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Education, Marriage Squeeze and First Marriage Formation: Evidence from Modern China

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Abstract. This article studies the effects of educational attainment and the gender ratio of the population within the same educational category on marriage formation in the context of modern China. The empirical analysis is based on macro data from the China statistical yearbook and micro data from the Chinese General Social Survey. The results show that education has a delaying effect and an inhibiting effect on women's marriage formation, whereas education only has a delaying effect but no depressing effect on men's marriage formation. Moreover, we find evidence of “marriage squeeze” only for educated women and less-educated men. For these two groups, the sex ratio for individuals of the same level of education is an essential determinant of marriage outcomes, suggesting that college-educated women and less-educated men tend to marry mainly to spouses of their same education level. Overall, these results suggest that Chinese marriage behavior and mate selection preferences in terms of education have gender asymmetry and educational differences.

Keywords: China; First Marriage; Education; Educational Homogamy; Marriage Squeeze

JEL: J12, J16, I26, N35

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Contents

1 INTRODUCTION	3
2 BACKGROUND	5
3 LITERATURE REVIEW	10
3.1 EDUCATIONAL ATTAINMENT AND MARRIAGE FORMATION	10
3.2 MARRIAGE SQUEEZE AND MARRIAGE FORMATION	13
3.3 EDUCATIONAL ASSORTATIVE MARRIAGE	14
4 RESEARCH QUESTION	15
5 DATA	17
5.1 DATA DESCRIPTION	17
5.2 DATA PROCESSING	18
6 ANALYSIS AND DISCUSSION	19
6.1 EDUCATIONAL ATTAINMENT, MARRIAGE SQUEEZE AND THE AGE AT FIRST MARRIAGE	19
6.1.1 <i>Model Specification</i>	19
6.1.2 <i>Descriptive Statistics</i>	21
6.1.3 <i>Results</i>	24
6.2 EDUCATIONAL ATTAINMENT, MARRIAGE SQUEEZE AND MARITAL STATUS	29
6.2.1 <i>Model Specification</i>	29
6.2.2 <i>Descriptive Statistics</i>	30
6.2.3 <i>Results</i>	32
7 LIMITATION	36
7.1 ENDOGENEITY	36
7.2 CLASSIFICATION OF EDUCATIONAL ATTAINMENT	37
7.3 ACCURACY OF THE MEASUREMENT OF THE MARRIAGE SQUEEZE	37
8 CONCLUSIONS	38
9 REFERENCES	40
APPENDIX	44

1 Introduction

In China, the number of college students, as well as the percentage of female students enrolled in vocation colleges or universities, keeps increasing after the expansion of higher education in 1999 (Han 2010; Yeung 2013). The expansion of college enrollment increases the opportunities of the Chinese to receive higher education and the extension of schooling years also tends to increase their mean age at first marriage (Blossfeld and Huinink 1991; Qian 2012). According to the China 2000 Census (table 5-4) and China 2010 Census (table 5-3), the proportion of people with higher education (vocational college, university and graduate school) among the population aged 15 and over increased from 4.85% in 2000 to 10.89% in 2010. At the same time, the proportion of singlehood among the educated population also increased a lot since 2000 (e.g., the proportion is 31.1% in 2000, while 42.7% in 2010). This trend suggests that increased access to college education might be responsible for the increased share of singlehood.

On the one hand, compared with the proportion of people in developed countries with at least a post-secondary degree (e.g., this proportion is 45.2% in the US population in 2018 and 44.1% in the UK population in 2017¹), the average educational attainment of Chinese still has plenty of room for improvement. At the same time, the percentage of life-long non-marriage is quite low among Chinese². Therefore, it will be very interesting to explore the correlation between individuals' educational level and their first marriage formation in a marriage-universal country with an increasing trend of average education level and a decreasing trend of the gender gap in higher education. On the other hand, the postponement of first marriage or the reduction of marriage rate will also affect the population size and demographic structure in the future, as marriage is a universal setting of childbearing in China and the out-of-wedlock birth is relatively rare (Xie 2013). From this perspective, it is of great practical significance to investigate the determinants that affect the formation of marriage, especially in the context of low fertility and the aging of the population in China.

This study contributes to the existing marriage literature by updating the effect of educational attainment on first marriage formation in China after massive college expansion in 1999 and shedding light on the impact of educational marriage squeeze³, as indicated by province-level male-to-female gender ratio of the population within the same educational category, on marriage formation in the modern China context. There are little researches that relate

¹ Data source: UNESCO Institute for Statistics: Share of population by educational attainment, population 25 years and older (September 2019 Release)

² Data source: China 1990 Census, China 1995 One-percent Sample Survey, China 2000 Census, China 2005 One-percent Sample Survey, China 2010 Census and China 2013 Annual Population Change Survey (1% Survey). Between 1990 and 2013, more than 90% of men aged 35 and over were married, while more than 95% of women aged 30 and over were married.

³ The marriage squeeze is related to educational assortative mating in the marriage market. Marriageable population generally prefers to marry someone with a similar educational background and gender imbalance in the marriageable population within the same educational category will result in a male or female marriage squeeze.

marriage formation to the gender ratio⁴ of the population with a similar educational level (Raymo and Xie 2000; Smits 2003). Some researches that focus on the marriage squeeze pay more attention to the aggregate gender ratio of a cohort and do not consider their educational attainment (Tuljapurkar et al. 1995; Das Gupta et al. 2010; Jiang et al. 2014). However, when choosing a spouse, his or her educational attainment is an important factor and this consideration also increases apparently in the modern society, as educational attainment is positively associated with an individual's economic prospect and socioeconomic status (Goldscheider and Waite 1986; Han 2010; Greenwood et al. 2014). Besides, the preference of individuals to marry people with similar educational background has been confirmed in massive empirical researches (Smits et al. 2000; Smits 2003; Blossfeld 2009; Qian 2012), and the increasing trend of educational assortative marriage among college-educated population has been found in China since the 1970s (Han 2010; Qian and Qian 2014). Therefore, the gender imbalance in the marriageable population with similar educational attainment will result in a male or female marriage squeeze.

In this paper, we empirically study the effects of educational attainment and sex ratio of the population within the same educational category on Chinese young people's marriage formation, like the age at first marriage and the likelihood of getting married. We create an index to indicate the intensity of educational marriage squeeze: homogeneous educational sex ratio, which is the male-to-female sex ratio within one's own educational group. The empirical research of this paper is made up of two parts. First, we pick out the married respondents who first married in 2002-2015 from Chinese General Social Surveys (CGSS)⁵ and insert the matched homogeneous educational sex ratio from China Statistical Yearbook (2002-2016) to explore the effects of educational attainment and the homogeneous educational sex ratio on the age at first marriage by using multiple OLS regression models. We also try to identify gender differentials and educational differentials in these effects, e.g., whether the influence power of educational attainment on the age at first marriage is similar between men and women and whether the influence direction of homogeneous educational sex ratio on the age at first marriage is same among the population in different educational categories. Second, we combine unmarried respondents with married respondents and match them with homogeneous educational sex ratio to test the effects of educational attainment and the province-level homogeneous educational sex ratio on the probability of entry into first marriage by using multiple OLS regression models. We also explore the gender asymmetry and educational differences in these effects, e.g., whether education has opposite effects on the likelihood of marriage between women and men and whether homogeneous educational sex ratio has a similar "squeezing effect" on the population with and without higher education.

Our results show that the prolonged years of schooling tend to postpone the entry into the first marriage of men and women, whereas it only inhibits women's first marriage formation. The educational marriage squeeze, as indicated by the homogeneous educational sex ratio, tends

⁴ Without any specific clarification, the gender ratio in this paper refers to the male to female ratio of the population.

⁵ CGSS 2003, 2005, 2008, 2010, 2011, 2012, 2013 and 2015.

to increase the searching time and searching difficulty in the marriage market of women with post-secondary education and men without post-secondary education; for college-educated men and less-educated women, the gender imbalance in the population with the same educational level does not significantly affect their marriage formation, as they might have a larger marriage pool⁶.

The paper is organized as follows: Section 2 introduces the background of higher education expansion and trends in marriage in modern China, including mean age at first marriage, marriage rate and educational assortative marriage. Section 3 reviews the previous researches on the association between educational attainment and marriage formation, the effect of marriage squeeze on marriage formation and the trend in educational assortative marriage to derive our research questions in Section 4. Section 5 briefly describes the macro and micro datasets employed in this paper. Model specifications and discussions of the results are presented in Section 6. Section 7 sorts out the limitations and Section 8 concludes the paper.

2 Background

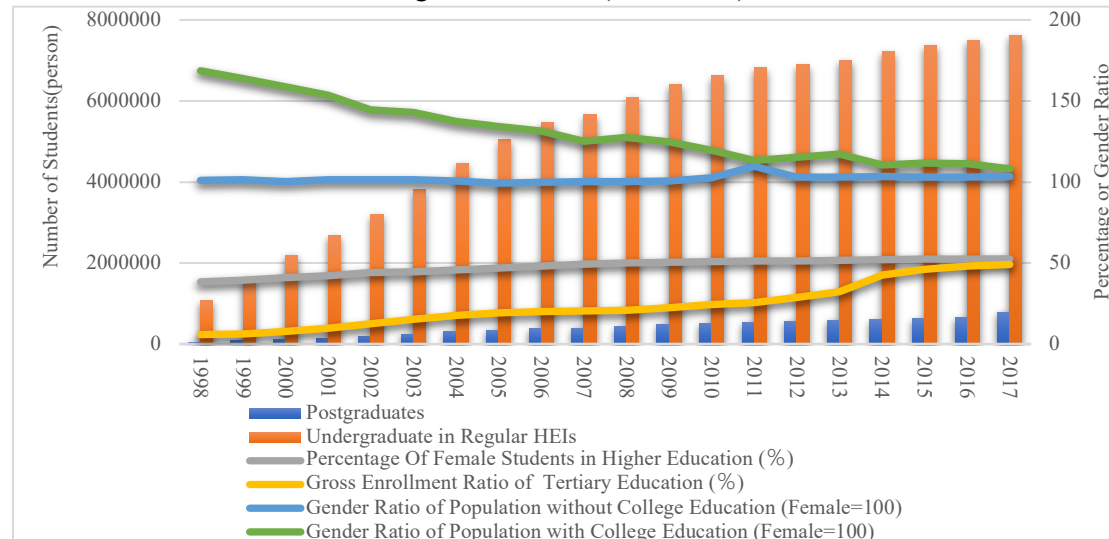
The expansion of college enrollment in China started in 1999. Since then, the number and the proportion of the Chinese population with higher education have increased significantly. As shown in Figure 2.1, the number of enrolled students in regular higher educational institutions (vocational colleges and academic universities) reached 7.6 million in 2017, which is about seven times that of 1998. The number of graduate students enrolled was 80 thousand in 2017, which is about 11 times that of 1998. According to the China 2000 Census (table 1-8) and 2010 Census data (table 1-8), the number of populations with vocational colleges degree, regular universities degree and above soared from 44.2 million in 2000 to 181 million in 2010. The proportion of the population (aged 6 and over) with a college education also increased from 3.8% in 2000 to 9.5% in 2010. The gross enrollment ratio of tertiary education from the UNESCO Institute for Statistics also confirms this trend of higher education expansion in China. At the same time, gender inequality in higher education has also decreased in the past 20 years.

As can be seen in Figure 2.1, the proportion of female students enrolled in higher educational institutions keeps rising since 1998. The ratio of female students exceeded 50% for the first time in 2009 and reached 52.54% in 2017. In line with this trend, the male-to-female gender ratio of the population with at least post-secondary degrees (green line in Figure 2.1) also decreased quickly in the same period, while the male-to-female gender ratio of their counterparts with less education did not change very much in the past twenty years.

⁶ Less-educated women and college-educated men are more likely to across the educational boundaries in the marriage market. For example, less-educated women could either choose better-educated men or less-educated men as their husbands, while educated women are reluctant to marry down. On the contrary, educated women could either choose educated women or less-educated women as their wives, while it is difficult for less-educated men to marry up.

Compared with the smooth expansion of college education before 1999, e.g., the gross college enrollment ratio⁷ only increased from 1.13% in 1970 to 2.97% in 1990, the sharply increasing number of college graduates will have a more significant influence on the labor market and the decreasing gender ratio among the college-educated population will also affect the marriage market, as most college graduates belong to the working-age and marriage-age population.

Figure 2.1: Enrollments in Higher Education and The Percentage of Female Students in Higher Education (1998-2017)



Source: China Education Statistical Yearbook (1999-2017); UNESCO Institute for Statistics; China Statistical Yearbook (1999-2017)⁸

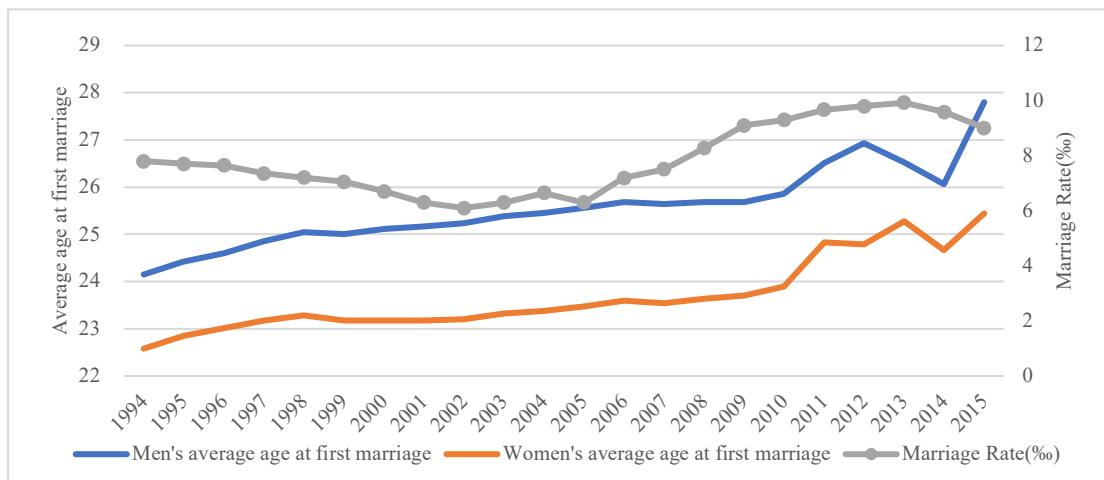
Attending college will delay the college students' entry into the marriage market (Blossfeld and Huinink 1991; Qian 2012) and might influence their attitudes towards marriage and their selection criteria for a spouse (Shu 2004), and thus affect their timing into marriage and marriage odds. For example, college graduates have higher odds of finding a college-educated spouse than their less-educated counterparts, as educated men are more likely to meet educated women when they are in college, and vice versa. Moreover, variation in gender ratio of marriage-age population will also have impacts on marriage formation by changing the searching time and searching difficulty for an ideal partner in the marriage market (Sautmann 2011; Jiang et al. 2014). For example, the decreasing gender ratio in university enrollments makes it relatively more difficult for college-educated women to find men with similar or higher education background. Therefore, what will be the changing track of marriage patterns (age at first marriage, marriage rate and educational assortative marriage) in China under the background of the college enrollment expansion and the narrowing gender gap in the higher education?

⁷ Data source: UNESCO Institute for Statistics(uis.unesco.org): school enrollment, tertiary(% gross), China

⁸ Number of enrollments (postgraduates and undergraduate) in regular higher education institutions and the percentage of female students come from China Education Statistical Yearbook, the gross enrollment ratio of tertiary education is from UNESCO Institute for Statistics(uis.unesco.org), the aggregate gender ratios of population aged six and over with and without college education are from China Statistical Yearbook.

If most young people choose not to marry, then the marriage rate in China should keep a downward trend. If the majority chooses to postpone their first marriage, the average age at first marriage will keep rising. As Figure 2.2 illustrates, both male's and female's mean age at first marriage is in an upward trend. This steady increase in the mean age at first marriage suggests that prolonged schooling might have a “delaying effect” on the first marriage formation. As shown in Figure 2.3, the age at first marriage of the better-educated population is generally greater than that of less-educated people and this phenomenon can be found among men and women, e.g., in general, college graduates get married later than high school graduates.

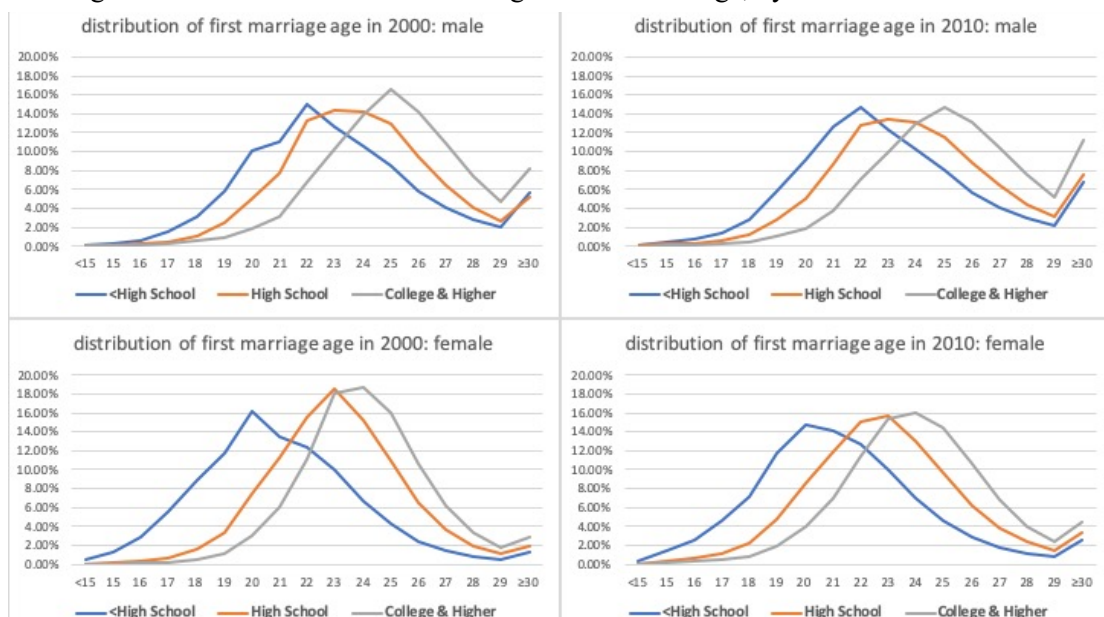
Figure 2.2: Marriage Rate and The Mean Age at First Marriage in China (1994-2015)



Source: China Civil Affairs Statistical Yearbook (2002-2017) and CGSS Dataset (2011-2015)

Note: the average age at first marriage in 1994-2010 is from China Civil Affairs Statistical Yearbook (2002-2010), the average age at first marriage 2011-2015 is author's rendering of CGSS data (2011-2015)

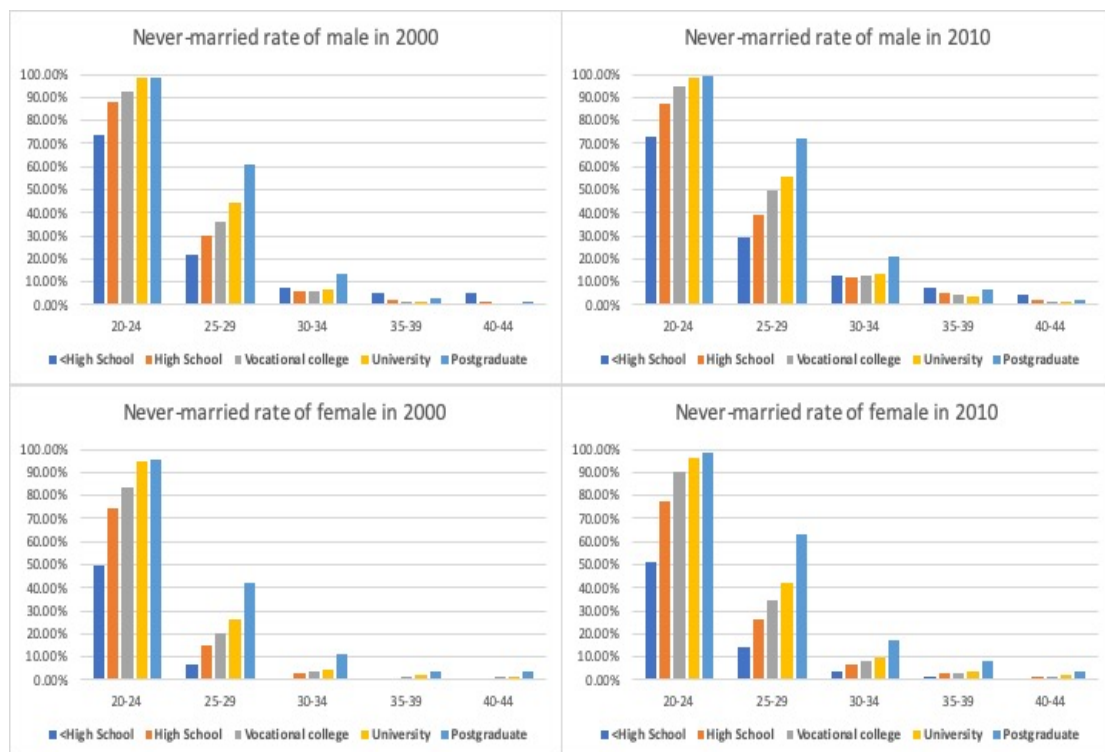
Figure 2.3: The Distribution of The Age at First Marriage, by Education and Gender



Source: Author's Rendering of China 2000 Census and China 2010 Census

As for the part of the marriage rate in Figure 2.2, it initially showed a smoothly downward trend in 1994-2002 but began to increase in 2002. We know that 2002 is the graduation year of the first batch of students (enrolled in 1999) who have undergone the expansion of university enrollment. If the improvement in the educational attainment of the marriage-age population is not conducive to marriage formation, then China's marriage rate should appear a downward trend or at least not an upward trend. However, China's marriage rate (2002-2013) continues to rise in the context of higher education expansion. Do current Chinese young people merely postpone entering into the marriage market but not forgo marriage?

Figure 2.4: Never-Married Rate, by Gender, Age and Education



Source: Author's Rendering of China 2000 Census and China 2010 Census

Figure 2.4 depicts the never-married rate of males and females by age group and educational level in 2000 and 2010. First, the overall never-married rate of women is lower than that of men. Second, we can see that the odds of a person staying single increases with educational attainment among males aged 20-29 and females aged 20-44.⁹ It is worth noting that, among men aged 35-44, those who with junior high school or lower education have the highest proportion of singlehood and we do not find this phenomenon in women's part. Third, the proportion of single men or single women of people aged 35-44 is quite low. It seems to be a piece of evidence supporting the view that education merely makes people postpone their marriage, but not forgo marriage. However, the never-married rate in all five age groups

⁹ For example, in 2000, among male in the 25-29 age group, the proportion of singlehood is 22.04% in men with junior high school or lower education, 30.20% in men with senior high school education, 35.92% in men with vocational college education, 44.09% in men with university education and increases to 60.58% in men with post-graduate degrees.

among people with tertiary education increased from 2000 to 2010¹⁰. Although we do not have the data on marriage rate by education and age after 2010, China's marriage rate has dropped for five consecutive years since 2013. Therefore, we can estimate that the proportion of single women and single men among the population with tertiary education is even higher in the recent five years, which implies that more and more highly educated population at marriageable age tends to stay single. This phenomenon demonstrates that the highly educated population is likely to forgo marriage, which seems to be inconsistent with the previous view.

Table 2.1: Trends of Educational Assortative Marriage (1970-2008)

	Educational Homogamy ¹¹	College + College	College + College: Man	College + College: Woman
1970-1974	83.60%	4.18%	22.94%	63.91%
1975-1979	83.92%	5.61%	30.10%	64.71%
1980-1984	85.04%	5.81%	32.33%	67.56%
1985-1989	83.87%	10.96%	46.66%	75.22%
1990-1994	82.55%	15.04%	53.77%	76.85%
1995-2001	80.48%	18.05%	57.39%	74.68%
2000-2008	82.06%	21.99%	65.41%	77.68%

Note: the distribution of educational attainment among married couples from period 1970-1974 to 1995-2001 is author's rendering of Han's (2010) finding on China's educational assortative marriage (Table 1) and the data of 2000-2008 is from the results (Table 2) of Qian and Qian (2014).

When we look at the pattern of who marries who, in terms of educational attainment, we can also find some interesting trends. First, as we can see from the second column in table 2.1, the proportion of educational assortative marriage among all marriages occurred between 1970 and 2008 was always remained at a high level (higher than 80%). This stable trend implies that people generally have more opportunities to meet and marry someone with a similar educational background, e.g., college-educated population is more likely to meet their spouse while they are in the college. The third column presents the percentages of marriages formed between college-educated men and college-educated women in all marriages formed at a specific period of time. We can find an increasing trend of "high-quality" educational assortative marriage, that is, more and more marriages are formed by college-educated couples. For example, about four couples of the 100 couples who got married between 1970 and 1974 had post-secondary degrees, while about 22 couples of the 100 couples who got married between 2000 and 2008 were college graduates. This trend not only reflects the fact of increased access to university education but also suggests that college students' preferences for their spouse's educational attainment might also be changing. The last two columns report the path of changing in selection criteria concerning a spouse's educational level among

¹⁰ The proportion of singlehood among males aged 35-39 with tertiary education increased by 137%-189% from 2000 to 2010 and increased by 110%-128% among females in the same age group and same educational background.

¹¹ We divide the different educational levels from the Chinese education system into two categories: senior high school and lower level of education, college and higher level of education. Therefore, if a married couple is both from the same educational category, their marriage could be categorized into educational homogamy.

college-educated men and college-educated women. Compared with their male counterparts, female college graduates are more likely to choose a college-educated man as their husband. At the same time, men with higher education were also increasingly inclined to marry women with post-secondary education, as the proportion of educational assortative marriage of college-educated men between 2000 and 2008 is about three times that between 1970 and 1974. The high degree of educational homogamy and the increasing propensity of the well-educated population to marry someone from the same educational category inspire us to explore the impact of the gender ratio of the population within the same educational level on the marriage formation.

In sum, the decreasing gender inequality in higher education and the trend of later marriage make China an ideal laboratory to examine the leading explanations for marriage behavior that work well in western industrialized countries (Becker 1973; 1974; 1981; Oppenheimer 1988; 1997) or Asian countries (Raymo and Iwasawa 2005). In addition, the high level of educational homogamy in marriages formed in 1970-2008 and the increasing probability of college graduates choose a spouse with educational similarity also support our idea of using homogeneous educational sex ratio as an indicator to measure the strength of marriage squeeze. Overall, it will be exciting to explore the impacts of educational attainment and marriage squeeze, as measured by the homogeneous educational sex ratio, on the formation of first marriage in the context of modern China.

3 Literature Review

We separate the literature review into three parts. It first begins by reviewing relevant literature for discussing the impact of educational attainment on marriage formation in different countries and different periods and its gender difference, then followed by the literature on the relationship between marriage squeeze and marriage formation. At last, we introduce the research on educational assortative marriage.

3.1 Educational Attainment and Marriage Formation

Education is one of the crucial individual attributes in the marriage markets (Blossfeld and Huinink 1991; Qian and Preston 1993; Smits 2003).

The leading explanation for delayed marriage is the economic independence hypothesis, that is, females' economic prospect measured by employment, income and educational attainment discourages their early entry into marriage (Goldscheider and Waite 1986; Oppenheimer 1997; Ono 2003). First, attending college or university tends to improve an individual's age at first marriage by crowding out the time used initially to search for a potential mate and delaying the entry into the marriage market, as most college students are at a marriageable

age. Based on the event-history analysis of female marriage formation in German society, Blossfeld and Huinink (1991) argue that pursuing a tertiary degree and prolonged years of schooling have an obvious effect on delaying female's entry into first marriage. A similar effect of education on postponing first marriage also exists in American and Japanese women's marriage formation process and the delayed timing of marriage is longer among better-educated women (Raymo 2003; Isen and Stevenson 2010).

In general, educational attainment is positively correlated with economic prospects or career prospects. Therefore, the well-educated marriageable population tends to set higher criteria, e.g., similar or higher educational level and higher income, for their future partners and are reluctant to marry someone who does not reach their minimum acceptable level. According to Oppenheimer's marriage-search model (1988), this will result in longer searching time for the desired mate in marriage markets and thus improve the age at first marriage.

Previous researches that investigate the impact of educational attainment on the likelihood of entering into marriage are mainly focused on women's marriage behaviors. There are two opposite views of this effect. The first one is that educated people have a relatively low probability of getting married. This view can be traced back to Becker's specialization and trading theory (1973; 1974): a rational individual will choose to get married only if the utility of starting a family is higher than that of remaining single; otherwise, both parties will postpone and forgo marriage. Becker (1973) believes that males have a comparative advantage in taking on economic responsibilities and females have a comparative advantage in taking on domestic responsibilities. Under the traditional division of household responsibility, educated women have less incentive or motivation to start a family due to the relatively small gains from marrying men, as they invest more career-related human capital on themselves, contribute more time in market work that tends to reduce the time allocation for housework and have greater economic independence (Becker 1981). In addition, women generally marry earlier than men and tend to look for older partners under the pattern of traditional marriage. However, pursuing a tertiary degree will delay women's entry into the marriage market and the competition for eligible men will increase with age for women, as the supply (potential mates that meet the criteria) declines and the demand (more young women start to enter the marriage market) increases (Goldman et al. 1984). As a consequence, the likelihood of finding a partner or entering into a marriage will decrease with women's educational attainment.

However, Becker's specialization and trading theory faces more and more challenges along with the convergence of gender roles and the improvement of female labor force participation, especially in developed countries in Europe and the United States. There is little micro-level empirical research support Becker's argument, that is, women's educational attainment is not negatively correlated with their marriage outcomes (Oppenheimer 1994; 1997; Goldstein and Kenney 2001). For example, in the context of the US (1964-1990), there is no distinct difference in women's marriage rates among different educational groups and less-educated women even have lower marriage rates (Oppenheimer 1997). According to the marriage-search framework of Oppenheimer, females' economic prospect plays a positive

role in the formation of marriage in modern society (Oppenheimer 1988). In particular, under the convergent trend in the economic roles of males and females, women with higher earning potential tend to have a relatively high probability of finding a marital mate in the marriage market. Moreover, the literature of modern American women's marriage behaviors also finds evidence that contemporary college-educated females are more likely to marry than earlier cohorts with a similar educational background (Goldstein and Kenney 2001). Based on the analysis of the trend in marriage and remarriage in the United States from 1950 to 2000, Isen and Stevenson (2010) conclude that the drop of marriage rate is more severe among less-educated population and women with college degrees have higher marriage rates and remarriage rates than those of less-educated women. That is to say, although the improvement of people's educational attainment in these countries will result in an increase in the delayed marriage, it might not lead to a decline in the marriage rate; most of the educated women only choose to postpone their marriage, but not to forgo the marriage.

In addition, other empirical research adopting the method of "event history analysis" also confirm the argument that women's educational attainment has no adverse effect on their first marriage formation in the context of the United States and western European countries (Blossfeld and Huinink 1991; Lichter et al. 1992; Sweeney 2002). On the other hand, attending college makes it possible for young people of similar age to meet their future spouses in the school and the long-term school life provides them with more chances to interact with the opposite gender, and thus improves their searching efficiency for a potential mate in the future (Lefgren and McIntyre 2006).

Many empirical research and event-history analysis have demonstrated that education is not an adverse factor or even has a positive effect on the process of marriage formation in the context of western developed countries where gender roles are not highly segregated (Oppenheimer 1988;1994; Lichter et al. 1992; Lefgren and McIntyre 2006; Isen and Stevenson, 2010). However, studies on marriage behaviors in countries where female's and male's economic roles are highly differentiated, such as Japan and some Asian countries, also find an opposite evidence, that is, females' economic prospect brought by the improvement of education and employment tends to reduce their probability of getting married, as the primary roles of female in these countries are still wife, mother and homemaker (Ono 2003; Raymo 2003). According to the marriage market mismatch hypothesis (Raymo and Iwasawa 2005), Japanese women's growing economic independence and economic dependence on their husband coexist at the same time and the low marriage rate of educated women is caused by the shortage of educated men and the prevailing marriage pattern (hypergamy) among Japanese women. Therefore, when we study the role of educational attainment on marriage formation in a specific country, the degree of gender role differentiation in this context should be taken into consideration.

Generally speaking, there is a consensus that educational attainment has a delaying effect on the age at first marriage of females and males in different countries, including western European countries, the United States and some Asian countries. However, the effect of education on the possibility of entering into the first marriage is inconclusive, as it depends on

the prevailing marriage match pattern (hypergamy or hypogamy) and the degrees of gender egalitarianism and sex-role differential within the particular country, as individuals' preferences for their potential spouses are commonly influenced by the persistent social norms and contextual characteristics.

3.2 Marriage Squeeze and Marriage Formation

In the context of the monogamous marriage system, the imbalance between supply and demand of marriageable men and women in the marriage market will increase searching time, searching difficulty and the risk of nonmarriage. Marriage squeeze is the most direct consequence of the abnormal sex ratio and sex ratio is a widely used measurement to indicate the intensity of marriage squeeze (Das Gupta et al. 2010). Gender imbalance in the marriageable population will increase one gender's searching difficulty of finding a desirable partner (Sautmann 2011; Jiang et al. 2014) and thus decrease their likelihood of entering into a marriage (Oppenheimer 1988).

Based on the analysis of 1985 Current Population Survey, Bennett, Bloom and Craig (1989) develop an explanation that marriage squeeze contributes to the decreasing marriage rates of black and white women in the United States. According to the event-history analysis of Lichter et al. (1992), the gender imbalance measured by local deficits of eligible men in the marriage market tends to increase the difficulty of entering into a marriage for both black women and white women in the United States. Hesketh and Xing (2006) explore the causes and outcomes of gender imbalance in Asian countries. In the case of China, they find that male-dominated gender imbalance is very unfavorable to unmarried males at the bottom stratum of wealth and with low educational attainment, as the marriage pattern of Chinese women is "up". In another paper which focuses on the marriage in some Pacific Asia countries, Jones (2007) also finds that "marriage squeeze" is more severe among well-educated women. Sautmann (2011) uses a two-sided matching model with the transferable utility to test the effects of India's marriage squeeze on marriage and dowries. Predictions of the model reveal the link between marriage squeeze and marriage age, that is, the shortage of men that meet their age preference will increase women's searching time and marriage age. Guilmoto (2012) applies longitudinal marriage simulation to analyze the consequences of marriage squeeze in the context of China and India. The results of China's part in three different scenarios present a positive association between marriage squeeze intensity and age at marriage for both men and women from 2010 to 2050 and a negative association between marriage squeeze indicator and the marriage prospect of men, which is measured by the proportion of singlehood for men at age 50.

Unlike the sex ratio defined in previous studies, Jiang et al. (2014) revise this indicator by taking into consideration the individuals' marital status, that is, the sex ratio of the never-married population. When using this indicator to quantify the magnitude of marriage squeeze, they find that marriage squeeze is a crucial contributor to increase males' age at first marriage and increase their difficulty of forming a family in China. In the other research conducted by

Jiang et al. (2016), they create a new squeeze indicator - spousal sex ratio, to estimate the strength of marriage squeeze in China and decompose this indicator into age and sex structure. According to their projection, there will be a female deficit in the marriage market of China from 2010 to 2050, which is in line with the finding of Goodkind (2006), and the dominant contributor (age structure or sex structure) to marriage squeeze might vary in different period, e.g., age structure is the main contributor from 2010 to 2020.

In sum, previous studies have shown that an excess of marriageable men or marriageable women will increase one side's difficulty of finding a spouse that meets the prevailing criteria, e.g., for well-educated women who want to marry men of their same education level, the narrowing gender gap in college enrollment numbers will reduce the probability of meeting an acceptable man; for less-educated men who want to find a spouse with a similar educational background, the improvement of female's educational level makes it even more difficult for them to enter into a marriage, and thus forcing them to postpone marriage or even forgo marriage.

3.3 Educational Assortative Marriage

It is difficult to give a complete explanation for the selection of a potential partner, but we can focus on some visible individual attributes that affect assortative marriage, e.g., age, income, job and educational attainment. When searching for a marital partner, people will set a series of standards, e.g., the range of age and income, the type of job and the level of education. Abundant empirical studies have found different degrees of educational homogamy in marriage and the preference of people to find a spouse with a similar educational background (Smits et al. 2000; Raymo and Xie 2000; Han 2010).

In the context of the United States between 1972 to 1987, Qian and Preston (1993) observe a noticeable trend of educational homogamy in white Americans' marriage (newlyweds), that is, the attractive force is quite high between marriageable population with the same educational background but is relatively low between individuals have large gaps in educational attainment. In line with Qian and Preston's findings, Schwartz and Mare (2005) also identify the decreasing likelihood of the college-educated population to "marry down" with respect to educational attainment and the increasing difficulty for people at the lowest educational strata to across the educational boundary in the marriage market in the United States during 1940-2003.

Smits, Ultee and Lammers's (2000) empirical research on the degree of educational homogamy and the trend in educational assortative marriage from 1940s to 1970s in 65 countries with different level of development demonstrates that East Asian countries with Confucian cultures, such as South Korea and Japan, have higher strength of educational homogamy than those with other religious backgrounds. While China should be, but not classified into Confucian countries as the strong antagonistic attitude towards religions of China's communist regime in the 1950s and 1960s, but the degree of educational homogamy

is also very high in China. In addition, the relationship between educational homogamy and economic development is in line with the inverted U-curve hypothesis. That is to say, educational homogamy is positively associated with the degree of economic development at first, and after reaching a certain stage, educational homogamy is negatively associated with the level of economic development. Focusing on the marriage behaviors of the well-educated population (with at least secondary education), Smits (2003) investigates the difficulty of crossing the educational boundary in the marriage market in 55 countries with different economic and cultural characteristics. He concludes that highly educated individuals have strong preferences to marry someone with the same educational level, especially in developing countries or Confucian countries. Based on the Fifth census data and 2001 DRHS, Han (2010) argues that the increasing trend of educational homogamy in Chinese marriage started in the 1980s. While in the context of urban China in the 2000s, educational assortative marriage is also a prevailing pattern of who marries whom in terms of education, as families formed by people with the same educational level accounted for more than 50% of the families formed in 2000-2008 (Qian and Qian 2014).

In sum, previous research has shown that, in the past decades, the marriage behavior of people in both western developed countries and developing countries reveals a propensity for educational homogamy in the marriage, although the strength of educational assortative marriage might vary across countries. In particular, people who have obtained college education are more inclined to choose the opposite gender with a similar educational background as their marital partner, and it is relatively more difficult for people at the low educational strata to across the educational boundary to marry up.

4 Research Question

In this part, we come up with the following research questions that are motivated by the previous study of the educational attainment and marriage squeeze affecting marriage formation:

1. To what extent will education induce to postpone the age at first marriage? Is there any gender asymmetry in this delaying effect?

On the one hand, attending more years of schooling will occupy the time originally used for searching in the marriage market (postpone the age at first marriage). On the other hand, it also enables a large number of marriageable-age population to gather together on the campus, long-term school life and many opportunities to contact opposite gender friends or classmates might increase the possibility of finding future spouses on the campus and improve their searching efficiency in the future.

2. How does educational attainment affect the likelihood of entering into first marriage and whether this effect has the same influence direction between men and women?

If Becker's (1973; 1974) specialization and trading theory could be applied to China's situation, we can expect a negative association between females' educational attainment and their odds of getting married but a positive association in males' part. Because women and men have different comparative advantages and household responsibilities within the family division, e.g., husband takes more responsibility in supporting the family financially and wife devotes more time and energy into the housework, while pursuing a higher education degree will improve individual's career prospect or earning potential and thus makes men more favorable in the marriage market, but reduces women's marriage prospect. If Oppenheimer's (1994; 1997) marriage-searching theory is able to explain China's marriage pattern, we could expect that schooling year is positively associated with either female's or male's likelihood of getting married because of the convergence of economic role between men and women. If the marriage market mismatch hypothesis (Raymo and Iwasawa 2005) works well in China's context, we could observe an adverse effect of education on females' odds of entering into marriage. Because women's standards of mate selection increase with their educational level, while the decreasing gender inequality in college education leads to a deficit of educated men and thus narrows educated women's marriage pool.

3. Given the trend of educational homogamy, how does the gender ratio of the marriageable population with a similar educational background affect their marriage timing and the likelihood of getting married? Do these effects have the same influence direction and influence force on people from different educational categories?

The odds or the difficulty of finding the desired spouse is largely depending on the number of the opposite genders that meet their own standards, to be more specific, the male to female share of the marriageable population in the marriage market. The high degree of educational homogamy and increasing preference of both college-educated women and men to marry someone from the same educational category (although men's preference is weaker than that of women, as educated men might still tend to marry down and educated women most likely do not.) tend to increase the marriage prospects of well-educated population, while the decreasing male to female ratio in higher education is likely to increase the difficulty of college-educated woman to find a partner with similar or higher educational level, as they are unlikely to marry down and thus there are fewer educated men whom educated women can marry. On the contrary, the increase in the proportion of women with high academic qualifications makes it more difficult for less-educated men to find a wife with the same or lower educational level.

5 Data

5.1 Data Description

In this study, we collect data from two distinct sources: China statistical yearbook and Chinese General Social Surveys (CGSS) to examine the effects of educational attainment and the gender ratio of the population within the same educational category on first marriage formation in China from 2002 to 2015.

First, China statistical yearbook is a national statistical publication that reflects the economics, social, political and culture development of China in recent years (Bureau C S 2000). It covers all provinces, autonomous regions and municipalities in China. More importantly, it includes statistics data of educational attainment by gender and province, which is the data source of the key explanatory variable (province-level homogeneous educational sex ratio) of this paper.

Second, Chinese General Social Surveys (CGSS) is a nation-wide study on general social trends that is jointly conducted by Hong Kong University of Science and Technology and Renmin University. It applies a multi-stage, stratified, random sampling method and covers all provinces, autonomous regions and municipalities except for Taiwan, Hong Kong, and Macau (Bian and Li 2012; Qian and Qian 2014). Although the survey design and sample size are not the same in different waves of CGSS¹² (Bian and Li 2012), it contains all key information that we need in this study.

The CGSS data are ideal for our study for the following reasons: First, CGSS provides representative and latest individual-level data, as it pertains to the civilian population of 31 provinces municipalities and autonomous regions from 2003 to 2015. Second, surveys collected the age, gender, occupation, home province, household registration status, marital status and educational attainment of the respondents, for those who are married, the age, gender, occupation, home province, household registration status and educational attainment of their spouses at the time of survey are also available. We do not know their educational attainment when they got married, but these indicators should be similar as our paper focus on the newlyweds who got married after 2001 and the average time gap between the year of first marriage and the survey time is about five years (see descriptive statistics in table 6.1). Besides, continuing to pursue higher levels of education after marriage is rare in China (Han 2010; Qian and Qian,2014). Third, CGSS datasets also have information about the year of first marriage for those who are married, which makes it possible to match the province-specific and time-varying homogeneous educational sex ratio with these married respondents.

¹² 2003-2008 is the first phase of CGSS and five annual surveys have been completed. Currently, CGSS 2003, 2005, 2006 and 2008 are available on the China National Survey Data Archive (CNSDA) website (cnsda.ruc.edu.cn). 2010-2019 is the second phase of CGSS and CGSS 2010, 2011, 2012, 2013 and 2015 have been published online. In a word, we can get access to the CGSS 2003, 2005, 2006, 2008, 2010, 2011, 2012, 2013 and 2015 until now.

5.2 Data Processing

First, we assume that students are not ready to enter into the marriage due to the limitations of time, energy and economic independence and what we are really interested in is the educational level, thus we have to drop the student respondents to eliminate the effect of school enrollment, as being a student will significantly reduce the odds of getting married (Marini 1985; Blossfeld and Huinink 1991; Thornton et al. 1995; Raymo and Iwasawa 2005). The CGSS questionnaire survey includes a question like that “Have you finished your highest educational level?” and the replies include “ongoing”, “completed”, “dropped out or failed to accomplish”. In this study, we only choose respondents whose answer is “completed”. Because educational attainment is one of the key independent variables in this study, we want it to be as clear as possible, as dropping out from school or failing to accomplish the school makes it a little bit unclear when calculating a person’s schooling years.

Second, considering that most Chinese universities follow the four-year educational system, 2002 was the graduation time for the first batch of people who underwent the college enrollment expansion in 1999. Therefore, the proportion of people holds a post-secondary degree in the marriage pool began to increase from 2002. We can identify the educational differences in the effects of interest on an individual’s marriage outcomes more clearly, as the policy of higher education expansion helps us to have more variability in the data. However, we will not treat this college enrollment expansion as a source of exogenous variation in marriage decisions, as the starting year of CGSS is 2003 and all unmarried populations in the marriage market are affected by the enrollment expansion policy of colleges.

Third, the legal minimum age at marriage is 20 for women and 22 for men under Chinese law (Lindgren 2009). Besides, according to our tabulation of CGSS datasets, only very few people (smaller than 1%) get their first marriage after 40 years old. As a consequence, we only focus on the respondents aged between 20 and 40. For the part of the first marriage age, we restrict the analysis to respondents who have completed their studies at the time of surveys, first married between 2002 and 2015 and whose first marriage age is between 20 and 40. For the analysis of the likelihood of first marriage, we choose unmarried respondents and first married respondents who were aged between 20 and 40 at the time of the surveys and had complete information about their educational attainment and marital status. Fourth, the age at second or higher-order marriage is more likely to be larger than the age at first marriage; thus, this part might induce to an overestimation of the effects of education and marriage squeeze on marriage age. Therefore, we only focus on the first married couples to avoid these potential biases.

The determination of schooling year is based on the highest degree completed and the Chinese education system¹³. We do not have to consider an individual’s possibility of

¹³ In China, the schooling year of primary school is generally 6 years, junior high school is 3 years, senior high school or high school level professional school is 3 years, vocational college is 3 years, the undergraduate education is 4 years and the graduate education is about 2-5 years. We code 0 as the schooling year for people who never attended school formally, 3 for people with traditional apprentice learning (si shu), 6 for people with

educational upgrading in the future, as once a marriage-age individual leaves school and he or she will automatically enter the marriage market. We can study the effect of the highest educational level this individual had obtained at the time of survey on his or her marriage outcomes. As for the likelihood of pursuing a higher degree in the future, it is beyond our consideration and it is just personal heterogeneity. Finally, we get 7423 respondents and 11437 respondents that meet the above criteria, respectively, for the analysis in the next two sections.

In order to calculate the homogeneous educational sex ratio, we divide the educational attainment into two levels: senior high school and lower-level education, college and higher-level education. Then, based on the statistics data of educational attainment by gender and province from China statistical yearbook (2002-2016), we calculate the province-specific, two-level and male-to-female homogeneous educational gender ratios from 2001 to 2015. In order to match the information of homogeneous educational sex ratio with the respondents, we also group the respondents into two categories according to their educational attainment. Those who have finished higher education (vocational college, university and graduate school) at the time of survey are regarded as college-educated population and those who have not received any college education are regarded as less-educated population. This classification of educational attainment will reveal the impacts of educational attainment and homogeneous educational sex ratio on the marriage formation among people at different educational levels more clearly. We match the province-level homogeneous educational sex ratio at the year of the survey with never-married respondents and match the province-level homogeneous educational sex ratio one year before their first marriage with married respondents, as people are still in the marriage market before they get married, to test the effect of marriage squeeze on first marriage formation.

6 Analysis and Discussion

6.1 Educational Attainment, Marriage Squeeze and The Age at First Marriage

6.1.1 Model Specification

In this part, we want to explore the effects of educational attainment (measured by schooling years) and the male-to-female gender ratio of the population within the same educational

primary school education, 9 for people with junior high school education, 12 for people with a vocational high school or technical school, high school level professional school and senior high school education, 15 for people with vocational college education, 16 for people with academic college, university, other regular higher education, 19 for people with graduate education.

level on the age at first marriage, and try to identify the gender difference and educational difference of these effects.

This part of the study first sheds light on the effect of homogeneous educational sex ratio on the age at first marriage, as no prior study uses the homogeneous educational sex ratio to measure the intensity of marriage squeeze and explores its effect on the age at first marriage. Besides, our study also updates the effect of education on the age at first marriage after 2010. We combine individual-level data from the CGSS dataset and province-level data from China Statistical Yearbook to examine how changes across individuals in educational attainment and changes across provinces in “marriage squeeze” will affect people’s first marriage age. We also explore the gender asymmetry of these effects by separating the analysis between men and women and also separate the analysis between population with and without post-secondary education to pick out the educational difference. To do this, we adopt a standard OLS regression for the age at first marriage.

$$(1) A_{ijt} = \beta_0 + \beta_1 edu_{ijt} + \beta_2 sr_{ijt} + \beta_3 age_{ijt} + \beta_4 hukou_{ijt} + \beta_5 work_{ijt} + \delta\gamma_j + \epsilon_{ijt}$$

$$(2) A_{ijt} = \beta_0 + \beta_1 edu_{ijt} + \beta_2 sr_{ijt} + \beta_3 age_{ijt} + \beta_4 hukou_{ijt} + \beta_5 work_{ijt} + \beta_6 fedu_{ijt} + \beta_7 medu_{ijt} + \beta_8 e_{ij} + \varphi\chi_{jt} + \delta\gamma_j + \epsilon_{ijt}$$

$$(3) A_{ijt} = \beta_0 + \beta_1 edu_{ijt} + \beta_2 sr_{ijt} + \beta_3 age_{ijt} + \beta_4 hukou_{ijt} + \beta_5 work_{ijt} + \beta_6 fedu_{ijt} + \beta_7 medu_{ijt} + \beta_8 e_{ij} + \beta_9 sr_{ijt} \times EduCategory_{ijt} + \varphi\chi_{jt} + \delta\gamma_j + \epsilon_{ijt}$$

Where the subscripts denote individual i , in province j , first married in year t ; age at the first marriage (A_{ijt} = year of first marriage – birth year) is the dependent variable; educational attainment (edu_{ijt}) measured by the years of schooling and province-level sex ratio of the population within the same educational category (sr_{ijt}) are the key independent variables in this analysis; $sr_{ijt} \times EduCategory_{ijt}$ in model (3) is the interaction term between the homogeneous educational sex ratio and a dummy variable indicating whether the respondent has post-secondary education; γ_j is a vector of province fixed effects- these will capture specific characteristics of each province, such as cultural and political factors; χ_{jt} is a province-specific and time-varying control variable of each province’s degree of social progress and gender equality¹⁴; ϵ_{ijt} is individual-specific error term. In model (3), the effect of one percentage point increase in homogeneous educational sex ratio on less-educated

¹⁴ We speculate that individual’s marriage behavior might be affected by the degree of progress of a province, e.g., if a woman lives in a more progressive province where women are more independent, then she might enter into a marriage later or she is more likely to stay single, thus we decide to include this province-specific and time-variant control. CGSS surveys (2010, 2012, 2013, 2015) contain questions about the attitude towards marriage and gender role and we use these answers to measure a province’s degree of progress. Respondents were asked to rate their responses from “strongly agree” to “strongly disagree” to the following two statements: “men should focus on career, while women should focus on family” and “women should value family more than a career”. We apply a 5-point method (1 = strongly agree, 5=strongly disagree) to code respondent’s answers and use this score as an indicator of the degree of social progress and gender equality. We take the average of these two scores of all respondents in a particular province and time to measure the time-varying degree of social progress and gender equality of a particular province. Based on the assumption that society is in an unceasingly progressive direction, we use interpolation to solve the problem of missing values in some years.

respondents' age at first marriage is captured by β_2 and captured by $\beta_2 + \beta_9$ for the college-educated respondents. β_9 shows the difference in the effect of homogeneous educational sex ratio on the age at first marriage between less-educated respondents to those that have at least post-secondary education.

We also include other individual attribute variables, e.g., age, socioeconomic variables, such as household registration (hukou_{ijt} is a dummy variable which equals 1 if individual i lives in urban area), and work status (work_{ijt} is a dummy variable which equals 1 if individual i has work experience), family background measured by parents' educational level (fedu_{ijt} and medu_{ijt}) and the degree of economic development of home province measured by economic zones (e_{ij}), into the model. The reason for including parents' educational attainment is that parents' attitudes and family socioeconomic background play an important role in influencing offspring's marriage behavior (Waite and Spine 1981; Jennings et al. 2012), as parents' educational attainment is a proxy of socioeconomic background of original family (Ono 2003; Raymo 2003) and will affect their beliefs towards marriage (Shu 2004). For example, people who grow up in family with educated parents are less likely to engage in too-early marriages (Waite and Spine 1981). We use work experience, not the current employment status as the description for work status¹⁵, as we do not have information about the respondent's work status at the time of marriage. Finally, we present robust standard errors in the main tables. As our respondents are from 31 provinces and the size is too small to cluster the standard errors at province level. However, we will report the standard errors from different error correction methods in the Appendix.

We first analyze the male and female respondents separately to explore the heterogeneous effects by gender, then analyze male and female respondents by two educational levels to explore the heterogeneous effects by educational category. We expect that more years of schooling will postpone individuals' entry into first marriage and the shortage of desired partners with similar educational attainment will extend people's searching time.

6.1.2 Descriptive Statistics

Table 6.1 lists the variables and descriptive statistics, including sample size, mean value, maximum, minimum and standard deviation. Among these 7423 respondents, the mean age at first marriage is 25 years old and the mean age at the time of survey is 30 years old, which implies the average time gap between their first marriage and survey time is about 5 years. On average, respondents have 11.5 years of schooling, which is about high school education level. Nearly 80% of the respondents have work experience and the mean homogeneous educational sex ratio is 110, while the variation of sex ratio seems to be substantial across provinces and time, as the standard deviation is near 20. Table A.1 reports two categories of

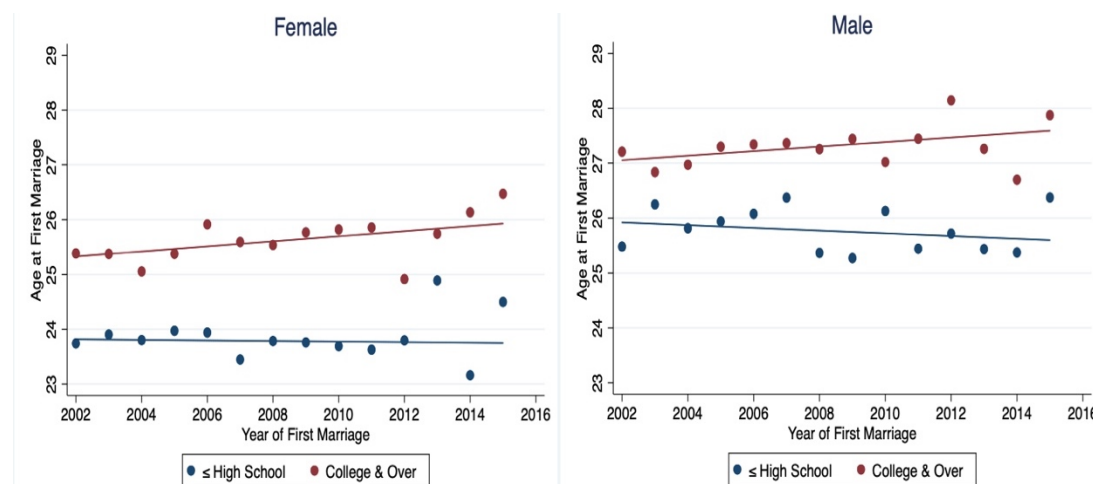
¹⁵ Because current employment status is possible to be inconsistent with the occupational status at the time of marriage, while work experience includes the past and current employment status. As a consequence, work experience is a better proxy for their occupational status in the year of first marriage. As for the coding of work status, we code 0 if the respondent has never worked before and 1 if the respondent is currently employed or once employed.

homogeneous educational sex ratio for all provinces between 2001 and 2015. In addition, the gender distribution and urban-rural distribution of our respondents are close to 1:1. For the family socioeconomic background measures, parents' educational level is generally very low, e.g., the average education year of respondents' father is about 7.8 years, and that of their mother is 6 years, which is at the primary school level. Province-specific attitude variable indicates the degree of social progress and gender equality, and the higher the score, the more progressive the province. We can see that the mean score is 2.6 and the variation of this score is quite small. From the economic region where the respondent is located, 47% of the respondents are in the east region, 31% are in the central region and the remaining 22% are in the western region.

Table 6.1: Descriptive Statistics for First Married Respondents

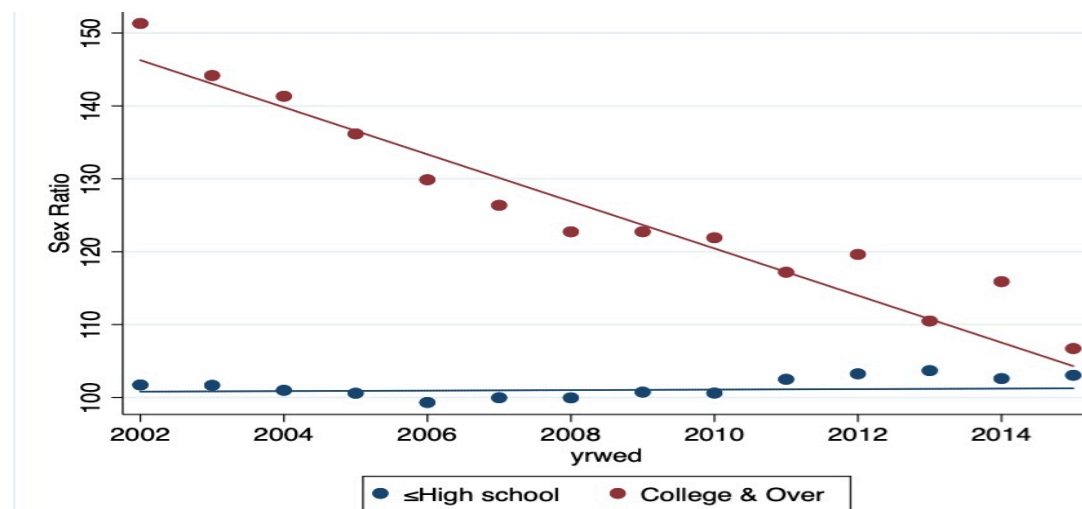
Variable	Sample size	Mean	Std. Dev.	Min	Max
First marriage age	7423	25.26728	3.462851	20	40
Age	7423	30.13674	4.704072	20	49
Gender (female=1; male=2)	7423	1.470026	0.4991343	1	2
Schooling year	7423	11.54183	3.521745	0	20
Homogeneous educational sex ratio	7423	110.2175	19.73086	47.67	253.99
Household registration (rural=0; urban= 1)	7423	0.4985855	0.5000317	0	1
Work status (never worked=0)	7423	0.7880911	0.4086882	0	1
Father's schooling year	7423	7.760474	3.857264	0	19
Mother's schooling year	7423	6.01172	4.169541	0	19
Attitude	7288	2.627386	0.3085934	2.01	3.42
Region					
East	7423	0.4715075	0.4992211	0	1
Central	7423	0.307827	0.4616257	0	1
West	7423	0.2206655	0.4147233	0	1

Figure 6.1: Trends of Age at First Marriage, by Gender and Educational Level (2002-2015)



The above graphs help us to observe the trend in mean age at first marriage and the differences between women (with and without post-secondary education) and men (with and without post-secondary education). We can observe a steeper increasing trend among our college-educated respondents but a flat trend among less-educated respondents, which implies an enlarging gap in the age at first marriage between college-educated population and their less-educated counterparts and we can also find that males (shown in right graph) generally get married later than females (shown in left graph).

Figure 6.2: Trends of Aggregate Gender Ratio of The Population within The Same Educational Category, by Educational Level (2002-2015)



Note: Female=100

Not surprisingly, the aggregate male-to-female gender ratio among the population with a post-secondary degree or higher-level education shows a downward trend and the aggregate male-to-female gender ratio among the population without college education did not change very much in the past fifteen years.

Table 6.2: Educational Assortative Marriage, by Gender and Education

Years of Schooling	Female			Male		
	All	≤ HS	≥ College	All	≤ HS	≥ College
Less than Spouse	28.61%	33.78%	16.85%	19.52%	25.06%	9.05%
Same as Spouse	51.9%	52.31%	50.97%	50.82%	51.25%	50%
Higher than Spouse	19.49%	13.91%	32.18%	29.66%	23.69%	40.95%
N of observation	3890	2703	1187	3355	2195	1160

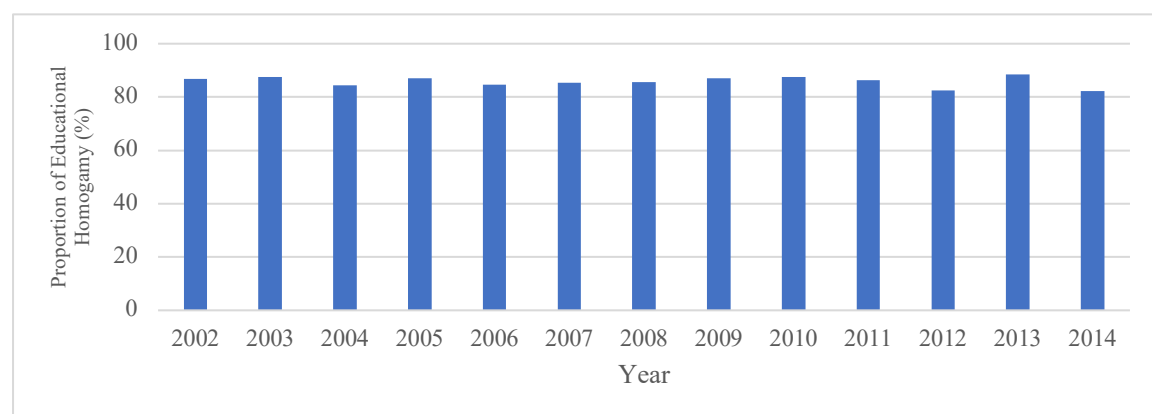
Note: ≤HS (Senior high school and lower level); ≥College (College and higher level)

When we use the years of education to measure the difference in educational level between husband and wife, we find out that more than half of (50%-52.31%) men and women have the same years of schooling as their partners. Nevertheless, there are some gender asymmetries in the preference for spouses' education. For example, nearly 30% of women are "marrying up" with respect to their spouse's education, and the proportion of less-educated women to start a

family with better-educated spouses (33.78%) is twice as high as that of college-educated women (16.85%). In addition, it is worth noting that the proportion of university-educated men who choose a marital partner with fewer years of schooling than themselves is very high (40.95%), which is the highest among all groups. However, it is not contradicted with the statement that the degree of educational homogamy is quite high in Chinese marriage, as the category of higher education includes vocational college, academic university and graduate school, thus couples who are categorized into the same educational level might not have same years of schooling. Besides, it is also possible that female graduate students marry male doctoral students, female undergraduates marry male master students and female vocational college students marry male undergraduates.

Next, if we classify the educational attainment into two categories, a distinct educational assortative pattern of who marries whom appears: about 85% of married people have a family with spouses from the same educational category, which is in line with the high degree of educational homogamy found in other two studies focus on the marriage in China (see Table 2.1). Therefore, homogeneous educational sex ratio is a plausible index to indicate the intensity of marriage squeeze in the marriage market.

Figure 6.3: Trend of Educational Homogamy (2002-2014)



6.1.3 Results

Table 6.3 presents the OLS estimated effects of educational attainment and homogeneous educational sex ratio on the age at first marriage from model (1), (2) and (3). The estimated effect from model (1) and (2) is consistent with our expectation that the length of education has a statistically significant postponing effect on the age at first marriage for both women and men. The higher the level of education, the older the age at first marriage, and this “delaying effect” is more significant on the women’s first marriage age than that of men. For instance, after controlling for the individual attributes and province fixed effects (model (1)), every additional year of schooling is expected to delay the first marriage by 0.163 years for women and 0.106 years for men, holding everything else constant, suggesting that education’s delaying effect has noticeable gender differences. According to the conventional

arguments of marriage squeeze literature (Goodkind 2006; Das Gupta et al. 2010; Guilimoto 2012), the male-dominated gender imbalance makes women more favorable in the marriage market, as the supply of marriageable men outnumbers that of women, and thus women can find their partners more quickly and easily. This will result in an earlier entry into first marriage for women, while men are on the opposite. However, the empirical results of our study show that the male-to-female gender ratio of the population within the same educational level is negatively associated with the age at first marriage among men and women, and the coefficient on sex ratio is statistically significant at 1% in all models. The negative association between the intensity of educational marriage squeeze and females' first marriage age is in line with our expectation, whereas the negative association in male's part is contradicted with the conventional view. In order to figure out the mechanism of changes across provinces in "marriage squeeze" affecting people's first marriage age, we divide the analyses into two parts in the next part, that is, study the respondents with higher education and without higher education separately.

While controlling for the family background, regional effect and province-specific attitude variables does not change the previous findings(model (2)), as the coefficients on education and sex ratio change slightly and are all statistically significant at 1%. The coefficient on the age reveals that older cohorts might get married at a lower age than younger cohorts. We observe that the coefficient on work status is negative for both males and females. However, it is statistically significant in the female's case and not statistically significant in the male's case. This suggests that the marriage timing of women and men are differently affected by the employment status. The gender asymmetry in the influence of economic prospect (education and employment) on the age at first marriage implies a low convergence of gender economic roles in Chinese society. Moreover, both females and males living in economically developed regions like urban areas or eastern provinces in China tend to marry later than their counterparts living in less-developed regions like rural areas or central and western regions in China. Surprisingly, family background measured by parents' educational level does not have a significant effect on the offspring's marriage timing in our analysis.

When comparing the specifications in (2) and (3), we can observe that the coefficients on education and homogeneous educational sex ratio have decreased significantly when including the interaction term of educational category and homogeneous educational sex ratio, e.g., the coefficient on the education decreased from 0.15 (statistically significant at 1%) to 0.0894 (statistically significant at 1%) in women's part and decreased from 0.0916 (statistically significant at 1%) to 0.00367 (not statistically significant) in men's part. This is because our base category is less-educated population and the magnitude of education's delaying effect on their marriage formation is relatively small. The coefficient on the homogeneous educational sex ratio decreased from -0.00741 to -0.0225 for women and decreased from -0.0101 to -0.0277 for men. In both specifications, the coefficients are statistically significant at 1%. In the female's part, the coefficient on the interaction term between homogeneous educational sex ratio and being college-educated is negative and statistically significant at 1%. This implies that for educated women, changes across provinces in "marriage squeeze" differentially affects the age at first marriage than it does for

less-educated women. Ceteris paribus, the negative effect of homogeneous educational sex ratio on the age at first marriage is even more negative for educated women than for less-educated women. However, the magnitude of the coefficient on the interaction term is low. In the male's part, the opposite phenomenon appears, that is, the magnitude of homogeneous educational sex ratio's effect on the better-educated men's age at first marriage is smaller than that of less-educated men (without post-secondary education).

Table 6.3: Estimated Effect of Educational Attainment and Homogeneous Educational Sex Ratio on Age at First Marriage, by Gender

	Female			Male		
	Model(1)	Model(2)	Model(3)	Model(1)	Model(2)	Model(3)
Education	0.163*** (0.0146)	0.150*** (0.0155)	0.0894*** (0.0192)	0.106*** (0.0189)	0.0916*** (0.0196)	0.00367 (0.0269)
Sex ratio	-0.00855*** (0.00211)	-0.00741*** (0.00215)	-0.0225*** (0.00331)	-0.0116*** (0.00234)	-0.0101*** (0.00238)	-0.0277*** (0.00371)
Edu×Sex ratio			-0.00842*** (0.00147)			0.0103*** (0.00183)
Age	0.434*** (0.0104)	0.440*** (0.0107)	0.441*** (0.0106)	0.538*** (0.00955)	0.548*** (0.00980)	0.547*** (0.00974)
Hukou	0.532*** (0.0895)	0.541*** (0.0906)	0.512*** (0.0904)	0.708*** (0.105)	0.672*** (0.106)	0.648*** (0.105)
Work status	-0.249** (0.0786)	-0.271*** (0.0789)	-0.316*** (0.0790)	-0.259 (0.181)	-0.298 (0.179)	-0.331 (0.180)
Father_edu		-0.0173 (0.0119)	-0.0170 (0.0118)		-0.00968 (0.0132)	-0.00835 (0.0131)
Mother_edu		0.00554 (0.0109)	0.00443 (0.0109)		0.0212 (0.0123)	0.0211 (0.0122)
Central		-0.435*** (0.0840)	-0.416*** (0.0839)		-0.329** (0.1000)	-0.303** (0.0998)
West		-0.125 (0.0952)	-0.135 (0.0947)		0.279* (0.110)	0.251* (0.109)
_cons	10.63*** (0.298)	8.328*** (0.505)	10.51*** (0.619)	9.571*** (0.344)	6.321*** (0.582)	9.156*** (0.776)
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Attitude	No	Yes	Yes	No	Yes	Yes
N	3934	3861	3861	3489	3427	3427
R-squared	0.4731	0.4767	0.4813	0.5516	0.5553	0.5607

Note: Model 1 includes only individual attributes and province fixed effects. Province-specific attitude and socioeconomic background are added in model 2. Model 3 reports the estimates of the full model, including the interaction term between the education category and homogenous educational sex ratio. Robust standard errors are presented in parentheses.

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

In next part, we separate the analyses by two educational categories. Table 6.4 shows the OLS estimates of the correlation between age at first marriage and education, the intensity of educational marriage squeeze from model (2) and all columns contain controls for individual characteristics, family background, regional economic attributes, province-specific attitude towards gender role and province fixed effects.

First, the results show that the magnitude of education's delaying effect on the age at first marriage is different between people with and without post-secondary education, suggesting that the delaying effect has educational differences. For example, in the case of women, holding everything else constant, every additional year of schooling is expected to delay the first marriage by 0.0789 years for less-educated women and 0.362 years for educated women, which is similar to the finding of Raymo and Iwasawa's research on Japanese women's marriage behavior (2005). Whereas in the case of men, schooling year has no statistically significant delaying effect on less-educated male's marriage but tends to delay the marriage formation of male with at least post-secondary education, e.g., if college-educated men's education goes up by one year, their mean age at first marriage is expected to increase by 0.225 years, all else equal, and the coefficient is statistically significant at the 1% level.

Second, the estimated effect of homogeneous educational sex ratio on the age at first marriage is also different between people with and without a college education. The coefficient on the homogeneous educational sex ratio of better-educated women is negative and statistically significant at 1%, suggesting the deficits of men with similar educational attainment will delay better-educated women's entry into a marriage. In our case, if the male-to-female gender ratio of the educated population decreased from 150 to 100, the mean age at first marriage of college-educated women is expected to delay by 0.815¹⁶ years, holding everything else constant. However, we do not find the evidence of this "educational marriage squeeze" among women without a post-secondary degree, as the coefficient on the homogeneous educational sex ratio is negative but not statistically significant. This might be due to the fact that less-educated females are more inclined to "marry up" than educated women (see Table 6.2, more than 30% of less-educated women choose to "marry up" with respect to their spouses' schooling years, compared with only 16.85% of high-educated women). Therefore, the higher proportion of men in the less-educated population might not necessarily make them enter the marriage earlier, as some of them want to marry men who are more educated than their own in the marriage market.

As for men, we can observe some opposite phenomena. Marriage squeeze is more severe among less-educated men but does not affect males with higher education. The shortage of females within the same educational level only increases the searching time for a marital partner of less-educated men, e.g., if the gender ratio of the population without post-secondary education increases from 100 to 150, the first marriage age of less-educated men is expected to increase by 1.91¹⁷ years, holding everything else constant. It is a bit incomprehensible that the sign of the coefficient on the gender ratio of the university-

¹⁶ $(150-100)*0.0163=0.815$

¹⁷ $(150-100)*0.0382=1.91$

educated men is negative, though it is statistically insignificant. Better-educated men may have a larger marriage pool (see Table 6.2), as they can either choose a spouse with comparable educational backgrounds or choose a partner whose educational attainment is lower than their own. As a consequence, the strength of marriage squeeze quantified by homogeneous educational sex ratio has no “delaying effect” on their entry into the first marriage. On the contrary, it is difficult for a man without a college education to across the educational boundary to find a college-educated spouse, as the proportion of women to “marry down” is quite low in the marriage context of China (Jones 2007; Han 2010; Tian 2013; Qian and Qian 2014).

Table 6.4: Heterogeneous Effects: Educational Category

	Female		Male	
	≤High school	College & Over	≤High school	College & Over
Education	0.0789*** (0.0193)	0.362*** (0.0603)	-0.0183 (0.0265)	0.225*** (0.0632)
Sex ratio	-0.00479 (0.00975)	-0.0163*** (0.00269)	0.0382** (0.0129)	-0.00282 (0.00270)
_cons	25.19*** (1.748)	23.82*** (3.269)	21.42*** (2.369)	18.01*** (2.682)
Controls				
Individual	Yes	Yes	Yes	Yes
Family	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes
Attitude	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes
N	2676	1185	2290	1199
R-squared	0.4917	0.4247	0.6414	0.5485

Note: All estimates control for province fixed effects. Robust standard errors¹⁸ are presented in parentheses. Controls for individual attributes contain age, home registration and employment status, controls for family background contain parents’ educational attainment, controls for regional effects contain the economic zone in which the respondent’s home province is located and controls for attitude contain province-specific and time-variant attitudes towards gender role and marriage.

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

In order to elucidate the independent influence of the “marriage squeeze”, we also investigate the effect of sex ratio of the never-married population, which is another crucial measurement of marriage squeeze but independent of homogeneous educational sex ratio (see Table A.2 in

¹⁸ We apply three methods of computing standard errors: homoscedastic, heteroskedasticity-robust, clustered. As shown in Table A.3 in Appendix, the robust standard errors are very similar to the uncorrected ones, the magnitude and the significance of the coefficient on the key explanatory variables do not change across specifications when adjusting standard errors (except for male’s part where the standard errors are clustered at the province level). Clustering the standard errors at the province level is aimed to correct for autocorrelation in the marriage formation within the provinces. However, we only have thirty-one provinces and this small sample size makes it unsuitable for clustering. Therefore, our substantive conclusions remain the same, as the only change we observed is caused by small sample bias induced by clustering the standard errors at the province level, which does not affect what we conclude from the model.

Appendix for more details). Interestingly, the male-to-female gender ratio of the never-married population is negatively associated with less-educated women's age at first marriage and positively associated with college-educated men's age at first marriage and both of estimates are statistically significant at 1% level, whereas the magnitude and significance of this estimate are smaller among less-educated men and college-educated women, which demonstrates once again that less-educated women and college-educated men have a larger marriage pool and the educational marriage squeeze has relatively less impact on their age at first marriage.

To sum up, this part of the analysis answers our research question (1) and some of the question (3), that is, the delaying effect of educational attainment on the age at first marriage is more pronounced among women (compared with their male counterparts) and college-educated population (compared with their less-educated counterparts), indicating that this effect has both gender differential and educational differential, and the intensity of marriage squeeze measured by the homogeneous educational sex ratio only affects the timing of first marriage of well-educated women and less-educated man.

6.2 Educational Attainment, Marriage Squeeze and Marital Status

6.2.1 Model Specification

In this part, we examine the effects of an individual's educational attainment and the intensity of province-level educational marriage squeeze on people's marital status (first married or single) and want to identify the gender difference and educational difference in their impacts. The basic assumptions and the selection criteria of the respondents are similar to those in part 6.2. It is worth mentioning that respondents here contain first married and never married respondents who were aged between 20 and 40 years old in the year of the survey. To test the effects of education and homogeneous educational sex ratio, the following OLS regressions are estimated:

$$(4) M_{ijt} = \alpha_0 + \alpha_1 edu_{ijt} + \alpha_2 sr_{ijt} + \alpha_3 age_{ijt} + \alpha_4 hukou_{ijt} + \alpha_5 work_{ijt} + \delta\gamma_j + \epsilon_{ijt}$$

$$(5) M_{ijt} = \alpha_0 + \alpha_1 edu_{ijt} + \alpha_2 sr_{ijt} + \alpha_3 age_{ijt} + \alpha_4 hukou_{ijt} + \alpha_5 work_{ijt} + \alpha_6 fedu_{ijt} + \alpha_7 medu_{ijt} + \alpha_8 e_{ij} + \varphi\chi_{jt} + \delta\gamma_j + \epsilon_{ijt}$$

$$(6) M_{ijt} = \alpha_0 + \alpha_1 edu_{ijt} + \alpha_2 sr_{ijt} + \alpha_3 age_{ijt} + \alpha_4 hukou_{ijt} + \alpha_5 work_{ijt} + \alpha_6 fedu_{ijt} + \alpha_7 medu_{ijt} + \alpha_8 e_{ij} + \alpha_9 sr_{ijt} \times EduCategory_{ijt} + \varphi\chi_{jt} + \delta\gamma_j + \epsilon_{ijt}$$

Our dependent variable M_{ijt} is a binary variable that takes the value 0 if the marital status of individual i in province j , is never married or cohabiting in year t and 1 if his or her marital status is first married. Educational attainment (edu_{ijt}) quantified by schooling years and province-level sex ratio of the population within the same educational category (sr_{ijt}) are the key independent variables in this analysis. We match the homogeneous educational sex ratio in the year of the survey with never-married respondents and the homogeneous educational sex ratio in one year before they got married with married respondents, as people are still in the marriage market before they get married. The control variables in Model (4), (5) and (6) are the same as those in Model (1), (2) and (3), respectively. In model (6), we create an interaction term between the homogeneous educational sex ratio and a dummy variable indicating whether the respondent has a post-secondary degree: $sr_{ijt} \times EduCategory_{ijt}$, to capture the educational difference in the effect of homogeneous educational sex ratio, the effect of one percentage point increase in homogeneous educational sex ratio on less-educated respondents' odds of getting married is captured by α_2 and captured by $\alpha_2 + \alpha_9$ for the college-educated respondents. α_9 shows the difference in the effect of homogeneous educational sex ratio on the odds of entering into the first marriage between less-educated respondents and those that have at least post-secondary education.

We present the results from OLS regression in the main tables and we also report the results of Probit models in the Appendix (see Table A.5 for more details). In general, the result of Probit regression is highly consistent with that of OLS regression, including the sign, magnitude and statistically significance of the coefficient on the key variables. We first run the regressions for the male and female respondents separately to explore the heterogeneous effects by gender, then analyze male and female respondents by two educational levels to explore the heterogeneous effects by educational category. We expect that the higher the level of education a person obtained, the more likely she or he is to be single and this effect of education on reducing the probability of getting married is more significant among women; the sex imbalance of the population within the same educational category is not conducive to the marriage formation of one gender with an excess population, e.g., high male-to-female gender ratio of less-educated population is expected to depress the marriage formation of less-educated men, while the decreasing male-to-female gender ratio of educated population is expected to reduce well-educated women's odds of getting married.

6.2.2 Descriptive Statistics

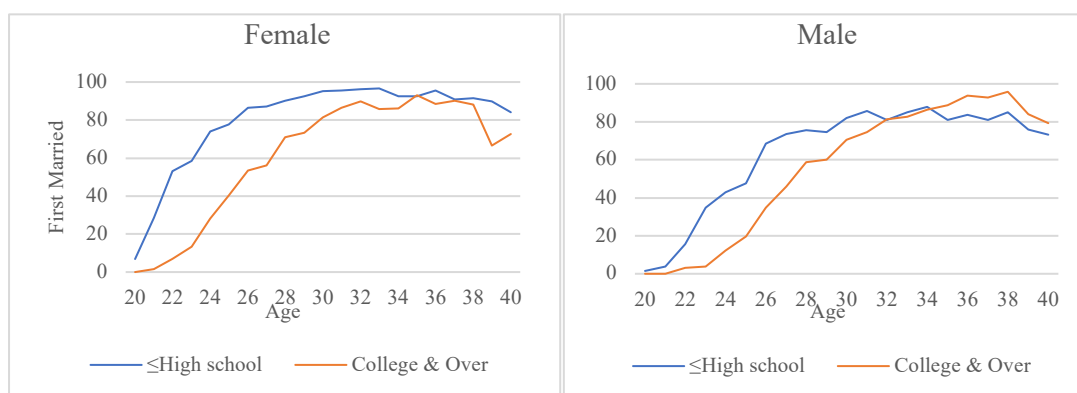
Table 6.5 presents the variables and descriptive statistics, including sample size, mean value, maximum, minimum and standard deviation. Among these 11437 respondents, the mean value of marital status is 0.63, which means that 63% of our respondents are first married and 37% of them are never married. The mean age at the time of the survey is 28.1 years old and the average schooling years are 12.1, which is about high school education level. The mean value of homogeneous educational sex ratio is 110, while the variation is substantial across provinces and years, as the maximum is 253, the minimum is 47.67 and the standard deviation is 18.3. In addition, the gender distribution of our respondents is close to 1:1, about

56% of them have urban residences, nearly 80% of them have work experience and the average educational level of their parents is junior school education level. The distribution of the economic region shows that half of the respondents live in the east region, 28% live in the central region and 22% live in the western region. Attitude variable indicates the degree of social progress and gender equality of each province, and the higher the score, the more progressive the province. We can see that the mean score is 2.66 and the variation of this score is quite small.

Table 6.5: Descriptive Statistics for Unmarried and First Married Respondents

Variable	Sample size	Mean	Std. Dev.	Min	Max
Marital status (unmarried & cohabiting =0; First married=1)	11437	0.6334703	0.4818776	0	1
Age	11437	28.0884	4.831288	20	40
Gender (female=1; male=2)	11437	1.512984	0.4998532	1	2
Schooling year	11437	12.06217	3.433432	0	20
Homogeneous educational sex ratio	11437	110.1824	18.32461	47.67	253.99
Household registration (rural=0; urban= 1)	11437	0.5584506	0.4965935	0	1
Work status (never worked=0)	11437	.786395	.409869	0	1
Father's schooling year	11437	8.422576	3.801873	0	19
Mather's schooling year	11437	6.830725	4.214105	0	19
Attitude	11233	2.663858	0.3000242	2.01	3.42
Region					
East	11437	0.5035411	0.5000093	0	1
Central	11437	0.2789193	0.4484874	0	1
West	11437	0.2175396	0.4125906	0	1

Figure 6.4: Proportion of First-Married by Age and Gender



As expected, we can observe an apparent gender and educational difference in the proportion of first married (see Figure 6.4). First, before the age of 35, women's marriage rate is always

higher than men's regardless of their education level. Second, in all age groups before 30, college-educated women are significantly less likely to enter into the first marriage than their female counterparts with less educational attainments; in the age group of 30-38, the gap between them gradually shrinks, that is, no matter which educational category they are in, most women still choose to enter into the marriage, suggesting that China is a marriage-universal country which has strong notions about family and marriage, the lifelong never-married rate of Chinese is very low (Hudson and Den Boer 2004; Jiang et al. 2014), for example, 92.45% of 35-year-old women who do not have a university degree are married, while the proportion is 93.06% in the college-educated women aged 35; after the age of 38, the possibility of getting married tends to decrease and this decline is steeper among college-educated women. In the case of men, there is also an obvious educational difference in their marital status. Before the age of 32, men without a post-secondary degree are more likely to get married than their male counterparts with the college education; after the age of 32, an interesting reversal appears, that is, better-educated men are more likely to have a family than their male counterparts with less educational attainments. However, this "catch up" phenomenon only exists in men's part, indicating that the marriage-inhibiting effect of education has both gender differences and educational differences.

6.2.3 Results

Table 6.6 reports the OLS estimated effects of educational attainment and homogeneous educational sex ratio on the marital status from model (4), (5) and (6). The dependent variable (M_{ijt}) is a binary variable, so the coefficient on the education expresses the change in probability that $M_{ijt}=1$ associated with a year change in schooling, that is, holding everything else constant, every additional year increase in education leads to a 3.22% decrease (an 1.29% decrease) in the probability of getting married of women (men) and the coefficient on education is statistically significant at the 1% level in both specifications. The estimated effect from model (4) is consistent with our expectation and this statistically significant depressing effect of education on the first marriage formation is more pronounced among women. However, this statistically significant negative effect of educational attainment on the individual's entry into first marriage is exactly in the opposite direction to that of western developed countries (Oppenheimer 1988;1995; Lichter et al. 1992; Goldstein and Kenney, 2001; Lefgren and McIntyre 2006).

The coefficient on the homogeneous educational sex ratio captures the change in probability that $M_{ijt}=1$ associated with a percentage point change in the gender ratio, e.g., if the male-to-female homogeneous educational sex ratio decreases from 150 to 100, the probability of getting married tends to decrease by 15.5%¹⁹ (8.7%²⁰) for women (men), *ceteris paribus*. Partially consistent with our predictions, the educational marriage squeeze measured by the homogeneous educational sex ratio is positively associated with the likelihood of getting

¹⁹ $(150-100)*0.0031=0.155$

²⁰ $150-100)*0.00174=0.087$

married among women, e.g., the higher the gender ratio of the population within the educational category to which a woman belongs, the lower the likelihood that she will remain single. However, the influence direction of the effect of homogeneous educational sex ratio on male's odds of getting married is against the logic of things, as the increase in the male to female share of the population will make it more difficult for males to find a marital partner. Therefore, we decide to do the analysis separately by two educational categories in the next part as we speculate that the influence directions of this effect on the marriage formation of people in different education categories are different.

In addition, the impact of employment on the first marriage formation is statistically significant at 1% in both the specifications of females and males, while the influence direction of the effect is opposite, e.g., female (male) who has a job is expected to have a 10.6% lower probability (an 18.2% higher probability) of getting married than a female (male) who has no job, holding everything else constant. Contradicted with the findings of previous studies that focus on the females' marriage behavior in western industrial countries (Goldscheider and Waite 1986; Oppenheimer 1994; Sweeney 2002), e.g., having a job in the labor market makes female more favorable in the marriage market, the employment status of Chinese women is negatively associated with their probability into marriage. This negative association reveals the fact that China is still a society with a high level of gender-role segregation, as the role of labor is conflicted with the role of housewife. Moreover, it is no great surprise that having a job tends to improve males' marriage prospects, as the husband is still the major breadwinner in a Chinese family.

The difference in the model specification of (4) and (5) is that family background, regional differentials and province-specific attitude towards gender role are omitted in (4) but included as control variables in (5). The coefficients on our key independent variables do not change a lot after controlling these socioeconomic backgrounds. Interestingly, family background measured by parents' year of schooling only affects females' entry into first marriage, but does not affect that of males, as the coefficients on father's education and mother's education are both statistically significant at 1% for female but not statistically significant for male, which implies a gender difference in the effect of parents' educational level on offspring's marriage formation. For example, growing in a well-educated family is possible to reduce a female's likelihood of getting married, as these women might be more progressive and economic independent, but it might have little impact on male's marriage formation. Moreover, we also observe a statistically significant negative effect of living in economically developed areas (e.g., urban areas and eastern province in China) on an individual's first marriage formation, except for males who live in western China (many studies on marriage formation in China have pointed out that marriage squeeze is extremely severe in western China, especially in rural areas, and the excessive number of marriageable males in these areas has led to a large number of men unable to find a spouse (Liu et al. 2014)).

We add the interaction term between educational category (without post-secondary education=0) and homogeneous educational sex ratio in model (6), which leads to a decrease in the magnitude of education's effect and an increase in the magnitude of the homogeneous

educational sex ratio's effect on first marriage formation, while the magnitude of the education's depressing effect on the male's marriage formation is near zero and it is statistically insignificant. This is because the baseline in this regression is less-educated population and education's depressing effect on their marriage formation is relatively small. Holding everything else constant, one percentage point increase in the homogeneous educational sex ratio tends to improve college-educated female's (male's) odds of getting married by $0.466\%+0.107\%=0.573\%$ ($0.291\%-0.0835\%=0.2075\%$) and 0.466% (0.291%) for their female (male) counterparts without college education, which indicates that the effect of homogeneous educational sex ratio is larger in magnitude on the odds of getting married among women with college education than that of women with less education; on the contrary, this effect is smaller in magnitude among men with college education relative to those without a post-secondary education.

Table 6.6: Estimated Effect of Educational Attainment and Homogeneous Educational Sex Ratio on the odds of First Marriage, by Gender

	Female			Male		
	Model(4)	Model(5)	Model(6)	Model(4)	Model(5)	Model(6)
Education	-0.0322*** (0.00205)	-0.0230*** (0.00221)	-0.0131*** (0.00267)	-0.0129*** (0.00232)	-0.00847*** (0.00250)	-0.000173 (0.00340)
Sex ratio	0.00310*** (0.00029)	0.00286*** (0.000305)	0.00466*** (0.000480)	0.00174*** (0.000297)	0.00151*** (0.000303)	0.00291*** (0.000469)
Edu×Sex ratio			0.00107*** (0.000205)			-0.000835*** (0.000223)
Age	0.0454*** (0.00119)	0.0437*** (0.00126)	0.0435*** (0.00126)	0.0479*** (0.00108)	0.0460*** (0.00117)	0.0462*** (0.00117)
Hukou	-0.106*** (0.0129)	-0.0831*** (0.0130)	-0.0801*** (0.0130)	-0.131*** (0.0131)	-0.121*** (0.0136)	-0.121*** (0.0136)
Work status	-0.112*** (0.0108)	-0.106*** (0.0109)	-0.101*** (0.0109)	0.182*** (0.0166)	0.183*** (0.0169)	0.186*** (0.0169)
Father_edu		-0.00658*** (0.00163)	-0.00657*** (0.00163)		-0.00157 (0.00187)	-0.00154 (0.00187)
Mother_edu		-0.00736*** (0.00154)	-0.00727*** (0.00154)		-0.00404 (0.00167)	-0.00403 (0.00167)
Central		0.0864*** (0.0121)	0.0848*** (0.0121)		0.0430** (0.0132)	0.0418** (0.0131)
West		0.0628*** (0.0136)	0.0631*** (0.0137)		-0.0186 (0.0145)	-0.0192 (0.0146)
_cons	-0.413*** (0.0389)	-0.220** (0.0711)	-0.494*** (0.0854)	-0.912*** (0.0364)	-0.507*** (0.0752)	-0.743*** (0.0996)
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Attitude	No	Yes	Yes	No	Yes	Yes
N	5570	5478	5478	5867	5755	5755
R-squared	0.3195	0.3369	0.3405	0.3045	0.3113	0.3131

Note: Model 4 includes only individual attributes and province fixed effects. Province-specific attitude and socioeconomic background are added in model 5. Model 6 reports the estimates of the full model including the interaction term between education category and homogenous educational sex ratio. Robust standard errors are presented in parentheses. Controls for attitude contain province-specific and time-variant attitudes towards gender role and marriage.

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

In the next part, we separate the analyses by two educational categories. Table 6.7 shows the OLS estimates of the correlation between odds of getting married and education, homogenous educational gender ratio from model (5) and all columns contain controls for individual characteristics, family background, regional economic attributes, province-specific attitude towards gender role and province fixed effects. We can observe an obvious gender asymmetry in education's impact on marriage formation, that is, the depressing effect of education on marriage formation only exists in female's case, as the estimates for the coefficient on education are smaller in magnitude and statistically insignificant among less-educated men and better-educated men. The negative association between women's economic independence measured by educational attainment and employment, and their marriage prospects implies that sex-specialization of domestic labor division is still a prevailing norm in China society as in Japan (Raymo and Iwasawa 2005), that is, women's earning potential and their career prospects are not highly-appreciated attributes in the Chinese marriage market, as the potential conflicts between the role of wife and breadwinner.

Table 6.7: Heterogeneous Effects: Educational Attainment

	Female		Male	
	≤High school	College & Over	≤High school	College & Over
Education	-0.0105*** (0.00258)	-0.0261** (0.00912)	0.00440 (0.00340)	-0.00655 (0.00898)
Sex ratio	0.00355* (0.00160)	0.00311*** (0.000389)	-0.0186*** (0.00155)	0.000574 (0.000386)
_cons	-2.440*** (0.246)	-5.448*** (0.316)	-2.444*** (0.285)	-4.301*** (0.326)
Controls				
Individual	Yes	Yes	Yes	Yes
Family	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes
Attitude	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes
N	3405	2073	3568	2187
R-squared	0.3885	0.4073	0.4021	0.4507

Note: All estimates control for province fixed effects. Robust standard errors²¹ are presented in parentheses.

²¹ We apply three methods of computing standard errors: homoscedastic, heteroskedasticity-robust, clustered. As shown in Table A.4 in Appendix, the robust standard errors are very similar to the uncorrected ones and clustered ones, the magnitude and the significance of the coefficient on the key explanatory variables do not change across specifications when adjusting standard errors. Therefore, our substantive conclusions are robust to different correction methods.

Controls for individual attributes contain age, home registration and employment status, controls for family background contain parents' educational attainment, controls for regional effects contain the economic zone in which the respondent's home province is located and controls for attitude contain province-specific and time-variant attitudes towards gender role and marriage.

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

The marriage squeeze is related to educational assortative mating in the marriage market, that is, the marriageable population generally prefers to marry someone with a similar educational background. However, this preference is also gender-asymmetrical and heterogeneous. For example, less-educated women have a higher tendency to "marry up" relative to well-educated women and less-educated men have fewer chances to across the educational boundary in the marriage market relative to well-educated men. As a consequence, the magnitude and the sign of the coefficient on the homogenous educational gender ratio might be inconsistent with the classical theories of marriage squeeze. In the case of women and less-educated men, although this estimate is less significant (10% level) on less-educated women's odds of getting married, the squeezing effect of homogeneous educational sex ratio on their marital status is quite straightforward, as the shortage of eligible opposite gender (gender imbalance) tends to decrease their odds of getting married. On the contrary, the magnitude of this estimate of college-educated men is near zero and the sign is positive, although it is statistically insignificant, which re-verified that college-educated males have a larger marriage pool and they might value more about some unquantifiable attributes of their marital partners, such as appearance and personality. In sum, better-educated women and poorly educated men are more likely to be squeezed in the marriage market in the context of educational assortative marriage when excessive gender imbalance occurs.

In conclusion, this part of the analysis answers our research question (2) and part of the question (3), that is, the inhibiting effect of educational attainment on the odds of getting married only exists in female's first marriage formation and education has no significant effect on males' probability of entering into first marriage, and the educational marriage squeeze only exists in women and less-educated men's first marriage formation.

7 Limitation

7.1 Endogeneity

Aside from the education and gender ratio of the population within the same educational category proposed in this paper, many other socioeconomic factors will change people's marriage behavior. For example, the family planning policy implemented in the 1970s encouraged people to marry and bear children at a later age and the increasing house price

since the 2000s has raised the entry barrier to marriage. In this paper, all of our married respondents got married after 2001. Therefore the marriage market of respondents is affected by the family planning policy and we are unable to disentangle the effect of family planning policy on people's marriage behavior. In addition, the rapid increase in housing prices since 2002 will also increase the cost and pressure to enter into a marriage, as owning a house is still an important prerequisite of marriage in China (Li and Wu 2014). From this point of view, the association we observed between education and marriage formation, the association between the homogenous educational sex ratio and marriage formation cannot be interpreted as being causal. We cannot identify whether the changes of people's marriage behavior are due to our variables of interest (education and the gender ratio of the population with the same educational level) or the implementation of the family planning policy and the rise of housing price, or the combination of the above factors. The main focus of this paper is analyzing the correlation between marriage formation and our interested variables.

7.2 Classification of Educational Attainment

Due to the limitation of sample size and the classification of educational attainment in the China Statistical Yearbook (2001-2014), only two education categories are classified in our paper and we are unable to subdivide college-educated population into more categories, such as vocational college education, academic university education and postgraduate and doctoral education. As we can image, the earning potential and career path of these populations might be substantially different, the roles of education and educational marriage squeeze in marriage formation might also differ distinctively. In addition, according to our tabulation of the differences in schooling years of married couples in the CGSS dataset, nearly 90% of married respondents have less than four years difference in schooling years with their spouse, which suggests that crossing large educational boundaries is uncommon in the Chinese marriage market. If more data and enough respondents are available in the future, we could divide respondents into more educational categories. Thus the measurement of educational marriage squeeze would be more precise.

7.3 Accuracy of The Measurement of The Marriage Squeeze

In this paper, we apply the male-to-female gender ratio of the population within the same educational level to indicate the intensity of the marriage squeeze. However, this index does not take into account the marital status and age structure of the population. If the real gender ratio of the never-married population or marriage-age population within the same educational level is different from the homogenous educational sex ratio of the total population, then the magnitude of its effect on marriage formation might be biased, whereas the sign of this estimates would not change, as women's overall marriage rate is higher than that of men, thus the gender ratio of the never-married population would be a little bit higher than that of the total population. Moreover, age is also an essential individual trait in the marriage market, but

due to the limitation of data, we cannot calculate the homogenous educational sex ratio by age groups, whereas it could be a future research direction.

8 Conclusions

The importance of education and marriage squeeze in marriage formation has longed been emphasized. China, through the higher education enrollment expansion policies, improved the average educational attainment of Chinese and reduced the gender inequality in college education in such a short period, which makes it a natural laboratory to examine the effects of education and homogeneous educational sex ratio on the marriage formation. In this paper, we use micro data from the Chinese General Social Surveys to update the effect of education on the age at first marriage and the likelihood of entry into first marriage from 2002 to 2015 in the Chinese context and identify the heterogeneous effects on marriage formation by gender and educational level. Combined with the macro data from the China statistical yearbook, we also examine the effect of marriage squeeze, as indicated by the homogeneous educational sex ratio, on marriage formation and its gender differential and educational differential.

We find that the roles that education and homogeneous educational sex ratio play in marriage formation differ distinctively by gender and educational level. First, education has both a delaying effect and an inhibiting effect on female's marriage formation. The magnitudes of these effects are larger among college-educated women relative to less-educated women, suggesting that educational difference exists in the effect of education on the marriage formation. However, educational attainment merely postpones educated male's entry into first marriage and has no depressing effect on males' odds of getting married, indicating that gender asymmetry exists in the impact of education on the marriage formation. Furthermore, the empirical results show that the educational marriage squeeze has gender and educational differentials. The shortage of the opposite gender with the same educational level will lead to an educational marriage squeeze for college-educated women and less-educated men. On the contrary, gender imbalance in the population within the same educational category does not cause a marriage squeeze for college-educated men and women without a post-secondary education. The above findings might be an implication that reveals some underlying marriage behaviors of modern Chinese young people. For example, women's education or economic prospect might not be a highly-valued individual attribute in the Chinese marriage market. Moreover, the pattern of educational assortative marriage makes less-educated women and college-educated men have a relatively larger marriage pool, as less-educated women have a higher probability to "marry up" and educated men have higher propensity to "marry down". Thus educational marriage squeeze has less impact on these two groups' marriage formation, whereas educated women's unwillingness to "marry down" and less-educated men's low probability to "marry up" make them the most vulnerable population in the marriage market when the excessive gender imbalance occurs.

Finally, although our study suggests that educational attainment and the homogeneous educational sex ratio are likely to affect marriage timing and the odds of getting married, we do not rule out the possibility that other changes in the social environment might lead to changes in people's marriage behavior. For example, future research can dig into the association between the house price and marriage formation in China's context. Besides, the investigation in the correlation between the one-child policy and trends in marriage might be a research direction, as the time of the first batch of people affected by the one-child policy (born in 1979) attending colleges or universities is almost the same as the intervention of higher education expansion. In addition, researchers could also shed more light on the link between marriage behaviors and fertility to give more policy suggestions with respect to the low fertility rate in China.

9 References

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Appendix

Table A.1: Homogeneous Educational Sex Ratio by Year and Province

		Beijing	Heilongjiang	Guangdong	Tianjin	Hebei	Shanxi	Inner Mongolia	Liaoning	Jilin	Gansu
2001	≤HS	105.96	103.89	102.68	98.59	100.54	104.26	103.29	99.79	98.51	104.96
2001	≥College	87.94	125.00	167.84	121.05	140.39	130.17	142.73	127.95	125.75	166.99
2002	≤HS	109.53	103.62	101.87	96.04	100.77	105.03	104.07	100.04	100.08	103.81
2002	≥College	124.59	129.02	162.47	121.32	131.86	124.56	136.79	130.42	118.45	148.12
2003	≤HS	102.41	101.48	100.11	94.63	101.72	103.49	103.54	97.70	98.93	102.93
2003	≥College	120.29	130.03	157.30	118.57	122.30	120.68	122.57	120.51	121.29	162.22
2004	≤HS	101.06	101.81	101.28	95.58	102.41	104.00	104.64	98.82	98.32	103.77
2004	≥College	118.39	127.63	149.01	112.52	118.19	132.70	123.24	115.97	117.94	139.12
2005	≤HS	98.91	100.72	99.15	97.92	99.15	101.53	102.68	98.48	101.52	98.73
2005	≥College	113.59	124.80	138.22	115.04	109.71	117.06	127.58	118.01	120.39	156.82
2006	≤HS	94.42	101.42	101.92	97.39	101.13	102.79	102.80	100.49	101.16	100.10
2006	≥College	103.22	120.87	147.25	90.96	112.15	95.49	119.77	114.35	115.29	152.88
2007	≤HS	97.02	100.57	101.32	98.98	102.43	103.79	102.58	99.56	100.18	100.39
2007	≥College	103.28	121.05	127.53	104.51	109.92	101.24	99.23	113.49	130.84	148.56
2008	≤HS	101.60	101.26	101.99	95.01	102.12	102.31	103.55	99.43	100.38	99.88
2008	≥College	107.23	117.58	132.02	107.89	121.89	98.29	122.40	109.49	118.27	135.61
2009	≤HS	100.72	101.54	98.88	102.10	102.29	103.47	103.75	99.16	103.73	100.97
2009	≥College	111.70	122.21	129.53	101.65	109.80	116.01	112.60	113.17	119.01	143.52
2010	≤HS	107.76	101.70	106.26	115.44	101.61	104.98	107.37	101.06	101.35	101.20
2010	≥College	104.17	110.40	128.54	110.73	103.68	107.85	113.81	110.48	110.31	135.19
2011	≤HS	106.97	102.28	108.34	102.11	106.39	104.85	101.79	99.80	103.39	103.72
2011	≥College	98.12	89.45	179.04	83.93	112.20	107.34	81.71	137.71	107.98	155.20
2012	≤HS	101.84	102.63	108.90	99.42	102.99	103.48	104.64	99.92	103.07	102.17
2012	≥College	110.09	110.42	132.94	92.97	113.62	110.91	100.68	102.61	101.86	150.35
2013	≤HS	103.45	102.21	107.99	99.89	103.84	105.01	105.80	104.52	105.21	103.05
2013	≥College	113.41	107.04	136.35	92.71	107.97	110.34	119.66	91.99	112.80	129.10
2014	≤HS	109.80	103.87	113.13	102.64	103.88	102.19	103.06	100.52	102.54	104.39
2014	≥College	90.45	77.49	187.70	89.38	101.40	110.93	108.02	113.12	110.37	131.05
2015	≤HS	109.11	101.84	112.16	124.33	100.85	105.17	105.45	99.10	101.47	104.59
2015	≥College	109.49	97.80	119.54	110.25	103.32	121.46	96.08	105.74	102.79	112.72
		Shanghai	Jiangsu	Hainan	Sichuan	Ningxia	Shandong	Chongqing	Zhejiang	Shaanxi	Jiangxi
2001	≤HS	95.52	94.32	106.30	97.93	102.38	99.18	103.50	102.99	102.62	103.10
2001	≥College	138.32	189.75	206.90	156.51	140.38	174.10	118.26	169.38	164.74	249.33
2002	≤HS	94.10	97.23	105.09	98.39	102.11	99.05	101.91	99.52	103.23	101.16
2002	≥College	110.29	171.40	248.00	144.64	150.43	156.55	149.61	150.25	155.77	227.73
2003	≤HS	93.46	94.94	107.47	100.43	100.87	96.97	101.23	99.40	101.61	100.42
2003	≥College	138.56	160.56	209.42	151.93	143.59	156.50	141.11	147.23	149.66	183.94

2004	≤HS	90.26	95.02	103.86	99.93	98.63	97.39	97.80	99.68	102.46	101.02	
2004	≥College	129.63	153.09	198.44	134.74	140.26	147.62	129.01	136.68	147.44	199.50	
2005	≤HS	96.54	92.38	106.95	97.23	98.45	96.95	98.66	100.73	98.90	98.28	
2005	≥College	124.25	142.47	145.73	134.35	132.10	154.93	151.67	135.12	135.13	184.70	
2006	≤HS	92.41	91.05	106.41	99.07	100.04	96.11	100.30	100.33	97.44	99.16	
2006	≥College	121.55	130.81	162.59	195.80	148.32	193.60	136.48	108.44	138.77	170.28	
2007	≤HS	75.58	92.03	106.03	98.82	99.83	96.78	100.93	101.21	98.13	98.27	
2007	≥College	122.87	120.32	158.38	136.43	133.13	158.30	125.80	137.24	130.92	161.19	
2008	≤HS	93.99	90.83	104.40	101.02	101.20	97.03	100.78	100.44	100.08	99.25	
2008	≥College	121.92	135.99	203.73	127.64	127.49	137.83	104.82	132.25	123.37	141.38	
2009	≤HS	93.00	91.77	109.20	99.33	101.99	99.02	99.38	99.28	100.26	98.84	
2009	≥College	118.36	155.63	176.00	114.27	121.35	134.62	109.00	122.42	117.08	147.07	
2010	≤HS	103.04	97.67	109.12	101.25	102.77	99.00	100.31	104.22	104.66	101.89	
2010	≥College	115.98	124.77	141.93	122.10	119.56	123.49	119.88	114.23	120.70	143.54	
2011	≤HS	111.20	99.86	105.43	104.72	110.69	97.75	101.76	103.87	104.16	107.39	
2011	≥College	118.79	93.94	131.72	100.90	111.21	122.57	124.21	51.39	109.83	141.66	
2012	≤HS	108.26	98.09	110.27	108.84	103.38	99.01	98.97	112.87	104.38	102.23	
2012	≥College	110.45	92.77	135.71	117.33	105.94	125.05	117.30	65.82	128.10	155.11	
2013	≤HS	103.76	96.35	105.64	100.75	101.83	100.63	100.27	105.71	102.82	103.95	
2013	≥College	113.53	116.11	169.23	134.64	115.50	122.57	138.26	114.51	120.85	149.85	
2014	≤HS	104.64	97.87	111.72	99.45	104.62	99.34	103.26	107.57	104.44	105.53	
2014	≥College	111.40	117.21	155.50	84.75	111.76	119.57	119.85	125.62	120.04	138.91	
2015	≤HS	107.38	100.41	107.44	100.25	103.71	101.07	99.35	105.57	101.98	101.57	
2015	≥College	110.46	112.19	129.57	101.83	115.57	121.45	105.53	115.19	100.69	132.46	
		Fujian	Anhui	Henan	Qinghai	Xinjiang	Hubei	Hunan	Tibet	Yunnan	Guangxi	Guizhou
2001	≤HS	98.73	100.86	100.64	101.15	103.26	102.42	104.65	97.66	105.62	106.74	105.77
2001	≥College	204.25	221.23	152.06	160.42	104.97	190.69	163.57	100.00	155.71	190.95	144.47
2002	≤HS	106.20	102.12	100.83	104.24	101.53	100.90	104.57	91.65	105.37	106.41	105.59
2002	≥College	160.42	253.99	143.76	131.25	106.54	168.06	157.63	90.00	129.04	114.69	144.72
2003	≤HS	100.36	103.03	104.72	101.78	103.74	101.27	105.24	90.65	108.50	107.31	104.62
2003	≥College	195.87	147.44	146.21	136.27	111.26	147.90	151.18	100.00	135.43	156.28	146.77
2004	≤HS	97.15	100.90	102.89	103.20	101.93	99.79	102.39	94.61	100.76	104.12	105.14
2004	≥College	173.08	177.02	128.24	142.70	115.14	135.03	139.85	187.50	136.26	167.02	141.81
2005	≤HS	97.92	96.68	99.68	99.49	102.26	100.17	101.25	97.30	105.13	105.29	102.97
2005	≥College	150.99	164.93	103.44	126.29	105.53	150.81	146.69	124.43	129.66	134.96	159.38
2006	≤HS	98.85	98.62	99.75	101.47	102.75	99.90	101.25	95.89	105.41	107.55	104.16
2006	≥College	136.23	190.92	127.68	133.61	102.98	124.18	127.25	108.33	130.35	127.78	155.46
2007	≤HS	97.90	98.92	101.06	100.78	103.22	102.23	102.34	96.36	105.07	106.95	103.92
2007	≥College	142.68	116.90	128.12	127.59	103.24	109.23	153.56	93.33	121.58	124.79	144.87
2008	≤HS	97.60	100.27	99.12	99.30	102.91	100.99	102.89	94.68	105.36	107.90	105.54
2008	≥College	151.13	159.75	115.92	128.29	106.94	116.48	166.52	86.36	216.11	136.96	148.21
2009	≤HS	97.89	100.95	99.42	99.14	102.79	101.75	102.49	96.05	106.96	108.58	104.46
2009	≥College	111.14	204.12	114.12	117.30	98.21	138.26	130.08	100.00	125.00	133.91	146.90
2010	≤HS	102.76	99.25	99.12	105.70	107.20	101.96	103.19	104.35	106.68	106.07	103.20

2010	≥College	127.51	139.93	112.05	123.66	105.35	129.96	122.23	129.94	121.20	123.88	136.33
2011	≤HS	105.61	98.36	101.96	102.30	105.78	100.28	102.72	103.27	104.73	103.76	106.13
2011	≥College	47.67	151.80	165.04	93.30	104.28	143.35	128.43	131.37	90.04	186.28	195.63
2012	≤HS	100.76	98.90	99.77	104.35	103.97	98.92	103.62	97.87	104.41	105.55	103.04
2012	≥College	101.61	234.82	111.04	128.65	104.68	136.75	128.46	108.51	123.67	121.67	123.82
2013	≤HS	104.90	101.50	97.03	102.42	104.76	99.73	103.90	103.54	106.23	108.33	107.58
2013	≥College	129.15	110.14	123.84	118.18	105.77	125.32	115.16	96.43	123.64	117.78	88.69
2014	≤HS	107.64	98.32	99.93	104.02	105.63	99.86	103.61	101.68	104.54	106.70	108.71
2014	≥College	102.22	85.15	108.59	80.83	97.81	126.82	108.93	106.67	116.78	112.90	68.83
2015	≤HS	102.54	98.59	102.59	108.50	105.46	99.50	100.57	102.25	104.97	105.51	105.17
2015	≥College	118.61	152.13	103.15	117.82	95.25	125.32	110.36	99.02	100.93	91.95	112.90

Source: author's rendering of China statistical yearbook (2002-2016)

Note: ≤HS (Senior high school and lower level); ≥College (College and higher level)

Table A.2: Education, Sex Ratio of Never-Married Population and First Marriage Age
by Gender and Educational Category

	Female		Male	
	≤High school	College & Over	≤High school	College & Over
Education	0.0784*** (0.0192)	0.360*** (0.0627)	-0.0173 (0.0264)	0.231*** (0.0630)
Sex ratio	-0.00913** (0.00306)	-0.00109 (0.00451)	0.00881* (0.00367)	0.0157*** (0.00447)
_cons	23.97*** (1.414)	19.66*** (3.390)	23.49*** (1.887)	13.59*** (2.777)
Controls				
Individual	Yes	Yes	Yes	Yes
Family	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes
Attitude	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes
N	2676	1185	2290	1199
R-squared	0.4935	0.4034	0.6409	0.5523

Note: All estimates control for province fixed effects. Robust standard errors are presented in parentheses.

Controls for individual attributes contain age, home registration and employment status, controls for family background contain parents' educational attainment, controls for regional effects contain the economic zone in which the respondent's home province is located and controls for attitude contain province-specific and time-variant attitudes towards gender role and marriage.

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

Table A.3: Adjustment of Standard Errors (Age at First Marriage)
by Gender and Education

	Homoscedastic			
	Female		Male	
	≤High school	College & Over	≤High school	College & Over
Education	0.0789*** (0.0193)	0.362*** (0.0628)	-0.0183 (0.0241)	0.225*** (0.0638)
Sex Ratio	-0.00479 (0.0103)	-0.0163*** (0.00248)	0.0382** (0.0126)	-0.00282 (0.00262)
	Heteroskedasticity-robust			
	Female		Male	
	≤High school	College & Over	≤High school	College & Over
Education	0.0789*** (0.0193)	0.362*** (0.0603)	-0.0183 (0.0265)	0.225*** (0.0632)
Sex Ratio	-0.00479 (0.00975)	-0.0163*** (0.00269)	0.0382** (0.0129)	-0.00282 (0.00270)
	Clustered			
	Female		Male	
	≤High school	College & Over	≤High school	College & Over
Education	0.0789*** (0.0260)	0.362*** (0.0888)	-0.00841 (0.0287)	0.266*** (0.0598)
Sex Ratio	-0.00479 (0.0171)	-0.0163*** (0.00431)	-0.0162 (0.0240)	-0.0170*** (0.00257)

Note: All estimates control for individual attributes, socioeconomic background, province-specific attitude towards gender role and province fixed effect. Standard errors are presented in parentheses. Controls for individual attributes contain age, home registration and employment status, controls for family background contain parents' educational attainment, controls for regional effects contain the economic zone in which the respondent's home province is located and controls for attitude contain province-specific and time-variant attitudes towards gender role and marriage.

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

Table A.4: Adjustment of Standard Errors (Odds of First Marriage)
by Gender and Education

	Homoscedastic			
	Female		Male	
	≤High school	College & Over	≤High school	College & Over
Education	-0.0105*** (0.00265)	-0.0261** (0.00923)	0.00283 (0.00318)	-0.00770 (0.00866)
Sex Ratio	0.00355* (0.00144)	0.00311*** (0.000401)	-0.0170*** (0.00156)	0.000333 (0.000413)
	Heteroskedasticity-robust			
	Female		Male	
	≤High school	College & Over	≤High school	College & Over
Education	-0.0105*** (0.00258)	-0.0261** (0.00912)	0.00440 (0.00340)	-0.00655 (0.00898)
Sex Ratio	0.00355* (0.00160)	0.00311*** (0.000389)	-0.0186*** (0.00155)	0.000574 (0.000386)
	Clustered			
	Female		Male	
	≤High school	College & Over	≤High school	College & Over
Education	-0.0105*** (0.00227)	-0.0261** (0.00893)	0.00283 (0.00435)	-0.00770 (0.0101)
Sex Ratio	0.00355 (0.00226)	0.00311*** (0.000679)	-0.0170*** (0.00314)	0.000333 (0.000633)

Note: All estimates control for individual attributes, socioeconomic background, province-specific attitude towards gender role and province fixed effect. Standard errors are presented in parentheses. Controls for individual attributes contain age, home registration and employment status, controls for family background contain parents' educational attainment, controls for regional effects contain the economic zone in which the respondent's home province is located and controls for attitude contain province-specific and time-variant attitudes towards gender role and marriage.

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

Table A.5: Probit Model: Education, Homogeneous Educational Sex Ratio and Marital Status,
by Gender and Educational Level

	Female		Male	
	≤High school	College & Over	≤High school	College & Over
Education	-0.0683*** (0.0176)	-0.0749* (0.0344)	0.0216 (0.0137)	-0.00332 (0.0347)
Sex ratio	0.0165* (0.00762)	0.0143*** (0.00190)	-0.0731*** (0.00693)	0.00225 (0.00178)
_cons	-16.20*** (1.218)	-21.67*** (1.612)	-4.888*** (1.117)	-12.91*** (1.663)
Controls				
Individual	Yes	Yes	Yes	Yes
Family	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes
Attitude	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes
N	3405	2073	3568	2187
Log likelihood	-1097.9855	-905.64205	-1539.25	-888.64909
Pseudo R2	0.3910	0.3621	0.3576	0.4130

Note: All estimates control for individual attributes, socioeconomic background, province-specific attitude towards gender role and province fixed effect. Robust standard errors are presented in parentheses. Controls for individual attributes contain age, home registration and employment status, controls for family background contain parents' educational attainment, controls for regional effects contain the economic zone in which the respondent's home province is located and controls for attitude contain province-specific and time-variant attitudes towards gender role and marriage.

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