X controls include household income per capita, child age, number of children in the household, mother's age at birth, and indicators for han ethnicity, and coastal province.

Table 7: The impact of mother's education on height- and weight-for-age: urban sample

	(I) OLS	(II) OLS	(III) 2SLS	(IV) 2SLS	(V) 2SLS	(VI) 2SLS
Height-for-age						
A: Urban Boys						
Mother's Education	0.024	0.008	-14.844	0.694	-0.187	0.221
	(0.023)	(0.027)	(319.362)	(1.155)	(0.326)	(0.237)
Hansen J P-stat					0.408	0.669
F-stat first stage			0.002	0.733	0.493	194.944
Observations	372	360	372	360	372	360
B: Urban Girls						
Mother's Education	0.045	0.036	-0.149	0.126	-0.135	-0.163
	(0.033)	(0.029)	(0.464)	(0.569)	(0.427)	(0.282)
Hansen J P-stat					0.837	0.337
F-stat first stage			0.698	0.419	0.424	37.242
Observations	422	416	422	416	422	416
Weight-for-age						
A: Urban Boys						
Mother's Education	-0.000	-0.026	8.817	-0.352	0.792	-0.449
	(0.024)	(0.020)	(240.356)	(0.785)	(1.083)	(0.942)
Hansen J P-stat					0.781	0.585
F-stat first stage			0.001	1.144	0.372	0.545
Observations	383	370	383	370	383	370
B: Urban Girls						
Mother's Education	0.094^{***}	0.081^{**}	-0.274	-0.221	-0.281	-0.189
	(0.026)	(0.026)	(0.404)	(0.349)	(0.422)	(0.219)
Hansen J P-stat					0.765	0.532
F-stat first stage			0.769	0.778	0.445	41.455
Observations	436	430	436	430	436	430
Province and Wave FE	Y	Y	Y	Y	Y	Y
Province Trends	Y	Y	Y	Y	Y	Y
X controls	N	Y	N	Y	N	Y

Standard errors are clustered at the province level and are shown in brackets. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. X controls include household income per capita, child age, number of children in the household, mother's age at birth, and indicators for han ethnicity, and coastal province. Columns (III) and (IV) refer to 2SLS results when the instrument is *Post*; Columns (V) and (VI) refer to 2SLS results when the instruments are *Post*, *Post*∗Pre-reform education, Pre-reform education.

Table 8: The impact of mother's education on stunting: rural sample

	(I) OLS	(II) OLS	(III) 2SLS	(IV) 2SLS	(V) 2SLS	(VI) 2SLS
A: Rural Boys						
Mother's Education	-0.016**	-0.016**	-0.084***	-0.078***	-0.070***	-0.066***
	(0.007)	(0.007)	(0.030)	(0.025)	(0.017)	(0.017)
Hansen J P-stat					0.311	0.193
F-stat first stage			3.656	3.903	2.286	2.165
Observations	1130	1116	1130	1116	1130	1116
B: Rural Girls						
Mother's Education	-0.020***	-0.019***	-0.332	-1.438	-0.046	-0.035
	(0.006)	(0.005)	(0.697)	(8.317)	(0.071)	(0.081)
Hansen J P-stat					0.396	0.367
F-stat first stage			0.253	0.028	6.769	9.035
Observations	782	778	782	778	782	778
Province and Wave FE	Y	Y	Y	Y	Y	Y
Province Trends	Y	Y	Y	Y	Y	Y
X controls	N	Y	N	Y	N	Y

Standard errors are clustered at the province level and are shown in brackets. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *X* controls include household income per capita, child age, number of children in the household, mother's age at birth, and indicators for han ethnicity, and coastal province. Columns (III) and (IV) refer to 2SLS results when the instrument is *Post*; Columns (V) and (VI) refer to 2SLS results when the instruments are *Post*, *Post*∗Pre-reform education, Pre-reform education.

Figure 1: Map of provinces included in analysis

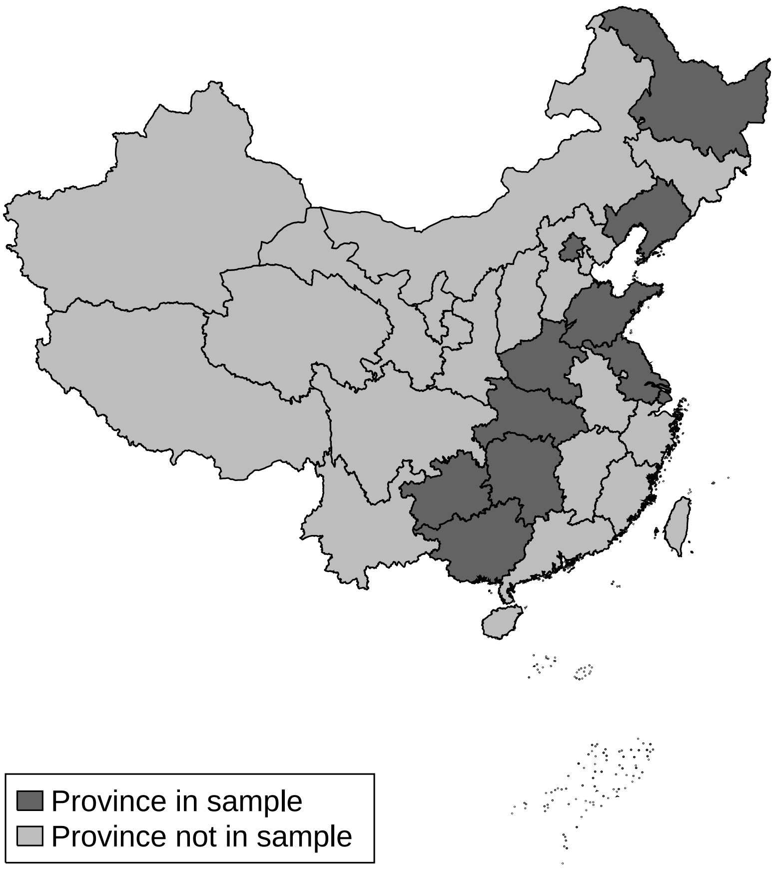
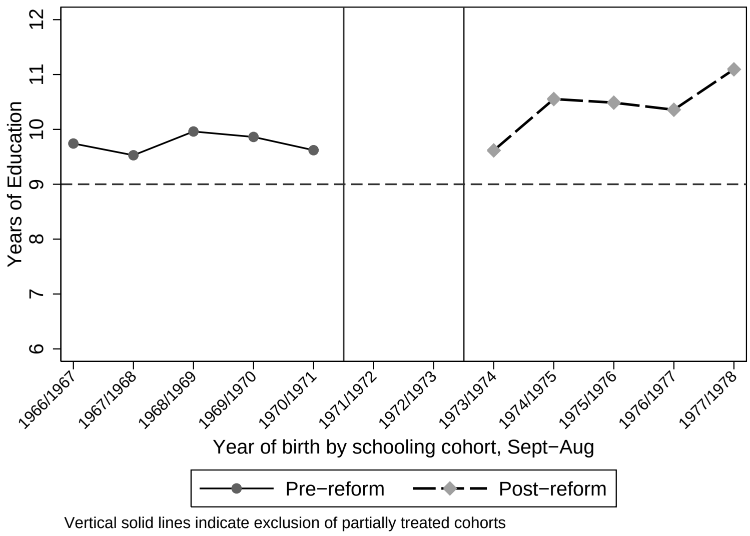


Figure 2: Trends in education around the reform: by schooling cohort

(a) Men



(b) Women

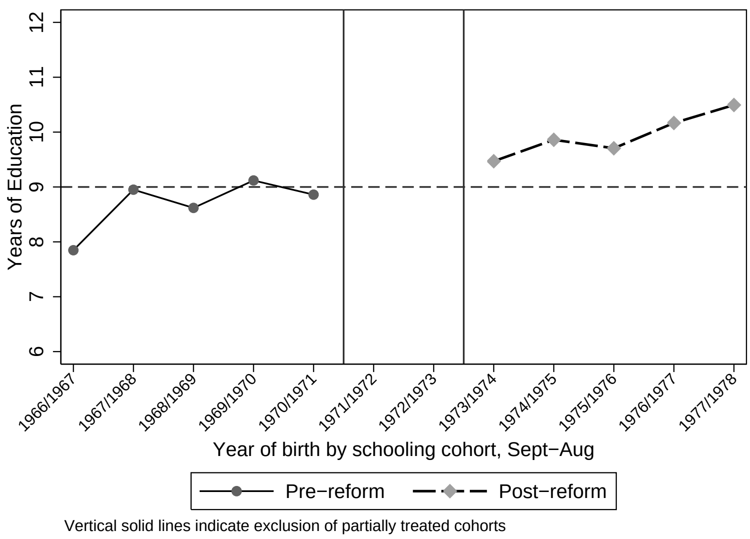
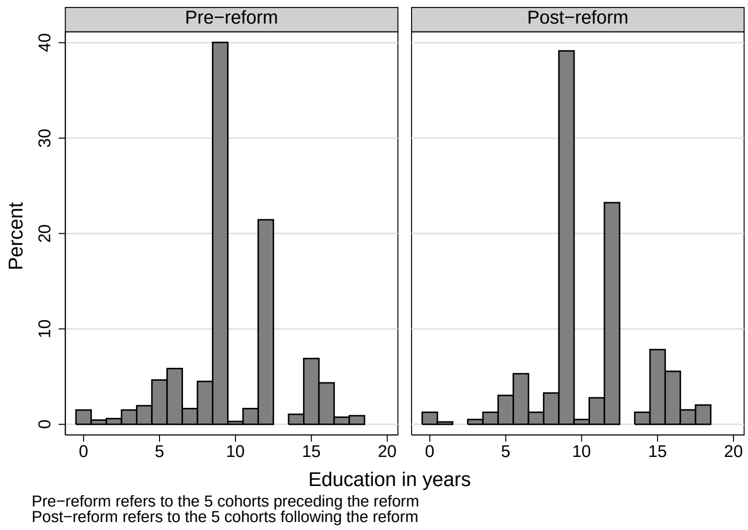


Figure 3: Pre- and post-reform distributions of education

(a) Men



(b) Women

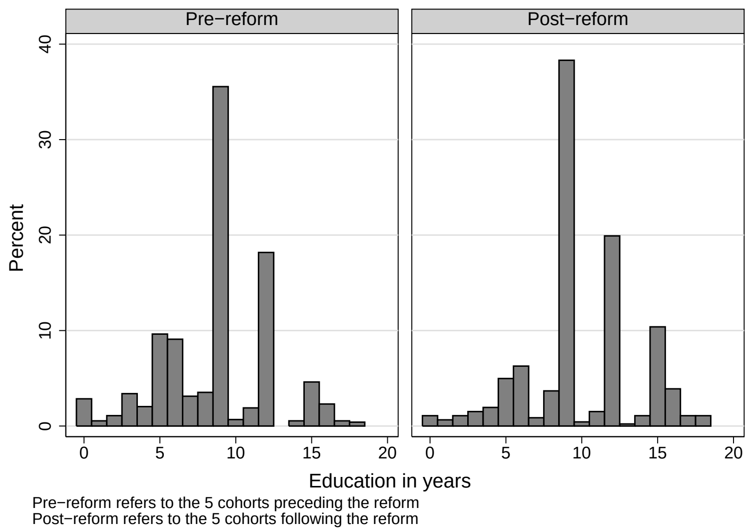
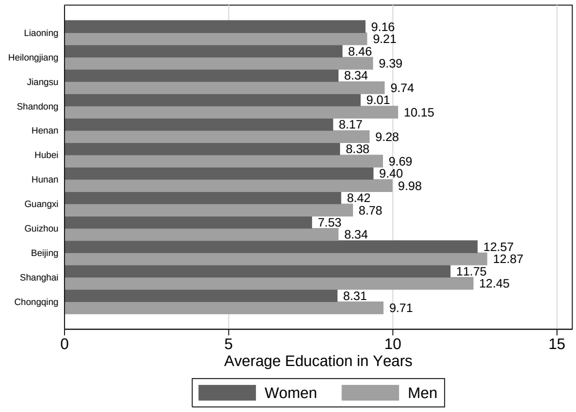
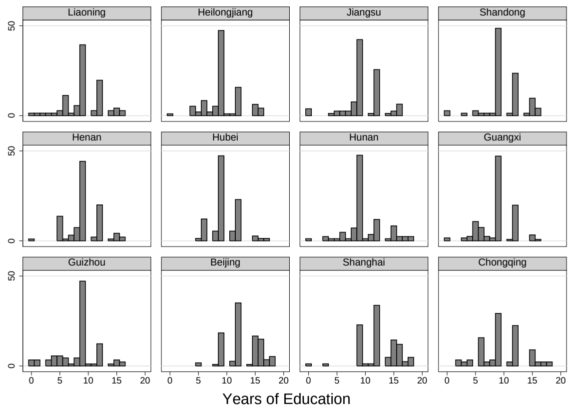


Figure 4: Provincial variation in education

(a) Average education: Men and Women



(b) Men: histogram of education in years



(c) Women: histogram of education in years

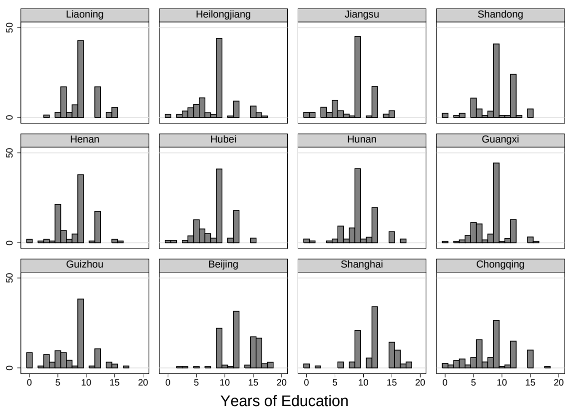
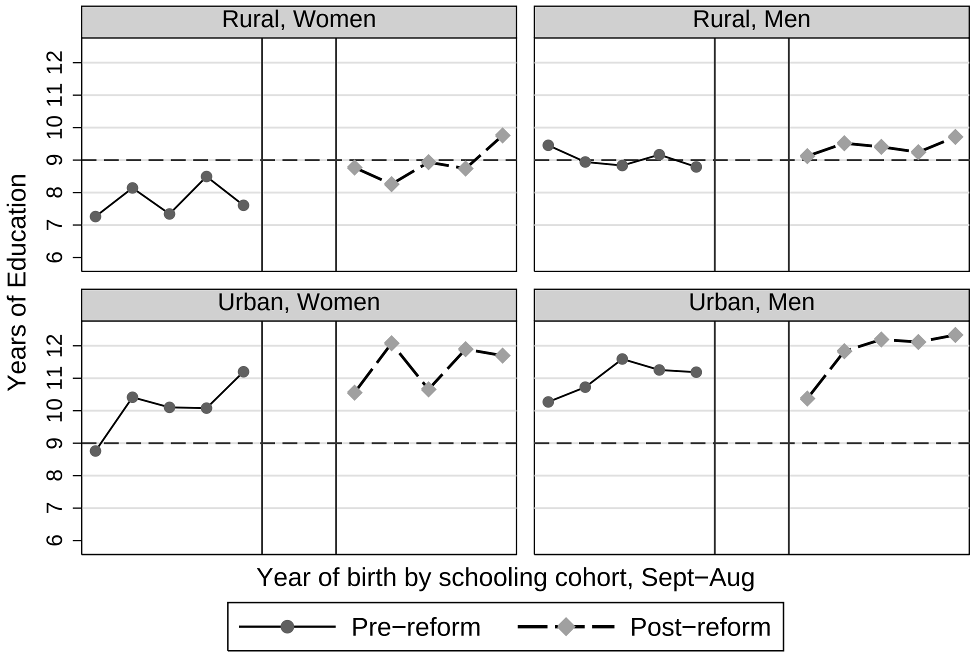


Figure 5: Rural and urban trends in education: by schooling cohort



Vertical solid lines indicate exclusion of partially treated cohorts

Figure 6: Province variation in health and education

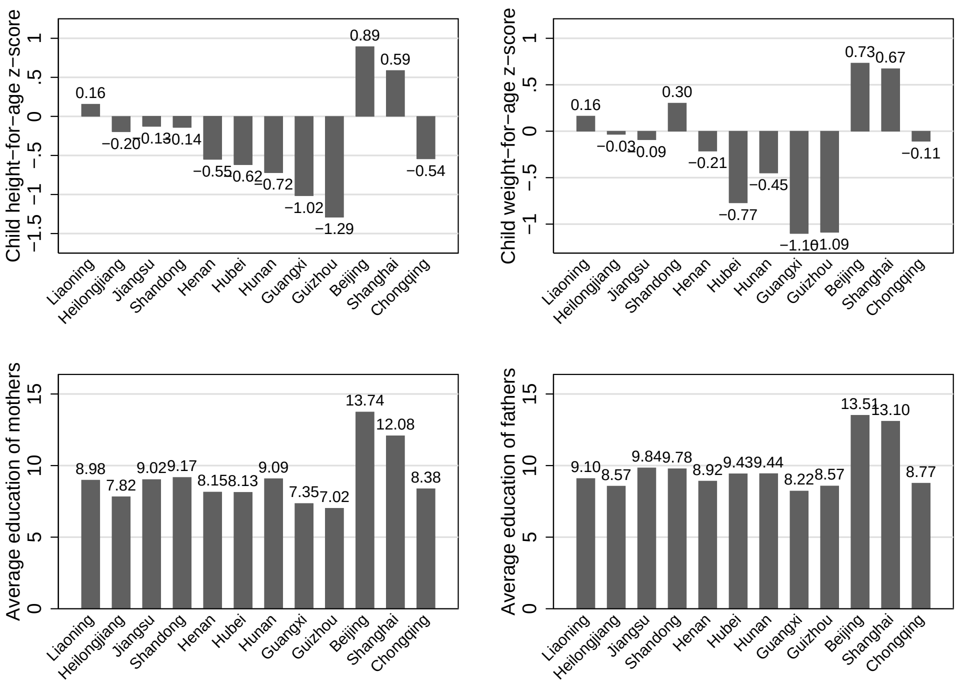
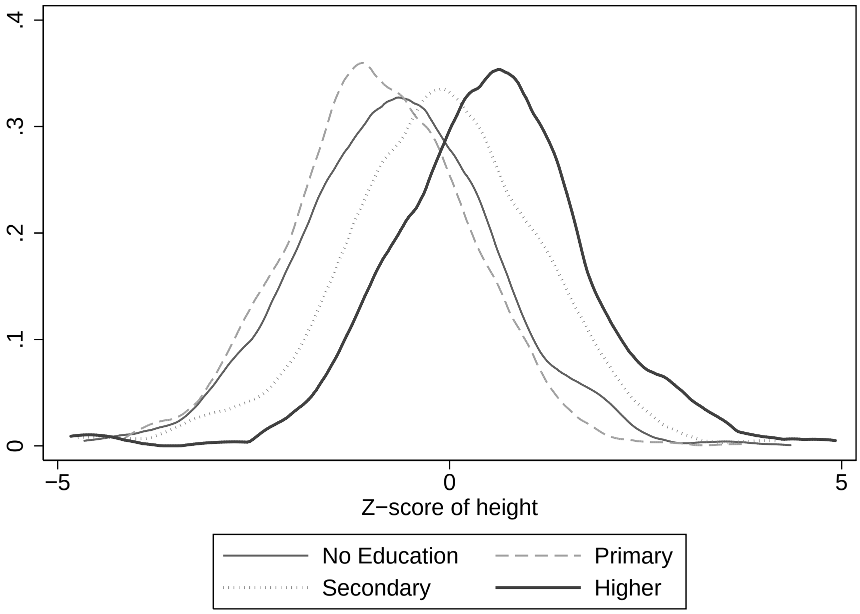


Figure 7: Distribution of height by education level of parent

(a) Mother's Education



(b) Father's Education

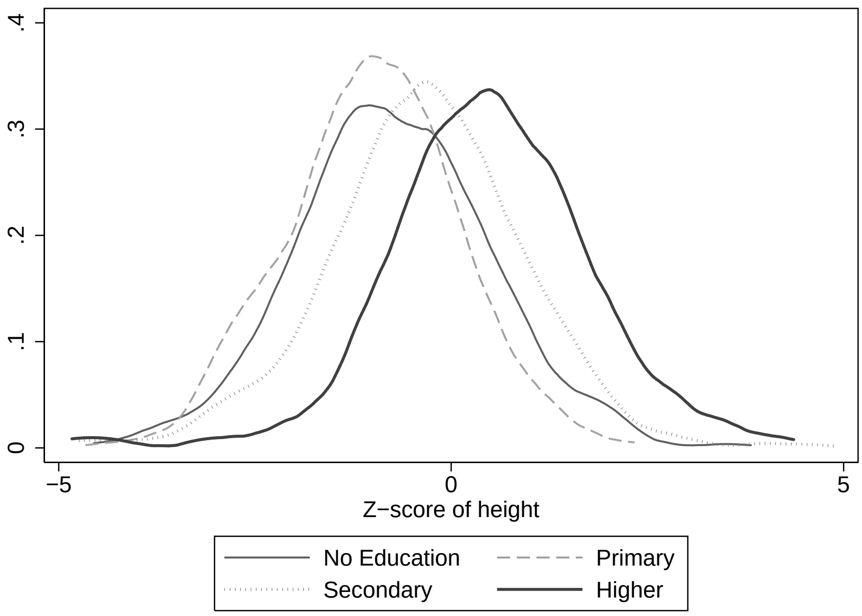
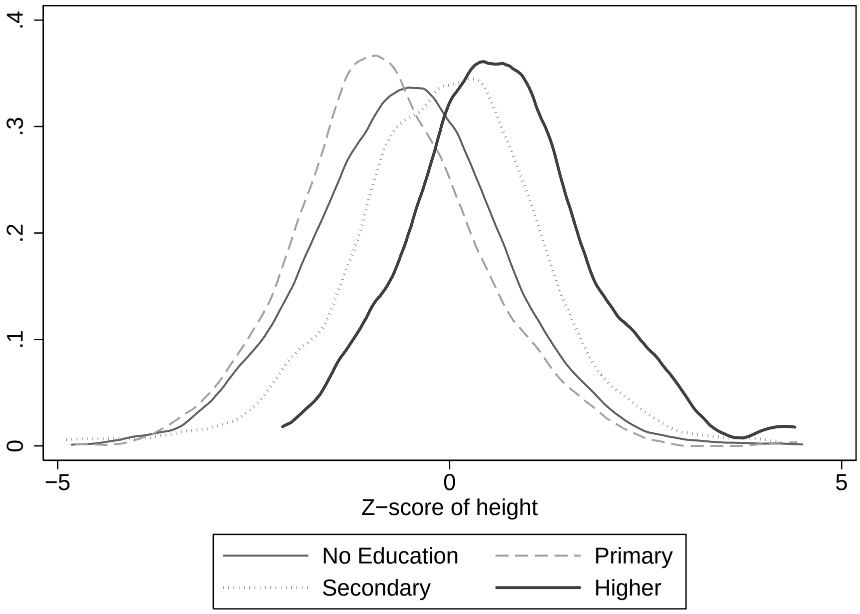
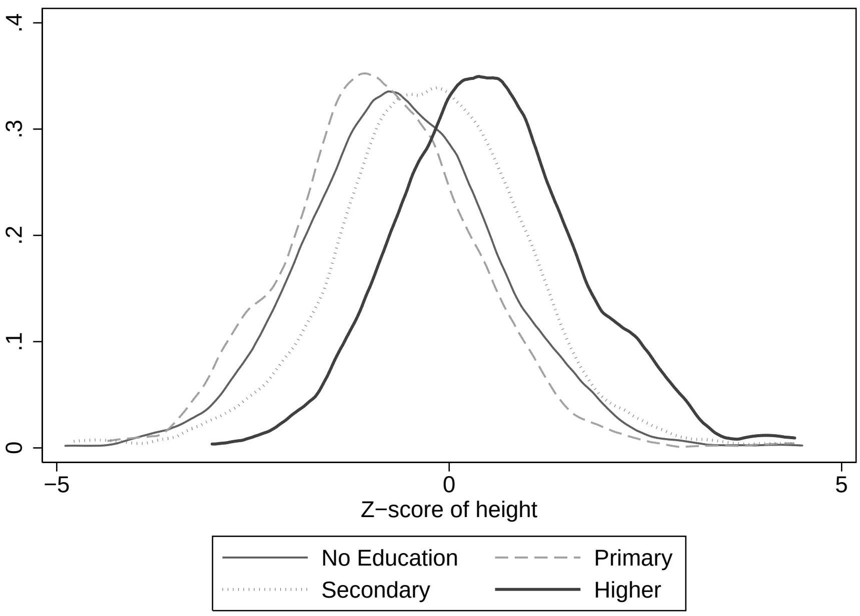


Figure 8: Distribution of weight by education level of parent

(a) Mother's Education



(b) Father's Education



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