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SON PREFERENCE AND GENDER INEQUALITY IN EDUCATION IN CHINA

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ABSTRACT

This study investigates how son preference at birth is associated with the gender inequality in education in adulthood in China and how different mechanisms can explain their correlation. I hypothesized that son preference would be associated with greater gender inequality in education in adulthood. Using the provincial-level data collected from the National Population Census of the People's Republic of China (1982, 1990, 2000 and 2010) and the China Statistical Year Book (1949-2004), I primarily analyzed the adult educational outcomes of two groups: cohorts of infants born in 1982 (individuals age 18 in 2000) and in 1990 (individuals age 20 in 2010). Indicators of son preference towards newborns, cohort sex ratio at birth and infant mortality rate (IMR) found in 1982 and 1990 Census, are matched with adult educational outcomes measuring gender inequality in education for same cohorts, age 18 or 20, in the Census data from 2000 and 2010. The primary results did not support the hypothesis. Rather, the primary results indicate that sex ratio at birth is negatively associated with gender inequality in education. Three possible explanations are discussed for this surprising result: 1) Under the One-child policy, extremely high male-skewed sex ratio at birth may not be equivalent to extremely greater son-biased parental investment in education; 2) The development of health care system, which has been promoted by the modernization of China, has enabled prenatal sex determination through ultrasound technology, resulting in a high sex ratio. At the same time, strong modernizing forces has enhanced gender equality in education; 3) Regarding to China's traditional values favoring son and the son-biased fertility stopping behavior, a higher sex ratio at birth implies a greater likelihood of having older sister(s) in households. In such circumstances, limited by shared parental care and investments, boys are more likely to be a later-born child and therefore might not have greater advantages in education compared with girls.

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Section 1. Introduction

The link between son preference and gender inequality in education in China is a topic of growing interest. More generally, gender inequality appears to stem from traditional patriarchal social structures in which power is unequally distributed, with men traditionally holding authority over women (World Development Report, 2017). Education is one dominant area where such gender gaps exist. Gender inequality in education is of social and policy significance because education influences the development of both individuals and the whole country (The World Bank, 2002). Additionally, gender inequality in education can affect or even amplify gender inequalities in other areas, such as participation in the labor market, income and bargaining power in the household (Buchmann, DiPrete and McDaniel, 2008). In short, examining gender inequality in education, especially in a country like China where gender inequality is relatively serious compared with other countries (United Nations Development Programme, 2014), provides a way to gain a better understanding of social injustice problems and to develop ideas for further reducing inequalities and promoting both personal and national development.

Examining how gender inequality in education is influenced by son preference is one possible way to look closely at the problem of gender inequality in China. According to Jenq (2014), son preference is associated with gender inequality in education. In my proposed research, I plan to use two primary indicators of son preference, including (1) the extremely unbalanced sex ratio at births, and (2) the ratio of female to male infant mortality rates. After China's one-child policy established in 1979, the proportion of boys born increased substantially as couples enacted sex-selective abortion and other means to ensure that their only child would be a boy. The sex ratio at birth (the ratio of boys relative to girls born) reached unprecedentedly high levels in some provinces. What's more, the ratio of the female to male infant mortality rate became dramatically unbalanced with much higher female infant

mortality rates in many provinces (Population Census of the People's Republic of China, 1982, 1990, 2000), suggesting that investments in infants' health and safety increased for sons relative to daughters.

My question concerns what the longer-term implications of son preference was for educational attainment when these children reach young adulthood. Although many sociologists called attention to the impact of son preference on gender inequality in education, there are few systematic studies that give consistent and clear results of this correlation and its implications overtime (Bauer, Wang, Riley, and Zhao 1992; Poston, Gu and Liu, 1997; Jenq, 2014). Two main drawbacks of those existing models of how son preference affects gender inequality in education in China are: (1) they did not come up with a consolidated conclusion; (2) some research papers only used relatively old data from the twentieth century and may not generate corresponding results for the current situation in twenty-first century. My research thesis is necessary and needed here to gain a better understanding of gender inequality as a social problem focusing on education in China. In particular, this project investigates how son preference is associated with gender inequality in education in China. The key research question addressed in this article is:

How is son preference in childhood related to gender inequality in education in adulthood?

This research thesis is divided into seven sections. Section 1 introduces the purpose of this research, explains the research questions and summarizes the framework of the whole paper. Section 2 includes background literature related to the research question. Section 3 describes different possible mechanisms which can serve as the explanations of the relationship between son preference and gender inequality in education, especially for female educational attainment. The central hypothesis is also addressed at the end of this section.

Section 4 explains the variables, measurements, data resource and method used in this research. Section 5 describes the results based on the sample data. Section 6 discusses the implication of the results. Section 7 is the summary.

Section 2. Literature review

2.1 Son Preference

Son preference is a longstanding social phenomenon in China. Son preference is deeply rooted in Confucian values, which reflects women's status in China (Arnold and Liu, 1986). Although China's government and constitution have made particular progress in promoting gender equality in economic, educational, cultural and political aspects, a full realization of sexual equity is still not achieved (Croll, 1983; Whyte and Parish, 1984; Hooper, 1984; Zeng et al., 1993; Jiang, 2000). Patriarchal ideas and attitudes are prevalent, as men are generally valued more than women either within the family or in the larger society (Hooper, 1984; Jiang, 2000). The reason why sons are preferred over daughters by parents is complicated since it stems from a host of social, socioeconomic and socio-cultural determinants (Cronk, 1991; Rahma and DaVanza, 1993; Greenhalgh 1995). There are mainly three determinants of son preference in China, including the provision for family labor/ financial support, elderly security and support, family propagation and family lineage (Zhao and Zhu, 1983; Wolf, 1985; Gu and Xie, 1994).

First, in China, sons are traditionally valued as the provision for family labor or the primary household earners. Historically, within peasant households, Chinese families usually make a living from physical labor. Without the prevalence of advanced technology, the male has inherent advantages in doing heavy farm work because of the undeniable fact of physical sex difference. Based on the fact that family production largely depends on heavy physical labor and other farm work, boys are much more appreciated than girls. For the necessity of family surviving and production, son preference is adopted in Chinese society, especially in poor rural areas.

Second, son preference also reflects another economic concern: Elderly support. Affected by Confucian traditions, it is deeply believed that sons are more suitable than

daughters to take care of parents in their old ages. Sons are expected to provide emotional and financial support for their parents to show respect and gratefulness. Daughters, often viewed as outsiders of the family after they get married, are not supposed to take the responsibility of caring for the elderly. A good reflection of this traditional culture is an old Chinese saying, “A married daughter is like the water that is thrown out of door.”

Third, in most Chinese families, only sons can serve to continue family propagation and lineage. In Confucian traditions, only men constitute social order and values. Thus only sons can reproduce and sustain those values for both their families and society. Sons, but not daughters, are thought to keep the family blood stream continuously running as well as securing the existence and prosperity of the family and the whole society. In short, son preference in China is one of the representations of patrilineality which family propagation is only passing through the male line.

2.2 Sex Ratio at Birth and Infant Mortality Rate

Imbalanced sex ratio and excess female infant mortality rate are two significant consequences, or in other words, primary indicators of son preference. (Arnold and Liu, 1986; Zeng et al., 1993; Gu and Li, 1995; Poston et al., 1997; Das Gupta et al., 2003). According to Gupta and associates, son preference which leads to the discrimination against female infants is usually shown in three significant ways: during pregnancy, at birth, and during infancy. During pregnancy, by knowing infants’ sex through advanced technique, such as an ultrasound scan, some parents chose to not have a daughter through sex-selective abortion. Such sex discrimination is reflected on abnormal sex ratio which is usually higher than the natural sex ratio around 105. At birth, son preference is highly related to female infanticide, which also reflects on imbalanced sex ratio. During infancy, and early childhood, son preference is associated with both physical and mental neglect and poorly nutritional

investment on daughters. Such sex discrimination is reflected in higher female infant mortality than male infant mortality.

China's sex ratio has changed significantly since the 1980s. In most developed countries, sex ratio at birth is consistently reported around 104 to 107 (Chahnazarian, 1991). Usually, sex ratio at birth does not vary significantly with parity, by the age of mother, or between regions (Johansson and Nygren, 1991). So, an abnormal sex ratio at birth usually is considered to be an indicator of a social phenomenon, such as son preference, which breaks the regularly biological force. In the 1960s and 1970s, the sex ratio at birth in China remained stable at around 106 (Zeng et al., 1993). Since 1980, the total sex ratio in China has been sharply increasing. According to the population Census of China, the national sex ratio at birth was 107.4 in 1980, 111.4 in 1985, and 113.8 in 1989. Furthermore, since the early 1980s, an excess female infant mortality rate in China has become a social problem that draws a lot of people's attention. According to the Coale-Demeny Model Life Tables (1966), one of the best known empirical models identifying general mortality patterns, female usually has a significant survival advantage than male at almost every age. Nevertheless, recent Chinese Census indicates excess female infant mortality. For instance, infant mortality for boys was 12% higher than girls in the 1970s, but this changed to being 24% lower for boys than for girls in the 2000s (Sawyer, 2012).

2.3 Gender Inequality in Education

Gender inequality in education is a social problem prevalent across the world (Wils and Goujon, 1998). Education is essential to both individual's life and the development of human societies. It not only has a massive impact on one's future life chances such as employment opportunities, occupational status, and marriage prospects but also linked to one's status within the household and in the whole society (Arnold and Liu, 1986). On the other hand,

education is essential to a nation's development which unlocks its potential. Thus, understanding gender inequality in education is of great importance to both people, especially women, and country.

Since 1978, China has provided nine years of free and compulsory education, including six years in elementary school and three years in junior high school. This improvement in the education system has dramatically enhanced children's education opportunities and levels, raising their future living standards. Nevertheless, the gender gap still exists in education, whereby girls appear to have less educational opportunity compared to boys. Gender discrimination favoring boys is less evident in primary school and middle school because of the compulsory education system but is seen more significantly in senior high school and higher education (Zeng et al., 2013). Additionally, the educational gender gap remains greater in rural areas than urban areas. Parents in rural areas usually prefer to spend their money on their sons' education given their constrained resource (Connelly and Zheng, 2003; Zeng et al., 2013). Despite these lingering examples of gender inequality, some research indicates that there is an overall declining trend in educational gender inequality. This change appears to be related to China's rapid economic development since the 1980s and a series of policies and law which protect equal educational rights (Hannum et al., 2008; Zeng et al., 2013)

Section 3. Possible Mechanisms Linking Son Preference to Gender Inequality in Education

Based on China's historical and cultural background, there are several possible explanations for the relationship between son preference and gender inequality in education. Four plausible mechanisms explaining a positive relationship is given in Section 3.1. Section 3.2 introduces four mechanisms of non-positive correlation.

3.1 Positive Correlation

In what follows, I describe some different mechanisms that could introduce a positive correlation between indicators of son preference and gender inequality in education.

3.1.1 Son-biased Parental preference

Some research indicates that son preference is related to greater sex inequality in education because parental preference for sons is life-long and difficult to change (Arnold, Choe, and Roy, 1998; Wils and Goujon, 1998; Das Gupta et al., 2003). Or in other words, son preference shown before birth, at birth, and during infancy will continue to persist to affect female through education and employment (Das Gupta et al., 2003; Wang, 2005).

First, a positive relationship between son preference and more significant opportunities and investment in education for sons compared with daughters may arise because both are related to a common factor – the patrilineal family system. According to Das Gupta et al. (2003), in East Asia, son preference is deeply rooted in a patrilineal family system where men are valued more in their fundamental social norms and females are generally marginalized in the social order. Son preference is a reflection of traditional cultures and values in East Asia. Sex discrimination affects various aspects of the whole society, including education system and employment market, and is seen in extremely imbalanced sex ratio at birth and high

excess of female infant mortality rate. Further, as conducting a cross-national analysis including agrarian countries of China and India as well as the urbanized society South Korea, Gas Gupta, and his associates argue that such sex discrimination is not significantly varied by economic factors and social changes.

Furthermore, according to Wang (2005), parental son preference is an important factor leading to sexual inequality in children's educational opportunities, especially in rural areas. With finite resources, parents who prefer sons, based on the perception of boys with more education will have higher chance to get jobs, are likely to believe that investment on son's education is more likely to bring long-term welfare for the whole family including financial support and elderly security. Similarly, Arnold and Liu (1986) find parental son preference leads to continuous discrimination in education and an unequal investment in sons versus daughters. Believing women are less likely to succeed in the job market, parents invest more on sons to gain more returns.

Another explanation for why son preference may be directly linked to gender inequality in education is related to the son-biased fertility stopping rule, which refers to parents being more likely to stop bearing child after the birth of son rather than the birth of daughter (Clark, 2000; Altidag, 2015). The son-biased fertility preference is both a reflection and stimulus of the decline of fertility (Altidag, 2015). This stopping rule leads to a family structure pattern which is disadvantageous to daughters as they will have, in general, more male siblings and a larger family size on average (Jensen, 2005).

3.1.2 Development of Society and Education Supply

The development of society and increasing supply of education is another mechanism explaining why son preference could be related to a gender gap in education. Basically, son preference may be correlated with gender inequality in education as both are weakened by

larger society-wide changes in development and advancements in education. Since the 1970s, there is a worldwide boom in the education of women, especially in higher education (Becker et al., 2010). This result is related to both societal and individual factors. The rapid development of economy and society brings significant changes to both people's material lives and social customs. Better health facilities and greater economic strength promote higher female survival rate. Furthermore, the perspectives toward gender have gradually become more open-minded and diverse, which leads to weaker persistence in son preference. With the development of society and globalization, demands of education also increase, as well as its benefits, including better health, better marriage prospects, better jobs and so on (Becker et al., 2010). These benefits, or the returns of education, have led to smaller gender differences since 1970 (Becker et al., 2010; Pitt et al., 2010). Furthermore, Becker and his associates find females are more likely to succeed than males in school because the supply of education to women is more elastic than men and in general, women reported they find school less difficult than men did. Because of these advantages toward females, the gender gap in education has significantly narrowed. In short, since the 1970s, son preference and gender disparities in education have both become weaker under the effect of societal development and increasing supply of education.

3.1.3 Nutritional investments

Nutritional investments may also help explain the positive correlation between son preference and gender inequality in education (Pitt et al., 2010; Jenq, 2014). Based on the Roy model (1957) which divides workers into two categories: brawn and skill, boys are more likely than girls to be engaged in brawn which requires less schooling, since males tend to have inherent advantages in physical labor (Pitt et al., 2010). According to this assumption, it is found that nutritional supplements and health interventions provided to children leads to greater schooling and more material returns to girls rather than boys ((Jayachandran and

Lleras-Muney, 2009; Maluccio et al., 2009; Pitt et al., 2010). Meanwhile, improved investment in nutrition and health also contributed to the decline in female infant mortality rate and maternal mortality (Hogan et al., 2010). This suggests that a greater survival chance to female infants at birth and during infancy due to nutritional investment, will be associated with a narrowed gender gap in education.

3.1.4 Health Care

According to Jenq (2014), increasing supply of heath can be one reasonable factor to explain the relationship between son preference, primarily measured by sex ratio, and the educational gender gap. Using pre-1976 (1950-1975) Hukou population in China as a sample, Jenq (2014) found that the negative relationship between sex ratio and female educational attainment largely depends on the growth in health beds per capita. After the People's Republic of China founded in 1949, the system of healthcare had been well-established and expanded. The improvements of public health bureaucracy dramatically enhanced medical conditions, increased female infant survival rates, and thus, lowered sex ratios in general. Meanwhile, lowering maternal mortality rates and increasing female life expectancies, influenced by the enlargement of the public health system, led to the improving female educational attainment. It is further possible that the expectations of longer life expectancy of daughters may stimulate parental beliefs on children's education investment (Jenq, 2014).

3.2 Non-positive Correlation

All of these explanations assume a positive association between the sex ratio at birth and gender inequality in education. However, it is also possible that a high sex ratio at birth could not be positively associated with gender inequality in education. Sections 3.2.1 and Section 3.2.2 provide explanations for a negative relation; Section 3.2.3 indicates a possibility that there might be no association.

3.2.1 One Child Policy and Son-biased Fertility Stopping Behavior

One reason a negative correlation could arise relates to son-biased fertility stopping behavior and birth order effects in education. Son-biased fertility stopping behavior refers to when parents are more likely to stop bearing the child after the birth of son rather than the birth of daughter (Clark, 2000; Altidag, 2015). In other words, a family often tries again to have a son if their first child is a girl. Under this rule, the first-born child is often a daughter, whereas the last-born child is much likely male. In China, although most families were only allowed to have one child in the 1980s, couples whose first child was a daughter was allowed to have a second child in some rural areas. Thus, in those larger families having more than one child, daughters tend to be the older sisters whereas sons are more likely younger brothers.

According to Black, Devereux, and Salvanes (2005), there is a clear pattern of decline in educational attainment by birth order, which means in general, first-born children have better educational attainment than later-born siblings. There is a substantial literature on this birth order effects in education. One stream of research tests that dilution hypothesis, which attributes that advantages of first-born children to the fact that within a certain period of time, the firstborn child does not have to share the "available stock of parental quality time input" with other siblings, whereas those born later usually can only receive limited parental care as the demand for parents' quality time increased (Price, 2008). A second stream of literature investigates the possibility that there may be differences in the genetic endowment of children by birth order. The idea here is that later-born children are more likely to have older mothers, so they are more likely to receive a lower quality genetic endowment (Hotz and Pantano, 2013). Regardless, these two possibilities may help explain the relationship often seen between birth order and children's cognitive ability, specifically the tendency for earlier-

born children to have better academic achievements than later-born children (Bjerkedal, et al., 2007).

Overall, since earlier-born children do better in school, parents are more likely to invest in their education. In light of the son-biased fertility stopping rule, sons are more likely to be the later-born child and thus have poorer school performance. Similarly, those provinces with higher male-skewed sex ratio, sons often tend to be later-born children and have poorer performance in school. Thus, a negative relationship between sex ratio and gender inequality in education may arise if parents are less likely to invest in their sons who do not perform very well in school.

3.2.2 Equal investment

An alternative reason that the sex ratio at birth could be negatively associated with educational inequality is that son preference may be restricted to the likelihood that parents have sons versus daughters and does not extend to other aspects of parenting. According to Seema Jayachandran, son preference refers to *both* wanting to have sons rather than daughters and choosing to invest more on sons but not daughters. These two dimensions of preference often exist side by side, but they are not the same. Specifically, parents might have a preference for sons over daughters but value the quality of both the same. For example, Seema Jayachandran found that India has an extremely skewed sex ratio, but its gender gap in human capital such as schooling is not that big. Thus, even though in China there is a widespread preference for having a son, parents could invest in their sons and daughters relatively equally. So even though some provinces have high sex ratios at birth, the chances of getting into high school between girls and boys may not be that skewed.

In conclusion, according to previous literature, the correlation between indicators of son preference and educational gender inequality could either be expected or observed as positive or negative. As described above, plausible reasons for a positive relationship are related to

life-long son-biased paternal preference, a positive link between social development and increasing education supply, enrichment in nutritional investment, and the expansion of health care. On the other hand, a negative relationship could arise due to son-biased fertility stopping behavior leading to daughters more often being first-born children, sex ratio at birth not being a good indicator of son preference, and the possibility that parent may make equal investments in sons and daughters despite an skewed sex ratio at birth.

In this research, given that the prior research literature appears to be more supportive of the positive relationship between indicators of son preference and inequality in educational attainment (favoring women), I hypothesize a positive relationship between indicators of parental son preference at birth and gender inequality in education at adulthood. Additionally, I hypothesize that indicators of health development and investments in education will partially explain the correlation between indicators of son preference and gender inequality in education.

3.2.3 Sex ratio at birth is not the same as son preference

A plausible reason that the sex ratio may not be positively associated with educational inequality is that high sex ratio is not identical to son preference. Instead, technological innovation and declining fertility may be related to a skewed sex ratio, and these factors may also be related to greater gender equality in education (Jayachandran, 2014). First, technological innovation, such as ultrasound, enables individuals to ascertain the sex of a fetus. With the help of such advanced techniques, the sex ratio has become extremely skewed through sex-selective abortion (Chen et al., 2013; Lin et al., 2014). Second, son preference does not mean that parents always have a stronger desire for wanting sons rather than daughters. Instead, individuals express a strong desire to have at least one son. Therefore, son preference may not lead to high sex ratios unless fertility is very low. Indeed, according to

Jayachandran (2014), when family size becomes smaller, couples in India are more likely to use sex-selective abortion as a means to have an (only) son.

These factors may contribute to a negative correlation between sex ratio at birth and gender inequality in education. From 1981 to 1989, because of the implementation of the one-child policy, most families were more willing to have their only child as a boy through sex-selective abortion. Under the effect of technical innovation and declining fertility, the sex ratio at birth has become more male-skewed. On the other hand, with the development of the whole society, the gender gap may remain the same or may even decline. Thus, in some provinces with high sex ratio at birth, the difference between gender in high school attainment may not be that big.

Accordingly, my two main hypotheses are:

Hypothesis 1: In China, higher levels of son preference in childhood, as indicated by skewed sex ratios at birth and higher infant mortality rates for girls than boys, are related to higher levels of gender inequality in education when reaching to adulthood.

Hypothesis 2: In China, the association of son preference in childhood and gender inequality in education will be partially explained by provincial differences in health development and educational development.

Section 4. Description of Method and Data

The National Population Census of the People's Republic of China in 1982, 1990, 2000, and 2010 is used as the primary data source of data to calculate the majority of variables in provincial level. The China Statistical Yearbook (1949-2004) is used as the additional source for the analysis of control variables measuring health care access and educational supply. All data taken from the China Population Census and the China Statistical Yearbook contains information in 31 provinces, including 4 municipalities, in mainland China.

In this research, I focus on the adult educational outcomes of two groups: cohorts of infants born in 1982 (individuals age 18 in 2000) and in 1990 (individuals age 20 in 2010). Specifically, information about birth cohorts found in the China Population Census data from 1982 and 1990 are matched with adult educational outcomes of the same cohorts, then age 18 or 20, in the Census data from 2000 and 2010. I used the earlier years (1982 and 1990) to measure son preference toward newborns, and the later years (2000 and 2010) to measure gender inequality in education.

There are total eleven variables used in this research: one dependent variable, two independent variables, and eight control variables. Gender inequality in education is the dependent variable, which is measured by the ratio of male high school attainment rate to female high school attainment rate. Specifically, the population born in 1982 age 18 in 2000 and population born in 1990 age 20 in 2010 are the subjects of the measurement of sex inequality in high school attainment. From Figure 1, the sex ratio of high school attainment is greater than 1.0 in most provinces tested, indicating a tendency for males to be advantaged in high school education.

Sex ratio at birth and ratio of the female to male IMR (infant mortality rate per 1,000 persons) are the two primary independent variables. Using the China Population Census from

1982 and 1990, sex ratio at birth and sex ratio of the IMR are indicators of the level of son preference at the time of the birth year in the province of birth for the cohorts in my analysis. As shown in Figure 2, the majority of provincial-level sex ratios at birth (boys to girls) are higher than 1.05, which is considered the "natural sex ratio at birth" (World Health Organization). This indicates a preference for sons in most cases. Figure 3 indicates the sex ratio of IMR, as the ratio of female infant mortality rate to male infant mortality rate, is higher than 0.9 in the majority of the cases tested. This result consistently indicates excess female infant mortality. Using the estimates of IMR from the UN Interagency Group on Child Mortality Estimation (UN IGME) and life table entries set by WHO, Alkema et al. (2014) found the average sex ratio of IMR (female to male) is 0.88 in 1990 and 2012, the ratio is even as low as 0.78 for developed regions in 1990. For most populations, a female has natural advantage in IMR compared to a male. So the fact that the IMR ratio is equal to 0.9 or higher in many provinces in indicative of son preference.

Eight control variables are chosen based on two mechanisms explained in Section 3, the mechanism of health care and the mechanism of development of society and education.

Average IMR per 1,000 persons and the number of beds per 10,000 persons in health institutions in the birth year, and growth in hospital beds per 10,000 persons at age 0-15, are chosen as measurements for health development, testing the mechanism of health care described in Section 3.4. The average IMR per 1,000 persons at age 0 in each province collected from China Population Census (1982&1990) measures the condition of public health care, especially for the medical condition of lying-in women and infants. Similarly, the hospital beds per capita, collected from the China Statistical Year in the same years, is an indicator of health care supply in the year of birth. The growth of the hospital beds per capital is used to measure to the development of public health care system that occurred for the birth cohorts in my analysis as they aged from 0 to 18.

GDP per capita, GDP growth per capita at age 0-18, number of high school teachers per 10,000 enrolled high school students, growth in primary teacher per enrolled 10,000 students at age 5-15, and the average high school attainment rate, based on the mechanism explained in Section 3.2, are four proxy indicators of the development of society and education supply. GDP per capita measures the level of living standard in the year of birth, whereas GDP growth per capita measures the societal and economic development from birth to adulthood. The number of high school teachers per capital measures the level of educational supply at age 0, whereas the average high school attainment rate measures the level of educational access at age 18 (born in 1982) or at age 20 (born in 1990). The changes in *primary* teachers per capita at age 5-15, but not the changes in *high school* teachers per capita, is chosen as the measurement of growth of education supply because primary teachers per capita increases consistently in recent decades, whereas the change of high school teacher per capita fluctuates (see Figure 4).

Unfortunately, this research is unable to test the mechanism of nutritional investments described in previous section due to the lack of appropriate data.

Table 1 provides summary statistics of all eleven variables listed above, including their means, standard deviations, minimums, and maximums.

Section 5. Results

Table 2 lists the bivariate correlations between gender inequality in high school attainment with other vital variables. Column 1 in Table 2 shows that sex ratio at birth, IMR per 1,000 persons, beds per 10,000 persons in health institutions, growth in health beds per capital at age 0-15, and average high school attainment rate are all correlated with the gender inequality in high school attainment. Specifically, the sex ratio at birth has a relatively strong and significant correlation with the gender inequality in education as the p-value for its relation is less than 0.01 ($p<0.01$). Nevertheless, inconsistent with the hypothesis predicting there is a positive correlation between son preference in childhood and gender inequality in education, the result in Column 1 actually estimates a negative relation between sex ratio at birth and gender inequality in school attainment. This surprising result will be further analyzed and discussed in the next session.

The correlations between gender inequality in high school attainment and the three measurements of the development of public health care all show statistical significance. The correlation between gender inequality in high school attainment and IMR per capita is positive ($p<0.001$), whereas for beds per capita and growth in beds per capital, both coefficients for their relationship with the sex imbalance in school attainment are negative ($p<0.05$). All of the results suggest that higher level of health care development is correlated to lower level of gender inequality in education.

As seen in Column 1 in Table 2, the high school attainment rate, as the measurement of the level of education access at age 18 or age 20, also shows a statistically significant association with gender inequality in high school attainment ($p<0.05$). The negative association between average high school attainment rate and gender inequality in high school attainment is consistent with the mechanism of educational development negatively relating to gender inequality in education.

Table 3 reports the results of the ordinary least square (OLS) regression models, predicting gender inequality in three different models. In general, with different groups of control variables designed based on the three mechanisms described in the previous sections, all three regression models estimate a strong negative correlation between the primary independent variable sex ratio at birth and the independent variable gender inequality in education, which is consistent with the previous result shown in Table 2.

Model 1 estimates the relationship between the indicators of son preference and gender inequality in education, including only two independent variables: sex ratio (favoring boys) at birth and ratio IMR by sex. Model 2 adds the controls for health development. Model 3 adds the controls for societal and educational development. According to Model 1, the relationship between sex ratio at birth and sex inequality in education is negative and statistically significant at the 5% level ($p<0.05$). This estimate suggests that a 10% increase in the sex ratio at birth is associated with an approximately 17.11% decrease in the ratio of male to female high school attainment rate.

Adding the controls of IMR per capita, hospital beds per capita and growth in beds per capital in Model 2 weakens the strong negative correlation between sex ratio and gender inequality in high school attainment, but the correlation remains statistically significant and negative. According to Model 2, the significant coefficient ($p<0.1$) estimate indicates that the increase in 10% sex ratio is associated with a 13.66% decrease in gender inequality in high school attainment. Similar to the result found in Table 2, the coefficient estimates for both beds per capital and growth in beds per capital is significant and negative, supporting the idea that greater health care supply relates to a lower level of gender inequality in education. The only exception in Model 2 is that the coefficient for IMR per capital is not significant, whereas the bivariate association is significant.

Model 3 further supports the finding showing a significant and negative relationship between sex ratio and gender inequality in high school attainment ($p<0.1$). Similar as what is found in Model 2, the coefficient estimates for beds per capita and growth in beds per capital are still both significant and negative, favoring the mechanism of increase in public health care increasing gender equality in education. It is also worth mentioning that none of the measures of educational development shows a significant relationship with the dependent variable.

In sum, from Table 2 and Table 3, the main finding, which is inconsistent with the primary hypothesis, is that the relationship between sex ratio at birth and gender inequality in education in adulthood is negative. Specifically, a higher sex ratio at birth (favoring boys) is associated with *lower* gender inequality in high school attainment. In the areas with greater levels of son preference (as indicated by higher sex ratios at birth), girls, rather than boys, have greater chance to attend high school when they grow up. This association is partially explained by indicators of health development, as shown by the attenuation of the coefficient between Models 1 and 2. Furthermore, the negative correlation between health development and gender inequality in education is shown in both the correlation and regression results, implying that a higher level of health care in the year of birth, as well as greater development of the health care system over time, is associated with a lower level of gender inequality in education. Combining the results shown in Table 2 and Table 3, it is unlikely that there is a correlation between educational development and gender inequality in education, which is contradictory to the mechanism of development of society and education supply in Section 3.2.

Section 6. Discussion

This section will interpret and discuss the results tested in the previous section.

According to the results in the previous section (see Tables 1, 2 and 3), the relationship between the sex ratio at birth and gender inequality in education is consistently negative, no matter which group of controls or two groups of controls were included in the model, or whether controls were included at all. This main result implies that in the areas where parents appear to have greater ability and likelihood of choosing to have boys than girls, there is a greater chance for girls to attend high school as they grow up. Also, according to Table 3, only two control variables – those measuring health care development -- show a significant relationship with the gender inequality in education, indicating that the higher development in public health system, the lower gender inequality in education. The indicators of educational and socioeconomic development of the Province was unrelated to gender inequality in education. In short, Hypothesis 1 is rejected as the main result indicating greater son preference at birth is more likely related to less gender inequality in education when reaching to adulthood. On the other hand, the negative relationship between health development and gender inequality in education, and the fact that the relationship between the sex ratio at birth and inequality in high school attainment declines and is therefore partially explained when indicators of health development are added to the model, partially confirms Hypothesis 2.

There might be three alternative interpretations of the negative correlation between sex ratio at age 0 and gender inequality in education when grow up.

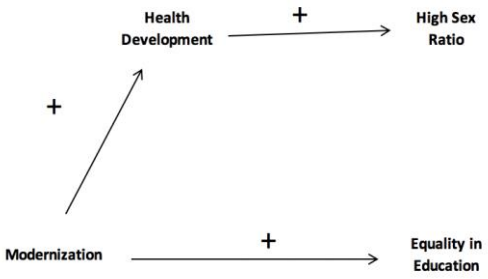
First, since both of the groups of infants examined in my analysis were born under the One-child policy, the sex ratio at birth may not reflect parent's true desire having a boy or girl. According to the mechanisms described in section 3.2.2 and section 3.2.3, when fertility

is low, son preference is more likely to lead to a high sex ratio at birth. Thus, the extremely male-skewed sex ratio in some provinces is not always equal to parents' sharply strong desire for having sons rather than daughters and may instead be contingent on the level of fertility. Further, even if parents might have a preference for sons over daughters, they could still value the educational attainment of both sons and daughters equally. In other words, an extremely high male-skewed sex ratio may not be a good indicator of son preference, and even greater son-biased parental preference at birth may not be equivalent to greater son-biased parental investment in education.

Second, the increase in the development of health care might provide a possible explanation of the negative correlation between sex ratio and gender inequality in education. In other words, the relationship between son preference and inequality in education may be spurious due to their association with a third factor, modernization and health care. This is illustrated in Figure 5. According to previous results shown in Table 3, with controls, increases in health beds per capita are associated with decreases in gender inequality in education, and increases in the sex ratio at birth are associated with decreases in gender inequality in education. These two relationships might imply that, the sex ratio is higher in the areas with better conditions of health care because more individuals in those areas were able to get the access of ultrasound, and thus able to choose the sex of their unborn child. In 1979, China was able to manufactured its first ultrasound B machine. Since mid 1980s, as the most inexpensive and convenient technology for sex determination, ultrasound gradually became available nationwide. During 1980s, the introduction of ultrasound machines was often treated as an important indicator of the achievement in public health sector (Chen, et al. 2013). Thus, during 1980s and 1990s, areas of greater development in public health were more likely equipped with ultrasound technology. With easier accessibility to ultrasound, women were more likely to do prenatal sex determination, thus leading to higher sex ratio at

birth through sex-selective abortion. At the same time, girls would have much equal chance to attend high school in the areas of better health care conditions. According to several mechanisms described in section 3, rapid development in health care system reflects the strong modernizing forces in that region, which is often coincided with and/or benefits the development in female education (Das Gupta, 1987; Becker et al., 2010). Besides, according to the research regarding discrimination against female children in rural India, Das Gupta (1987) found that women's education was associated with declined child mortality which was reduced by greater health care development and decreased fertility. Thus, the negative association between sex ratio at birth and gender inequality in education might be explained by their associations health care development, as shown in Figure 5 below.

Figure 5. Possible model linking modernization
with sex ratio and equality in education



Third, the negative relationship between sex ratio and gender inequality in education might also be explained by a potential phenomenon that in the areas with higher sex ratio favoring sons, boys were more likely to have older sister(s) who might use up the limited family resources before their younger brothers can take advantage of family resources. In China, the One-child policy was established in 1979, limiting each couple to have only one child. In 1984, the Chinese government made some adjustments to enforce this policy better.

One of the crucial adjustments is that residents in rural areas could have a second child if their first child was a girl. Recall that ultrasound technology became available in China in mid 1980s, enabling women to engage in sex-selective abortion (Zeng et al. 1993). So, one reasonable explanation of the extremely high sex ratio during the 1980s and 1990s is that those rural residents who initially only have one daughter, before they have the access to ultrasound technology, were more likely to have their second child, especially a boy. Recent research demonstrates that women who had easier access to ultrasound were more likely to have a son at the second parity (Ebenstein, Li, and Meng, 2013). What's more, researchers using Census data found that the reported sex ratio at birth in China is higher than normal for infants with an older sister(s) but not for those with an older brother (Zeng et al, 1993). This explanation is also consistent with the mechanism of son-biased stopping fertility behavior explained in section 3.2.1. In light of this situation, the higher sex ratio at birth (favoring boys) might indicate higher possibilities of having older sister(s) for those tested in this research. Although having traditional son-preference ideas, the parents who first had a daughter as their only child were not able to predict whether and when they would have a son in the future, thus invested in their only child's education as much as they could. Later, when those families had their younger son, they might not have had enough resources for their son's educational investment (many were rural residents so tended to be poor). Still another explanation is that larger family size would have a negative impact child achievement (Cáceres-Delpiano, 2006). This is consistent with the explanation described in section 3.2.1, indicating parents would be more likely to invest in their earlier-born children as earlier-born children usually have better academic performance than later-born. Thus, even if son preference was persistent in the areas with greater sex ratio, boys might not have greater advantages in education compared with girls at the same age.

Section 7. Summary

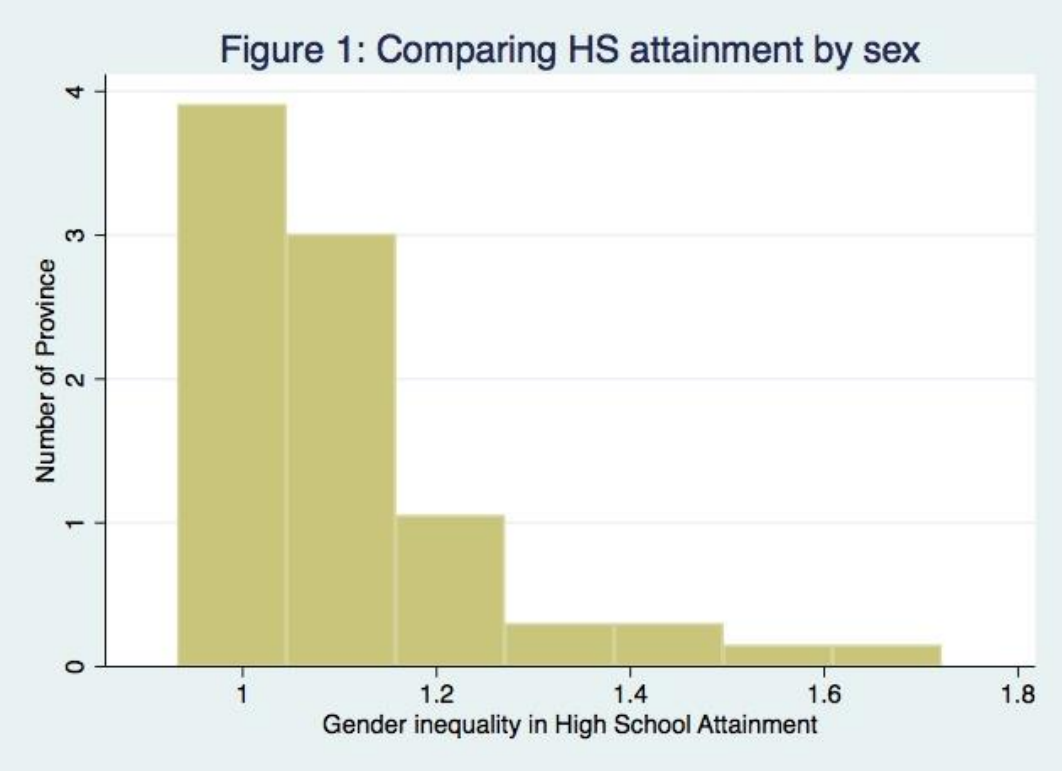
This research thesis examines the relationship between son preference at birth and gender inequality in education when infants grow up. The analysis relied on data from China Population Census in 1982, 1990, 2000 and 2010, and the China Statistical Yearbook in 32 provinces. The results indicate that sex ratio at birth is negatively associated with gender inequality in education. Hence, Hypothesis 1 is not supported.

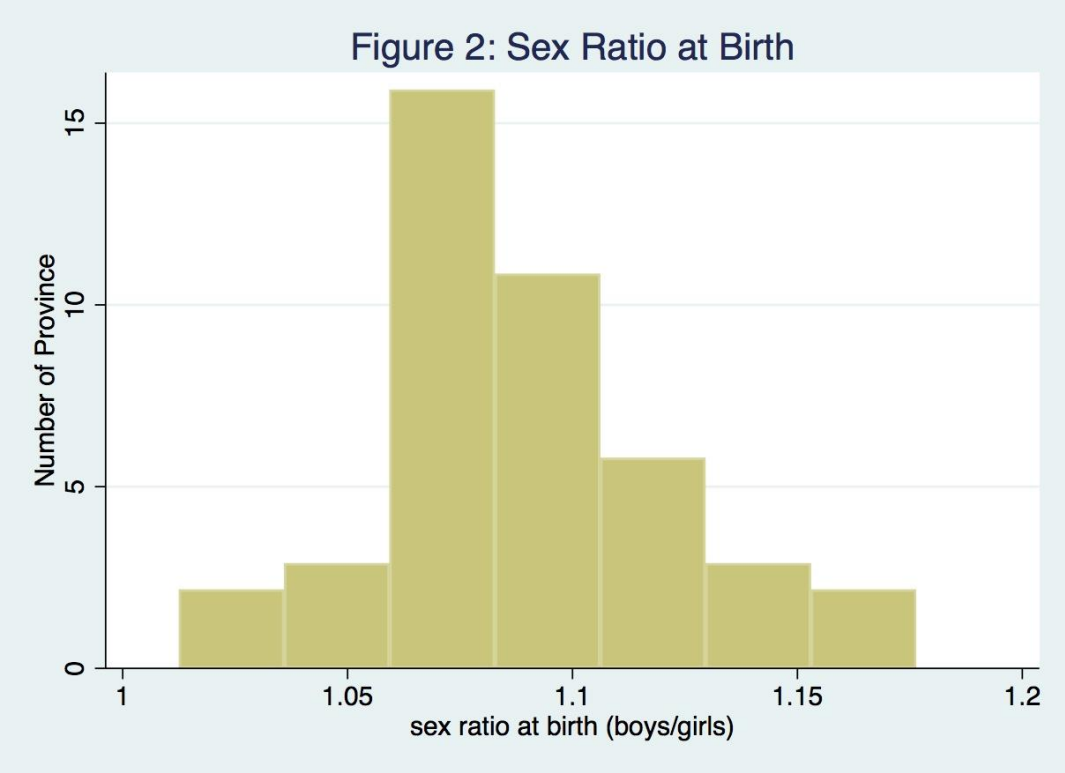
The development in public health care system, but not the development in economic and education, appears to help explain this main finding. This finding is partially consistent with Hypothesis 2. According to the results found in this research, increases in hospital beds per capita is associated with decreases in gender inequality in education. Specifically, the expansion in the healthcare system, measured by the increase in hospital beds per capital, could be strongly linked to the rapid accessibility of ultrasound technology since mid 1980s in China. Combined with the traditional son preference in China, females in regions with better health care conditions were more able to have sex-selective abortions, leading to higher male-skewed sex ratio of infants. At the same time, development in healthcare is often treated as an important indicator of modernization, which is associated with the development in education, benefiting female in general. Additionally, and as supported by other research findings, an abnormally high sex ratio of infants is more common for later birth orders (especially in rural areas), leading to families more often having older sisters and younger brothers. In such families, where the family resources are already being divided among multiple children, younger brothers might not show obvious advantages over their older sisters in education.

To better understand the relationship between son preference and gender inequality in education, future research could include more controls to test related mechanisms described in previous part. For example, future research could add control variables measuring the

weights of infants and young children to test how nutritional investment affects the relationship between son preference and gender inequality. Additionally, measurement of sibling composition could be added to test the mechanism of son-biased fertility stopping behavior. Dividing analyzed subjects into urban population and rural population could better test the effect of economic development on the relationship between son preference and gender inequality in education, Analysis of population migration between provinces would be helpful to increase the accuracy of findings. Overall, future investigation of alternative explanations could help explain why greater son preference at birth is associated with less gender inequality in education.

APPENDIX: TABLES AND FIGURES





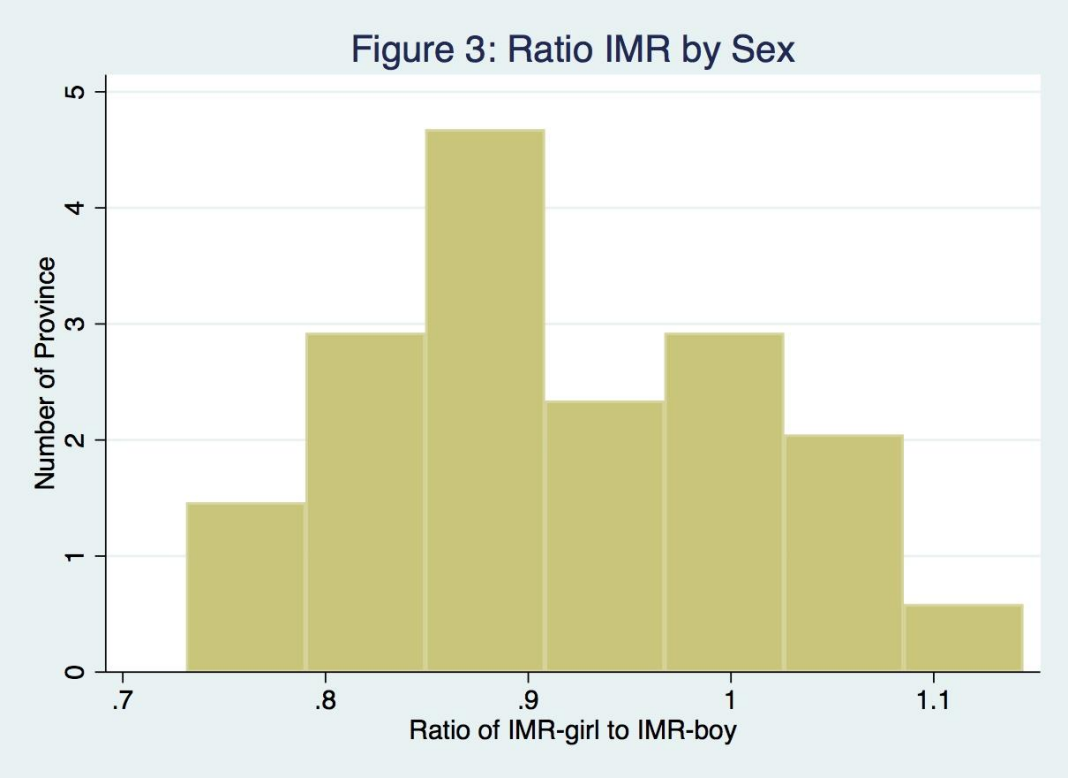


Figure 3: Ratio IMR by Sex
Number of Province
0
1
2
3
4
5
.7
.8
.9
1
1.1
Ratio of IMR-girl to IMR-boy

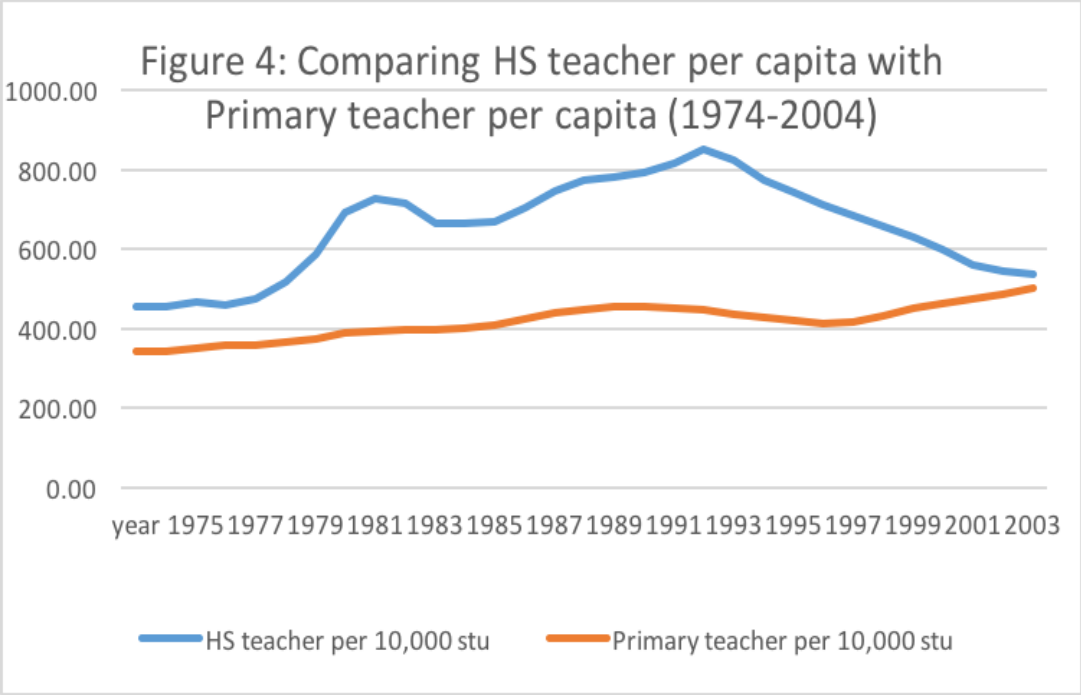


Figure 4: Comparing HS teacher per capita with Primary teacher per capita (1974-2004)
1000.00
800.00
600.00
400.00
200.00
0.00
year 1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003
HS teacher per 10,000 stu
Primary teacher per 10,000 stu

Table 1: Summary statistics of key variables of interest

	Mean	Std. Dev	Min	Max
Gender inequality in HS Attainment	1.10	0.15	0.93	1.72
Sex Ratio	1.09	0.03	1.01	1.18
Ratio IMR by sex	0.91	0.10	0.73	1.14
IMR per Capita	39.46	23.22	13.01	121.92
Beds per Capita	25.52	9.85	2.3	53.7
Beds Growth, age 0-15	0.10	0.19	-0.27	0.60
GDP per Capita	1240.90	1039.80	278	5911
GDP Growth, age 0-18	12.05	3.40	7.40	23.49
HS Teachers per Capita	688.84	140.24	521.41	1115.08
Primary Teachers Growth, age 5-15	0.12	0.21	-0.24	0.78
HS Attainment	0.21	0.14	0.06	0.76

Data: National Population Census of the People's Republic of China (1982, 1990, 2000, 2010), China Statistical Yearbooks
Notes: N=62. Ratio IMR by sex given in the ratio of IMR-girl/IMR-boy. IMR per Capita given in the unit of per 1,000 persons. Beds per Capita given in the unit of per 10,000 persons. HS Teachers per Capita given in the unit of per 10,000 persons.

Table 2: Bivariate correlations comparing gender inequality in HS attainment and other key variables

	1	2	3	4	5	6	7	8	9	10	11
(1)Gender inequality in HS Enrollment	1.00										
(2)Sex Ratio	-0.39**	1.00									
(3)Ratio IMR by sex	-0.18	0.62***	1.00								
(4)IMR per Capita	0.44***	-0.46***	-0.28*	1.00							
(5)Beds per Capita	-0.29*	-0.09	-0.22	-0.16	1.00						
(6)Beds Growth, age 0-15	-0.26*	0.02	-0.14	-0.35**	-0.11	1.00					
(7)GDP per Capita	-0.15	0.06	0.07	-0.35**	0.64***	0.09	1.00				
(8)GDP Growth, age 0-18	-0.07	0.13	0.12	-0.13	-0.13	0.33**	-0.02	1.00			
(9)HS Teachers per Capita	0.05	-0.24	-0.21	-0.10	0.37**	0.06	0.60***	-0.19	1.00		
(10)Primary Teachers Growth, age 5-15	-0.12	0.21	0.04	-0.16	0.35**	-0.02	0.38**	0.07	0.08	1.00	
(11)HS Enrollment	-0.29*	-0.09	-0.19	-0.48***	0.44***	0.61***	0.54***	0.23	0.37**	0.11	1.00

*p<0.05, **p<0.01, ***p<0.001. N=62

Data: National Population Census of the People's Republic of China (1982, 1990, 2000, 2010), China Statistical Yearbooks

Table 3:Ordinary Least Squares (OLS) regressions predicting gender inequality in HS enrollment

	Model 1			Model 2			Model 3		
	Coef.	SE		Coef.	SE		Coef.	SE	
Son Preference									
Sex Ratio	-1.711	0.717	**	-1.366	0.714	*	-1.327	0.788	*
Ratio IMR by sex	0.084	0.242		-0.093	0.228		-0.211	0.254	
Health Dev.									
IMR per Capita				0.001	0.001		0.001	0.001	
Beds per Capita				-0.005	0.002	**	-0.008	0.003	**
Beds Growth, age 0-15				-0.204	0.104	*	-0.268	0.152	*
Educ. Dev.									
GDP per Capita							0.00004	0.00003	
GDP Growth, age 0-18							0.002	0.006	
HS Teachers per Capita							0.00002	0.0002	
Primary Teachers Growth, age 5-15							0.035	0.101	
HS Enrollment							-0.017	0.851	
Y-intercept	2.884			2.785			2.831		
R-squared	0.124			0.323			0.379		

**p<0.1, **p<0.05. N=62*

Data: National Population Census of the People's Republic of China (1982, 1990, 2000, 2010), China Statistical Yearbooks

REFERENCES

Arnold, Fred, and Liu Zhaoxiang. "Sex preference, fertility, and family planning in China." *Population and Development Review* (1986): 221-246.

Arnold, Fred, Minja Kim Choe, and Tarun K. Roy. "Son preference, the family-building process and child mortality in India." *Population studies* 52.3 (1998): 301-315.

Altindag, O., et al. "CUNY Academic Works Son Preference, Fertility Decline and Non-Missing Girls of Turkey Son Preference, Fertility Decline and the Non-Missing Girls of Turkey." *City University of New York (CUNY)* (2015).

Bauer, John, Wang Feng, Nancy E. Riley, and Zhao Xiaohua. "Gender Inequality in Urban China." *Modern China* 18.3 (1992):333–70.

Becker, Gary S., William HJ Hubbard, and Kevin M. Murphy. "Explaining the worldwide boom in higher education of women." *Journal of Human Capital* 4.3 (2010): 203-241.

Black, Sandra E., Paul J. Devereux, and Kjell G. Salvanes. "The more the merrier? The effect of family size and birth order on children's education." *The Quarterly Journal of Economics* 120.2 (2005): 669-700.

Bjerkedal, Tor, et al. "Intelligence test scores and birth order among young Norwegian men (conscripts) analyzed within and between families." *Intelligence* 35.5 (2007): 503-514.

Bose, Sunita. "A contextual analysis of gender disparity in education in India: The relative effects of son preference, women's status, and community." *Sociological Perspectives* 55.1 (2012): 67-91.

Brandt, Loren, and Thomas G. Rawski, eds. *China's great economic transformation*. Cambridge university press, (200)8.

Buchmann, Claudia, Thomas A. DiPrete, and Anne McDaniel. "Gender Inequalities in Education." *Annual Review of Sociology* 34 (2008): 319-337.

Cai, Yong and William Lavely. "China's Missing Girls: Numerical Estimates and Effects On Population Growth." *China Review* (2003):13-29.

Chen, Yuyu, Hongbin Li, and Lingsheng Meng. "Prenatal sex selection and missing girls in China: Evidence from the diffusion of diagnostic ultrasound." *Journal of Human Resources* 48.1 (2013): 36-70.

Das Gupta, Monica, et al. "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 (2003): 153-187.

Ebenstein, Avraham, Hongbin Li, and Lingsheng Meng. "The impact of ultrasound technology on the status of women in China." Hebrew University and Tsinghua University Working Paper. (2010).

Graham, Maureen J., Ulla Larsen, and Xiping Xu. "Son preference in Anhui province, China." *International family planning perspectives* (1998): 72-77.

Gupta, Monica Das. "Selective discrimination against female children in rural Punjab, India." *Population and development review* 13.1 (1987): 77-100.

Hannum, Emily, Peggy Kong, and Yuping Zhang. "Family sources of educational gender inequality in rural China: A critical assessment." *International journal of educational development* 29.5 (2009): 474-486.

Hotz, V. Joseph, and Juan Pantano. "Strategic parenting, birth order, and school performance." *Journal of population economics* 28.4 (2015): 911-936.

Jayachandran, Seema. "The roots of gender inequality in developing countries." *economics* 7.1 (2015): 63-88.

Jenq, Christina. The Relationship Between Cohort Sex Ratios and Relative Female Educational Attainment in Post-1949 China. The University of Chicago. (2014).

King, Elizabeth. M. and M. Anne Hill. Women's Education in Developing Countries: Barriers, Benefits, And Policies. The World Bank.(1993).

Lai Dejian. “Sex Ratio at Birth and Infant Mortality Rate in China: An Empirical Study.” *Social Indicators Research* 70.3 (2005):313-326.

Lee, Jungmin. "Sibling size and investment in children's education: An Asian instrument." *Journal of Population Economics* 21.4 (2008): 855-875.

Pitt, Mark M., Mark R. Rosenzweig, and Mohammad Nazmul Hassan. "Human capital investment and the gender division of labor in a brawn-based economy." *American Economic Review* 102.7 (2012): 3531-60.

Poston Jr, Dudley L., Baochang Gu, Peihang Peggy Liu and Terra McDaniel. 1997. "Son Preference and The Sex Ratio at Birth in China: A Provincial Level Analysis." *Social Biology* 44.1-2 (1997): 55-76

Population Census Office under the State Council and China National Bureau of Statistics. 1985. 1982 Population Census of China (Results of Computer Tabulation). Beijing: China Statistics Press

Population Census Office under the State Council and China National Bureau of Statistics. 1993. Tabulation on the 1990 Population Census of China. Beijing: China Statistics Press

Population Census Office under the State Council and China National Bureau of Statistics. 2002. Tabulation on the 2000 Population Census of the People's Republic of China. Beijing: China Statistics Press

Population Census Office under the State Council and China National Bureau of Statistics. 2012. Tabulation on the 2010 Population Census of the People's Republic of China. Beijing: China Statistics Press

Ming, Tsui and Rich Lyne. "The Only Child and Educational Opportunity for Girls in Urban China." Gender & Society 16.1 (2002): 74-92.

Sawyer, Cheryl Chriss. "Child mortality estimation: estimating sex differences in childhood mortality since the 1970s." PLoS Medicine 9.8 (2012).

Wolf, Margery. "Marriage, family, and the state in contemporary China." *Pacific Affairs* 57.2 (1984): 213-236.

World Development Report. Gender equality and development. The World Bank. Washington, DC. (2017)

Xiong, Z., Chen, Q., & Liu, W. Women and men in China: Facts and figures. (1995)

Yi, Zeng, et al. "Causes and implications of the recent increase in the reported sex ratio at birth in China." *Population and development review* (1993): 283-302.

Academic Vita

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EDUCATION

The Pennsylvania State University — *State College, PA*
Bachelor of Arts in Sociology, Bachelor of Arts in Philosophy — *Jun 2016 - Dec 2019*

Honor thesis: "Son Preference and Gender Inequality in Education in China"

Relevant Coursework: Sociological Theory (graduate-level), Intermediate Social Statistic, Social&Political Philosophy, Feminist Philosophy, Calculus I

Honors & Awards: Phi Beta Kappa Honor Society (Fall 2018); Schreyer Scholar; Paterno Fellow; Alpha Kappa Delta International Sociology Honor Society; The President's Freshman Award; Dean's list (2016-2019)

ACEDEMIC EXPERIENCE

Penn State University Department of Sociology — *State College, PA*
Research Assistant in the Intergroup Hostility Project — *May 2019 -Present*

- Research about societal discrimination against religious minorities and how this discrimination contributes to social conflict.
- Reviewed and analyzed 2,000+ news articles about societal discrimination and/or advocacy to Muslim.
- Worked on data collection, data management, and data coding of raw research materials.

Penn State University Department of Sociology — *State College, PA*
Research Assistant in the Association of Religion Data Archives (ARDA) — *Feb 2018 - Present*

- Worked directly for the Project Manager Dr. Gail Ulmer to manage data and maintain the website of ARDA
- Re-organized and re-coded syntax for 30+ archived survey data files about public opinions regarding social & religious issues in SPSS.

Penn State University Department of Sociology — *State College, PA*
Teaching Assistant — *Jan 2018 - May2019*

- Assisted Dr. Erik Nielsen teaching in a 150-people Intro Sociology course
- Helped to grade students' essays monthly with comments; Co-designed multiple-choice exam questions; Helped students better understand the course material and answered their questions

Sociology Club, Penn State University Department of Sociology — *State College, PA*
President — *Jan 2017 -Present*

- Organize activities related to Sociology, such as Graduate School Panel, Involvement at departmental career fair, Legal studies Info Session, etc.
- Marketing activities around campus; Collect money from members to help them join in activities relate to sociology.

VOLUNTEER EXPERIENCE

Centre Helps — *State College, PA*
Hotline Counselor — *Feb 2018 - Oct 2018*

- Volunteered as a hotline counselor after intensive training (Average 6hrs/wk.) Counseling more than 50 clients with basic needs problems, suicidal situation, and other general counseling questions.

Peer China — *Hunan, China*
Alumni and Volunteer — *Jul 2017 - Aug 2017*

- Volunteered four weeks in economically underdeveloped regions of China. Brought the concept of liberal arts education to 65 high school students and nurtured their interests in liberal arts education and social justice.
- Team leader of volunteers, responsible for activity design and arrangement of the whole project.
- Helped to interview future volunteers (Spring 2019).

SKILLS, CERTIFICATIONS & OTHERS

- **Skills:** STATA, SPSS, Excel, Office
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