Textiles and the Historical Emergence of Gender Equality in China*

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Abstract

This paper seeks to better understand the historical determinants of son preference among Han Chinese. I test the hypothesis that historical textile production led to a decline in son preference. I exploit exogenous variation in historical textile production at the county level to casually identify the effect of textiles on son preference, following a technology shock in late 13th Century. I find that historical textile production is positively correlated with female labor participation, and negatively correlated with sex ratio imbalances and sex-specific parental investment. My results are robust to various robustness checks, micro-level analyses, propensity score matching, and an instrumental variable estimation. I identify cultural transmission as a possible channel of the persistence effect of historical textile production on today's son preference and gender norms.

Keywords: Culture, textile production, son preference, historical persistence
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I Introduction

This study examines an important deeply held belief in China that sons are superior to daughters. Despite the general son preference, the degree of preference varies widely across regions. A direct consequence of son preference is sex selection at the fetal stage. Every year, some regions have many more sons born than daughters; others region have roughly the same number of sons and daughters born. The variations are visible in the population censuses. According to the Chinese population census, in Jincheng, 102 boys were born to every 100 girls; whereas in Erzhou, 170 boys were born per 100 girls.

My interest is in the role past historical events have played in shaping this preference for sons. I test the hypothesis that historical textile production led to a reduction in son preference. Textile production, following major technological innovations in the 13th century, greatly increased women's productivity. Textile production required adroitness and patience, but not as much upper body strength as animal husbandry. The emergence of textile production increased women's productivity relative to men's, raising the relative benefit of having daughters. However, as regions varied in their local geo-climatic suitability for textile production, it was women in textile-suitable regions who reaped the greatest benefit from the technological innovation.

I exploit a technology shock in textile production that was exogenous to China. In the Yuan Dynasty (1271–1368), Huang Dao Po, a Shanghai native (1245–1330), learned new technologies in both spinning and weaving from Hannan Island. She developed a pedal spinning wheel with three spindles, a piece of equipment similar to the Spinning Jenny. This new technology was then promoted to the rest of China, but was only able to set roots where geo-climatic conditions were favorable to textile production.

Data on historical textile production obtained from local gazetteers, enables me to identify whether a place had textile production in the past. I link this data to contemporary measures of son preference and gender inequality. My outcome variables include sex ratio at birth, education gap between sons and daughters within a family, attitudes towards remarried women owning property, and female labor force participation. My analysis examines variation across counties and individuals. I find a strong negative relationship between historical textile production and son preference today. Historical textile production is also positively correlated with female labor participation and positive attitudes towards remarried women owning property, and negatively correlated with sex ratios, as well as the education gap between sons and daughters within a family.

To identify the causal impact of historical textile production on modern outcomes, I apply various empirical strategies. The baseline estimates suggest that the presence of cotton textile industry is associated with a reduction of 15% in the deviation of the sex ratio at birth from

the upper bound of normal sex ratios at birth in the population.[1]

I include controls for a number of historical characteristics of each county, such as the suitability of its environment for agriculture,share of rice paddies, its distance to the Grand Canal or Yangtze River, number of courier routes passing the county, its level of economic development before the adoption of textile technologies, and whether it became a treaty port in 19th century, as well as set of geographic controls, such as latitude, longitude, elevation and distance to coast. I also control for current per capita GDP, scale of current textile production, share of agricultural workforce, share of non-agricultural household registration, share of ethnic population, total fertility rate, and whether a county is located in a provincial capital. Region, province or prefecture fixed effects are included in all specifications.

My results are robust to an instrumental variable approach. Farnie (1979) points out that humidity played a key role in textile production. Humidity makes cotton fibers more pliable and reduces the chance of breakages in the yarn. This motivates the use of county-level relative humidity as an instrument for historical textile production. To account for the correlations between relative humidity and other geographic characteristics, I include overall agricultural suitability, share of rice paddies, distance to coast, longitude and latitude. My IV estimates are comparable to OLS estimates, and IV estimates are robust to inclusion of other geographic covariates.

The relationship between sex-specific income and the desirability of daughters in east Asia is hardly surprising (Qian, 2008). What is to be explained is that this effect has persisted to this day, when proto-textile production is long out of the picture. It is likely that historical textile production has shaped cultural beliefs about the desirability of daughters and gender norms. However, it is also likely that part of the long-term impact arises because historical textile production promoted the development of formal institutions, gender-specific economic opportunities and overall wealth that favor the decision to raise daughters. To rule out the first channel, I rely on within-country, within-region, within-province and even within-prefecture variation, where formal institutions are identical and policies are enforced to a similar extent.[2] Due to pervasive communist reforms in favor of gender equality, official sex discrimination or labor laws hardly vary at a local level, benefiting my identification of the role of historical determinants in today's gender norms. To account for the second channel, I control for sectoral composition today, including scale of textile production and agricultural workforce. To best account for the third channel, I control for both current per capita GDP and past levels of economic development. I show that overall wealth alone hardly explains the large and systematic differences in sex ratios, attitudes, sex-specific education investment, and female labor force participation documented in this paper.

[1] According to UN research, sex ratios at birth normally range from 103 to 107.

[2] Despite the highly centralized law making process, policies can be implemented by local governments with greater latitude.

This paper contributes to the literature on historical determinants of cultural norms and beliefs. Guiso et al. (2008) find that a history of independent city states in medieval Italy is associated with higher levels of social capital. Nunn and Wantchekon (2011) study the effects of the trans-Atlantic Slave trade and find that areas which exported large numbers of slaves have lower trust and higher levels of corruption today. Grosjean (2011) examines the persistence of a culture of honor among Americans of Scots-Irish descent. She finds that this culture of honor results in higher homicide rates among Scots-Irish in the US South and Mountain West but not elsewhere and argues that this culture has only persisted where formal institutions are comparatively weak. Voigtländer and Voth (2012) study the persistence of antisemitic beliefs in Germany. They exploit the exogenous shock of the Black Death in the fourteenth century and demonstrate that towns in Germany which persecuted their Jewish communities displayed higher support for the Nazi party and saw more denouncements and deportations of Jews during the 1930s than did towns which did not persecute their Jews in the fourteenth century. Jha (2013) shows that a cities in India that were medieval trading ports experienced significantly less religious riots between Muslims and Hindus in the period after 1850.

The most closely related paper is Alesina et al. (2013) which explores how traditional agricultural practices influenced the historical gender division of labor and the modern levels of gender equality.[3] A more recent paper discusses conservative gender norms and its origins in historical marriage market conditions in Australia (Grosjean and Khattar, 2014).

This paper also contributes to the literature on parental gender bias and sex ratio imbalances, by identifying an important source of differentials in sex ratios. Edlund (1999) explicitly models sex ratios in relation to son preference, indicating multiple factors contributing to unbalanced sex ratios. Daul and Moretti (2008) finds evidence for parental gender bias in the U.S. that parents favor boys over girls. Others have studied son preference, sex-selective abortions, and changes in sex ratios in non-western countries (Gupta, 2014; Li and Lavely, 2003). Qian (2008) focuses on the short-term relationship between women's productivity and prenatal sex selection. Chung and Gupta (2007) suggests income levels play a key role in unbalanced sex ratios and that sex ratios can change in nonlinearity through different stages of development. Almond et al. (2013) discovers positive incomes shocks from land reforms increased sex ratios. The economic consequences of sex ratio imbalances have also attracted scholarly attention in recent years. Wei and Zhang (2011) links sex ratio imbalances to differential saving rates across China.

The third literature this paper builds on is the economic history literature studying the impact of textile production on the pre-modern Chinese economy in the context of the Great Divergence (Huang, 1990; Goldstone, 1996; Li and Li, 1998; Ma, 2005; Pomeranz, 2009; Wong, 2002). Several scholars have argued that the 17th and 18th centuries were a comparatively golden period for the Yangtze Delta, one of the major textile regions. Pomeranz and Li, in particular, have argued that China's textile industry remained highly productive and profitable through to the

[3]For surveys of field see Guiso et al. (2006); Bisin et al. (2011) and Nunn (2012).

19th century (Li and Li, 1998; Pomeranz, 2009). These claims motivate my focus on the textile industry.

This paper is organized as follows. The second section lays out the conceptual framework. Section III lists data sources and discuss historical context for the paper. Section IV summarizes my baseline results and subjects them to a series of robustness tests. Section V demonstrates that similar effects can be found using an alternative micro-database. My instrumental variable analysis is contained in Section VI. I explore how the effects of textile production persisted after the demise of the traditional textile industry in the late nineteenth century in Section VII. In Section VIII I discuss some possible channels that could be responsible for the persistent effect of textile production on son preference in China. Section IX concludes the paper.

II Conceptual Framework

The emergence of the textile industry in Ming China constituted a significant shock to the level of women's participation in market work. I argue that historical textile production has a strong, persistent impact on gender roles, gender norms and gender equality today. In particular, I hypothesize a relationship between historical textile production and son preference in contemporary China.

In this section I discuss the channels that can potentially account for this persistence. First, I discuss a variety of approaches economists have employed to explain the determination and persistence of cultural values. Second, I note that sex ratio imbalances are an important indicator for differential values being assigned to each sex and thus a good proxy for contemporary gender attitudes. Finally, I show that the emergence of the textile industry did constitute a large enough shock to women's economic opportunities that could give rise to new gender norms which persist to this day.

A number of recent papers have studied how attitudes to women have changed in recent decades (Doepke and Tertilt, 2009; Doepke et al., 2012; Jensen and Oster, 2009). In this paper I emphasize how a set of gender norms that emerged historically continue to shape the sex ratio in modern China. Recent research suggests that cultural beliefs can be viewed as decision-making heuristics or "rules-of-thumb", which explain how a productivity shock in the past can continued to shape cultural values today.

Economists have recently devoted considerable attention to the determination and persistence of cultural beliefs (see for survey Bisin et al., 2011). However, there is no single dominant approach to modeling cultural values. One approach is to treat cultural values as preferences (Weber, 1930) or as a form of consumption capital (Becker and Murphy, 2000).[4] Cultural values

[4]For an example of the culture as preferences view see Ichimrua (2000, 23) who argues that '[c]ulture is a major determinant of [an individual's] utility function ... Culture determines the tastes, preferences, beliefs shared by a majority of people in a country.'

have also been modeled as deriving from the value individuals attach to a particular identity (Akerlof and Kranton, 2000). Other approaches study the role cultural beliefs have in forming social norms (Greif et al., 1994; Greif, 2006).[5] In this approach observed societal-level norms such as attitudes towards women are an equilibrium phenomenon shaped by preferences, beliefs and expectations about the attitudes of others, and informal institutions.

Gender norms comprise a complex of nexus of different beliefs and attitudes concerning the relative status of woman. For my purposes it is sufficient to note that gender norms are both perpetuated from generation to generation (as shown theoretically by Bisin and Verdier (2001) and as discussed empirically by numerous studies in sociology and economics (Moen et al., 1997; Vella and Farré, 2007)) and also shaped by the attitudes of others in society (Burda et al., 2007). Both mechanisms generate cultural persistence and can explain why cultural values, once established, can be difficult to dislodge (at least in certain circumstances).

Inherited gender attitudes shape a wide range of outcomes today. The most important one I focus on is the sex ratio. When parents today make a decision as to whether to have a boy or a girl, they do not have complete information on the future prospects of a boy or a girl in contemporary world. They instead resort to general beliefs about whether boys or girls are morel likely to thrive in society and to favor the family.[6] These cultural beliefs are particularly important under a one-child policy regime and can be exercised at low cost given the availability of sex-selection technology.

In pre-modern China, it was folk wisdom that a family would suffer economically from the birth of a daughter.[7] This cultural belief was consistent with economic reality: daughters could not work outside home due to "chastity" concerns, and had to rely on family resources to survive.[8] And unlike sons, a daughter would not provide for her own parents once she was married. Coupled with the cost of dowries, the birth of additional daughters could mean poverty for an entire household (Harrell, 1995; Watson and Ebrey, 1991). Excess female mortality during infancy and childhood was widely observed.[9] After the rise of the textile industry in the fourteenth century, however, women in textile regions became able to earn enough to support a

[5]In Greif's formulation '[c]ultural beliefs are the shared ideas and thoughts that govern interactions among individuals and between them, their gods, and other groups. Cultural beliefs differ from knowledge in that they are not empirically discovered or analytically proved. Cultural beliefs become identical and commonly known through the socialization process, by which culture is unified, maintained, and communicated.' (Greif, 2006, 269-70). Cultural beliefs 'conjointly generate a regularity of behavior' (Greif, 2006, 30).

[6]Altruistic parents who care about whether or not their children have fruitful lives will prefer to have boys if they live in a society where women are treated less well.

[7]In an early Yuan era play *Qujiang Chi*, the heroine refers to herself as *pei qian huo*, which literally means a money-losing proposition. The term is still used in Mainland China, Singapore, Malaysia, Taiwan, Macau and Hong Kong today. In 2007, the Yahoo dictionary in Taiwan was caught giving the English-language translation of the Chinese term *pei qian huo* as (1) "a money-losing proposition" and (2) "a girl; a daughter" (`http://news.tvbs.com.tw/entry/305992`).

[8]Chow (1991) regards non- western women's "purity" or "chastity" as both sexual and nationalistic.

[9]Historian James Z. Lee and sociologist Cameron D. Campbell (2007) discovered that girls between ages one and five had a 20 percent higher mortality than boys.

household independently for the first time. This shock led to the breakdown of prior cultural beliefs concerning women's productivity.

As new textile production technologies were introduced to mainland China in 14th century, cotton textile production was made economically viable for the first time in history (Bray, 1997; Kang, 1977). In the areas where textiles were produced, women were able to produce a surplus of cotton textiles for market exchange—the fact that this work was for market is significant as it meant that the women (and not male household heads) were residual claimants.

As textiles were sold on the market, textile production shared many similarities with work in the industrial world.[10] Textile production represented an new opportunity for women to earn monetary income and thereby contribute to household income.[11] As the payoff to producing textiles was sufficiently high, women were induced into entering the labor market and switched away from performing non-market work or producing other fabrics at low quantities mainly for home use. Although Chinese women had been doing productive work prior to textile production, textile production provided women with a new role as a major income earner. By the late Ming period, both unmarried and married women became prominent working directly for the market, and in many cases their production became the main source of family incomes. In the High Qing period, diligent productive manual labor was seen as the virtue for all women, regardless of class (Mann, 1997). To summarize this change, using Pomeranz's terms, women became more respectable; to describe the change from the perspective of parents, it became less worrisome to have a daughter born to the family. Women had a potential role as productive members of the economy in their own right.[12]

My conceptual framework therefore indicates that a sufficiently large productivity shock to women's income could cause the breakdown of traditional gender norms in some parts of Ming China. This breakdown in traditional gender norms led to the emergence of more favorable attitudes towards woman and a more optimistic assessment of the prospective fates of potential daughters.

My argument relies on the effects of textiles not being confounded by other factors such as labor mobility. I discuss below, this assumption holds as labor mobility was limited for most parts of Ming and Qing Dynasty, due to the strong influence of clans (as discussed in Greif and Tabellini, 2010). This constrained women's ability to relocate to textile-suitable areas for jobs. Consequently, cotton textiles continued to generate enough incomes for women to be

[10]China had a well developed market economy in the late Ming period. Shiue and Keller (2007) shows the performance of markets in China and Western Europe overall was comparable in the late 18th century

[11]Pomeranz in his research on economics of respectability describes the role of daughters in a family: a family's capacity to survive and to profit from its work relied upon "an optimal mix of family members of particular ages and sexes" (Pomeranz, 2005).

[12]For example, due to a strong emphasis on a women's fidelity to her husband, even after he passed away, women would rarely remarry, which often meant deep poverty or suicide for the widowed. Ability to produce textiles helped women to support themselves in more situations.

a major contributor to the household income through to the end of the 19th century, when manufactured textile products from the west began to dominate the Chinese market. During that period, cultural beliefs about women's role in a family and the prospects of having a daughter continued to evolve in favor of women. Because of the persistent nature of cultural beliefs, I hypothesize that these beliefs may have persisted even after China moved out of proto-industries, affecting women's participation in market work and sex ratios today.

III Data and Historical Context

I use data from several periods regarding historical textile production. I also construct contemporary measures of son preference and gender equality, and historical and contemporary county characteristics. For modern outcome variables, I use the county-level Fifth National Population Census (2000) from China Geo Explorer, Chinese City Statistical Yearbooks and individual-level census data (1990) from IPUMS-International.

A Textile production from 1300 to 1800

Following the technological breakthrough in cotton textile production around 1300, the industry went through a period of rapid expansion. Cotton quickly gained popularity for many of its attractive properties, compared with silk and linen. Due to strict geo-climatic conditions required for textile production, only relatively humid areas could produce textiles for most periods of Ming Dynasty. Dry climate impeded weaving more than spinning. Places that were semi-humid could end up having only spinning but not weaving. As weaving was much more value-added than spinning, places specializing in spinning did not see as big an effect of textiles on women's ability to generate incomes.

To account for the location of textile production within China I use climate data. The Climate Research Unit of University of East Anglia, UK provides 30-year monthly average relatively humidity data across 10 arc-minute by 10 arc-minute grid cells globally. I extract relative humidity values on the basis of x, y coordinates. I construct a relative humidity variable at the county level by averaging over all relative humidity values within a polygon that stands for a county.

Due to lower transportation costs, a higher percentage of counties located near the Yangtze River and Grand Canal produced textiles historically. Huang (1964) paints a vivid picture of the importance of the Grand Canal in Ming Dynasty China, confirming that many counties famous for textile production were located in the great canal area, and the size of trade was considerable.[13] This could pose a challenge to my identification strategy, which I will discuss in the next section.

From Harvard University's digital world map collection, I obtain shape files that contain histor-

[13]Huang estimates the size of trade in cotton cloth to be one million teals around 1600.

ical characteristics for the counties within China. I calculate the distance to the Grand Canal or Yangtze River at the county level by matching the shape file for the Grand Canal, the shape file for the Yangtze River and shape file for contemporary China .

To best control for pre-adoption levels of economic development prior to 1300, I match the shape file for commercial tax quota in 1077 and the shape file for contemporary China to obtain an estimate for historical level of development.

Prior to 1800, only about 10% of all counties produced textiles. Despite later improvement in humidification, textile producers from less humid areas struggled to compete with their counterparts from more humid areas, particularly in the high-ended market, because top quality cotton cloths had to be weaved in a more humid environment than those less humid areas could ever provide. Thus the prices of textiles stayed at a level that generated enough income for a skilled textile worker to support a family of four.[14]

Textile production was predominantly performed by women. Weaving was defined as a womanly skill and women were far more productive in producing textiles than they were in agriculture. The earnings of women from cotton textile production were significant. Allen's (2011) wage regressions indicate that textile workers earned a wage premium compared with workers in construction or agriculture. Women who were able to weave artisan cloth, the more skilled workers, managed to earn an even higher income.[15]

Using data from local gazetteers between 1368 and 1800, I construct an indicator variable on historical textile production at a county level. Local gazetteers were published by prefecture governments and county governments, containing information on local produces and manufactured products. A total of 1260 counties are included in the county-level analysis, within which a smaller set of counties are known to produce textiles. A prefecture-level indicator is constructed separately for analyses conducted with IPUMS-International census micro-data.

It is possible a county that started textile production first would see a larger impact of textile productions in shaping values and beliefs. As timings of starting textile production are relatively clustered, this particular source of heterogeneity is limited. Unfortunately, due to data limitations, I cannot test the differential impact of quantity of total production by each county, and quality. As quantity produced and quality can be potential sources of heterogeneity in the treatment effect, the estimates should be interpreted as average effect of having historical textile production.

To obtain an estimate of the distribution of then textile-producing counties across China today. I match county names with county names in a point shape file that codes all counties in 1305,

[14]Allen (2009) shows one day's work by a weaver in the late seventeenth century produced 7,684 calories, which was adequate to support a family.

[15]The production of artisan cloth was backed up popular demand of weddings and funerals in pre-modern China.

a polygon shape file that codes all prefectures in 1305, a point shape file that codes all counties in 1820 and a polygon shape file that codes all prefectures in 1820. Then I spatially join all two county shape files with the county shape file corresponding with the 2000 population census to obtain a county-level estimate of cotton textile production.[16]

B Sex ratio imbalances in contemporary China

Communist China has been promoting gender equality through laws, policies and institutions for over half a century (Johnson, 2009). However, even during the period that the most strict measures were imposed to eliminate gender-based differences, women's reported earning were less than men. As the economy opened up in 1979, and the state relaxed its control on the economy, hidden gender inequality has surfaced (Li and Lavely, 2003).

Sex ratio imbalances reflect gender inequality from another angle. China has had the most unbalanced sex ratios in East Asia for the past decade. In the 2000 Census, the national average sex ratio for Age 0 is 118:100, i.e. every 118 boys were born to every 100 girls. Ethnic Han Chinese have a particularly strong son preference.

Prior to the one-child policy, most families went for higher-parity births, if they were unable to have male births in first few attempts. A major problem for identifying the magnitude of son preference in this setting is the characteristics associated with low fertility are often correlated with characteristics associated with gender equality. Though stopping rules can distort sex ratios, the distortions become smaller as the number of kids increases. As a result, places with high fertility and high level of gender inequality does not necessarily have a more distorted sex ratio.

When level of fertility is imposed rather than chosen, the relationship between son preference and sex ratio not only becomes more pronounced, but also more comparable across China. In the 1980s, the state initiated its well-known one-child policy. Since then, families have mostly lost their ability to pursue sons by going for higher-parity births. As sex-selective technology improved, families started to rely on ultrasound and other technology to aim for a son in their first or second attempt, depending on their household registration status. The strategy of sex selection at a lower-parity birth causes sex ratios within a family to be artificially chosen, contributing to sex ratio imbalances on a much larger scale at the aggregate level (Ebenstein, 2010).

There is considerable variation in the extent of sex ratios. At the county level, sex ratios range from 81:100 to 196:100. With the exclusion of five autonomous regions, where ethnic minorities account for a much higher proportion of the total population, I still find a wide range of sex ratios (94:100 to 196:100) across counties.

[16]Central districts within the urban core of a particular prefecture are treated as one polygon during the matching process, as they have the same administrative level as counties, but are of much smaller geographic sizes.

For the outcome variables, I include deviation of sex ratios at birth from the upper bound of normal range of sex ratios to proxy son preference. Data on sex ratios at birth are available at the county level. I also use other measures of gender equality, such as attitudes towards remarried women owning property, female labor participation and education gap between daughters and sons within a family. Those measures are taken at the household level. Micro-level data allows me to produce more precise county or prefecture estimates by taking out individual and household-level variations.

C Descriptive Statistics

I construct my data set as follows. I limit the sample to areas historically populated by Han Chinese people, since they have pronounced son preference. I exclude five autonomous regions, as well as autonomous counties in other provinces, that historically comprise ethnic minorities. Next, I collect information on all the counties that are in provinces having local gazetteers prior to 1800. A few historic prefectures are excluded that are known to have had textile production but lacking in data sources on county-level production.

Table 1: Summary Statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Textile production by 1800	0.096	0.294	0	1	1260
Sex ratio at birth	118.546	13.376	94.524	176.888	1260
Deviation in sex ratio at birth	12.009	12.867	0	69.888	1260
Log per capita GDP	13.222	1.116	3.472	16.251	1260
Total fertility rate	1.237	0.298	0.59	2.51	1260
Number of textile plants	85.839	245.035	0	2617	1260
Share of urban residents	23.042	20.163	3.02	92.81	1260
% Agriculture workforce	62.979	26.268	0.09	96.59	1260
Provincial capital	0.122	0.328	0	1	1260
% Ethnic population	1.428	6.371	0.01	94.05	1260
Agricultural suitability	-4.092	1.906	-8	-1	1260
Treat port	0.137	0.343	0	1	1260
Number of courier routes	0.467	0.868	0	6	1260
Dist. to Great Canal or Yangtze River	1.913	1.722	0	8.423	1260
Commercial tax quota in 1077	19577.896	28785.905	274.91	217343.172	1260
Share of rice paddies	34.295	31.214	0.1	90.900	1260
Elevation	3.309	3.436	0.081	20.823	1260
Dist. to coast	414.633	325.344	1.423	1175.69	1260
Latitude	32.119	4.16	21.274	39.96	1260
Longitude	114.235	4.396	102.284	122.391	1260
Relative humidity index	-30.756	16.294	-64.004	-12	1260

Table 1 gives an overview of the key variables in the main sample, where a total of 1260 counties are included. Only a small percentage of the counties were able to produce textiles. Average distance to the Great Canal or Yangtze River is 191.3km. Agricultural suitability ranges from -8(worst) to -1(best). An average county has a suitability level of -4.1. In 2000, average sex

(a) Textile Production—Whole Sample

(b) Textile Production—Restricted Sample

Figure 1: The distribution of textile production

ratio at age 0 in 2000 was 118.5 boys per 100 girls, with a standard deviation of 13. Roughly 23% of the population had non-agricultural household registration. I refer to these households as "urban residents" for convenience.

Figure 1a shows textile production at the county level including historic prefectures with no local production details. Figure 1b shows the main sample used in the following analysis. Counties shaded in black had textile production historically.

IV County-level OLS estimates

Having constructed county-level measures of historical textile production, I can examine the relationship between historical textile use and son preference or gender equality in modern day China. I begin by examining variation at the county level. My main outcome of interest at this stage of analysis is sex ratio imbalances, which is intended to reflect son preference. My measure is each county's sex ratio in 2000:

$$\text{Dev. sex ratio} = \begin{cases} \log(\text{sex ratio at birth} - 107 + 1)_c & \text{if sex ratio at birth} >= 107, \\ 0, & \text{if sex ratio at birth} < 107 \end{cases} \tag{1}$$

I first examine the unconditional relationship between sex ratio and historical textile production. I find the bivariate relationship is both consistent with the hypothesis and statistically significant. Moving from not producing textiles to producing textiles can reduce the deviation in the sex ratio at birth by 16%. The relationship continues to hold when I add controls and region fixed effects. Specifically, I test my hypothesis by estimating the following equation:

$$\text{Dev. sex ratio} = \alpha + \beta \text{Textile}_c + \mathbf{X}_c^H \mathbf{\Omega} + \mathbf{X}_c^G \mathbf{\Lambda} + \mathbf{X}_c^C \mathbf{\Pi} + \epsilon_p \ , \tag{2}$$

where c denotes a county. Textile_c is my measure of historical textile production at a county level. $\mathbf{X}_c^H$ is a vector of historical controls, and $\mathbf{X}_c^G$ and $\mathbf{X}_c^C$ are vectors of geographical and

contemporary controls respectively, each measured at the county level.

$\mathbf{X}_c^G$ and $\mathbf{X}_c^H$ are intended to capture geographic and historical characteristics that may have been correlated with historical textile production and may still affect present-day outcomes. In particular, how textile production was located was likely influenced by access to market. I control for distance to the Grand Canal or Yangtze River, number of courier routes passing the county in all specifications and pre-adoption levels of commercialization measured by commercial tax quota in 1077. To account for geographic differences across counties that may be correlated with access to market, I include in $\mathbf{X}_c^G$ distance to coast[17] and elevation. I also control for the county historical economic specialization, by including in $\mathbf{X}_c^H$ share of rice paddies. As overall levels of economic development in the past might have affected both the adoption of textile production and attitudes towards women, and China had an agrarian country between 1300 and 1800, I include in $\mathbf{X}_c^H$ agricultural suitability as a proxy for the county earning potential, and include in $\mathbf{X}_c^G$ latitude and longitude.

The contemporary control variables $\mathbf{X}_c^C$ include the natural log of a county's per capita GDP measured in 2000 and its squared term, number of textile plants, share of agriculture workforce, share of non-agricultural household registration, share of ethnic population, and whether a county is located in a provincial capital. I use share of non-agricultural household registration to capture the variation in the details of one-child policy.[18] Whether a county is located in a provincial capital is intended to capture different levels of enforcement in one-child policy, with the assumption that provincial capital has the strictest control on its residents. Both could have had an effect on sex ratios through one-child policy (Ebenstein, 2010). In addition, as son preference is the most predominant among Han Chinese, I control for share of ethnic population to reduce composition bias.

OLS estimates of equation (1) including above controls are reported in Table 2. Column 1-3 reports estimates with prefecture, province or region fixed effects respectively.[19] Column 4-5 reports specifications with two potentially endogenous variables excluded. Column 4 shows estimates when per capita GDP is excluded from the specification, and Column 5 shows estimates when total fertility rate is included.

The estimates show that in counties with the presence of historical textile production, fewer girls are missing today. The coefficient estimates are both statistically significant and economically meaningful. Based on the estimates from column 1, one unit increase in historical textile production is associated with a decrease of 16% (exp (0.15)) in deviation in sex ratios. The size of the effect can range from reducing 0 to 10.5 boys ($70 * 16\%$) per 100 girls, depending on

[17]Distance to the nearest coast data are taken from NASA (http://oceancolor.gsfc.nasa.gov/DOCS/DistFromCoast

[18]Though one-child policy is strictly enforced among Chinese citizens on non-agricultural registration status, a more relaxed version of one-child policy is enforced among those on agricultural household registration status.

[19] Region dummies are taken from the Skinner Regional Systems Analysis Dataverse - Skinner socioeconomic macroregions (http://worldmap.harvard.edu/maps/skinner).

the size of the "boy surplus". At the mean sex ratio (119:100), historical textile production can reduce the "boy surplus" by 2 boys($12 * 15\%$) per 100 girls. The coefficients are slighter smaller in Column 2 and still larger in Column 3, ranging from reducing deviation in sex ratio by 16% to 21 %. The coefficient estimates for per capita GDP and its squared term are very sizable, but not significant. Column 4 suggests the strength of the coefficient for textile production does not depend on whether I control for per capita GDP.[20] From Column 1 to Column 4, total fertility rate is positively associated with deviation in sex ratios. This is not a surprising result, given that higher parity births remain as a strategy for parents to have male offspring under many circumstances. Column 5 shows the coefficient of historical textile production does not change as a result of including total fertility rate.

A Robustness checks

A.1 Subsamples

I first check the robustness of my results to the use of alternative samples. Motivated by the fact that the Yangtze Delta is of special importance to Chinese economy both historically and contemporarily, I test to see if my results are robust to the omission of three provinces (Jiangsu, Zhejiang & Shanghai) from the sample. Table 14 in the appendix summarizes the results. The coefficient estimates are relatively stable (-0.142 to -0.189) across the columns.

The second set of robustness checks look at counties with different rates of migration. Historically, labor mobility was low due to the control of the clan system. In modern China, the speed of migration has picked up. Gender norms in the less developed regions of China could have been strengthened if individuals with more progressive gender norms are more likely to move to more developed areas for a better life. Hence my results could be biased if textile locations are correlated with unobservable characteristics of counties that attract many modern migrants. I omit counties with high rates of in-flow migration, and focus solely on counties that are mostly dominated by locals. Table 15 in the appendix shows counties with mostly locals have a slightly stronger textile effect. The effect of historical textile production does not go away if I omit high-migration counties. This shows the textile effect is unlikely to be driven by urban-rural differences, or by different characteristics between migrants and locals.

The third set of robustness checks try to address potentially uneven effects of the industrialization process across counties with or without textile production. China began to industrialize from the 19th century onwards, first in treaty ports. Jia (2014) shows that treaty ports had a long-lasting impact on local economies.

This is a potential source of bias if textile locations overlapped with areas that experienced early industrialization, as gender norms might be affected by such drastic economic and social

[20]Though large sex ratio imbalances are a relatively new phenomenon in China, per capita GDP could still have already been affected, i.e. per capita GDP is possible to be endogenous to sex ratio imbalances (Wei and Zhang, 2011).

change. Historical evidence suggests that this should not be a major concern as industrialization in China was gradual and highly isolated.[21] Hence to control for this I drop counties that used to be treaty ports, to see if the textile effect remains in the remaining sample. Table 16 in the appendix shows coefficient estimates of textile production are robust to omitting all or some of the treaty ports.

[21] During late Qing and Republican China era, many parts of rural and hinterland China continued to maintain autonomous economies, as well as traditional lifestyles. cite industrial sites in 1930s; rural China in early 20th century.

Table 2: Historical Textile Production and Sex Ratio Imbalances: OLS Results

	Dev. sex ratio)				
	(1)	(2)	(3)	(4)	(5)
Textile production by 1800	-0.157*	-0.146+	-0.201*	-0.156+	-0.150+
	(0.0727)	(0.0747)	(0.0716)	(0.0725)	(0.0717)
Log per capita GDP	0.0234	0.205	0.175		0.0653
	(0.184)	(0.182)	(0.159)		(0.182)
Log per capita GDP^2	-0.00191	-0.0128	-0.0110		-0.00332
	(0.00857)	(0.00936)	(0.00832)		(0.00843)
Total Fertility Rate					0.518*
					(0.230)
Contemporary controls	Yes	Yes	Yes	Yes	Yes
Historical controls	Yes	Yes	Yes	Yes	Yes
Geographic controls	Yes	Yes	Yes	Yes	Yes
Fixed effects	Prefecture	Province	Region	Prefecture	Prefecture
Observations	1243	1243	1243	1246	1243
R^2	0.575	0.295	0.312	0.574	0.579
Adjusted R^2	0.507	0.277	0.297	0.507	0.511

Standard errors in parentheses $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: The table reports OLS estimates. The unit of observation is a county in 2000 Census. The dependent variable is log of deviation from normal sex ratios plus 1, when sex ratio at birth is greater than 107; 0 otherwise. 107 is the upper bound of normal sex ratio ranges (103 - 107) in the population. Column 1- 3 reports estimates with prefecture, province or region fixed effects respectively. "Contemporary controls" are log of current per capita GDP, log of number of textile plants plus 1, log of share of non-agricultural household registration, share of agriculture workforce, log of share of ethnic population, and whether a county is located in a provincial capital. "Historical controls" are agriculture suitability, log of share of rice paddies, log of distance to the Grand Canal or Yangtze River plus 1, number of courier routes passing the county, log of commercial tax quotas in 1077, and whether a county was located in a treaty port in 19th century. "Geographic controls" are latitude, longitude, log of elevation plus 1 and log of distance to coast. Column 4 shows estimates when per capita GDP is excluded from the specification, and Column 5 shows estimates when total fertility rate is included. Robust standard errors are clustered at the province level.

A.2 Propensity Score Analysis

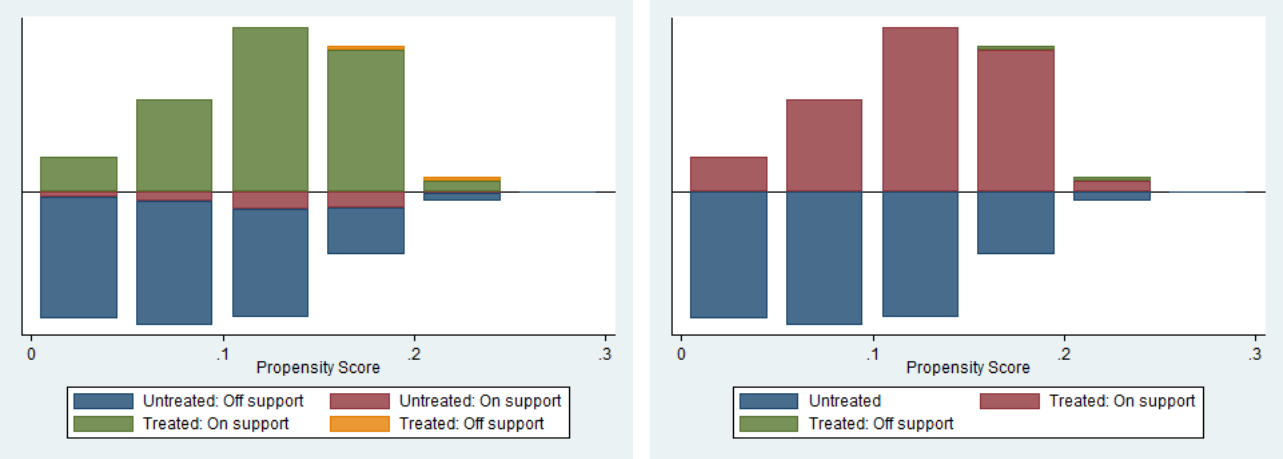
To further demonstrate the strength of my results, I also use propensity score matching estimation on pre-adoption covariates. Pre-adoption covariates includes pre-1300 historical characteristics agricultural suitability, share of rice paddies, distance to Grand Canal or Yangtze River, number of courier routes passing the county, commercial tax quota in 1077, as well as geographic characteristics, such as latitude, longitude, elevation and distance to coast. This exercise yields an even larger coefficient estimate. With the nearest neighbor matching method, textile production, on average, reduces deviation in sex ratios by 33% (exp (0.29)) to 40% (exp(0.34)).

I estimate propensity scores using a logit model. Table 13 presents estimates from an OLS and logit regressions (see the Appendix). It show adoption of textile technologies was positively correlated with commercial tax in 1077 and longitude, and negatively correlated with elevation distance to Grand Canal or Yangtze River. I use the estimates from Table 13 to compute propensity scores. Figure 2 plots densities of propensity score for textile counties and non-textile counties. It shows that there is substantial overlap in the entire distributions for textile and non-textile counties propensity scores.

Figure 2: Propensity Score Densities

Table 3 summarizes matching results using propensity scores calculated in Table 13. I use nearest neighbor matching with no replacement and a small caliper in all models.[22] Following the literature (Frölich, 2004; Austin, 2009), I use a caliper size of 0.001 in most of my models, except for Column 2. Figure 3a and Figure 3b provide a basic summary of matched observations

[22]Caliendo and Kopeinig (2008) summarize the bias-efficiency trade-off associated with the width of a caliper and various matching methods. A decrease in caliper width reduces the bias of the estimator. 1:1 nearest neighbor matching, relative to 1:n nearest neighbor, radius or kernel matching, reduces the most bias but decreases precision.



(a) ATE (b) ATT

Figure 3: Matched Samples

in the treatment group (textile counties) and the control group (non-textile counties).

Column 1 of Table 3 reports baseline results. The common support [0.0178, 0.227] is determined by the "minima and maxima criterion", i.e. to delete all observations whose propensity score is smaller than the minimum and larger than the maximum in the opposite group. Column 2 reports estimates with a wider caliper, 0.01. Column 3 and Column 4 presents estimates on trimmed samples.[23] Column 5 reports estimates with more on-support observations, when only average treatment effects on the treated (ATT) are estimated. Across all models, average treatment effects on the treated (ATT) are quantatitively similar and statistically significant, ranging from -0.296 to -0.344. Average treatment effects (ATE) are slightly smaller in magnitude, ranging from -0.217 to -0.256. Estimates of ATE are statistically significant in Model 2 and Model 4, when a wider caliper or a trimmed sample is used. Average treatment effects are not significant on unmatched samples.[24]

Covariates balancing is satisfied in all models. Strata analysis produces similar average treatment effects to propensity score analysis performed directly on the entire sample. OLS regressions weighted by propensity score weights, carried on on-support observations, have quantitatively larger effects than OLS regressions on unmatched samples, but those effects are often not significant (Model 2 - Model 4). This is likely due to lower precision caused by shrinking sample size, as well as heterogeneous treatment effect across the strata. [25]

[23]Crump et al. (2009) develops optimal bounds for common support, and recommends [0.1, 0.9] as a rule of thumb. Given the range of scores I have [0.0007, 0.2566], I apply a common support [0.025, 0.227] in Column 3. In Column 4, in addition to the "minima and maxima criterion", I impose common support by dropping 6 percent of the treatment observations at which the propensity score density of the control observations is the lowest. The cut-off point, 6 percent, is also used by (Li and Zhao, 2006).

[24]These results are consistent with those of models with change in the raw numbers of deviation in the sex ratio (rather than logged values) being the dependent variables. Those results are not reported here, but are available on request.

[25]These results are not reported here, but are available on request.

Table 3: Deviation in Sex Ratio at Birth in Textile vs. Non-Textile Counties

	Difference in Dev. in sex ratio at birth				
	Baseline	Caliper=0.01	Trimmed - 1	Trimmed - 2	ATT
Unmatched sample	-0.164	-0.165	-0.132	-0.130	-0.165
Matched sample - ATT	-0.302*	-0.296^{+}	-0.323*	-0.343*	-0.313*
Matched sample - ATE	-0.217	-0.219^{+}	-0.241	-0.256^{+}	
On-support observations	232	236	222	218	1244

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: The table summarizes estimated average treatment effects of historical textile production on deviation in sex ratio at birth based on propensity scores. Nearest neighbor matching with no replacement is used in all models. A caliper width of 0.001 is used in Column 1, 2 and 4. Column 1 reports baseline results, with a common support [0.0178, 0.227]. Column 2 reports estimates with a caliper width of 0.01. Column 3 presents estimates derived from a trimmed sample, with a common support [0.025, 0.227]. Column 4 presents results of an alternative trimmed sample, where a common support is imposed by dropping 6 percent of the treatment observations at which the propensity score density of the control observations is the lowest. Column 5 reports estimates of average treatment effects on the treated (ATT) with all but two off-support observations.

Propensity score matching estimation supports the main conclusions of the OLS estimation. After correcting for selection bias, historical textile production demonstrates a greater impact on modern-day sex ratio at birth.

V Micro-level analysis

A Evidence from CGSS

I now begin a micro-level analysis that examines variation in attitudes towards women owning property across survey respondents in the CGSS 2005 (Chinese General Social Surveys). The CGSS includes questions on individual attitudes and preferences across a wide range of topics. The CGSS also includes information on age group, gender, marital status, education attainment, party member status, socioeconomic status, and whether a daughter-in-law has joined the family since 1998. The measure of attitudes towards women owning property is constructed from each respondent's view of the following question: "Do you think a woman should be allowed to keep her land when she marries a second time,?" The respondent can choose from *a. the village reclaims the land b. Woman's first husband keeps the land c. if the woman marries a man in you village, she can keep the land d. if a woman marries a man outside of your village, she cannot keep the land e. she can take the land with her to wherever she is going to be registered f. she can keep her land g. her husband can keep the land for now before next round of land distribution by the village committee h. don't know i. others.* I code answer e and f as "1", meaning positive attitude towards remarried women owning land. All other answers are coded as "0". h and i are recorded as missing values.

Other than attitudes and values, CGSS also reports a woman's work status. I construct an indicator variable that equals one if a woman has ever been in the workforce which is defined as full-time, part time, temporary employment, retired, unemployment, part-time farming, or full-time farming. The indicator variable takes the value of 0 if a woman reports "has never worked", and she is older than 30.

Examining the two outcomes attitudes about remarried women owning property and "a woman has never worked," I estimate the following individual level equation:

My estimation equation is

$$y_{i,c} = \alpha + \beta \text{Textile}_p + \mathbf{X}_c^H \mathbf{\Omega} + \mathbf{X}_c^G \mathbf{\Lambda} + \mathbf{X}_c^C \mathbf{\Pi} + \mathbf{X}_i^I \mathbf{\Gamma} + \epsilon_{i,c} \,, \tag{3}$$

where c denotes a county. Textile_c is my measure of historical textile production at the county level. $\mathbf{X}_c^H$ includes agriculture suitability, log of distance to the Grand Canal or Yangtze River plus 1, number of courier routes passing the county in all specifications and log of commercial tax quotas in 1077. $\mathbf{X}_c^G$ includes latitude, longitude, log of elevation plus 1. $\mathbf{X}_c^C$ includes log of current per capita GDP, log of share of non-agricultural household registration, share of agriculture workforce, log of share of ethnic population, total fertility rate, and whether a county is located in a provincial capital. $\mathbf{X}_i^I$ denotes current individual-level controls: sex, age group, urban/rural, marital status, education attainment, father's education, mother's education, communist party member, socioeconomic status, and whether the respondent has a daughter-in-law. Standard errors are clustered at the county level for all specifications.

Table 4 summarizes the estimates of equation 3 with outcome variable being attitudes towards remarried women owning property, based on Logit estimation. Column 1 reports estimates of equation 3 without including $\mathbf{X}_I^i$. Estimates with the full set of controls are reported in Column 3. Estimates with a nonlinear term of distance to the Great Canal or Yangtze River, in the addition to the full set of controls, are reported in Column 4. I find a positive relationship between historical textile production and attitudes towards remarried women owning property. All four relationships are qualitatively and quantitatively similar. The coefficient estimates range from 18.1 to 19.5 In average marginal effects terms, historical textile production increases the probability of supporting remarried women owning property by 37% in Column 4.

Table 4 summarizes the estimates of Equation 3 using the outcome variable "has never worked" based on Logit estimation. Column 1 reports estimates of equation 3 without including $\mathbf{X}_I^i$. I include $\mathbf{X}_I^i$ in the specification for Column 2, with exception of education attainment. Column 3 contains estimates with the full set of control. Column 4 controls for nonlinearities in the effect of distance to the Great Canal or Yangtze River. I find a negative relationship between historical textile production and the probability that a woman has never worked. The coefficient estimates are between -1.6 and -2.4. The size of the coefficient is greater as more individual characteristics are controlled for. In Column 4, historical textile production reduces the probability that a woman has never worked by 12% (marginal effects).

Table 4

	Attitudes towards remarried women owning property			
	(1)	(2)	(3)	(4)
Textile production until 1800	18.12*	19.23**	19.54**	18.91*
	(7.493)	(7.261)	(7.240)	(8.016)
Socioeconomic status - middle			0.737	0.527
			(0.807)	(0.751)
Socioeconomic status - low			0.617	0.423
			(0.864)	(0.769)
Daughter-in-law since 1998			1.066+	1.098+
			(0.592)	(0.648)
Log (dist. to Great Canal or Yangtze +1)	0.314	0.443	0.427	1.806
	(0.244)	(0.349)	(0.352)	(1.861)
Log (dist. to Great Canal or Yangtze+1) ^{2}				-0.274
				(0.367)
Individual controls	No	Yes	Yes	Yes
Contemporary controls	Yes	Yes	Yes	Yes
Historical controls	Yes	Yes	Yes	Yes
Geographic controls	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes
Observations	1807	1693	1672	1672

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: The table presents results of Logit estimation when the dependent variable is an individual's response to "In you village, if a woman gets married a second time, what's your view on her rights to land should be handled?". I code answers e. she can take the land with her to wherever she is going to be registered and f. she can keep her land others as "1". "1" means positive attitudes towards remarried women owning land. "0" means negative attitudes. The unit of observation is an individual in a Census 2000 county. "individual controls" are sex, age group, urban/rural, marital status, education attainment, father's education, mother's education, communist party member, socioeconomic status, and whether the respondent has a daughter-in-law. "Contemporary controls" are log of current per capita GDP, log of share of non-agricultural household registration, share of agriculture workforce, log of share of ethnic population, total fertility rate, and whether a county is located in a provincial capital. "Historical controls" are agriculture suitability, log of distance to the Grand Canal or Yangtze River plus1, number of courier routes passing the county, and log of commercial tax quotas in 1077. "Geographic controls" are latitude, longitude, log of elevation plus 1. Column 1 includes all but individuals controls. Column 2 includes all controls except for socioeconomic status and whether to have a daughter-in-law. Column 3 contains full set of controls. Column 4 includes the squared term of in addition to the full set of controls. Regional fixed effects are included in all specifications. Robust standard errors are clustered at the county level.

Table 5

	Women who never worked			
	(1)	(2)	(3)	(4)
Textile production until 1800	-2.120**	-1.625**	-1.601**	-2.463**
	(0.807)	(0.593)	(0.600)	(0.849)
Education attainment			-0.165***	-0.162***
			(0.0242)	(0.0246)
Log (dist. to Great Canal or Yangtze+1)	0.174	0.221	0.217	-0.621
	(0.236)	(0.204)	(0.199)	(0.456)
Log (dist. to Great Canal or Yangtze+1)^2				0.141$^+$
				(0.0720)
Individual controls	No	Yes	Yes	Yes
Contemporary controls	Yes	Yes	Yes	Yes
Historical controls	Yes	Yes	Yes	Yes
Geographic controls	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes
Observations	2155	2313	2313	2131

Standard errors in parentheses

$^+$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: The table presents results of Logit estimation when the dependent variable is whether a woman has ever worked. The unit of observation is a woman older than 30 in a Census 2000 county. The sample is restricted to Han Chinese women. "individual controls" are age group, urban/rural, marital status, education attainment, father's education, mother's education and household size. "Contemporary controls" are log of current per capita GDP, log of share of non-agricultural household registration, share of agricultural workforce, log of share of ethnic population, and whether a county is located in a provincial capital. "Historical controls" are log of share of rice paddies, log of distance to the Grand Canal or Yangtze River plus1, number of courier routes passing the county, and whether a county was located in a treaty port in 19th century."Geographic controls" are latitude and longitude, log of elevation plus 1, and log of distance to coast. Column 1 includes all but individual controls. Column 2 includes all controls except for education attainment. Column 3 contains full set of controls. Column 4 includes the squared term of in addition to the full set of controls. Regional fixed effects are included in all specifications. Robust standard errors are clustered at the county level.

B Evidence from IPUMS-International

I turn to a micro-level analysis that examines variation in parental investment across individuals and households. The 1982 and 1990 Population Census are available via IPUMS - International. These two censuses are considered to have the best quality data, due to limited migration occurring during that period. I use the 1990 population census to construct my outcomes of interest: education gap between the best educated daughter and the best educated son within a family. I select all individuals who were at least 22 by 1990, and were the children of the head to the household. I compare educational attainment of the most educated daughter and the most educated son within a household. With educational and financial resources being scarce in rural China during the sample period, family sources of educational gender inequality is known to exist (Brown and Park, 2002; Hannum, 2003; Hannum et al., 2009; Wang, 2005). In rural China, it is not uncommon for female children to work to support their brothers through school. I interpret differences in educational attainment between the best educated daughter versus son as driven by gender-specific parental investment.Compared with the CGSS, the 1990 Census has more geographic coverage and a much greater sample size.

Table 17 in the appendix describes my micro analysis sample. 37% of prefectures engaged in textile production in the past. As high as 94.8% of the female in my sample are part of the workforce. Educational attainment takes the value of 0 for "illiterate or semi-illiterate", 1 for "primary education", 2 for "middle school education, 3 for "high school education", and 4 for "university education or above". My outcome variable education gap has a mean of 0.395, which is quite substantial given that the best educated daughter receives less than middle school level (1.662) education on average.

My estimation equation is

$$y_{i,p} = \alpha + \beta \text{Textile}_p + \mathbf{X}_p^H \mathbf{\Omega} + \mathbf{X}_p^G \mathbf{\Lambda} + \mathbf{X}_p^C \mathbf{\Pi} + \mathbf{X}_i^I \mathbf{\Gamma} + \epsilon_{i,p} \ , \tag{4}$$

where p denotes a prefecture.[26] Textile_p is my measure of historical textile production aggregated to the prefecture level. $\mathbf{X}_p^H$ includes agriculture suitability, log of distance to the Grand Canal or Yangtze River plus1 and log of commercial tax quotas in 1077. $\mathbf{X}_p^G$ and $\mathbf{X}_p^C$ are vectors of geographical and contemporary controls respectively, each measured at the prefecture level. $\mathbf{X}_p^G$ includes latitude, longitude and distance to coast. $\mathbf{X}_p^C$ includes non-agricultural household registration, share of primary industry and share of ethnic population.[27] $\mathbf{X}_p^C$ denotes current individual-level controls: age group.[28] father's education and mother's education.[29] Standard

[26]In the IPUMS 1990 census data, individual residence is only recorded at the prefecture level.

[27]Log of share of non-agricultural household registration and share of primary industry are taken from 2000 China City Yearbook, in which the jurisdiction of a prefecture is more restricted. A prefecture in the Yearbook is smaller and more urbanized.

[28]Age group is computed from the mean age of the best educated son and the best educated daughter. Three age groups are Age Group 23-30, Age Group 31-40, and Age Group 41-50

[29]Household income would be a crucial budget constraint on the decision to educate children, but is unfortunately not available in the census data.

errors are clustered at the prefecture level for all specifications.

Table 7: Historical Textile Production and Within-Household Education Gap: OLS Results

	(1)	(2)	(3)	(4)	(5)
			Education gap		
Textile production by 1800	-0.0627^{+}	-0.0376^{+}	-0.0333^{+}	-0.0365^{+}	-0.0356^{+}
Total Number of children			0.0316**		
			(0.00793)		
Log population density in 1820				-0.0121	
				(0.0547)	
Log (dist. to Great Canal or Yangtze+1)	-0.0250^{+}	-0.0245*	-0.0239*	-0.0251*	0.0138
	(0.0127)	(0.0104)	(0.00985)	(0.00915)	(0.0371)
Log commercial tax quota in 1077	0.00206	0.0144	0.0146^{+}	0.0149	0.165
Log (dist. to Great Canal or Yangtze+1)^2					-0.00726
					(0.00794)
Log commercial tax quota in 1077^2					-0.00784
					(0.00563)
Individual controls	Yes	Yes	Yes	Yes	Yes
Contemporary controls	No	Yes	Yes	Yes	Yes
Historical controls	Yes	Yes	Yes	Yes	Yes
Geographic controls	Yes	Yes	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	53909	53909	53909	53909	53909
R^2	0.038	0.043	0.045	0.043	0.044
Adjusted R^2	0.038	0.043	0.045	0.043	0.043

Standard errors in parentheses $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The table reports OLS estimates. The dependent variable is the difference in education attainment between the best educated daughter and the best educated son within a household. Educational attainment ranges from 0 (illiterate to semi-illiterate) to 4 for (university education or above). The unit of observation is a prefecture in the 2000 Census. Individuals aged between 22 and 50 in 1990 are included in the sample. In Column 1, "Individual controls are age group, father's education and mother's education. Three age groups are Age Group 23-30, Age Group 31-40, and Age Group 41-50"Historical controls" are agriculture suitability, log of distance to the Grand Canal or Yangtze River plus 1 and log of commercial tax quotas in 1077. "Geographic controls" are latitude, longitude and log of distance to coast. Robust standard errors are clustered at the prefecture level. Column 2 contains the full set of controls, including contemporary controls: log of share of non-agricultural household registration, share of primary industry and log of share of ethnic population. In addition to the full set of controls in column 2, total number of children is included as a control in Column 3, population density in 1820 is included as a control in Column 4, and squared terms of log of distance to the Grand Canal or Yangtze River plus1 and log of commercial tax quotas in 1077 are included in Column 5. Population density in 1820 is taken from Shujin Cao's work (Ge and Cao, 2001). Columns 2 through Column 5, robust standard errors are clustered at the province level. Province fixed effects are included in all specifications.

Estimation results are reported in Table 7. Coefficient estimates are statistically significant for all columns, and economically meaningful. The presence of historical textile production is associated with a reduction in education gap of 0.03 to 0.06, or 2 to 4 months of education, which is equal to 8% to 16% of the sample mean. Column 1 reports estimates without contemporary controls. Contemporary controls are included in the specification in Column 2, reducing the size

of the coefficient estimate by about half. I include total number of children in Column 3. As expected, total number of children is positively associated with the size of the education gap, but the coefficient estimate does not change much from Column 2. When population density in 1820 is controlled for in Column 4, the coefficient estimate remains similar. This suggests historical textile production does not positive affect modern-day outcomes through higher past levels of development. Column 5 contains estimates with nonlinearities of commercial tax quota in 1077 and distance to the Great Canal or Yangtze river being controlled for. The coefficient estimate stays close to those in Column 2, 3 and 4. The same robustness checks are repeated for the IPUMS sample. The results remain robust.

VI IV Estimation

A potential concern with the OLS estimates is that the counties that were textile producers may have a higher likelihood of adopting textile technologies. It is possible that counties that were economically more developed were more likely to have adopted textile technologies, and counties that were closer to the market or transportation routes were more likely to sustain its production and make greater profits. If these counties are richer and have less son preference and more gender equality, this would bias the OLS estimates away from zero. Though a set of variables (mainly overall agricultural suitability, commercial tax quota in 1077, and distance to the Grand Canal or Yangtze River) have been included in the main specification and its variants, I am unable to address likely issues caused by unobservable characteristics, such as attitudes towards women prior to textile production. Besides, due to imperfect data on historical textile production, some of the coefficient estimates can suffer attenuation bias due to measurement error.

An important determinant for the location of textile industry is geo-climatic conditions. Among all contributing factors, scientists, engineers and industry experts highlight the importance of relative humidity in producing textiles. In a report on the textile industry in China 1909, the word "humidity" occurs more than 100 times, suggesting the pivotal role of humidity in the textile industry. The role of relative humidity was even more crucial for the earlier period (1300-1600), when humidification technologies remained underdeveloped.

Textiles could be more produced much more efficiently during parts of the day, and parts of the year that were comparatively humid. For places that experience greater variance in humidity within the day, the number of hours available for textile production could be limited, regardless of the average relative humidity. A textile machine represented a large fixed cost. Thus for a family the decision to own textile machinery the total number of hours possible for textile production was a key consideration. In addition, it is widely acknowledged that hardly any textiles can be produced when relative humidity drops between 60%, and that the benefit of moisture is offset by stickiness of the fiber once relative humidity exceeds 80%, i.e. there is a

non-linear relationship between relative humidity and suitability for textile production.

Using high resolution gridded datasets from the Climate Research Unit, University of East Anglia, I can identify the monthly average relative humidity of each county and construct a relative humidity index variable in the procedure below.[30] Every county receives a score ranging from 1 to 5 for each month, based on its average relative humidity for the month.

Ideally, this variable would represent the hours available for textile production. In practice, data does not exist on the relative humidity for any particular day, let alone variance within a day. Hence I restrict my focus on the number of months humid enough for textile production. Every county receives a score ranging from 1 to 5 for each month, based on its average relative humidity for the month. To account for non-linearity in the impact of relative humidity on historical textile production, I set the lower-bound relative humidity for feasible production to be 60%, and make it take a value of "5" if actual relative humidity is below that level. Once above 60%, a county will be scored on a lower number as its relative humidity level increases.[31] When I add up monthly scores, I get a number ranging from 12 to 60 for each county, with 12 being the most suitable, and 60 being the least suitable. I take the negative of the total score to build an suitability index where suitability increases in its value. This index can be seen as approximating the number of months available for production with a gradient to quality and efficiency. Figure 4

I begin my IV estimation by testing the relationship between my relative humidity index and historical textile production excluding treaty ports. Due to the special properties of a binary regressor, I opt for a treatment-effect model for IV estimation that has the first stage being a Probit model. In the first stage of a treatment-effect model, I am only allowed to include the excluded instrument, which is relative humidity index (in six quantiles) in this case, and strictly exogenous variables. Other than relative humidity, it is plausible to think that textile technologies were adopted based on access to the market and prior level of development, as proxied by distance to the Grand Canal or Yangtze River, agricultural suitability, and commercial tax quota in Song Dynasty and its square. Panel A of Table 4 shows the estimates from the first stage: relative humidity index is positively correlated with historical textile production. Wald test rejects the null of independent equations in all specifications. Values of athrho are recorded at the bottom of the table. Second-stage results are reported in Panel B. Column 1 contains my OLS estimates. Column 2 report IV estimates with relative humidity index being the instrument. Column 3 reports estimates of a specification with relative humidity index * log of distance to the Great Canal or Yangtze plus 1 being the instrument. This allows the effect of relative humidity to vary at the distance to Great Canal or Yangtze. IV estimates range from -7.3 to -8.6, meaning the surplus of boys is reduced by roughly seven to eight boys per a hundred

[30] This data is downloaded from http://www.cru.uea.ac.uk/cru/data/hrg/. The dataset contains information on 10 arc-minute by 10 arc-minute grid-cells globally.

[31] "4" for 61%-65%, "3" for 66%-70%, "2" for 71%-75%, "1" for 76% or above

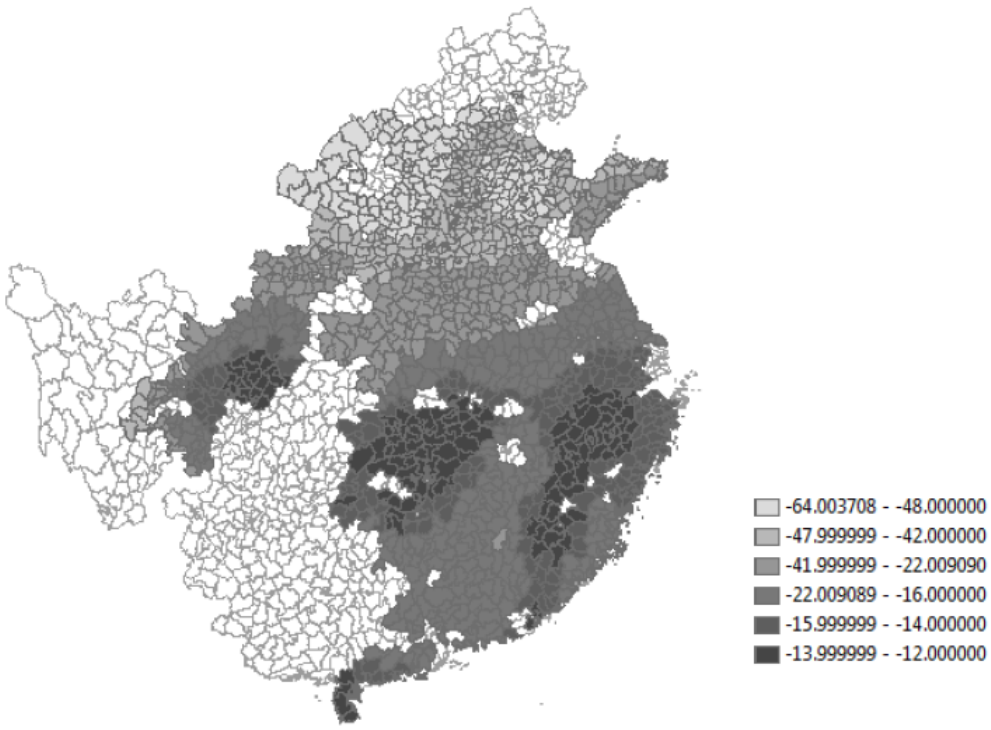
Table 8: Historical Textile Production and Sex Ratio Imbalances: Instrumental Variable Analysis

	(1)	(2)	(3)
		First Stage	
Dependent variable: Textile production by 1800			
Relative humidity index		0.150	0.009
		(0.235)	(0.009)
Relative humidity * Log (dist. to Great Canal or Yangtze+1)			0.0007
			(0.002)
		Second Stage	
Dependent variable: Sex ratio at birth			
Textile production by 1800	-2.147 *	-8.663 *	-7.335**
	(1.187)	(4.085)	(3.541)
Contemporary controls	Yes	Yes	Yes
Historical controls	Yes	Yes	Yes
Geographic controls	Yes	Yes	Yes
Province Fixed effects	Yes	Yes	Yes
athrho		0.391**	0.259*
		(0.155)	(0.141)
Observations	1080	1080	1080

Standard errors in parentheses $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The table reports IV estimates. The dependent variable is sex ratio at birth. The unit of observation is a 2000 Census county. The same controls as in Column 1 of Table 2 are included. Column 1 contains OLS estimates. Column 2 report IV estimates with relative humidity index being the instrument. Column 3 reports estimates of a specification with relative humidity index * log of distance to the Great Canal or Yangtze plus 1 being the instrument. Province fixed effects are included in all specifications. Robust standard errors are clustered at the province level.

Figure 4: Relative Humidity Index



girls, if a county produced textiles historically versus not. The increase in coefficient estimates is likely explained by a removal of attenuation bias due to the use of better measured data.

While these results are highly suggestive, I am aware that relative humidity is closely correlated with other geographic characteristics that can have an independent role on gender equality, such as agricultural suitability, distance to coast, and in the case of China, latitude. Distance to coast is certainly economically important, and it can affect gender equality through openness to trade, or economic development in general. Likewise, distance to the Grand Canal had an effect on past economic development, which could in turn affect local conditions for women's well being in the past.[32] However, it should be noted that in previous estimations, agricultural suitability, distance to coast, latitude and longitude are already controlled for, and commercial taxes collected in Song Dynasty (1077) are used to account for differential economic conditions and commercial activities prior to the introduction of textile technologies.

I acknowledge it is possible that relative humidity and distance to the Grand Canal can affect son preference and gender equality conditional on covariates through channels other than historical textile production (for instance, perhaps through the channel of women's appearance which might plausibly give women from certain parts of China a competitive edge in an open marriage market), so the results have to be interpreted with caution.

[32]The Grand Canal was first built during the Sui Dynasty (581 - 618 AD.

VII The Emergence and Persistence of Gender Equality

A Changing notions of women's possible role in society, 1300 - 1800

Differing from the Europe Marriage Pattern (De Moor and Van Zanden, 2010; Voigtländer and Voth, 2009), pre-modern China had both universal marriage and early marriage. Women had limited opportunities to participate in society on their own. Despite the overall conservative gender norms in Ming Dynasty, widows were given a certain amount of autonomy in making economic decisions for the household (Afeng, 2002). From 1300 to 1800, Ming and Qing China witnessed an unprecedented number of widows who participated in a wide range of economic and social activities. Relying on textile incomes, widows continued to support their children and in-laws (Zurndorfer, 1998; Sommer, 2000; Elvin, 1984). Textiles played a conducive role in broadening the understanding of women's possible role in society (Pomeranz, 2004; Bray, 1997; Pomeranz, 2005).

Prior to 1300, ordinary women typically lacked the means to support themselves after their husband's death. Most would get remarried when their husband passed away before their own death. Between 1000 and 1300, inheritance laws became more stringent, and it became increasingly more difficult for women to inherit wealth from their deceased husband, further limiting women's choices as a widow. Under Neo-Confucianism, which developed during Song Dynasty (960–1279), women were praised for maintaining female chastity after their husband's death. Those women were called "virtuous" women and often documented in local gazetteers for their deeds.

After 1300, textiles began to provide women with a means of living. Before Ming, among "virtuous" women, half stayed widowed to provide for her in-laws and children for an extended period of time, the other half committed suicide upon their husband's death to demonstrate their exemplary character (Jiazun, 1979).[33] The percentage of women who chose chaste widowhood over suicide dramatically increased in the Ming Dynasty. Though many factors were at play (Theiss, 2005; Ropp et al., 2001), textiles likely affected women's decision between suicide and chaste widowhood, since availability of financial means was key to the latter. All else equal, women with no financial means would be at a higher risk to commit suicide. To test the relationship between textile production and suicide, I search county gazetteers for evidence on "virtuous" women. I focus on women awarded imperial testimonials of merit (*jingbiao*) by the state. Table 9 suggests that from 1424 to 1644, among "virtuous" women with *jingbiao*, only about 3.5% committed suicide in the twelve textile counties, as opposed to 21.8% in the twenty-nine non-textile counties. A two-group mean-comparison test shows numbers of suicidal women

[33]According to Qing regulations, to be eligible to the title of " chase widow", a woman either had to remain chaste since before the age of 30 years old to the age of 50 years old, or had been chaste ten years or more but died before reaching 50 (Mann, 1987).

Table 9: Summary Statistics

Non-Textile Counties				
Variable	Mean	Std. Dev.	Min.	Max.
Widow	2.345	2.663	0	14
Suicide	0.655	1.396	0	6
N		29		
Textile Counties				
Variable	Mean	Std. Dev.	Min.	Max.
Widow	2.25	2.927	0	11
Suicide	0.083	0.289	0	1
N		12		

Table 10: *Jingbiao*: Suicidal and Long-Widowed Women

	Difference in Means	Standard Error
Suicides	0.572^{*}	(0.272)
Widows	0.0948	(0.979)
Observations	41	

Standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: The table reports a two-group mean-comparison test on number of records on suicidal women and chaste widows. The unit of observation is a historic county. The sample is restricted to counties that could be identified on the map of Year 1305.

are statistically different between textile counties and non-textile counties. Women in textile counties were far less likely to commit suicide upon the death of their husband.

These numbers supply qualitative evidence that suggests that women in regions where textile production was more important had a greater chance of avoiding the fate of suicide. Textiles enabled women to maintain a livelihood in the absence of their husband, contributing to a new notion that women could be productive and independent members of society. From the perspective of parents, daughter's ability to support herself under adverse circumstances reduced their mental and financial exposure to an ill-fated daughter.[34]

B Persistence of gender norms after 1800

From the late 19th century onwards, China began to industrialize, starting from the treaty ports. The 1916 Economic Census documents the number of male and female workers in various industries at a province level. In provinces where textiles had been produced for commercial purposes, women were much more likely to work outside the home. The presence of women in industrial plants was much more common in Jiangsu, Zhejiang and Shanghai, where women

[34]Bossler (2000) finds evidence for a continued relationship between a married woman and her natal family. While a woman became a member of her husband's extended family upon marriage, her natal family could still be involved in times of crisis. This includes cases in which a widowed woman in poverty imposed a financial burden on her natal family.

often outnumbered men. Women working outside the home was extremely rare in Zhili, Shanxi and Shaanxi, where women had little experience with market work. A higher representation of women was noticed in a wide range of industries, including textile manufacturing plants. Table 11 summarizes the results.

I do a simple correlation test between share of female workers and textile population. Textile population is computed as share of population in a province residing in prefectures with historical textile production. Prefecture-level population in 1820, taken from Shuji Cao's work (Ge and Cao, 2001), is used in the calculation. All industries with at least 5% of the workers being women, and present in more than half of provinces, are included in the sample. Table 11 shows historical textile production is positively correlated with the share of female workers in most industries, with the exception of fur making. No similar correlations are observed in traditional family production.

Table 11: Historical Textile Production and Share of Female Workers

	(1) Cotton	(2) Fur	(3) Knitting	(4) Attire	(5) Ceramics	(6) Match	(7) Gunpowder	(8) Pharmaceuticals
Textile Population	0.483	-0.207	0.498	0.063	0.344	0.056	0.352	0.086
0.011								

Notes: The table summarizes correlations between share of female workers in 1916 (by industry) and share of population residing in prefectures with historical textile production. The unit of observation is a province in 1916. All industries with at least 5% of the workers being women, and present in more than half of provinces, are included in the sample.

Table 12: Persistence: Transmission by Parents

	Female Labor Force Participation					
	Mother's reg. known	Mother reg. elsewhere	Mother reg. locally	Father's reg. known	Father reg. elsewhere	Father reg. locally
Textile production 1800	-0.971*	-0.928*	-1.289**	-0.444	-0.454	-0.683*
	(0.417)	(0.412)	(0.395)	(0.348)	(0.340)	(0.307)
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes
Contemporary controls	Yes	Yes	Yes	Yes	Yes	Yes
Historical controls	Yes	Yes	Yes	Yes	Yes	Yes
Geographic controls	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1183	1168	1046	950	937	835

Standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The table presents results of Logit Estimation when the dependent variable is women's labor-force status: "homemakers", "unemployed or retired", "never worked or still at school" are coded as out of workforce. The unit of observation is a woman older than 30 in a Census 2000 county. The sample is restricted to Han Chinese women. Same controls as in Column 3 of Table 5 are included in all specifications. Column 1 contains estimates of the full sample where mother's household registration is known. Column 2 contains estimates on a subsample of respondents who themselves are registered locally, but whose mother is registered elsewhere. In Column 3, both respondents and mothers are registered locally. Column 4 - Column 6 repeat Column 1—Column 3, with "mother" being replaced by "father". Robust standard errors are clustered at the county level.

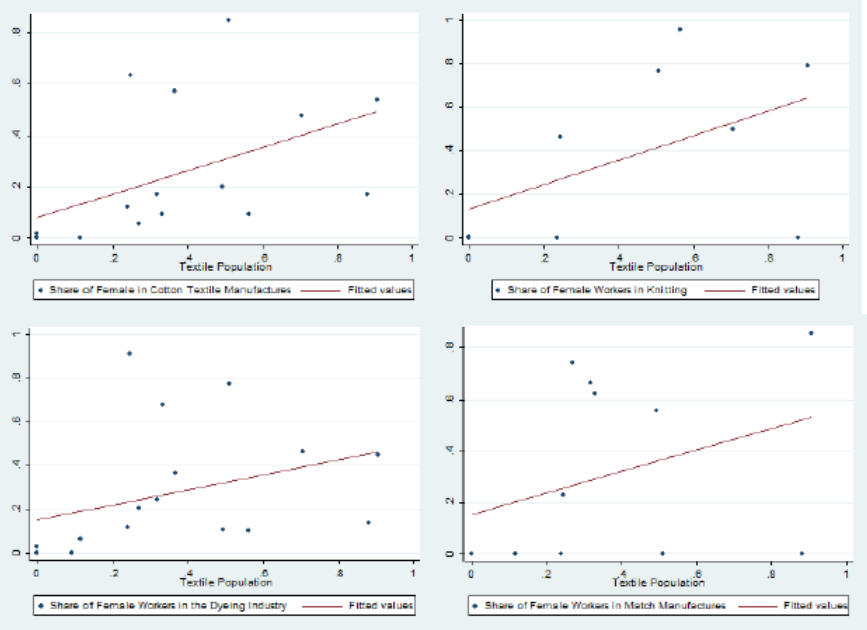


Figure 5: Share of Female Workers in 1916

The results reported in Table 11 provide suggestive evidence that when China started to industrialize, textile regions saw a higher level of female labor force participation. The effect is present in, but not limited to, the textile manufacturing. Figure 5 illustrates this point with a scatter plot and a fitted regression line for each of cotton textile manufacturing, knitting, dyeing, and match manufacturing. One interpretation of these results is in textile regions, women continued to do market-oriented work when Chinese economy began to industrialize. Families that were used to incomes provided by women quickly adapted to new economic realities, and began to let women work in manufacturing jobs to support a family. Notably, these results do suggest an alternative mechanism for historical textile production to affect modern-day outcomes: places that had more equal gender norms may have had more rapid industrialization due to abundant female labor, and early industrialization became proximate causes of better later outcomes for women.[35]

VIII Channels for Persistence

My results indicate that textile production improved the status of women in premodern China and that these effects continue to shape attitudes to women in China today. I now take a closer look at the causal mechanisms underlying my results. The long-term impacts of historical textile production could have directly affected how daughters are valued as manifested in sex

[35]Previous studies have shown the effect of proto-industry on the locations of modern industries (Farnie, 1979). If places with more equal gender norms had better labor market conditions, and therefore, had more success in the process of industrialization, those places might continue to have more favorable labor market conditions for reasons less related to gender norms.

ratios, as well as indirectly affected sex ratios through development of institutions, policies, laws and industries that are more complementary with women in more recent periods. My micro-level analyses based on CGSS and IPUMS provide evidence consistent with historical textile production shaping values and beliefs about women. In this section, I discuss uniformity in formal institutions in greater details, and explore cultural transmission of values as one possible mechanism for the effect of historical textile production on modern-day outcomes.

A Uniformity in Formal Institutions since 1949

Due to communist efforts to impose gender equality, modern China has a range of formal institutions designed to promote gender equality. In the communist period, Chinese women's status changed from a "family private person" of traditional society to a "social person", and Chinese women gained the same legal status as men. The Constitution of the People's Republic of China enacted in 1954 expressly stated that women and men enjoy equal rights. In the era of planned economy, China was able to realize the ideal of equal pay for equal work for men and women in legal terms (Entwisle and Henderson, 2000; Hannum and Xie, 1994; Johnson, 2009; Yang, 1999). Moreover, there is very little local variation in these formal institutions because of its high level of political centralization, as urban authorities in China have little or no ability to shape labors laws and policies at a local level.[36] This history of both radical reforms and institutional uniformity makes formal institutions an unlikely candidate for a channel of persistence.

Despite a lack of variation in either labor laws or maternity leave law at a local level, one could still argue that the recent growth in China has led some regions to develop informal institutions that indirectly encourage or discourage gender equality. And it could be similarly argued that as economy grew, policies and laws have not been created accordingly to maintain gender equality, implying a "deficit" of formal institutions in more developed areas. In both cases, per capita income plays a central role in differential gender equality in the post-reform era. To account for the effect of newly emerging institutional differences, I control for per capita income in my specifications, as well as including prefecture, province or region fixed effects.

B Cultural Transmission of Values

In Section A, I show that places with more local residents see a greater textile effect. Low-migration areas seeing a greater textile effect could be related to a higher percentage of residents descending from ancestors who lived in the same area. This implies cultural norms have been passed down from generation to generation. An alternative interpretation is, values spread horizontally, and low-migration areas are more effective in horizontal transmission of values.

To separate these two mechanisms, I conduct an additional analysis with CGSS data. My dependent variable is female labor force participation. I consider women listed as "homemakers", "unemployed or retired", "never worked or still at school" as out of workforce. In CGSS, "never worked" and "still at school" are lumped into the same category. As I am mostly interested

[36]Rural China has more policies generated through democratic processes at the local level (O'brien and Li, 2000).

in out-of-labor-force status due to reasons other than additional years of education, I primarily focus on women older than 30. I use place of household registration as a proxy for place of birth. As part of the "internal passport" system, household registration identifies the legal residence of a Chinese citizen. Due to difficulty in changing one's place of registration, a person is sometimes registered in one place, but lives in another place. Place of registration often lags behind actual residence. I infer from household registration status that when a person's registration status matches his/her actual residence, he/she is less likely to be a migrant, and that when a person has the same place of registration as his/her parents, he/she should possess stronger values identified in the locality, if there is vertical transmission of values.

Table 12 summarizes the results of Logit estimation. Column 1 contains estimates of the full sample where mother's household registration is known. Column 2 contains estimates on a subsample of respondents who themselves are registered locally, but whose mother is registered elsewhere. In Column 3, both respondents and mothers are registered locally. Column 4 - Column 6 repeat Column 1 - Column 3, with "mother" being replaced by "father".

Table 12 illustrates how the textile effect varies from respondents with the same place of registration as their parents, to respondents with different places of registration. Overall, more people have a known mother's registration than have a known father's registration. The difference is mostly driven by differences in female and male life expectancy. Among those who have a living father (Column 4 - Column 6), the textile effect is slightly weaker, compared with those with a living mother but not necessarily a living father (Column 1 - Column 3). Column 1 and Column 4 include migrants who are registered elsewhere. The textile effect is statistically significant in Column 1, but not in Column 4. Column 2 and Column 5 only include respondents whose actual residence of household registration match. Column 3 and Column 6 further restrict the sample to those who have the same household registration as their mother or father. This considerably increases the size of coefficient and statistical significance of estimates in both cases. The textile effect is the strongest in respondents whose parents are likely to have been born and raised in the town they currently reside. In other words, parents can have an effect on respondents' gender norms, weakening the effect of current residence on a respondent. Results from Table 12 support the hypothesis that at least some of the cultural values are transmitted vertically from parents to children.

IX Conclusion

This paper provides evidence that a portion of the variation in son preference in modern day China can be accounted for by the historical production of textiles in a location. It suggests that gender norms can be shaped by long-lasting relative productivity shocks.

I use both OLS and IV to estimate the impact of historical textile production on today's son preference and gender equality. The results are robust to the exclusion of regions famous for

historical textile production, such as the Yangtze Delta, and regions that barely had any textile production at all. My micro-level analysis lends support to my county-level analysis, and generates additional insights that allow me to extend my analysis to include other variables more commonly discussed in the context of gender equality. I find that historical textile production also helps to eliminate gender-specific parental investment and to increase female labor workforce participation.

Finally, I am able to explore historical trajectories of gender equality and gender norms in China. I find evidence for quick adaptation in gender norms in face of the "textile revolution", and persistence of the new norms. My analysis suggests that an important channel of persistence is through cultural transmission from parents to children.

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Appendix

Table 13: Regression Analysis of the Adoption of Textile Techonologies

	(1) Logit	(2) OLS
Agricultural suitability	-0.0985	-0.0101
	(0.0741)	(0.00695)
No. courier routes	0.0241	0.000180
	(0.0782)	(0.00719)
Log (dist. to Great Canal or Yangtze+1)	0.0544	0.00263
	(0.0850)	(0.00854)
Log (dist. to Great Canal or Yangtze+1) ^{2}	-0.0000153*	-0.000000665*
	(0.00000632)	(0.000000252)
Log commercial tax quota in 1077	0.192*	0.0142$^+$
	(0.0954)	(0.00694)
Log (elevation+1)	-0.397*	-0.0341*
	(0.176)	(0.0137)
Log distance to coast	0.169	0.0152
	(0.157)	(0.0147)
Latitude	-0.0767	-0.00564
	(0.0536)	(0.00412)
Longitude	0.167*	0.0137*
	(0.0751)	(0.00614)
Region Effects	Yes	Yes
Observations	1238	1246
R^2		0.030
Adjusted R^2		0.017
F		2.372

Standard errors in parentheses

$^+$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: The table reports Logit and OLS estimates. The unit of observation is a county in 2000 Census. The dependent variable is historical textile production. Regressions include regions effects and controls agriculture suitability,number of courier routes passing the county, log of distance to the Grand Canal or Yangtze River plus 1 and its squared term, log of commercial tax quotas in 1077, log of elevation plus 1 and log of distance to coast, latitude and longitude. Robust standard errors are clustered at the province level.

Table 14: Robustness Check: Yangtze Delta

	Dev. sex ratio			
	(1)	(2)	(3)	(4)
Textile production by 1800	-0.178*	-0.189*	-0.142+	-0.154+
	(0.0783)	(0.0712)	(0.0797)	(0.0742)
Log per capita GDP	-0.0287	0.0339	0.00145	0.0578
	(0.180)	(0.187)	(0.180)	(0.186)
Log per capita GDP^2	0.00163	-0.00182	0.000150	-0.00300
	(0.00833)	(0.00869)	(0.00829)	(0.00856)
Total Fertility Rate	0.574*	0.549*	0.546*	0.523*
	(0.234)	(0.235)	(0.229)	(0.228)
Individual controls	Yes	Yes	Yes	Yes
Contemporary controls	Yes	Yes	Yes	Yes
Historical controls	Yes	Yes	Yes	Yes
Geographic controls	Yes	Yes	Yes	Yes
Prefecture fixed effects	Yes	Yes	Yes	Yes
Observations	1079	1164	1158	1243
R^2	0.580	0.578	0.582	0.579
Adjusted R^2	0.511	0.509	0.513	0.510

Standard errors in parentheses $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: See Table 2. All controls are the same as in Column 1 of Table2. In Column 1, all three provinces (Zhengjiang, Jiangsu & Shanghai) are omitted. Zhejiang is omitted in Column 2, Jiangsu is omitted in Column 3, and Shanghai is omitted in Column 4. Robust Standard errors are clustered at the province level.

Table 15: Robustness Check: Migration

	Dev. sex ratio			
	(1)	(2)	(3)	(4)
Textile production by 1800	-0.218*	-0.250**	-0.193*	-0.196*
	(0.0771)	(0.0730)	(0.0656)	(0.0673)
Log per capita GDP	-0.0658	-0.0226	-0.0293	-0.0688
	(0.147)	(0.156)	(0.154)	(0.144)
Log per capita GDP^2	0.00173	-0.000635	-0.0000626	0.00218
	(0.00680)	(0.00688)	(0.00684)	(0.00628)
Total Fertility Rate	0.464$^+$	0.547$^+$	0.529$^+$	0.593$^+$
	(0.238)	(0.271)	(0.275)	(0.275)
Individual controls	Yes	Yes	Yes	Yes
Contemporary controls	Yes	Yes	Yes	Yes
Historical controls	Yes	Yes	Yes	Yes
Geographic controls	Yes	Yes	Yes	Yes
Prefecture fixed effects	Yes	Yes	Yes	Yes
Observations	853	942	973	1009
R^2	0.570	0.552	0.553	0.562
Adjusted R^2	0.494	0.475	0.477	0.488

Standard errors in parentheses $^+$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: See Table 2. All controls are the same as in Column 1 of Table2. Counties above the threshold of migration rates are omitted. From Column 1 to Column 4, the threshold is that total population is 101%, 102%, 103%, and 104% of the local population respectively. Robust standard errors are clustered at the province levels.

Table 16: Robustness Check: Treaty Port

	Dev. sex ratio			
	(1)	(2)	(3)	(4)
Textile production by 1800	-0.160*	-0.199**	-0.170*	-0.181*
	(0.0727)	(0.0593)	(0.0646)	(0.0654)
Log per capita GDP	0.164	0.0517	0.0740	0.139
	(0.178)	(0.187)	(0.178)	(0.177)
Log per capita GDP^2	-0.00840	-0.00267	-0.00386	-0.00725
	(0.00763)	(0.00870)	(0.00810)	(0.00766)
Total Fertility Rate	0.395	0.476$^+$	0.390	0.411
	(0.228)	(0.245)	(0.243)	(0.247)
Individual controls	Yes	Yes	Yes	Yes
Contemporary controls	Yes	Yes	Yes	Yes
Historical controls	Yes	Yes	Yes	Yes
Geographic controls	Yes	Yes	Yes	Yes
Prefecture fixed effects	Yes	Yes	Yes	Yes
Observations	1080	1216	1159	1136
R^2	0.595	0.581	0.582	0.587
Adjusted R^2	0.528	0.512	0.513	0.518

Standard errors in parentheses $^+$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: See Table 2. All controls are the same as in Column 1 of Table2. All treaty ports are omitted in Column 1. In Column 2, Wave 1 treaty ports (treated ports set up in 1842) are omitted. In Column 3, Wave 1 & 2 treaty ports (treaty ports set up before 1864) are omitted. In Column 4, Wave 1, 2 & 3 (treaty ports set up before 1890) are omitted. Robust standard errors are clustered at the province level.

Table 17: Summary Statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Education	1.662	0.895	0	4	53909
Education gap	0.393	0.879	-4	4	53909
Textile production by 1800	0.428	0.494	0	1	53909
Mother's education	0.415	0.702	0	4	53909
Father's education	0.982	0.86	0	4	53909
Age	27.931	4.673	23	49	53909
Total number of children	3.083	1.303	2	14	53909
%Ethnic population	1.034	2.52	0.08	77.19	53909
%Non-agricultural household registration	155.601	94.086	24.97	441.14	53909
%Agriculture in GDP	16.45	9.016	1.1	40.6	53909
Agricultural suitability	-4.023	1.807	-7	-1	53909
Dist. to Great Canal or Yangtze	2.364	2.422	0	8.584	53909
Commercial tax quota in 1077	19328.586	30892.488	407.248	217343.172	53909
Dist. to coast	274.56	308.118	0.087	1175.69	53909
Longitude	115.442	4.441	103.658	121.941	53909
Latitude	30.755	4.703	21.065	39.281	53909
Province	37.995	8.852	13	61	53909