SHANGHAITECH SEM WORKING PAPER SERIES
No. 2019-006

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December 6, 2019

https://ssrn.com/abstract=3499450

Does Higher Education Empower Women?
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Abstract

Empowering women and closing the gender gap are key issues for economic and social development. This paper explores whether and how higher education can empower women. Taking advantage of China's higher education expansion in the late 1990s, I examine the impact of higher education on increasing women's educational attainment, reducing gender stereotyping, promoting women in the labor market, and changing outcomes in the marriage market. The results show that the reform significantly increased higher educational attainment for both women and men. However, gender ideology became more traditional, especially for women. Women's opportunities in both the labor market and marriage market became more disadvantaged after the expansion. The results suggest that higher education expansion policy itself is inefficient to change rigid gender norms and eliminate the gender gap. Introducing policies that directly improve the disadvantaged status of women and guarantee gender equality in both the labor market and households is vital to foster female empowerment.

Keywords Higher education expansion, Gender norms, Gender inequality, Labor market, Marriage market

JEL classification: I23, I24, J12, J16

1   Introduction

Women's empowerment plays an essential role in development outcomes, such as reducing gender inequity, improving health and education for children and women themselves, and improving the functioning of political processes and society (Behrman et al., 1999; Doepke and Tertilt, 2019; Doepke et al., 2012; Duflo, 2012; Hill and King, 1995). Despite improving trends in gender equality, gaps between men and women in labor markets and households remain pronounced in modern societies (Bertrand et al., 2010, 2015; Blau and Kahn, 2017; Dieckhoff et al., 2016; Sasser, 2005; Wood et al., 1993). Although women currently actively participate in the labor force, situations of gender inequality exist at both the workplace and at home. This phenomenon has been referred to as a "stalled revolution" (England, 2010; Hochschild and Machung, 1989). Moreover, cross-country studies show evidence of gender inequality on hindering development and economic growth (Bandiera and Natraj, 2013). Therefore, eliminating gender disparity and empowering women constitute an indispensable development effort in many countries, especially in the developing world, and have attracted wide attention among policymakers and researchers.

In this paper, taking advantage of China's higher education expansion in the late 1990s, I focus on the effect of higher education on female empowerment, especially through its impact on reducing gender stereotyping and promoting gender equality in the labor market and within households.

Expanding higher education could play a crucial part in empowering women through at least three channels. First, expansion increases the probability of women achieving higher education and reducing gender inequality in education. Second, as education is the key to better job opportunities and higher income, higher educational attainment opens more opportunities for women in the labor market to achieve self-determination and success through careers. Women's labor force participation and labor income are critical factors determining female autonomy and intrahousehold bargaining power (Anderson and Eswaran, 2009; Manser and Brown, 1980). Higher education could increase women's labor market productivity and skills and thus lead to higher female wage rates, thereby increasing the opportunity costs of women staying at home and enabling women to participate in a variety of professions that have traditionally been occupied by men. Third, higher education may have a direct effect on changing gender ideology from more traditional gender-role attitudes, which stress women's family-focused role and men's career-focused role, toward more egalitarian and progressive views that emphasize gender equality, female rights, and autonomy. The enlightening and liberalizing effect of higher education could therefore have impact both women and men (Brewster and Padavic, 2000; Mason and Lu, 1988). As found by Fernández et al. (2004), the growing presence of men with less stereotypical gender-role attitudes has had a significant effect on increasing female labor force participation and re-

ducing gender gaps. Moreover, higher education expansion could also affect outcomes in the marriage market. The trends of assortative mating suggest that people tend to marry partners with similar characteristics, such as education levels and gender-role attitudes. Increased opportunities for women to obtain higher education could not only enhance their chances to marry higher-educated partners with similar gender-role attitudes but may also increase the marital surplus contributed by women and thus increase their intrahousehold bargaining power.

To facilitate the empirical analysis, I exploit the higher education expansion in China in 1999. In addition to the fact that the expansion policy serves as a natural experiment to estimate the impact of higher education, several more important reasons exist for using China as an empirical case in this study. First, China is a developing country with a large population. Because of the close link between female empowerment and economic development, it makes sense to conduct the study in the context of developing countries. Second, China has a long history of patriarchal society and masculine culture, with deeply rooted and rigid traditional gender norms that men should be breadwinners and women should be homemakers.[1] Even in recent decades, son preference has not been uncommon in many Chinese families, as evidenced by the imbalanced sex ratio at birth and the "missing girl" problem in China (Almond et al., 2019; Ebenstein and Sharygin, 2009; Qian, 2008). Hence, female empowerment is particularly necessary and crucial for changing traditional gender norms, reducing gender gaps, and promoting gender equality and social development in China. Third, as documented by many previous studies (Chi and Li, 2014; Dong and Bowles, 2002; Gustafsson and Li, 2000; Hare, 2016; Maurer-Fazio and Hughes, 2002), although it is not uncommon for women in China today to enter the labor market, the existence of gender discrimination and gender gaps, which include discrepancies in the employment rate, wage gaps, and differences in promotion opportunities between male and female workers, have been long-time problems in the labor market of China.[2] Empowering women through higher education could be key to opening new horizons for women in the labor market and achieving gender convergence in China and in many other developing countries with similar situations.

Vast literature on women's empowerment exists. Many important factors affecting gender equality and the intrahousehold bargaining power of women have been discussed, including education at primary and secondary levels (Hill and King, 1995; Jayaweera, 1997; Okojie, 2002), property rights (Deere and De Leal, 2014; Wang, 2014), female income (Anderson and Eswaran, 2009), suffrage rights (Miller, 2008), political participation (Bargain et al., 2019), and health and birth control (Chiappori and Oreffice, 2008), especially in the context of developing

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[1] "Nan zhu wai, nu zhu nei", as the old Chinese saying goes.

[2] For instance, the labor force participation rate of females (% of the female population ages 15+) was 61% in 2018 and that of males was 76%, according to the World Bank statistics (International Labour Organization, ILOSTAT database).

countries. A recent thread of the literature highlights the impact of social norms and gender ideology on gender equality and gender gaps (Akerlof and Kranton, 2000; Bertrand et al., 2015; Fernández et al., 2004; Fortin, 2005; Kandpal and Baylis, 2019; Lippmann et al., 2016; Marianne, 2011). Cultural transmission of gender identity norms has been recognized as an influential and persistent factor in female labor supply and gendered intrahousehold specialization (Alesina et al., 2013; Farré and Vella, 2013; Fernandez and Fogli, 2009).

Moreover, Dinçer et al. (2014), Erten and Keskin (2018), Gulesci and Meyersson (2016), and Ralsmark (2017) investigate the impact of education on gender norms and women's right and equality; however, the findings have been inclusive. Exploiting a change in the compulsory schooling law in Turkey and examining the impacts of increased education of women, Dinçer et al. (2014) find no evidence of changing attitudes on gender inequality. Whereas Gulesci and Meyersson (2016) find small and insignificant effects of education on women's labor force participation, Erten and Keskin (2018) show that the educational reform in Turkey improves women's labor market outcome, but they do not find any positive evidence of female empowerment within households. Ralsmark (2017) exploits educational reforms of mandatory schooling in 15 European countries and finds that increased mandatory education impacts traditional gender norms in the labor market but not gender norms in the household. Most previous studies have focused on the effects of mandatory education, but little is known about the impact of higher education on reducing gender inequality and empowering women. Different stages of education may have different impacts on gender-role attitudes. Only a few studies have investigated the effect of higher education on female empowerment and development. Malik and Courtney (2011) conduct surveys among female faculty members and female students at universities in Pakistan and find that higher education reduces discrimination against women. Miyata and Yamada (2016) analyze the relationship between gender-role attitudes and labor market participation in Egypt and find that attitudes toward gender roles do not affect female labor force participation. Their estimates show that higher-educated females are more likely to be unemployed due to the strong social norms and traditional cultural background.

My work adds to the literature by providing new evidence and insights from China, where traditional gender-role attitudes and substantial gender gaps persist in the labor market and within households. Using data from the Chinese General Social Survey (CGSS) in 2010, 2012, 2013, and 2015, I estimate the impact of the expansion of higher education on educational attainment, gender-role attitudes, labor market outcomes, and marriage market outcomes. To identify the causal effect, I use a difference-in-differences instrumental variable (IV-DiD) strategy that explores two sources of variation (Duflo, 2001; Hudson et al., 2017). The first is variation across birth cohorts that were affected or unaffected by the expansion. As the expansion began in 1999, the reform affected mainly individuals aged 18 or younger at that time, with older cohorts less likely to be affected. The second source of variation lies in the

higher education resources that an individual could potentially acquire. Individuals whose birth province has relatively rich higher education resources would, in principle, gain more opportunities to go to college due to the expansion. After controlling for year of birth and province of birth fixed effects, interactions between dummy variables indicating whether the individual belongs to the younger cohort affected by the expansion and whether his or her birth province has rich higher education resources are plausibly exogenous variables and are used as an instrument for having higher education in the empirical strategy. The results show that the reform significantly increased women's probability of going to college; however, female's gender-role attitudes became more traditional. The results are likely attributed to the finding that women's opportunities in both the labor market and the marriage market shrank after the expansion. As predicted by the theoretical framework, the female wage rate is a key factor in female empowerment, and the empirical analysis fails to find any significant increases in women's income following the educational reform. The theoretical framework also predicts that both women and men prefer partners with similar gender-role attitudes. Declining marriage opportunities after the higher education expansion might account for the shift in women's gender-role attitudes towards more traditional because women with traditional gender-norm attitudes may be more likely to get married. Overall, the results indicate that higher education expansion itself does not have a positive effect on changing people's gender ideology and improving women's disadvantaged status in the labor market and households, at least in the Chinese context, where traditional gender norms prevail.

My results are in line with previous findings under the context of developing countries with rigid traditional gender norms, *e.g.,* Egypt (Miyata and Yamada, 2016) and Turkey (Dinçer et al., 2014; Gulesci and Meyersson, 2016). The results are also in accordance with previous studies on the labor market effects of higher education expansion in China, which generally find negative impacts on the labor market outcomes of college graduates, at least in the short term (Knight et al., 2017; Li et al., 2008, 2014; Ou and Zhao, 2016; Xing et al., 2017). However, this paper specifically investigates the impacts of higher education expansion on a range of outcomes related to women's empowerment.

The rest of the paper is organized as follows. The next section presents a theoretical framework to specify how gender ideology could affect intrahousehold bargaining power, female labor supply, and marital preferences. Section 3 introduces the background of China's higher education expansion. Section 4 illustrates the empirical strategy and describes the data used for the empirical analysis. Section 5 presents the results, and the final section discusses the results and concludes the paper.

2 Theoretical Framework

In this section, I present a stylized theoretical framework in a household setting that features the influence of gender ideology of both partners on determining the intrahousehold balance of power, intrahousehold specialization, and marital preferences, following the theoretical framework and implications of Basu (2006) and Montalvao-Machado (2014). With the assumptions that partners' utilities are nontransferable and each person's utility function is separable, the theoretical framework describes a simplified collective household model with the intrahousehold equilibrium level of bargaining power, female labor supply, and marital payoff to be endogenously determined by the gender ideology of both partners.

2.1 Intrahousehold Bargaining and Female Labor Supply

The household's maximand is assumed to be given by

$$\Omega \equiv \theta U_w + (1 - \theta) U_h, \tag{1}$$

where $\theta \in [0, 1]$ measures the balance of power of a wife and husband within a household. Further assume that

$$U_i = x - C_i(e, l_i), \tag{2}$$

$i = w, h$. U_w and U_h are the utility functions of the wife and the husband, respectively, and x stands for total household goods consumption. The wife's time can be split between doing household chores and working in the labor market. e is the wife's share of time allocated to working in the market sector, and $e = \frac{n_w}{n_w + n_h}$, where n_i is i's time spent working. For later algebraic simplicity, I standardize $n_w + n_h = 1$; then, $e = n_w$. l_w and l_h represent the wife's and the husband's *ideal* level of the *wife*'s share of time working, respectively, and represent each person's gender-role attitudes toward female labor force participation. The closer l_i is to 0, the more traditional the person is since a lower level of female labor force participation is appreciated; the closer l_i is to 1, the more progressive and egalitarian are the gender-role attitudes of the individual. $C_i(e, l_i)$ is a cost function that accounts for the differences between i's realized level and the ideal level of intrahousehold specialization. Specifically,

$$C_i(e, l_i) = \sigma \frac{(e - l_i)^2}{2}, \tag{3}$$

where $\sigma \geq 0$ is the strength of gender ideology on intrahousehold specialization. Thus, $C_i' = \sigma(e - l_i)$. $C_i' > 0$ if $e > l_i$; $C_i' < 0$ if $e < l_i$; and $C_i'' = \sigma \geq 0$.

Given the above assumptions, the maximization problem can be rewritten as the household choosing (x, e) to solve

$$\max_{x,e} \quad \Omega = x - [\theta C_w(e, l_w) + (1 - \theta)C_h(e, l_h)]$$
$$\text{s.t.} \quad px \leq e\omega + Y.$$

(4)

The household is assumed to consume only one good x at price p; the husband always works and his income is subsumed in Y. Let ω be the female wage rate in the market sector. Then, the first-order condition of (4) gives

$$\frac{\omega}{p} = \theta C'_w(e, l_w) + (1 - \theta)C'_h(e, l_h).$$

(5)

Since (5) describes the relationship between the wife's wage rate and her labor effort, it represents the wife's "labor-supply curve".

Furthermore, without loss of generality, the balance of power θ is assumed to be an increasing function of the wife's income contribution, y, where

$$y = \frac{e\omega}{e\omega + Y},$$

(6)

and

$$\theta = a + by,$$

(7)

where $a \in (0, \frac{1}{2})$ and $b = 1 - 2a$, then $b \in (0, 1)$. Hence, we have $\theta = \frac{1}{2}$ when $y = \frac{1}{2}$, $\theta > \frac{1}{2}$ when $y > \frac{1}{2}$, and $\theta < \frac{1}{2}$ when $y < \frac{1}{2}$. From (6) and (7), we obtain

$$\theta = \theta(e\omega) = a + \frac{be\omega}{e\omega + Y}.$$

(8)

Since (8) relates the wife's wage rate to her bargaining power in the household, it represents the wife's "power-bargaining curve". Thus, the wife's balance of power is increasing with her effort and her wage rate in the market sector since

$$\frac{\partial \theta}{\partial e} = \frac{b\omega Y}{(e\omega + Y)^2} > 0,$$
$$\frac{\partial \theta}{\partial \omega} = \frac{beY}{(e\omega + Y)^2} > 0.$$

2.2 Intrahousehold Equilibrium and Gender Ideology

Combining the above conditions, we obtain that (θ^*, e^*) is an intrahousehold equilibrium if it is the solution of (5) and (8), that is,

$$\frac{\omega}{p} = \theta^* C'_w(e^*, l_w) + (1 - \theta^*) C'_h(e^*, l_h). \tag{9}$$

In equilibrium, (θ^*, e^*) is the point of intersection of the wife's power-earnings curve and labor-supply curve. To analyze how a wife's labor supply and bargaining power change in response to her wage rate, two cases must be distinguished. In this simplified case, the labor-supply curve is linear ($\partial^2 \theta / \partial e^2 = 0$); however, the slope of the labor-supply curve depends on the levels of the wife's and husband's *ideal* level of the *wife*'s share of time working, *i.e.*, l_w and l_h.[3]

Case I: $l_w > l_h$, $\forall e$, *i.e.*, the wife's ideal level of working in the market sector is higher than her husband's ideal level of her share of time working. In this case, the labor-supply curve has a positive curve since the balance of power, θ, increases with an increase in the wife's share of time working, e, keeping her wage rate, ω, and consumption price, p, constant. Moreover, the power-earnings curve is always concave down ($\theta' > 0, \theta'' < 0$). Then, the intrahousehold equilibrium (θ^*, e^*) in this case can be illustrated in Figure 1 (a). Clearly, in the case of $l_w > l_h$, an increase in the wife's wage rate, ω, causes both her balance power, θ, and her labor supply in the market sector, e, to increase.

Case II: $l_h > l_w$, $\forall e$, *i.e.*, the wife's ideal level of working in the market sector is lower than her husband's ideal level of her share of time working. In this case, the labor-supply curve is negative, since the balance of power, θ, decreases with an increase in the wife's share of time working, e, keeping her wage rates, ω, and the consumption price, p, constant. The intrahousehold equilibrium (θ^*, e^*) can be illustrated in Figure 1 (b). In the case of $l_h > l_w$, an increase in the wife's wage rates, ω, causes her balance of power, θ, to rise; however, the impact on her labor supply, e, is uncertain.

In the above analysis, l_w and l_h are assumed to be predetermined and exogenous. To explore how the gender ideology of both partners could impact interhousehold bargaining and specialization, the following analysis further examines how l_w and l_h could affect e and θ at the intrahousehold equilibrium. Suppose that the wife and husband have the same wage rate (remember that we have standardized $n_w + n_h = 1$); thus, $e = y$.[4] Thus,

$$\theta = a + be. \tag{10}$$

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[3]The derivation is straightforward and is presented in Appendix B.1.

[4]Given that the wife and husband have the same wage rate, ω, the wife's income contribution, y, can be rewritten as $y = \frac{e\omega}{\omega(n_w + n_h)}$.

(a) $l_w > l_h$ **(b)** $l_h > l_w$

Figure 1: Intrahousehold Equilibrium
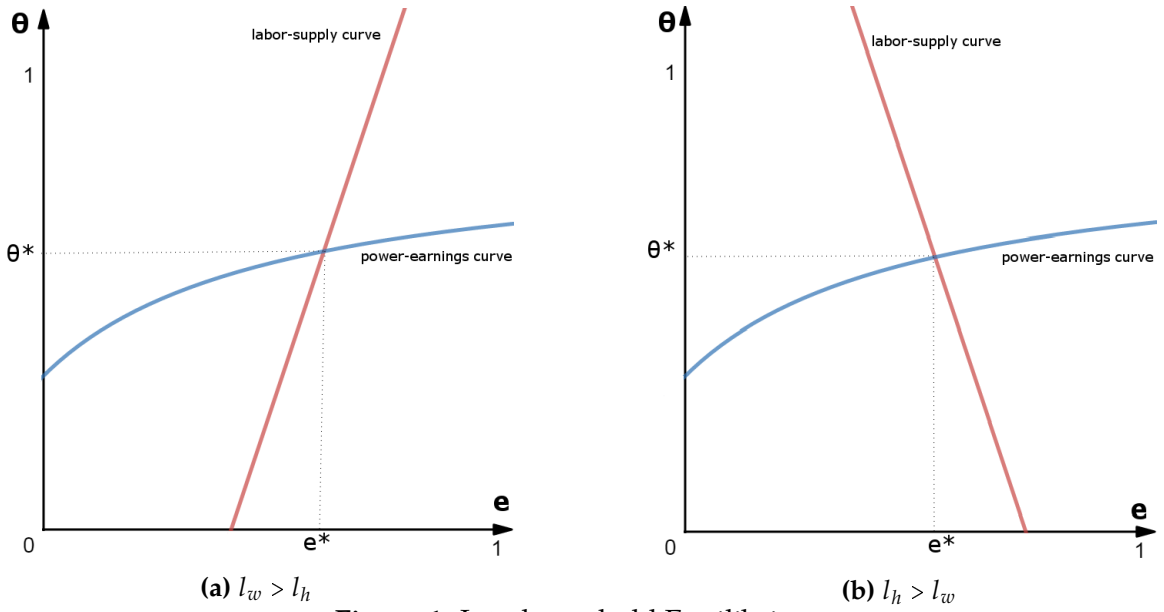
Note: The plots are the two cases of intrahousehold equilibrium, $l_w > l_h$ and $l_h > l_w$. The blue curve is the wife's power-earning curve and the red linear line is the wife's labor-supply curve.

Furthermore, the wife's share of time, e, is determined by the average of her and her partner's ideal level of female labor participation based on their balance of power, that is,

$$e = \theta l_w + (1 - \theta) l_h. \tag{11}$$

By solving (10) and (11), the equilibrium level of intrahousehold balance of power, θ^*, and intrahousehold specialization, e^*, are determined by l_w and l_h as,

$$\theta^* = \frac{1 - b(1 - 2l_h)}{2(1 - b(l_w - l_h))}, \tag{12}$$

$$e^* = \frac{l_w + l_h - b(l_w - l_h)}{2(1 - b(l_w - l_h))}. \tag{13}$$

The implications from (12) and (13) are

$$l_w + l_h < 1 \Rightarrow \theta < \frac{1}{2} \quad \text{and} \quad \frac{\partial e}{\partial l_w} < \frac{\partial e}{\partial l_h}; \tag{14}$$

$$l_w + l_h > 1 \Rightarrow \theta > \frac{1}{2} \quad \text{and} \quad \frac{\partial e}{\partial l_w} > \frac{\partial e}{\partial l_h}. \tag{15}$$

(14) and (15) indicate that in a household with a relatively "traditional" gender ideology, which stresses the wife's family-focused role (less time in the labor market), the husband has more bargaining power than his wife and has a stronger influence on intrahousehold specialization. By contrast, in a household with a relatively "progressive" gender ideology toward female labor force participation, the wife has more bargaining power than her husband and

has a stronger influence on intrahousehold specialization.

2.3 Marital Preferences in the Marriage Market

Following Montalvao-Machado (2014), the framework further assumes that in the marriage market, there is a continuum of women and men whose respective types, l_w and l_h, follow a uniform distribution on $[0,1]$. Their characteristics are publicly observable; thus, individuals can perfectly anticipate the intrahousehold equilibrium associated with each potential partner when searching the marriage market. Therefore, the marital payoff U_{ij} for individual i from matching with partner j can be obtained by solving individual i's utility function, given by (2) and (3), with the equilibrium intrahousehold specialization, given by (13). The anticipated marital payoff for individual i from marrying partner j is given as

$$U_{ij} = \omega - \rho_{ij} \frac{(l_i - l_j)^2}{2}, \tag{16}$$

where $i = w, h$. As shown by the detailed derivations in Appendix B.2,

$$\rho_{wh} = \sigma \Big[\frac{1 - \theta_w}{1 - (\theta_w - \theta_h)} \Big]^2 \quad \text{and} \quad \rho_{hw} = \sigma \Big[\frac{\theta_h}{1 - (\theta_w - \theta_h)} \Big]^2, \tag{17}$$

where $\theta_w = a + b l_w$ and $1 - \theta_h = 1 - a - b l_h$ represent the balance of power of a woman typed l_w and a man typed l_h, respectively, if they are matched with each other and have the same gender-role attitudes since $\theta_w + (1 - \theta_h) = 1$ at $l_w = l_h$.

The marital preferences for both women and men can readily be derived from the marital payoff function given by (16). Assuming there is search friction in the marriage market, people cannot always match with partners with perfect positive assortativeness on gender ideology; thus, mismatches could occur due to imperfect assortiveness. Let $\Delta = l_w - l_h$ measure the level of mismatch; the marginal cost of mismatch can be derived from (16), that is,

$$MC_{ij} = \frac{\partial U_{ij}}{\partial \Delta} = - \frac{\Delta \rho_{ij}}{1 - b\Delta}, \tag{18}$$

where $i = w, h$. Since $MC_{ij} = 0$ at $\Delta = 0$ and $\frac{dMC_{ij}}{d\Delta} = - \frac{\rho_{ij}}{(1 - b\Delta)^2} < 0$, the marital payoff U_{ij} is maximized at $\Delta = 0$, i.e., $l_i = l_j$, when there is no mismatch and an individual would expect a higher marital payoff if she or he married a partner with similar gender-role attitudes. That is, the anticipation of intrahousehold equilibrium suggests that there would be positive assortative matching on gender ideology in the marriage market.

2.4 Predictions

In summary, three predictions can be deduced from the theoretical framework.

Prediction 1: A female will have greater power over intrahousehold specialization in a more "progressive" household that appreciates female labor force participation and less power in a more "traditional" household that values a wife's family-focused role. Both the husband's and the wife's gender-role attitudes matter.

Prediction 2: An increase in female wage rates in the labor market will increase a wife's balance of power in the household, whereas a decline in wage rates will decrease the balance of power.

Moreover, as an increased female wage is also likely to increase both l_w and l_h, the first two predictions imply that increasing women's labor income and opportunities in the labor market would play an essential part in empowering women.

Prediction 3: In the marriage market, both women and men prefer partners whose gender-role attitudes are similar to their own.

Given the above predictions, it is reasonable to infer that higher education could serve as a spur to empower women if it effectively promotes an egalitarian gender ideology for both women and men and benefits women in the labor market. Moreover, it could also affect outcomes in the marriage market by influencing people's gender-role attitudes.

3   Background: China's Higher Education Expansion

In my empirical analysis, I study the case of China, taking advantage of its higher education expansion in the late 1990s. China has had a state-run system of public education since 1949 that consists of six years of elementary school, three years of junior secondary school (middle school), three years of senior secondary school (high school), and tertiary education—including junior college, Bachelor's, Master's, and Doctoral degree programs. Elementary education and junior secondary education have been compulsory and free of charge for all citizens since 1986 and are financed by the government. Elementary schooling starts at age six. After nine years of compulsory education, a student can either choose to go to a three-year normal high school by taking the entrance exam or to go to career-oriented medium-level professional schools, polytechnic schools, or occupational schools, which usually also take three years. A university education that grants a Bachelor's degree commonly takes four years, and admissions are based on a standardized and highly competitive national college entrance examination that takes place once a year. Candidates whose college entrance exam grades make them unqualified for the Bachelor program level can choose to

go on to short-cycle (three-year) junior college studies or wait and prepare for another year and retake the college entrance exam the following year.

The education system was severely interrupted during the political turmoil of the Cultural Revolution (1966-1976), especially the higher education system (Deng and Treiman, 1997). The normal procedure of university admission was resumed in 1977, and since then, three small-scaled higher education expansions occurred in 1978, 1985, and 1992 to 1993 (Bao, 2012). The tertiary education enrollment rate increased from 1.55% in 1978 to 9.76% in 1998 (Ou and Zhao, 2016). Tuition fees for college were introduced in 1995, and the average annual tuition for a student increased from CNY 800 in 1995 to CNY 5000 in 2006 and has remain stable since 2006 (Li et al., 2014).[5]

At the beginning of 1999, the central government and the Ministry of Education in China promulgated the *Higher Education Law of the People's Republic of China*, which aimed to expand the higher education sector and transfer the system from the elite to the masses. The higher educational attainment ratio has been very low in China compared to that of its international counterparts, especially before the expansion. Figure A.1 compares the gross enrollment ratios of China and several developed and developing countries around the world. Even after the expansion, the total college enrollment ratio in China has remained relatively low.[6] The higher education expansion policy was motivated by several factors. One important reason was to meet the growing demand for high-skilled labor and enhance economic development (Heckman and Yi, 2012; Wu and Zheng, 2008); another purpose was to alleviate the unemployment pressure and stimulate aggregate demand against the impact of the Asian financial crisis of 1997-98 (Che and Zhang, 2018; Li et al., 2014).[7] The decision to increase enrollment in tertiary education was finalized and announced in June of 1999, and the higher education admission quota was increased by 0.55 million in 1999 (Li et al., 2014; Xing et al., 2017). Considering that the National College Entrance Examination was taken in early July, the expansion policy published one month earlier had little chance of altering the behavior of high school students and can thus be treated as a natural experiment.[8]

As a result of the expansion policy, the number of new entrants to colleges and universities, including both new undergraduate students and junior college students, in 1999 reached almost 1.60 million, 40% more than the total number in 1998. The growth in enrollment has continued each year, although at a slower rate. Figure 2 (a) presents the growth rates

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[5]The per capita annual disposable income of urban households was CNY 4283 and CNY 11759.5 in 1995 and 2006, respectively, and that of rural households was CNY 1577.7 and CNY 3587.0 (National Bureau of Statistics, Various years). 1 Chinese Yuan (CNY) ≈ 0.15 US dollars.

[6]The gross enrollment ratio is the total enrollment divided by the population of the age group that corresponds to tertiary education.

[7]In the late 1990s, a reform of state-owned enterprises in China generated a large quantity of low-skilled laid-off workers, resulting in an unemployment problem.

[8]The National College Entrance Examination has been recognized as being highly difficult and competitive, especially at that time when the enrollment rate was very low. It usually takes high school students at least one entire year (last year in high school) to prepare for the entrance examination.
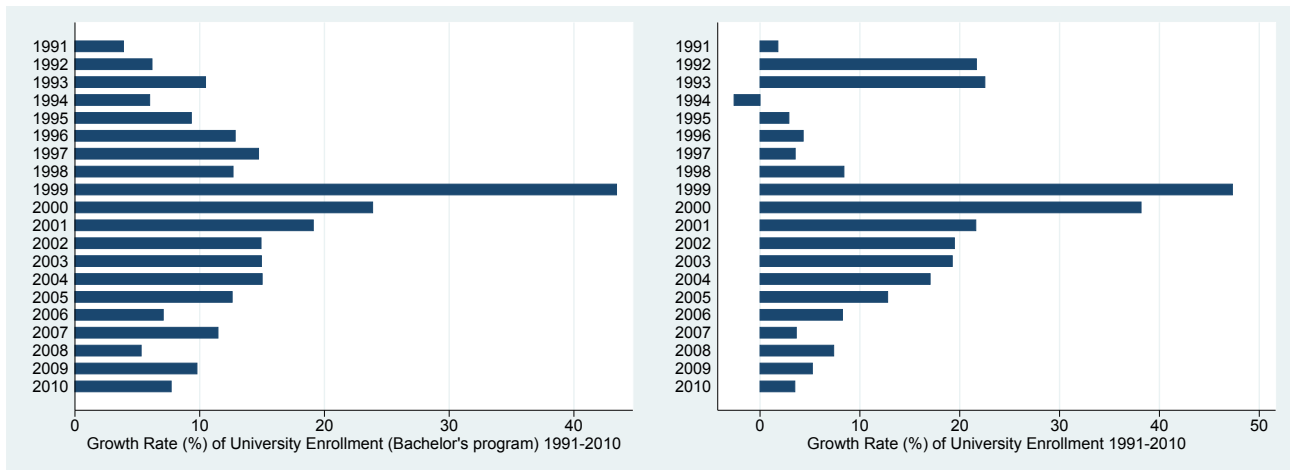
(a) Enrollment in Universities   **(b)** Enrollment in Universities and Junior Colleges

Figure 2: Growth Rate of University Enrollment, 1991-2010

Source: National Bureau of Statistics of the People's Republic of China.

of new undergraduate students from 1990 to 2010, and Figure 2 (b) presents a plot that also includes new junior college students. The large-scale expansion in 1999 and 2000 is particularly obvious, and some growth is also observed in the following years.

Several studies have focused on the impacts of the higher education expansion in China, especially on the labor market consequences of college graduates. Li et al. (2008) note that the higher education expansion may lead to overeducation and employment challenges considering the current situation of the Chinese labor market. Li et al. (2014) estimate a short-term impact and show that China's higher education expansion increased the unemployment rate among young college graduates. Knight et al. (2017) also identify increased unemployment and reduced relative wages for new graduates after the expansion, while the incumbent graduates were mostly unaffected. Xing et al. (2017) confirm that the higher education expansion increased unemployment rates in the short term, but they also find that the negative impact decreased in the longer term. Moreover, Ou and Zhao (2016) find that the expansion decreases labor force participation for women but not for men and decreases individual earnings in high-skilled white-collar jobs. Additionally, Wu and Zhang (2010) and Yeung (2013) focus on higher education expansion and social stratification and find that higher education became more inclusive of students from disadvantaged family backgrounds and that the expansion decreased gender inequality in college attendance.

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4 Empirical Strategy and Data

4.1 Empirical Strategy

To explore the exogenous change in higher education due to the expansion, my identification strategy exploits the variations in "treatment" intensity across the province of birth and the cohort of birth, which jointly determine an individual's exposure to the reform. Since the expansion began in 1999, the "treated" cohorts who were affected by the policy should be 18 years old or younger in 1999. Moreover, according to Chinese regulation, college candidates have to take the entrance examination in the province where their *hukou* (household registration) is located.[9] Admission quotas for new students at each university are set before the entrance examination every year, and the quotas are usually larger for local students in the provinces where the universities are located. In other words, students have a higher probability of enrolling in their home province universities. Therefore, college candidates from provinces with a larger number of university slots per capita should experience a relatively greater "treatment" effect of the higher education expansion than their peers whose home provinces have a smaller number of university slots per capita.

The identification challenge of estimating the causal effects of higher education on gender-role attitudes, labor market outcomes, and other outcomes of interest is that an individual's higher educational attainment could be related to many unobservable characteristics that also correlate with the outcomes under study. As a result, an OLS estimation may be biased due to omitted variables. Therefore, I use an IV-DiD strategy to identify the causal effect of higher education on the outcomes of interest by exploiting two sources of variation, as mentioned above. The instrument for an individual having a higher education is an interaction term between dummy variables indicating whether the individual belongs to the younger cohort affected by the expansion and whether his or her birth province has rich higher education resources, *i.e.*, the number of university slots per capita. The first-stage regression illustrates the effect of the expansion on an individual's higher educational attainment, as presented by the following equation:

$$HE_{ipc} = \alpha + \phi(RHE_p \times Young_i) + X_i'\gamma + \delta_p + \eta_c + \epsilon_{ipc}, \tag{19}$$

where HE_{ipc} is an indicator for individual i having a higher education degree.[10] The dummy variable RHE_p is equal to one if i's home province p ranks above the top tercile among the

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[9]China's *hukou* system is a household registration system that records a specific permanent residence for each citizen. The registration is usually a person's birthplace, but it can be changed with changes in long-term residence.

[10]In the empirical analysis, I define a higher education degree as a Bachelor's degree or higher, which conforms to the common standards in China's labor market. The results are largely similar if I also include junior college degrees in the higher education category.

national ranking of the number of university slots per ten thousand high school graduates in 1998, the year before the expansion [11]. $Young_i$ is an indicator for the "treated" cohort aged 18 years or younger in 1999 that could be affected by the expansion policy. The interaction $RHE_p \times Young_i$ serves as an instrument. The coefficient of interest is ϕ, which captures the effect of the expansion on an individual's higher educational attainment. The vector of exogenous covariates X_i includes a gender indicator, a dummy for being born in city areas, a dummy for Han nationality, sex ratios in each province of each birth cohort, dummies for the parents' level of education, dummies for parents' communist party membership, and parents' occupation information.[12] Birthplace fixed effects δ_p and year of birth fixed effects η_c absorb the effects of time-invariant birthplace characteristics and birth cohort effects. A key assumption in the IV-DiD framework is that the instrument affects outcomes only through the effect on higher educational attainment. To ensure that this assumption holds, I also include interactions between birth-region (eastern, central, western, and northeastern) and birth-year dummies, in addition to the baseline model, to flexibly control for contemporaneous changes in time-varying unobservable factors at the birth region level that may be correlated with the expansion.[13] Standard errors are clustered at the level of birth place-year to account for any arbitrary correlation of the error term, ϵ_{ipc}.

In the second stage, I estimate the causal effect of higher education on the main outcomes of interest, including gender-role attitudes and labor market outcomes. To better understand the results, I also investigate the impact of higher education expansion on some marriage market outcomes. Under the IV-DiD framework, the reduced-form model is then in a difference-in-differences setting and provides an estimate of the intention-to-treat (ITT) effect of higher education expansion. The specification is as follows,

$$Y_{ipc} = \alpha + \theta(RHE_p \times Young_i) + X_i'\gamma + \delta_p + \eta_c + \eta_{ipc} \tag{20}$$

where Y_{ipc} is the outcome variable and θ is the coefficient of interest.

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[11]Figure A.3 is a map of China with the geographic distribution of normalized university admissions quota in 1998. The darker the color is, the greater the number of university slots per capita of the province/municipality.

[12]An indicator of whether being born in urban areas is included because there is a large urban-rural gap in education resource and quality in China. A dummy for Han nationality (the ethnic majority group) is included because ethnic minority students can be enrolled in universities with scores lower than those of the Han ethnic group under a nationwide policy in China. Sex ratios in each province of each birth cohort are included to control for the effects of peer gender composition. Parents' characteristics (education, occupation, and communist party membership) are included following the implications from Yeung (2013) and Li et al. (2012), which stress the influence of family background and parents' political status on an individual's higher educational attainment and job opportunities in China.

[13]Birth provinces are divided into four regions — eastern, central, western, and northeastern. This division is officially standardized and is based on different socioeconomic and geographical levels.

4.2 Data

I use data from the Chinese General Social Survey (CGSS) in the years 2010, 2012, 2013 and 2015. The CGSS is a nationally representative annual/biannual survey project that is part of the International Social Survey Program and has been conducted jointly by Renmin University of China and Hong Kong University of Science and Technology since 2003 (Bian and Li, 2012). The surveys use multistage random sampling and cover urban and rural households from almost every province in mainland China, providing repeated cross-sectional data of socioeconomic measures. The CGSS datasets provide a wealth of information concerning individuals' demographic characteristics, family background, educational experience, and occupation, *etc*.

I use data from the years 2010, 2012, 2013 and 2015 since survey questions about gender ideology are included in the questionnaires in these years. Respondents were asked to what extent they agree with the following five statements related to gender-role attitudes.

Statement 1. A man should focus more on his career, while a woman should focus more on her family.

Statement 2. Males are more capable than females by nature.

Statement 3. For a woman, a good marriage brings her a better life than does a good job.

Statement 4. When jobs are scarce, men should have more right to a job than women.

Statement 5. Husband and wife should share household chores equally.

Clearly, Statements 1 to 4 indicate traditional gender-role attitudes that stress women's family-focused role and men's career-focused role. By contrast, Statement 5 expresses an egalitarian view. In the survey, each statement is presented as a question with a five-level Likert scale, and respondents report an answer from 1 = strongly disagree, 2 = disagree, 3= neither agree nor disagree, 4 = agree, to 5 = strongly agree. To obtain a composite index of egalitarian gender-role attitudes, I first recode Statement 1 to Statement 4 to have the same direction as Statement 5; that is, a higher value indicates a more egalitarian and progressive attitude. Then, I standardize the value of each statement to obtain a Z-score with zero mean and unit variance of each measure. Finally, a composite index of egalitarian gender-role attitudes is obtained as the average of the five Z-scores. As a result, the lower the value of the composite index is, the more traditional are the gender-role attitudes of the respondent; the higher the value is, the more progressive is the person. Alternatively, I also implement principal component analysis (PCA) in the final step to generate a composite index of egalitarian gender-role attitudes as a robustness check. Table 1 shows the summary statistics of the reported values for each statement. Men report a more traditional opinion than women on every statement except for Statement 3 *"For a woman, a good marriage brings her a better life than does a good job"*, but the differences are not substantial. Women in China

Table 1: Summary Statistics

	All				Females		Males	
	Mean	S.D.	Min	Max	Mean	S.D.	Mean	S.D.
Age	35.30	5.22	24	45	35.26	5.20	35.35	5.23
Male	0.47	0.50	0	1	0.00	0.00	1.00	0.00
Han nationality	0.91	0.29	0	1	0.90	0.30	0.91	0.29
Born in urban areas	0.27	0.44	0	1	0.25	0.43	0.28	0.45
Sex ratio	1.03	0.06	1	1	1.03	0.06	1.03	0.06
Birthplace rich HE resources	0.30	0.46	0	1	0.29	0.45	0.30	0.46
Higher-educated	0.10	0.30	0	1	0.08	0.28	0.11	0.32
Marital status	0.88	0.33	0	1	0.91	0.28	0.84	0.36
Age at first marriage	23.97	3.40	17	42	23.19	3.10	24.91	3.51
Higher-educated spouse	0.09	0.28	0	1	0.09	0.29	0.08	0.27
Father less-educated	0.79	0.41	0	1	0.79	0.41	0.78	0.41
Father more-educated	0.19	0.39	0	1	0.18	0.39	0.19	0.39
Father communist party member	0.18	0.38	0	1	0.17	0.38	0.19	0.39
Father agricultural worker	0.52	0.50	0	1	0.54	0.50	0.50	0.50
Father non-agricultural employee	0.29	0.45	0	1	0.27	0.45	0.30	0.46
Mother less-educated	0.87	0.33	0	1	0.88	0.33	0.87	0.34
Mother more-educated	0.11	0.31	0	1	0.10	0.30	0.11	0.32
Mother communist party member	0.04	0.19	0	1	0.03	0.18	0.04	0.20
Mother agricultural worker	0.61	0.49	0	1	0.62	0.49	0.60	0.49
Mother non-agricultural employee	0.16	0.37	0	1	0.15	0.36	0.18	0.38
Currently working	0.80	0.40	0	1	0.70	0.46	0.91	0.29
Log annual income	9.05	3.16	0	16.12	8.09	3.80	10.08	1.77
Weekly working hours gap btw couple	3.71	19.28	−520	135	4.40	18.79	2.88	19.81
Gender-role attitude measure	−0.00	0.60	−2	1	0.06	0.62	−0.07	0.58
The Five Statements on Gender Norms:								
"A man should focus more on his career, while a woman should focus more on her family."	3.38	1.20	1	5	3.33	1.23	3.43	1.16
"Males are more capable than females by nature."	2.85	1.21	1	5	2.81	1.24	2.91	1.17
"For a woman, a good marriage brings her a better life than does a good job."	3.04	1.19	1	5	3.09	1.20	2.99	1.17
"When jobs are scarce, men should have more right to a job than women."	2.01	0.97	1	5	1.90	0.95	2.14	0.97
"Husband and wife should share household chores equally."	3.82	1.03	1	5	3.97	0.98	3.66	1.06
Observations	13271				7007		6264	

Notes: "Male" is a dummy variable equal to 1 if the individual is a man. "Han nationality" is an indicator of whether the individual is of the Han ethnic group. "Born in urban area" is a dummy equal to 1 if the individual was born in an urban area. "Sex ratio" measures the ratio of males to females for each birth year in each birth province. "Birthplace with rich HE resources" is an indicator of whether the individual's birthplace ranks above the top tercile among the national ranking of the number of university slots per ten thousand high school graduates in 1998 in each province. "Higher-educated" is an indicator for having a Bachelor's degree or higher. "Marital status" is a dummy equal to 1 if the individual is married or has a partner. "Age at first marriage" is the age at which the individual married for the first time. "Higher-educated spouse" is an indicator of whether the individual's spouse is highly educated. "Father less-educated" is an indicator of whether the schooling level of the individual's father is no more than junior secondary education. "Father more-educated" is an indicator of whether the schooling level of the individual's father is no less than senior secondary education. "Father communist party member" is an indicator of whether the individual's father is a communist party member. "Father agricultural employee" and "Father non-agricultural employee" are indicators of the individual's father's job type. The same indicators are used for mother's education level, party membership, and job categories. "Currently working" is a dummy equal to 1 if the individual is currently working/has a job. "Log annual income" is the logarithm of the individual's annual income adjusted to 2015 CPI. "Weekly working hours gap between a couple" is the gap in weekly working hours between the husband and wife for working couples. "Gender-role attitude measure" is a composite index of egalitarian gender-role attitudes: the more negative the value is, the more traditional are the gender-role attitudes, and vice versa.

appear to attach high importance to marriage. Figure A.2 illustrates a more straightforward picture by showing the distribution of men and women's reported value for each statement.

As the higher education expansion started in 1999, I include individuals who were born between September 1980 and 1986 as the young cohort; such individuals were 18 years old or younger in 1999 and should be affected by the policy.[14] Individuals who were born between 1970 and August 1980 are included as the control group. Therefore, we have a repeated cross-sectional sample for the analysis that contains 13271 observations, including 3504 observations in 2010, 3383 observations in 2012, 3464 observations in 2013, and 2920 observations in 2015. Table 1 presents summary statistics for the main variables, including key information on individual characteristics, family background, outcomes related to the labor market and marriage market, and a measure of gender ideology, for the whole sample and for females and males separately.

Furthermore, before presenting the main empirical results, I conduct a balancing test of exogenous characteristics on the key estimator $RHE_p \times Young_i$ to check whether there is a selection of individuals, following the procedure proposed by Pei et al. (2019), which puts the variables on the left-hand side as an outcome rather than controls to check whether they are affected by the "treatment". The balancing test results are presented in Table 2. Reassuringly, there is no significant difference in most variables between the cohorts who were most likely to be affected by the higher education expansion and the others.

5 Empirical Results

5.1 Higher Educational Attainment

To examine the effect of higher education expansion on an individual's probability of going to college, I estimate the first-stage regression and report the results in Table 3. Columns (1) and (2) present the results for the whole sample, columns (3) and (4) report the results for the female sample, and columns (5) to (6) for the male sample. Columns (1), (3), and (5) estimate the results of the baseline models in Equation (19), which control for exogenous covariates, birthplace fixed effects, and birth year fixed effects. Columns (2), (4), and (6) also include the interaction terms between dummies of birth region and birth year. The results for the whole sample show that the higher education expansion significantly increased the probability of obtaining higher education for the "treated" cohort by 7.7 percentage points. After controlling for the birth region and year interaction fixed effects, the estimate decreases slightly to 7.0 percentage points. For the female sample, the higher education expansion significantly increased a woman's probability of attending university by 8.0 percentage points.

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[14]In China, the age for starting mandatory schooling is six years. Each academic year begins in September.

Table 2: Balancing Test of Individual Characteristics

	Whole Sample			Female Sample			Male Sample		
	Coefficient	Std. error	P-value	Coefficient	Std. error	P-value	Coefficient	Std. error	P-value
Male	0.015	0.021	0.469						
Han nationality	0.002	0.009	0.841	0.013	0.012	0.309	-0.012	0.012	0.312
Born in urban areas	0.023	0.017	0.178	0.026	0.025	0.291	0.018	0.025	0.458
Sex ratios by birth cohort-region	-0.007	0.009	0.445	-0.009	0.009	0.326	-0.005	0.009	0.608
Father less-educated	0.001	0.019	0.962	-0.016	0.026	0.548	0.017	0.025	0.485
Father more-educated	-0.002	0.018	0.898	0.020	0.025	0.437	-0.025	0.025	0.316
Mother less-educated	-0.019	0.016	0.223	-0.042	0.020	0.032	0.008	0.023	0.727
Mother more-educated	0.020	0.016	0.200	0.044	0.019	0.021	-0.008	0.023	0.747
Father communist party member	-0.008	0.016	0.594	0.003	0.022	0.891	-0.023	0.025	0.368
Mother communist party member	0.013	0.008	0.111	0.005	0.011	0.610	0.022	0.013	0.084
Father agriculture worker	0.014	0.018	0.434	0.046	0.025	0.063	-0.019	0.024	0.421
Father non-agriculture employee	0.002	0.020	0.932	-0.030	0.026	0.249	0.032	0.027	0.230
Mother agriculture worker	-0.006	0.019	0.730	-0.008	0.023	0.732	-0.001	0.025	0.954
Mother non-agriculture employee	-0.002	0.017	0.921	0.003	0.024	0.894	-0.011	0.026	0.664

Notes: The balancing test follows Pei, Pischke and Schwandt (2019). This table shows the coefficients, standard errors, and P-values of the interaction $RHE_p \times Young_i$ in the equation when each variable in the first column is used as a dependent variable, controlling for birth place, and birth year fixed effects.

Table 3: First Stage: Effects on Higher Education Attainment

Dependent Variable:	Have a Higher Education Degree					
	All		Females		Males	
	(1)	(2)	(3)	(4)	(5)	(6)
Young × Rich HE resources	0.077	0.070	0.080	0.077	0.070	0.055
	(0.015)***	(0.015)***	(0.019)***	(0.019)***	(0.021)***	(0.022)**
Mean of Dep. Variable	0.097	0.097	0.082	0.082	0.113	0.113
Birth place + birth year	Yes	Yes	Yes	Yes	Yes	Yes
Exogenous covariates	Yes	Yes	Yes	Yes	Yes	Yes
Birth region × birth year	No	Yes	No	Yes	No	Yes
IV F-stat	26.60	20.65	18.45	15.66	11.01	6.07
Observations	13271	13271	7007	7007	6264	6264

Notes: Robust standard errors in parentheses are clustered at the level of birth place-year. The dependent variable is an individual's probability of having a higher education degree. The set of exogenous covariates includes gender, type of ethnic group, whether born in urban area, sex ratios in each province of each birth cohort, parent education levels, parent party membership, and parent occupation information. Survey year fixed effects are controlled. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

The estimate decreases slightly to 7.7 percentage points after controlling for the birth region and year interaction fixed effects. For the male sample, the expansion significantly increased a man's probability of going to college by 5.5 to 7.0 percentage points. Overall, the results show that the higher education expansion significantly increased the opportunity of obtaining a higher education for both women and men. Compared to men, women appear to receive a greater benefit in terms of obtaining a higher education.

To further examine the impact of higher education expansion, I plot the coefficients of the interactions between RHE_p and dummies of different birth cohorts in Figure 3 for the whole sample, the female sample, and the male sample. The plots connected by each solid line correspond to the coefficients of the interactions $RHE_p \times$ dummies of different birth cohorts in the education equation controlling for birthplace fixed effects, birth year fixed effects, and exogenous covariates. The birth cohorts aged 19-20 years in 1999 are treated as the reference group. As expected, for the cohorts aged 18 years and younger in 1999, the probability of attending university increased significantly.[15] Consistent with the results in Table 3, the positive effect is more evident and stronger for the female sample.

5.2 Gender Norms

In this section, I explore the question of whether higher education can affect gender ideology. I first present results for each of the five statements concerning gender-role attitudes in the CGSS questionnaires separately. The higher the score is, the more the respondent agrees
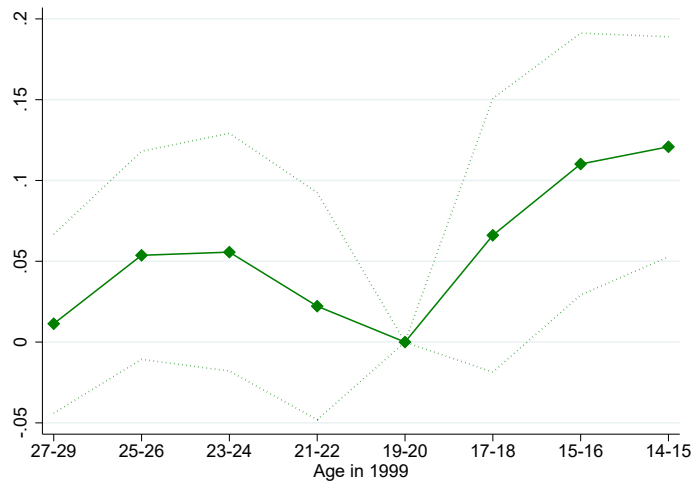
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[15]Notably, the small bump for the cohorts aged 23-24 and 25-26 years is likely caused by the small-scale higher education expansion during 1992 to 1993, which mainly affects the male sample. For the female sample, the pretrend is negligible.
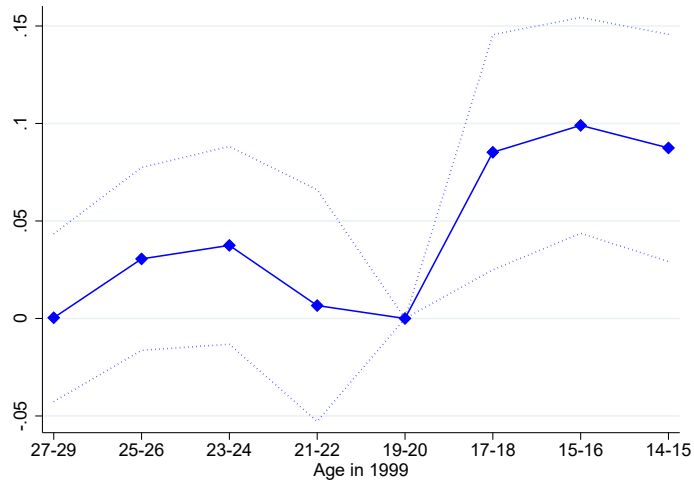
(a) The whole sample
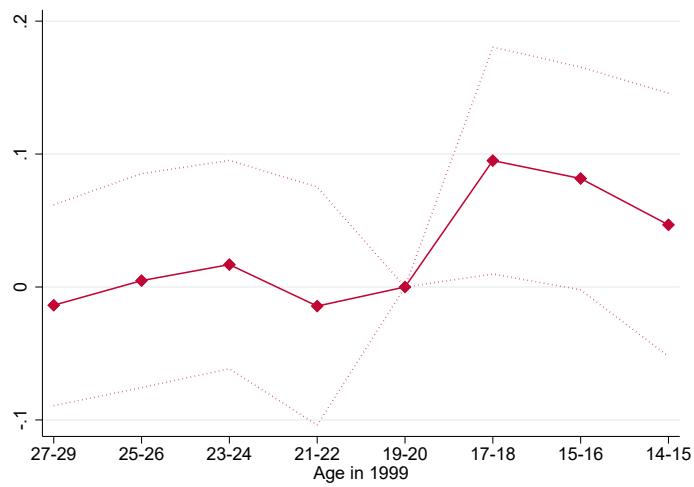
(b) The female sample

(c) The male sample

Figure 3: Higher Education Attainment by Birth Cohort

Note: The plots connected by each solid line correspond to the coefficients of the interactions $RHE_p \times$ dummies of different birth cohorts in the education equation controlling for birthplace fixed effects, birth year fixed effects, and exogenous covariates. The birth cohorts aged 19-20 years in 1999 are treated as the reference group. Dotted lines represent the corresponding 95% confidence intervals.

with the statement. Then, I estimate the results for a composite index of egalitarian gender-role attitudes based on the five statements to measure an individual's gender ideology. A higher value corresponds to a more egalitarian gender-role attitude.

The results for each of the five statements are presented in Table 4. Columns (1) and (2) present the OLS estimates, columns (3) and (4) report the IV results, and the estimates of the reduced-form regression are listed in columns (5) and (6). For each statement on gender-role attitudes, the OLS results generally indicate that higher education is negatively associated with gender stereotypes. However, the results may be due to the impact of omitted variables that correlate with an individual's higher educational attainment and affect his or her gender ideology. The outcomes from the IV and reduced-form estimates contradict the OLS results. In Panel I, the first statement is *"A man should focus more on his career, while a woman should focus more on her family"*. The IV estimates show a minimally significant impact of higher education on people's opinion concerning this statement. Similarly, there is no significant impact for the second statement *"Males are more capable than females by nature"*, as shown in Panel II. However, for the third statement in Panel III, *"For a woman, a good marriage gives her a better life than does a good job"*, higher education significantly increases people's approval by 2.017 to 2.353 points. The results for the fourth statement, *"When jobs are scarce, men should have more right to a job than women"*, is also unexpected. Higher education is significantly associated with an increase in approval of this statement by 1.536 to 1.789 points, as shown in Panel IV. An increased approval of these two gender discriminatory statements, which particularly devalue female labor participation, implies that women may face disadvantaged circumstances in the labor market after the expansion. Finally, the fifth statement is *"Husband and wife should share household chores equally"*. As shown in Panel V, the IV results indicate that higher education does not lead to an opinion on equal obligations between men and women in the household. Overall, the reduced-form estimates are consistent with the IV results.

Moreover, to obtain a general measure of gender ideology, I construct a composite index of egalitarian gender-role attitudes using the average value of the five measures after recoding the first four statements to have the same direction as the fifth statement and standardizing each statement to obtain a Z-score. Using the composite index as the dependent variable, I present the estimates in Table 5. Although the OLS results in columns (1) and (2) indicate a significantly positive correlation between higher education and egalitarian gender-role attitudes, the IV estimates in columns (3) and (4) show that higher education significantly decreases the egalitarian level of people's gender-role attitudes by 0.846 to 1.078 standard deviations. Consistently, the reduced-form results in columns (5) and (6) indicate that the higher education expansion decreases the egalitarian level of gender norms for the cohorts that are most likely to be affected by the reform. To understand the situation and to further explore gender differences, I perform the reduced-form analysis for the female and male samples separately and present the results in columns (7)-(8) and (9)-(10). Surprisingly, the

Table 4: Effects of Higher Education on Views about Statements of Gender-role Attitudes
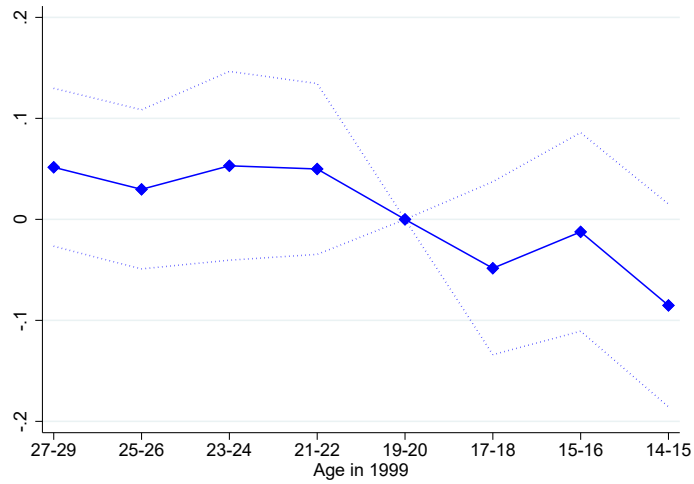
	OLS		IV		Reduced Form	
	(1)	(2)	(3)	(4)	(5)	(6)
I. "A man should focus more on his career, while a woman should focus more on her family."						
High Education	−0.249	−0.251	0.932	0.054		
	(0.039)***	(0.039)***	(0.598)	(0.646)		
Young × Rich HE resources					0.071	0.004
					(0.045)	(0.045)
Mean of Dep. Variable	3.378	3.378	3.378	3.378	3.378	3.378
Observations	13256	13256	13256	13256	13256	13256
II. "Males are more capable than females by nature."						
High Education	−0.213	−0.217	0.179	−0.189		
	(0.038)***	(0.038)***	(0.631)	(0.745)		
Young × Rich HE resources					0.014	−0.013
					(0.048)	(0.053)
Mean of Dep. Variable	2.854	2.854	2.854	2.854	2.823	2.823
Observations	13238	13238	13238	13238	13238	13238
III. "For a woman, a good marriage brings her a better life than a good job does."						
High Education	−0.118	−0.124	2.017	2.353		
	(0.038)***	(0.038)***	(0.729)***	(0.921)**		
Young × Rich HE resources					0.156	0.165
					(0.048)***	(0.053)***
Mean of Dep. Variable	3.042	3.042	3.042	3.042	3.042	3.042
Observations	13215	13215	13215	13215	13215	13215
IV. "When jobs are scarce, men should have more right to a job than women."						
High Education	−0.140	−0.145	1.789	1.536		
	(0.030)***	(0.030)***	(0.614)***	(0.629)**		
Young × Rich HE resources					0.137	0.108
					(0.039)***	(0.040)***
Mean of Dep. Variable	2.014	2.014	2.014	2.014	2.014	2.014
Observations	13179	13179	13179	13179	13179	13179
V. "Husband and wife should share household chores equally."						
High Education	0.019	0.019	−0.866	−0.673		
	(0.032)	(0.032)	(0.533)	(0.608)		
Young × Rich HE resources					−0.067	−0.047
					(0.040)*	(0.042)
Mean of Dep. Variable	3.824	3.824	3.824	3.824	3.824	3.824
Observations	13245	13245	13245	13245	13245	13245
Birth place + birth year	Yes	Yes	Yes	Yes	Yes	Yes
Exogenous covariates	Yes	Yes	Yes	Yes	Yes	Yes
Birth region × birth year	No	Yes	No	Yes	No	Yes

Notes: Robust standard errors in parentheses are clustered at the level of birth place-year. Panels I-V present an individual's propensity to agree with Statements 1-5, respectively, from 1 = totally disagree to 5 = completely agree. The set of exogenous covariates includes gender, ethnic group, whether born in an urban area, sex ratio in each province of each birth cohort, parent education levels, parent party membership, and parent occupation information. Survey year fixed effects are controlled. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.
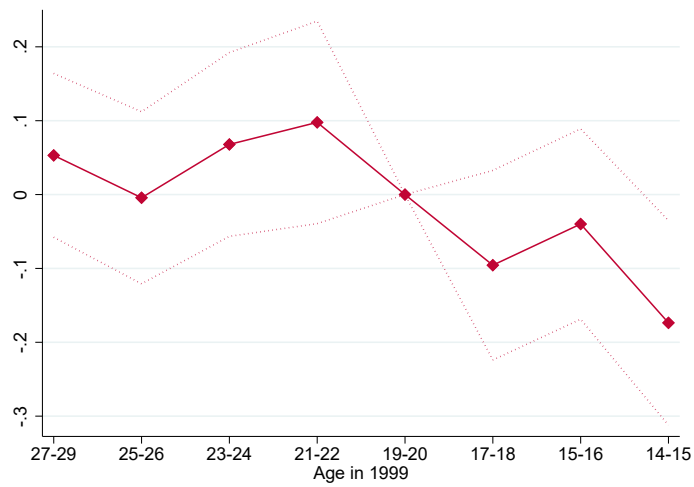
Table 5: Effects of Higher Education on Composite Index of Gender-role Attitudes

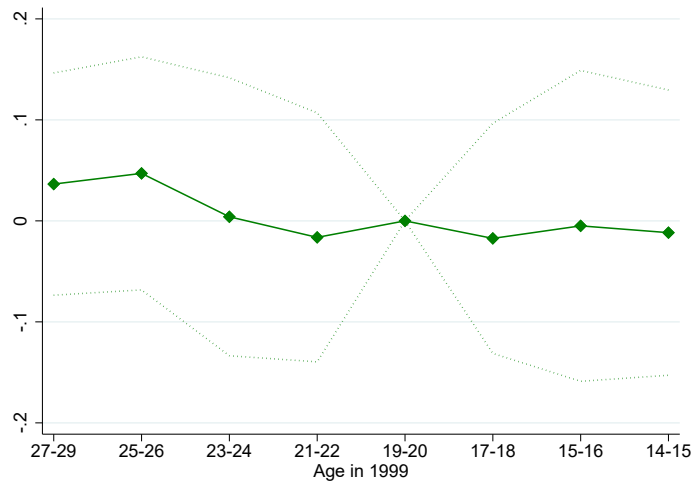| Dependent Variable:	OLS		Composite Index of Egalitarian Gender-role Attitudes IV		Reduced Form: All		Reduced Form: Females		Reduced Form: Males	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
High Education	0.130 (0.020)***	0.133 (0.020)***	-1.078 (0.373)***	-0.846 (0.406)**						
Young × Rich HE resources					-0.082 (0.023)***	-0.059 (0.025)**	-0.150 (0.032)***	-0.127 (0.034)***	-0.014 (0.035)	0.004 (0.039)
Mean of Dep. Variable	-0.0006	-0.0006	-0.0006	-0.0006	-0.0006	-0.0006	0.0577	0.0577	-0.0659	-0.0659
Birth place + birth year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exogenous covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Birth-region × birthyear	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	13263	13263	13263	13263	13263	13263	7004	7004	6259	6259

Notes: Robust standard errors in parentheses are clustered at the level of birth place-year. The dependent variable is a composite egalitarian index: the larger the value is, the more egalitarian is the person, and vice versa. The set of exogenous covariates includes gender, ethnic group, whether born in an urban area, sex ratio in each province of each birth cohort, parent education levels, parent party membership, and parent occupation information. Survey year fixed effects are controlled. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

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(a) The whole sample

(b) The female sample

(c) The male sample

Figure 4: The Level of Egalitarian Gender-role attitudes by Birth Cohort

Note: The plots connected by each solid line correspond to the coefficients of the interactions $RHE_p \times$ dummies of different birth cohorts in the education equation controlling for birthplace fixed effects, birth year fixed effects, and exogenous covariates. The birth cohorts aged 19-20 years in 1999 are treated as the reference group. Dotted lines represent corresponding 95% confidence intervals.

results show that the higher education expansion has significantly reduced the egalitarian level of gender-role attitudes for women. For men, the estimates are relatively small and insignificant. Figure 4 illustrates the results by plotting the coefficients of the interactions between RHE_p and dummies of different birth cohorts. For women, the egalitarian level of gender norms declines, whereas for men, the level is roughly unchanged.

Overall, the results indicate that the higher education expansion itself did not have any fundamental effect of changing people's gender ideology from traditional views to more egalitarian and progressive ones. On the contrary, the evidence suggests that attitudes became more traditional, especially toward gender-roles in the labor market and the household. The higher education expansion affected mainly females and their attitudes about gender roles. Notably, the OLS results suggest that higher education is associated with egalitarian gender-role attitudes. One potential reason for the divergence between the OLS and IV results is omitted variables that relate to both higher education attainment and progressive gender ideology. Another likely reason is that the IV recovers the local average treatment effect on the "compliers", *i.e.*, the individuals who had a chance to enroll in college only due to the expansion policy. These individuals might be different from their peers who were already able to gain higher education and might end up with different educational and labor market outcomes, causing a discrepancy in attitudes about gender norms.

5.3   Labor Market Outcomes

The labor market is another crucial channel through which higher education could affect women's empowerment. Understanding the impact of the expansion on the labor market would also help to interpret the results on gender ideology. In this section, I examine the impacts of higher education expansion on labor market outcomes.

Table 6 Panel I reports estimates on labor force participation. Although the OLS results show that higher education is positively correlated with an individual's probability of working, the IV estimates and reduced-form results suggest a statistically insignificant effect on labor force participation after the expansion. Additionally, the ITT effects for the female and male samples separately indicate that the expansion significantly decreased women's probability of working by 5.4 percentage points, after controlling for the birth region and year interaction fixed effects, while for men, the estimates are positive, though nonsignificant. The results suggest that although the expansion brought greater opportunities to women in higher education, it did not promote women's participation in the labor market. These results are in line with previous findings on the labor market effect of higher education expansion in China (Knight et al., 2017; Li et al., 2008, 2014; Ou and Zhao, 2016), which argue that the expansion raised the unemployment rate or reduced the labor force participation rate among college graduates, especially female graduates, who had more difficulties in job

Table 6: Effects of Higher Education on Employment

	OLS		IV		Reduced Form: All		Reduced Form: Females		Reduced Form: Males	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
I. Dependent Variable: Probability of Working										
High Education	0.114	0.113	0.034	−0.260						
	(0.009)***	(0.009)***	(0.195)	(0.228)						
Young × Rich HE resources					0.003	−0.018	−0.013	−0.054	0.012	0.012
					(0.015)	(0.016)	(0.025)	(0.027)**	(0.015)	(0.016)
Mean of Dep. Variable	0.799	0.799	0.799	0.799	0.799	0.799	0.691	0.691	0.921	0.921
Observations	13271	13271	13271	13271	13271	13271	7007	7007	6264	6264
II. Dependent Variable: Log Annual Income										
High Education	1.198	1.189	1.069	0.513						
	(0.076)***	(0.076)***	(1.524)	(1.753)						
Young × Rich HE resources					0.086	0.039	0.073	−0.028	0.056	0.073
					(0.124)	(0.134)	(0.224)	(0.242)	(0.101)	(0.102)
Mean of Dep. Variable	9.049	9.049	9.049	9.049	9.049	9.049	8.088	8.088	10.077	10.077
Observations	11968	11968	11968	11968	11968	11968	6183	6183	5785	5785
III. Dependent Variable: Weekly Working Hours Gap between Husband and Wife among Working Couples										
High Education	0.096	0.092	25.381	24.413						
	(0.627)	(0.623)	(12.904)**	(14.493)*						
Young × Rich HE resources					2.284	2.094	0.888	0.751	4.131	3.791
					(1.017)**	(1.130)*	(1.326)	(1.448)	(1.583)***	(1.745)**
Mean of Dep. Variable	3.706	3.706	3.706	3.706	3.706	3.706	4.404	4.404	2.879	2.879
Observations	7211	7211	7211	7211	7211	7211	3911	3911	3300	3300
Birth place + birth year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exogenous covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Birth-region × birthyear	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Robust standard errors in parentheses are clustered at the level of birth place-year. In Panel I, the dependent variable is an individual's probability of working. In Panel II, the dependent variable is the logarithm of an individual's annual income (inflation-adjusted). In Panel III, the dependent variable is, among working couples, the gap in weekly working hours between husband and wife. The set of exogenous covariates includes gender, ethnic group, whether born in an urban area, sex ratio in each province of each birth cohort, parent education levels, parent party membership, and parent occupation information. Survey year fixed effects are controlled. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

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seeking (Li et al., 2008; Ou and Zhao, 2016), and a large number of female graduates did not find jobs and were working informally at home (Li et al., 2014). Furthermore, to check the employment trend, I plot the coefficients of the interactions between RHE_p and dummies of different birth cohorts in Figure 5 for the whole sample, females, and males. For women, there is a decline in employment after the expansion, whereas for men, no such decline is observed.

Moreover, the effect of higher education on an individual's income is estimated and reported in Table 6 Panel II. The outcome variable is the logarithm of individual annual income, which is converted to 2015 prices using the Chinese CPI. No significant effects on income for women or men are observed after the expansion. Again, the OLS estimates show a positive correlation between higher education and income. The differences between IV and OLS could be driven by omitted variables and complier characteristics.

Furthermore, I check the gap in weekly working hours between husband and wife among working couples.[16] The IV estimates in Table 6 Panel III show that higher education increases the gap in weekly working hours between husband and wife by 24 to 25 hours. The ITT effect is approximately two hours. The subsample analysis by gender shows that after the expansion, a man is more likely to work longer than his wife by approximately four hours per week. However, the impact on the female subsample is minimal.

The labor market outcomes indicate that the higher education expansion did not have a positive effect on promoting women's career opportunities and income in the labor market, at least not for the sample considered in this study. On the contrary, women were likely to have a decreased probability of working. For men, however, no declines in labor force participation were observed. After the higher education expansion, gender inequality and women's disadvantaged status in the labor market appear to have intensified, probably due to the devaluation of a college degree after the expansion, when the supply of college graduates and thus competition increased dramatically. The results imply the existence of gender discrimination in the current labor market of China and reflect the traditional division of labor, which is rooted in gender norms. A similar scenario might be found in South Korea in the 1990s, where highly educated women were less likely to be employed because an adequate supply of highly educated men provided employers with few incentives to disobey social patriarchal preferences (Brinton et al., 1995).

The findings suggest that the higher education expansion itself, although it has increased women's higher educational attainment, is not effective in changing change gender norms and eliminating gender discrimination in the labor market. The results on labor market

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[16]The gap is defined as how many more hours per week a husband works than his wife works. Working couples are defined as couples where both husband and wife report working positive hours in a week. I use the sample of working couples instead of couples to avoid the confusion of nonworking and nonreported working caused by potential nonresponse in the surveys.
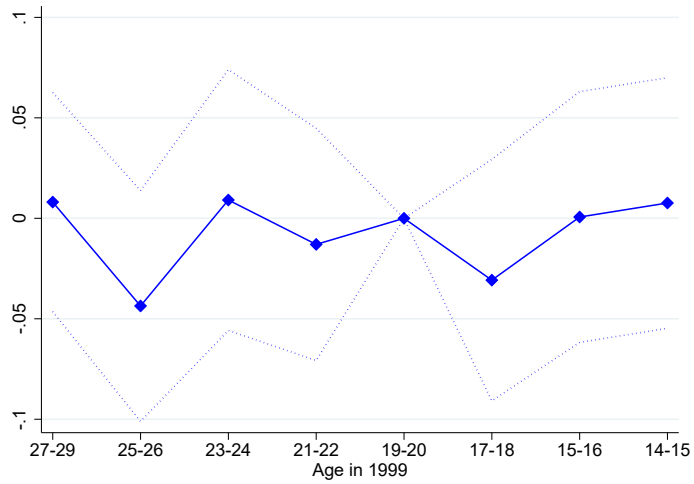
(a) The whole sample
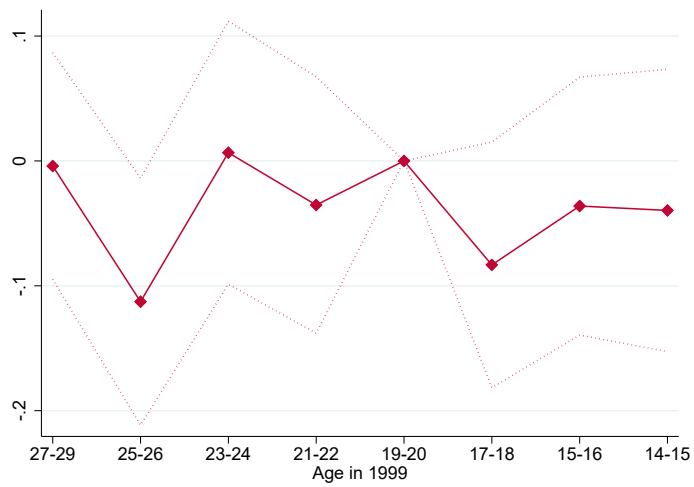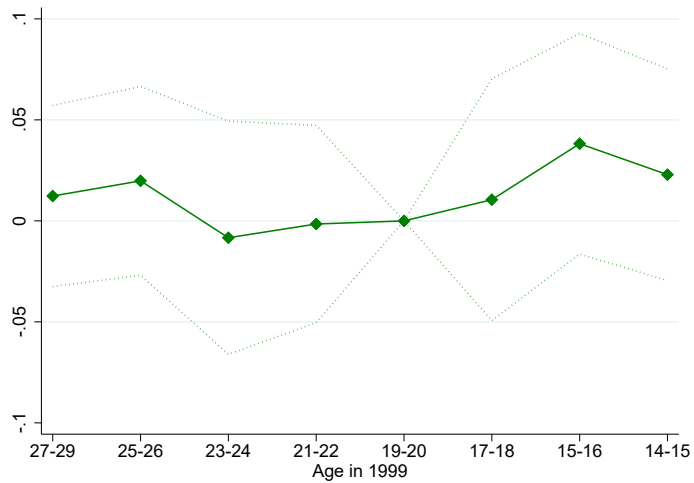
(b) The female sample

(c) The male sample

Figure 5: Probability of Working by Birth Cohort

Note: The plots connected by each solid line correspond to the coefficients of the interactions $RHE_p \times$ dummies of different birth cohorts in the education equation controlling for birthplace fixed effects, birth year fixed effects, and exogenous covariates. The birth cohorts aged 19-20 years in 1999 are treated as the reference group. Dotted lines represent the corresponding 95% confidence intervals.

outcomes may, to a large extent, explain the findings in the last section that the higher education expansion did not change gender-role attitudes from traditional to egalitarian and that women tend to have negative and self-deprecating views on labor force participation. The primary reason is that increased higher education opportunities and equality for women in educational attainment did not lead to increased opportunities and equality in the labor market. Women were more likely to be victims of increased competition and gender discrimination in the labor market after the expansion. As predicted in the theoretical framework, increasing women's labor force participation and labor income are vital for female empowerment. Unfortunately, the empirical evidence does not show an increase in job opportunities or relative wages for women.

5.4 Marriage Market Outcomes

Marriage market outcomes could also influence gender-role attitudes and intrahousehold specification. To further understand and interpret the results, I check whether the higher education expansion has affected marriage market outcomes.[17]

Table 7 Panel I reports the results of the higher education expansion on marital status. The higher education expansion significantly decreased the marriage rate by 4.4 to 6.4 percentage points. This trend was driven by the effect on females. Figure 6 directly illustrates the trend: a sharp decline is observed in the probability of marriage for the female sample. For the male sample, there are more fluctuations than an apparent decrease. Additionally, as shown in Panel II, there are no significant impacts on an individual's age at first marriage, which implies that the decline in marriage rate was not caused simply by postponing marriage due to a prolonged period of education. The results indicate that the higher education expansion had a gender-asymmetrical impact on the marriage market; that is, women with higher education had a lower marriage rate than their male counterparts.

As documented by Du et al. (2015); Ong et al. (2018); Qian and Qian (2014), the popular pattern of marriage formation in China follows the traditional practice of hypergamy, that is, women tend to "marry up" and prefer men who are older and have higher education and income levels than themselves, while men tend to "marry down" and prefer younger women and place more value on a partner's good looks than high education. The results in Table 7 Panel III provide some evidence of this marriage pattern. Among married couples, higher education expansion significantly increased the probability of having a higher-educated spouse for women by 6.2 to 6.9 percentage points, while there was no significant impact for men. Under the traditional practice of hypergamy, women have stronger preferences for assortativeness in education than men do. If women choose only men with at least the same

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[17]Considering many factors could affect marriage market equilibrium, the exclusion restriction may not hold. Therefore, I focus on reduced-form regressions under the framework of DiD to estimate ITT effect in this section.

Table 7: Effects of Higher Education on Marriage Market

|	OLS		All		Females		Males	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
I. Dependent Variable: Probability of Marriage								
High Education	−0.026	−0.024						
	(0.013)**	(0.013)*						
Young × Rich HE resources			−0.064	−0.044	−0.068	−0.049	−0.052	−0.036
			(0.019)***	(0.021)**	(0.021)***	(0.022)**	(0.027)*	(0.030)
Mean of Dep. Variable	0.880	0.880	0.880	0.880	0.912	0.912	0.843	0.843
Observations	13259	13259	13259	13259	7000	7000	6259	6259
II. Dependent Variable: Age at First Marriage								
High Education	1.766	1.786						
	(0.104)***	(0.105)***						
Young × Rich HE resources			0.087	0.173	0.250	0.289	−0.103	0.054
			(0.134)	(0.135)	(0.165)	(0.164)*	(0.184)	(0.198)
Mean of Dep. Variable	23.969	23.969	23.969	23.969	23.186	23.186	24.907	24.907
Observations	11850	11850	11850	11850	6456	6456	5394	5394
III. Dependent Variable: Having a Higher-educated Spouse among Couples								
High Education	0.489	0.488						
	(0.017)***	(0.017)***						
Young × Rich HE resources			0.045	0.045	0.062	0.069	0.030	0.014
			(0.016)***	(0.017)***	(0.023)***	(0.024)***	(0.020)	(0.021)
Mean of Dep. Variable	0.087	0.087	0.087	0.087	0.091	0.091	0.081	0.081
Observations	11663	11663	11663	11663	6387	6387	5276	5276
Birth place + birth year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exogenous covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Birth-region × birthyear	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Robust standard errors in parentheses are clustered at the level of birth place-year. In Panel I, the dependent variable is an individual's probability of being married. In Panel II, the dependent variable is an individual's age at first marriage. In Panel III, the dependent variable is, among couples, the probability of having a higher-educated spouse. The set of exogenous covariates includes gender, ethnic group, whether born in an urban area, sex ratio in each province of each birth cohort, parent education levels, parent party membership, and parent occupation information. Survey city fixed effects and survey year fixed effects are controlled. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.
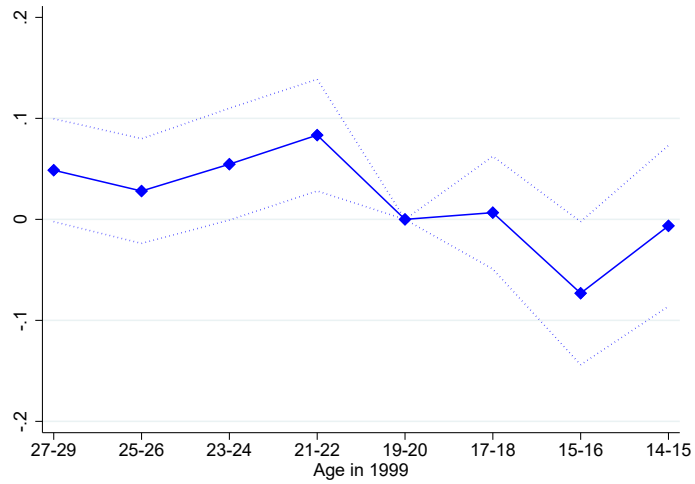
(a) The whole sample
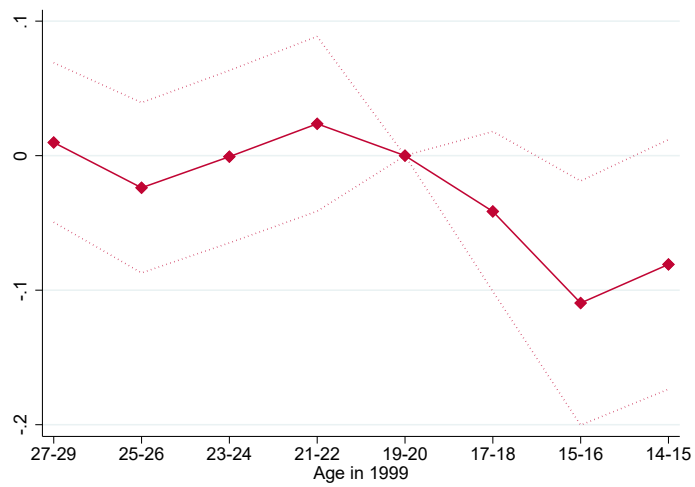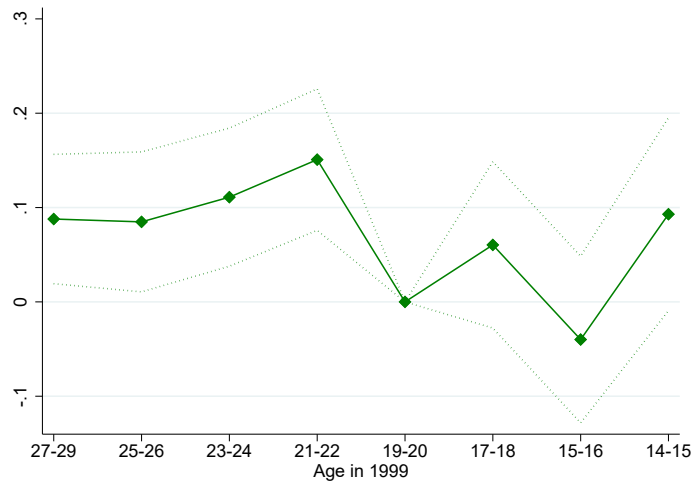
(b) The female sample

(c) The male sample

Figure 6: Probability of Getting Married by Birth Cohort

Note: The plots connected by each solid line correspond to coefficients of the interactions $RHE_p \times$ dummies of different birth cohorts in the education equation controlling for birthplace fixed effects, birth year fixed effects, and exogenous covariates. The birth cohorts aged 19-20 years in 1999 are treated as the reference group. Dotted lines represent the corresponding 95% confidence intervals.

or higher level of education, while men also accept lower-educated partners, then the higher education expansion has changed the number of desirable candidates in the marriage market disproportionately for women and men. Therefore, highly educated women are less likely to get married. This situation is consistent with the marriage market results in Table 7 and also with the real-life phenomenon that the media describe the increasing number of highly educated and professional single women in urban China as "leftover women" (Fincher, 2012; Magistad, 2013; Subramanian and Lee, 2011).[18]

The marriage market results could also explain why gender-role attitudes became more traditional after the expansion. The key reason is women's disadvantaged situation in the marriage market. As predicted in the theoretical framework, when searching for a partner in the marriage market, both women and men tend to prefer partners whose gender-role attitudes are similar to their own. Because men generally have more traditional gender-role attitudes than women, as shown in Table 1, women with more traditional gender-role attitudes should be more likely to get married than their peers with more progressive attitudes. The increased opportunities to get married with traditional gender norms and disadvantaged situations in both the labor and marriage markets may reinforce or revert women's gender ideology towards traditional views. Additionally, the evidence of the increased probability of women having a highly educated spouse after the expansion may imply that women are willing to contribute to marital surplus through domestic productivity since highly educated men have an advantage in being the breadwinner for the family.

5.5 Robustness Checks

5.5.1 Placebo Test

One of the key identifying assumptions of the empirical strategy is that regions with richer higher education resources (more university slots per capita) and regions with less higher education resources should not exhibit a differential trend in observable and unobservable characteristics that are correlated with an individual's probability of obtaining a college education and other outcomes of interest, apart from the higher education expansion. One concern that may arise is that regions with more higher education resources and regions with fewer higher education resources may have different pre-policy trends and thus are on different outcome tracks. To check if such different pre-policy trends exist, I conduct a placebo test using individuals born between 1966 and August 1980, who should mostly be exempt from the impacts of the expansion policy on their education, as a placebo sample for the test, and the sample size is close to that of the main sample of analysis. The placebo younger cohorts include individuals with birth years between 1974 and August 1980. The

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[18]The so-called "sheng nu" in Chinese.

Table 8: Placebo Tests on Policy-unaffected Cohorts

	All		Females		Males	
	(1)	(2)	(3)	(4)	(5)	(6)
I. Dependent Variable: Having a Higher Education Degree						
Young × Rich HE resources	0.011	0.007	0.012	0.010	0.010	0.006
	(0.012)	(0.011)	(0.015)	(0.014)	(0.016)	(0.017)
Mean of Dep. Variable	0.057	0.057	0.045	0.045	0.070	0.070
Observations	13171	13171	6922	6922	6249	6249
II. Dependent Variable: Composite Index of Egalitarian Gender-role Attitudes						
Young × Rich HE resources	−0.020	−0.005	−0.010	0.012	−0.027	−0.010
	(0.021)	(0.022)	(0.030)	(0.031)	(0.032)	(0.034)
Mean of Dep. Variable	-0.0007	-0.0007	0.0315	0.0315	-0.0363	-0.0363
Observations	13161	13161	6917	6917	6244	6244
III. Dependent Variable: Probability of Working						
Young × Rich HE resources	0.007	−0.007	0.016	0.009	−0.000	−0.022
	(0.016)	(0.016)	(0.025)	(0.027)	(0.015)	(0.016)
Mean of Dep. Variable	0.805	0.805	0.716	0.716	0.903	0.903
Observations	13171	13171	6922	6922	6249	6249
IV. Dependent Variable: Probability of Marriage						
Young × Rich HE resources	0.006	0.004	−0.003	−0.015	0.019	0.026
	(0.013)	(0.013)	(0.015)	(0.015)	(0.018)	(0.018)
Mean of Dep. Variable	0.923	0.923	0.936	0.936	0.909	0.909
Observations	13162	13162	6916	6916	6246	6246
Birth place + birth year	Yes	Yes	Yes	Yes	Yes	Yes
Exogenous covariates	Yes	Yes	Yes	Yes	Yes	Yes
Birth region × birth year	No	Yes	No	Yes	No	Yes

Notes: Robust standard errors in parentheses are clustered at the level of birth place-year. In Panel I, the dependent variable is an individual's probability of having a higher education degree. In Panel II, the dependent variable is a composite egalitarian index: the larger the value is, the more egalitarian is the person, and vice versa. In Panel III, the dependent variable is an individual's probability of working. In Panel IV, the dependent variable is an individual's probability of being married. The set of exogenous covariates includes gender, ethnic group, whether born in an urban area, sex ratio in each province of each birth cohort, parent education levels, parent party membership, and parent occupation information. Survey year fixed effects are controlled. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

results of the placebo tests are reported in Table 8. Panel I shows that for younger cohorts born in regions with rich higher education resources, the chances of attending a university did not differ from that of the other groups before the higher education expansion policy was introduced. This placebo test eliminates the concern of different time trends of unobservable characteristics concerning higher educational attainment of individuals between regions with rich higher education resources and others. Moreover, I conduct the same placebo test for the main outcomes of interest, including gender-role attitudes, employment, and marital status, and present the results in Panel II to Panel IV. No significant differences are observed in any of the main outcomes of interest for the placebo sample of individuals who should not be affected by the higher education expansion.

5.5.2 PCA Composite Index

In addition to using a standardized average to construct a composite index of egalitarian gender-role attitudes, I apply PCA as an alternative means of creating a composite index to see if the results change with the method of constructing the index. The PCA is performed over the five Z-score variables after recoding the first four statements to have the same direction as the fifth statement. Then, the first principle component is used as a composite index of egalitarian gender-role attitudes since it is the variable that accounts for the largest proportion of the variance of the five measures. With the PCA composite index as the dependent variable, the estimates of the effect of higher education expansion on gender-role attitudes are presented in Table 9 for the whole sample and by gender. The results are similar to the estimates in Table 5. Therefore, the results of the impact of higher education on gender-role attitudes are robust to the method used to construct the composite egalitarian index.

6   Discussion and Conclusion

In this paper, I explore the effects of higher education on women's empowerment, taking advantage of the higher education expansion in China. The higher education expansion may potentially empower women through at least three channels: by increasing women's chances of going to college, by providing more job opportunities and a higher income for well-educated women in the labor market, and by shifting people's traditional gender ideology toward more egalitarian views for both men and women through the enlightening and liberalizing effect of higher education. Additionally, the higher education expansion could also affect marriage market outcomes. China's higher education expansion policy since 1999 provides an empirical case to study the impact of higher educational attainment on female empowerment in the context of a developing country with strong social norms

Table 9: PCA Composite Index of Egalitarian Gender-role Attitudes

Dependent Variable:	PCA Composite Index of Egalitarian Gender-role Attitudes									
	OLS		IV		Reduced Form: All		Reduced Form: Females		Reduced Form: Males	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
High Education	0.318 (0.045)***	0.325 (0.045)***	-2.120 (0.808)***	-1.553 (0.873)*						
Young × Rich HE resources					-0.166 (0.054)***	-0.111 (0.058)*	-0.327 (0.073)***	-0.260 (0.076)***	-0.007 (0.084)	0.018 (0.095)
Mean of Dep. Variable	0	0	0	0	0	0	0.0877	0.0877	-0.0981	-0.0981
Birth place + birth year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exogenous covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Birth-region × birthyear	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	13263	13263	13263	13263	13263	13263	7004	7004	6259	6259

Notes: Robust standard errors in parentheses are clustered at the level of birth place-year. The dependent variable is the PCA composite egalitarian index: the larger the value is, the more egalitarian is the person, and vice versa. The set of exogenous covariates includes gender, ethnic group, whether born in an urban area, sex ratio in each province of each birth cohort, parent education levels, parent party membership, and parent occupation information. Survey year fixed effects are controlled. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

and a traditional cultural background.

I present a stylized theoretical framework in a collective household setting to specify how the gender ideology of both partners could affect the intrahousehold bargaining power of a woman, female labor supply, and marital preferences. Implications from the model suggest that both men's and women's gender-role attitudes affect intrahousehold bargaining power and intrahousehold specialization regarding female labor force participation. A woman has greater power in intrahousehold specialization when she and her husband have more egalitarian gender-role attitudes and less power if she is in a more traditional household. An increase in female wage rates in the labor market increases a woman's balance of power in her household and reduces gender stereotyping about female labor force participation. Moreover, the framework predicts that both women and men prefer partners whose gender-role attitudes are similar to their own. Thus, higher education could increase gender equality if it effectively promotes liberalization in gender ideology for both women and men and benefits women in the labor market.

Exploiting China's higher education expansion beginning in 1999, I conduct an empirical analysis to estimate the causal effect of higher education on women's empowerment using the CGSS data for the years 2010, 2012, 2013, and 2015. The results show that the higher education expansion increased the probability of attending university for women. The findings provide a positive message that following the expansion, women have more opportunities for higher education, which serves as a fundamental stepping stone for higher occupational attainment.

However, contrary to intuition, the results show that women's gender ideology becomes more traditional, stressing their family-focused role, and women are likely to have more negative views on their labor force participation. No impact on men's gender-role attitudes is observed. The results indicate that higher education itself might not have a considerable effect on changing men's and women's gender-role attitudes to become more egalitarian and progressive under the context of China, a society with deeply rooted social norms and stereotypical gender ideology.

Exploring the impact of higher education on labor market outcomes clarifies the picture. I find a decline in women's probability of working following the expansion. Among working couples, the gap in weekly working hours between husband and wife increases for highly educated men. This finding may largely account for the facts that the education expansion did not have any effect on reducing gender stereotyping and that women had more traditional attitudes toward their own participation in the labor market since there is a negative effect on promoting labor force participation and no impact on raising labor income for females, which is essential for women's empowerment, as predicted by the theoretical model. Furthermore, after the expansion, highly educated women had declined opportunities to get married. As predicted by the theoretical framework, people tend to marry partners with similar gender-

role attitudes. Because men generally have more traditional gender ideology than women, to increase their chances of getting married, women may revert to traditional gender norms to avoid becoming "leftover women". Women may also be willing to contribute to marital surplus through domestic productivity since their husbands have an advantage in the labor market. Considering all these issues, education expansion policies may not be sufficient to solve the problem of a "stalled revolution".

Given the current situation of China and other similar countries with persistent gender inequality and rigid gender norms, the findings in this paper reveal that the higher education expansion policy did not eliminate the gender gaps in the labor market and the household. On the contrary, women became even more disadvantaged in both the labor market and the marriage market. Gender inequality in the labor market and the "stalled revolution" in the household are the main problems impeding the process of empowering females. Therefore, it is fundamental and critical to introduce policies that can directly improve the disadvantaged status of females and guarantee gender equality in the labor market, including equal job opportunities, fair career potentials, and equitable labor income. Moreover, it is important to encourage and promote family-friendly occupations and firms to help women overcome the dilemma between career and family (Goldin, 2014; Goldin and Katz, 2016). Such policies could, for instance, include a better-designed parental leave policy to facilitate the sharing of responsibility for child care and bread-winning between men and women. The results in this study are consistent with previous findings in the context of developing countries with traditional gender norms (Dinçer et al., 2014; Gulesci and Meyersson, 2016; Miyata and Yamada, 2016). Considering that the problems of gender discrimination and gender inequality exist in labor markets and households around the world, this study provides evidence and policy implications for a larger population that includes many countries.

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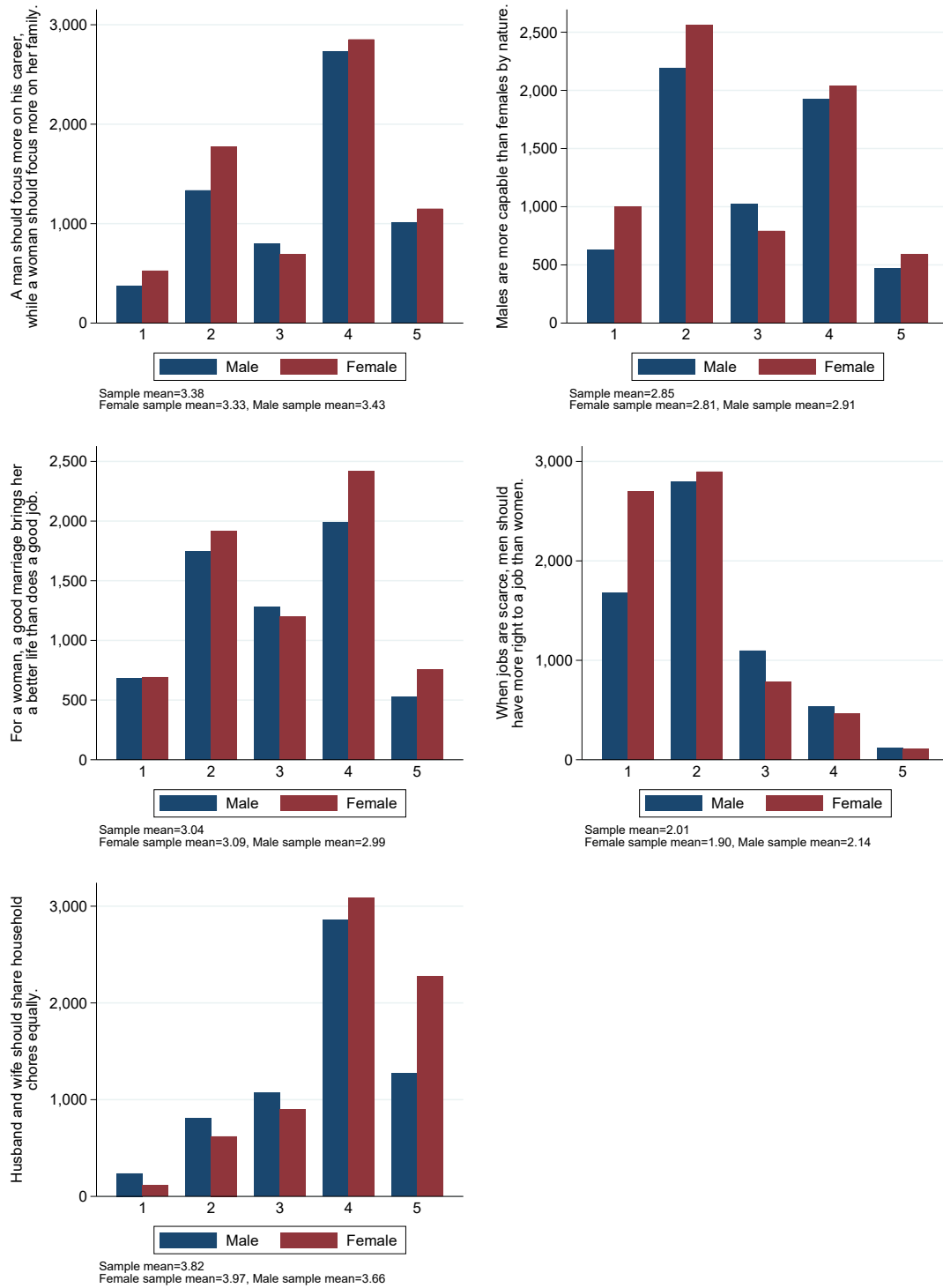
Appendix A

Figure A.1: Gross Enrollment Ratio in Tertiary Education
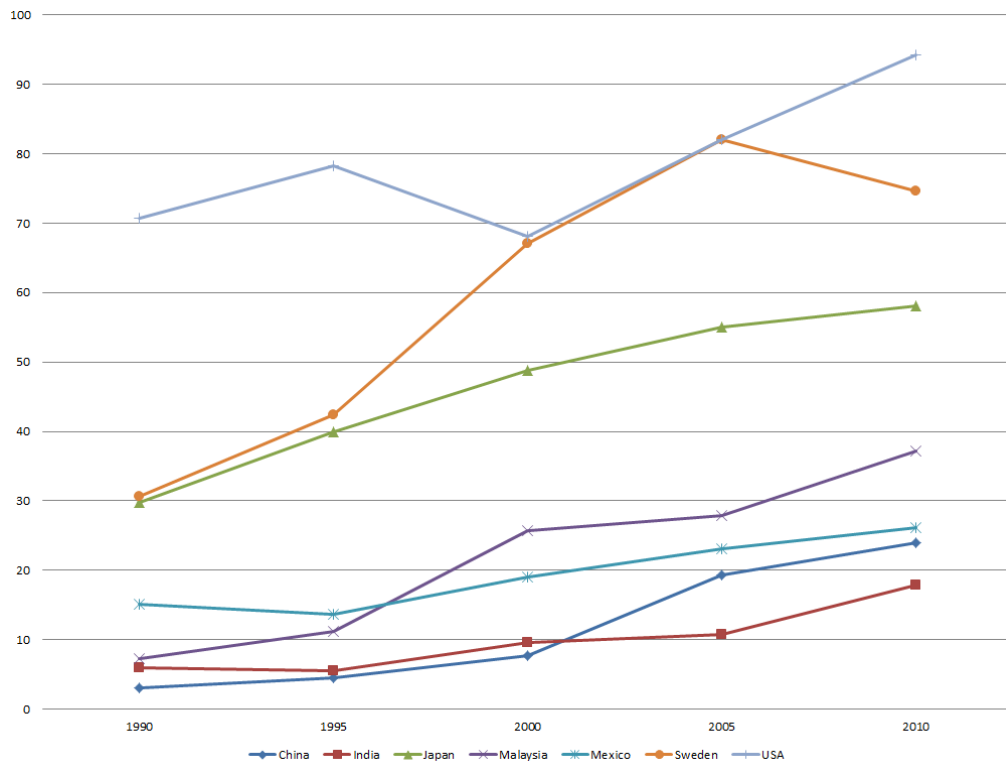
Note: Data from the UNESCO Statistic Database. The gross enrollment ratio is the total enrollment divided by the population of the official age group that corresponds to tertiary education.

Figure A.2: The Distribution of Reported Values of Statements on Gender Norms

Sample mean=3.38
Female sample mean=3.33, Male sample mean=3.43

Sample mean=2.85
Female sample mean=2.81, Male sample mean=2.91

Sample mean=3.04
Female sample mean=3.09, Male sample mean=2.99

Sample mean=2.01
Female sample mean=1.90, Male sample mean=2.14

Sample mean=3.82
Female sample mean=3.97, Male sample mean=3.66

Note: 1=Disagree strongly; 2=Disagree; 3=Neither agree nor disagree; 4=Agree; 5=Agree strongly.

Figure A.3: Normalized University Admissions Quota in 1998 across the Country

Source: National Bureau of Statistics of the People's Republic of China, author's calculations.

Appendix B Theoretical Derivations

B.1 The Slope of the Wife's Labor-supply Curve

In the theoretical framework in Section 2, the wife's labor supply curve is derived as

$$\frac{\omega}{p} = \theta C'_w(e, l_w) + (1 - \theta) C'_h(e, l_h). \tag{b.1}$$

We have $C_i(e, l_i) = \sigma \frac{(e - l_i)^2}{2}$, $i = w, h$, and $C'_i = \sigma(e - l_i)$. Then, (b.1) can be rewritten as

$$\frac{\omega}{p} = \theta \sigma(e - l_w) + (1 - \theta) \sigma(e - l_h). \tag{b.2}$$

Define an implicit function

$$F(\theta, e) = \theta \sigma(e - l_w) + (1 - \theta) \sigma(e - l_h) - \frac{\omega}{p}. \tag{b.3}$$

By taking partial derivatives of (b.3) with respect to θ and e, respectively, we have

$$F'_\theta = \sigma(e - l_w) - \sigma(e - l_h) = \sigma(l_h - l_w), \tag{b.4}$$

$$F'_e = \theta \sigma + \sigma - \theta \sigma = \sigma. \tag{b.5}$$

Hence, the slope of the wife's labor-supply curve can be determined by

$$\frac{\partial \theta}{\partial e} = -\frac{F'_e}{F'_\theta} = \frac{1}{l_w - l_h}. \tag{b.6}$$

There are two cases depending on the magnitudes of l_w and l_h:

Case I: If $l_w > l_h$, $\forall e$, then $\partial \theta / \partial e > 0$. The wife's labor-supply curve has a positive slope.

Case II: If $l_w < l_h$, $\forall e$, then $\partial \theta / \partial e < 0$. The wife's labor-supply curve has a negative slope.

B.2 Marital Payoff

By normalizing $p = 1$ and $n_w + n_h = 1$ and assuming the wife and husband have the same wage rate, ω, the household budget constraint $px = e\omega + Y$ can be simplified as $x = \omega$. Thus, individual i's utility function can be rewritten as

$$U_i = \omega - \sigma \frac{(e - l_i)^2}{2}. \tag{b.7}$$

Assuming that the intrahousehold equilibrium associated with each potential partner can be perfectly anticipated by people who are searching for partners in the marriage market, we can derive an individual's anticipated marital payoff by inserting the equilibrium intrahousehold specialization e^*, given by (13), into the utility function given by (b.7).

Let us start by deriving the marital payoff for a woman typed l_w from matching with a man typed l_h. As $e^* = \frac{l_w + l_h - b(l_w - l_h)}{2(1 - b(l_w - l_h))}$, then

$$e^* - l_w = \frac{l_i + l_j - b(l_i - l_j) - 2l_i(1 - b(l_i - l_j))}{2(1 - b(l_i - l_j))} = \frac{(l_i - l_j)(2bl_i - b - 1)}{2(1 - b(l_i - l_j))}. \tag{b.8}$$

Define $\theta_w = a + bl_w$ and $\theta_h = a + bl_h$; then, (b.8) becomes

$$e^* - l_w = \frac{(l_h - l_w)(1 - \theta_w)}{1 - (\theta_w - \theta_h)}. \tag{b.9}$$

Inserting (b.9) into (b.7), we obtain the woman's marital payoff U_{wh} as

$$U_{wh} = \omega - \rho_{wh} \frac{(l_w - l_h)^2}{2}, \tag{b.10}$$

where $\rho_{wh} = \sigma \left[\frac{1 - \theta_w}{1 - (\theta_w - \theta_h)} \right]^2$.

Similarly, the anticipated marital payoff for a man typed l_h from matching with a woman typed l_w can be obtained as

$$U_{hw} = \omega - \rho_{hw} \frac{(l_h - l_w)^2}{2}, \tag{b.10}$$

where $\rho_{hw} = \sigma \left[\frac{\theta_h}{1 - (\theta_w - \theta_h)} \right]^2$.