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Continuity and Change in Mainland China’s Recent Marriage History

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Continuity and Change in Mainland China's Recent Marriage History

A dissertation submitted in partial satisfaction of the requirements for the degree Doctor of Philosophy in Sociology

by

Dwight Ritchie Davis

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ABSTRACT OF THE DISSERTATION

Continuity and Change in Mainland China's Recent Marriage History

by

Dwight Ritchie Davis

Doctor of Philosophy in Sociology

University of California, Los Angeles, 2015

Professor Cameron D. Campbell, Chair

The intersection of demographic change and government policy is creating new challenges for mainland Chinese in the marriage market, particularly for men. This has spawned a renewed academic interest in marriage with many studies using current demographic conditions to forecast future marriage levels. These studies forecast a large "marriage squeeze" over the next generation with up to 20 percent of men unable to marry at its peak. Using China census microdata, this dissertation provides historical context for this literature by examining actual 20th century patterns of marriage in mainland China. The empirical results show the relative contribution of marriage market conditions (measured by the unmarried sex ratio) and the propensity to marry (or "force of marriage attraction") for changing marriage rates. This provides both context and warning for a literature that mostly considers the role of marriage market sex ratios in isolation from likely changes in marriage preferences and patterns of assortative mating. The results indicate the role of marriage market conditions was nuanced over the 1970-2000 period: marriage market conditions may have affected marriage behavior (chapter 5); but they were not responsible for most of the changes in marriage rates across yearly time periods (chapter 4). The results also show that the

assumption of static female marriage behavior made in recent studies does not fully fit with the recent past. Women (and men) did modify their marriage behavior and those changes were moderately associated with changes in educational attainment (chapter 2) and marriage market conditions (chapter 5). Most men and women eventually married, but marriage rates changed markedly across periods in ways not well explained by age, education, rural-urban status, or marriage market conditions (chapter 4). Other results show continuity with China's pre-20th century marriage regime in that long-term bachelorhood continued to be patterned by socioeconomic status (chapter 3) and marriage timing for both men and women continued to show indirect evidence of external pressures to marry and to marry at socially normative ages (chapter 2).

The dissertation of Dwight Ritchie Davis is approved.

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Musick, Kelly, Jennie E. Brand, and Dwight Davis. “How College Shapes Union Formation Processes.” Population Association of America, Marriage and Union Formation, Dallas, Texas, April 2010.

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Chapter 1. Mainland China's Marriage Regime in Context

1. Introduction

Marriage is an institution of central importance in Chinese society (Wang and Tuma 1993, Xu et al. 2007, Yan 2003). It is central to family formation and reproduction as non-marital fertility remains very low (Banister 1987, Wang and Yang 1996, Jones 2007). As fertility fell drastically after 1970, and single-child families became the norm, marriages were an ever larger share of total kinship ties in a society still largely built around the family (Chu and Yu 2010, Xu et al. 2007). The family remains the primary provider of social welfare in a population that is aging rapidly (Gu 2009, Wang 2005, Wang and Mason 2008). Social concern about marriage trends is tied to fears that increasing numbers of men will be unable to marry in the near future, will live alone as a result, and lose valuable connections to family and society (Jiang et al. 2007, Jiang et al. 2011a, Poston and Glover 2005, Sharygin et al. 2013). At least for men, there is a large literature demonstrating a nearly universal link between marriage and wellbeing across both socioeconomic and physiological dimensions (e.g. Light 2004, Waite 1995, Williams 2003). Given these facts, the study of marriage in mainland China remains of social scientific significance above and beyond the current preoccupation with forecasting future marriage trends (e.g. Jiang et al. 2014). This dissertation adds a small piece to this important research area.

The descriptive and analytic findings presented here provide new details of marriage change during a socially turbulent period in a country that comprises nearly a fifth of humanity. For mainland China, the latter half of the last century included the coming to power of the Chinese Communist Party (CCP) in 1949, the collectivization of society, the creation of the *hukou* system, and the Great Leap Forward in the late 1950s, the Cultural Revolution of the late

1960s and early 1970s, the political tumult of the late 1970s following the death of CCP chairman Mao Zedong, as well as the enforcement of a "one-child" fertility policy and the several stages of economic and political opening to the rest of the world in the 1980s and 1990s (Meisner 1999). These events certainly affected demographic outcomes, including marriage (Davis and Harrell 1993, Parish and Whyte 1978, Wolf 1986, Yan 2003, Zeng et al. 1985). This history is important context for the patterns described in the chapters to follow.

Most directly, this dissertation examines how education was related to marriage timing and assortative mating, and how the institution of household registration (or *hukou*) contoured this relationship. It does so for cohorts of Chinese who came of age in the middle and later decades of the 20th century. These men and women married, or in rare cases did not marry, during decades when the timing and meaning of marriage was changing across the globe, beginning in the west in the 1960s and in the Pacific (East and Southeast) Asian countries around them by the 1980s and 1990s (Blossfeld 1995, Bracher and Santow 1998, Cherlin 2009, Hirschman 1985, Jones 2004, Lesthaeghe 2010, van de Kaa 1987, Waite 1995). At first, these young Chinese remained socially isolated from sociocultural influences from abroad, but by the 1990s they were no longer isolated (Davis and Harrell 1993, Meisner 1999, Yan 2003). Nevertheless, from a demographic perspective, young mainland Chinese continued to follow their own marriage regime, one that remained exceptional both regionally and historically, most notably for the near universality of marriage for both men and women (Jones 2007).

The recent past was a period of both continuity and change for the mainland Chinese marriage regime. It was a period of change for men who had much higher levels of marriage than they had in pre-20th century China (Lee and Wang 1999). Because of traditional preferences for sons, a sex ratio imbalance favoring male survival appears to have been endemic in pre-20th

century China, which meant many men could not find spouses (Campbell and Lee 2008a, Chen et al. 2014, Lee and Campbell 1997, Lee and Wang 1999, Lin et al. 1994).

For women, the universality of marriage in the recent past was a continuation of the pre-20th century pattern (Chen et al. 2014, Lee and Wang 1999, Wolf and Huang 1980). However in other socio-demographic areas, women experienced important changes in the post-1949 period, including continuing improvements in their survival in infancy (Bannister and Hill 2004, Coale and Banister 1994, Wang and Mason 2008), gains in educational attainment (Hannum and Xie 1994, also see Figure 5), and greater personal autonomy (Yan 2003), including the legal right to marry when and to whom they chose (Croll 1981). Although with the advent of rural market reforms after 1978, the economic transaction nature of marriage may have been revived, with detrimental effects for rural women in particular (Fan and Huang 1998, Johnson 1983, Wolf 1985).

For men, the post-1949 period was also one of educational advancement and likely a reduction of socio-economic inequality along some dimensions (Deng and Treiman 1997, Vermeer 1982, Walder 1989, Whyte 1975); although average real wages fell during the 1956-76 period and the rural-urban inequality widened (Walder 1989). Importantly, life expectancy improved greatly for both men and women (Davis and Harrell 1993, Wolf 1986). These factors may have helped make more men healthy enough and socio-economically eligible to marry, which along with improved female survival may have helped drive bachelorhood levels down to historic lows.

This period of historically high marriage rates for men may be short lived. Sex ratios at birth started to rise again in the early 1980s (Gu and Roy 1995, Hull 1990), reaching approximately 118 (boys per 100 girls) by 2000 (Banister 2004, Cai and Lavely 2003). The

interaction of continuing underlying preferences for male sons, the "one-child" fertility policy, and the spread of ultrasound technology allowing for sex selective abortions is considered responsible for the relatively sudden change in birth sex ratios (Ebenstein 2011, Hull 1990, Zeng et al. 1993). The under-reporting of female births also contributed to the lopsidedness of the official estimate (Goodkind 2011), although most analysts discount this as a primary factor (Banister 2004, Cai and Lavely 2003, Coale and Banister 1994). Excess female infant mortality also rose sharply after 1985 (Wang and Mason 2008). This skew in the numbers of boys and girls within birth cohorts is forecasted to create to a "marriage squeeze" for men over the next generation with 10-20 percent of men unable to marry as a result (Attané 2006, Ebenstein and Sharygin 2009, Das Gupta et al. 2010, Guilmoto 2012, Jiang et al. 2011ab, Jiang et al. 2014, Sharygin et al. 2013, Tucker and Van Hook 2013, Tuljapurkar et al. 1995). This level of bachelorhood would be very much in line with pre-20th century levels.

While these higher rates of bachelorhood are seen as something of a crisis in both the popular and academic press (Edlund et al. 2013, Hudson and den Boer 2004, Jiang et al. 2011b, Liu et al. 2012, Poston and Glover 2005, Sharygin et al. 2013, Yang et al. 2014), they would in fact put male marriage rates more in line with other countries in the region like Japan (Jones and Gubhaju 2009), and western countries such as the U.S. (Cherlin 2009). As in those countries, however, bachelorhood will likely be more common among lower SES men (Sharygin et al. 2013), which raises the question whether bachelorhood is a deliberate choice or a response to socioeconomic hardship. In pre-20th century China, it evidently was not a choice but a hardship experienced by poorer men (Chen et al. 2014, Lee and Wang 1999, Harrell 1985). Marriage was not a matter of individual choice, but a strong social imperative given the central role it played in family and social reproduction, and the central economic, cultural, and social welfare role the

family played in society (Lee and Campbell 1997, Lee and Wang 1999, Parish and Whyte 1978, Wolf 1984, Wolf and Huang 1980).

In contemporary China, this question of choice versus imperative is less absolute, but likely a non-trivial portion of men would choose not to marry (a female spouse at least) for reasons related to personality, sexual orientation, economic and personal independence, etc. Another group of men likely would put marriage off until they are older if not for the external pressures on their marriage timing. If this line of reasoning is correct, the very high proportions of men marrying in the recent past in mainland China likely includes some men who would have chosen to remain unmarried, and others who would have further delayed it, in the absence of strong social pressure (Jones 2007, Tien 1983).

That women in China continue to marry universally in spite of the retreat from universal marriage in other East Asian countries (Jones 2004), and in most economically developed countries around the world (Blossfeld 1995; Lesthaeghe 1995, 2010), is indirect evidence that there are still strong external pressures to marry. Evidence of the continued pressure on women to marry is easy to find as well (Croll 1981, Jones 2007, Yan 2003). That marriage can be detrimental for women's socioeconomic position has been shown for the U.S. (Budig and England 2001, Waite 1995). These relationships are difficult to establish for mainland China, given that nearly all women marry, and marry at younger ages. Still, the hardships associated with marriage for women in China are certainly well known, especially in rural areas (Fan and Huang 1998, Johnson 1983, Wolf 1985). All of this is to say, the continued overwhelming popularity of marriage for women remains something of a mystery (Jones 2007), at least without considering an important role for external social pressure. Although, at least one analysis that

focused on educated, urban women in the early 2000s found that increasing numbers are delaying marriage into their 30s (Qian and Qian 2014).

One of the goals of this dissertation is to illuminate changes in preference. It is reasonable to expect mainland China's very high rates of marriage to hide substantial variation in underlying personal marriage preferences. That demographic studies avoid discussion of preferences is understandable given the extreme difficulty of measuring even partial preferences. In spite of this, changing preferences remain at the heart of marriage and marriage change; and at least considering how they may operate under the surface of demographic indicators should help enrich both the specification and the interpretation of marriage models. In the empirical chapters to follow, I consider the implications of the results for changing marital preferences wherever possible; however the results do not rely on the elusive nature of marriage preferences.

The analyses in chapters 2-5 add to the recent literature on marriage market conditions—i.e. the availability for marriage of men and women with particular characteristics such as age and education—and the situation of unmarried men in mainland China (e.g. Guilmoto 2012, Jiang et al. 2014, Sharygin et al. 2013, Tucker and Van Hook 2013). Some of this literature is summarized below. The bulk of this recent literature has focused on the potential role of marriage market conditions for the future marriage chances of men. I contextualize this forward-looking work by analyzing marriage behavior in the recent past. The goal of this dissertation, therefore, is not only to examine the relationship between marriage markets and marriage outcomes, but to put this relationship in the context of a broader historically informed study of marriage behavior.

To start, I examine variation in the interquartile range—a measure of numerical spread—of first marriage age across five-year birth cohorts in chapter 2. Note that all analyses in this

dissertation use first marriage only, which account for the vast majority of all marriages for the 1920-1975 birth cohorts considered here. Changes in the interquartile range of marriage age across cohorts, especially after controlling for education and urban-rural *hukou* status, indirectly reveal something about the social and/or structural pressure to marry. By structural I mean that certain institutions such as high schools and colleges may contour opportunities in such a way to create both opportunities and imperatives to match with potential spouses that influence the timing and assortative type of marriage (Mare 1991). Social pressures may include norms of both minimum and maximum marriage ages that young people internalize when they are dating. In pre-20th century China, women married young and within a narrow age range (Chen et al. 2014), both of which are evidence of external pressure to marry. While average age at marriage has risen across the 20th century (Barclay et al. 1976, Coale 1984, Tien 1983), the spread of marriage ages has narrowed (Smith and Wei 1986, Wang and Tuma 1993), which is, I argue, evidence that external pressures to marry are still strong.

I examine long-term bachelorhood in chapter 3, defining long-term bachelors as anyone 40 years of age or older who has never married. In the post-1949 period, more than 95 percent of men married by this age. Still, this left several million bachelors who may or may not have wanted to remain unmarried. Patterns of bachelorhood by education, *hukou* status, and geographic region again gives indirect evidence on this issue. If bachelorhood is strongly contoured by these background factors, I argue that is evidence against the idea that bachelorhood reflects a personal preference. Instead it is evidence that structural factors are pushing certain groups of men out of the marriage market, likely for economic reasons tied to educational attainment and geographic location.

Chapters 4 and 5 turn to assortative mating by age and education. Assortative mating refers to patterns of marriage partnering according to the characteristics of each spouse. Characteristics of common interest include age and education. Patterns of spouses' characteristics are produced by the interaction of individual preferences for the characteristics of a spouse and the availability of potential partners with the desired characteristics who are willing to marry. Of course, we almost never have the opportunity to measure individual preferences, or observe the potential partners from whom individuals make their selection. Even though assortative mating studies cannot say anything definitive about marriage preferences, changes in the revealed sorting behavior do provide insights to into how underlying preferences may have changed over time, particularly when changes in marriage market conditions are accounted for (Schoen 1988, Qian and Preston 1993).

The empirical results also will show that the assumption of static female marriage behavior made in most marriage squeeze studies does not fully fit with recent past. These results will show that women did modify their marriage behavior—and likely their preferences—and these changes were associated with changes in educational attainment (chapter 2) and marriage market conditions (chapter 5). Women above age 30 still married universally, but the pace and timing of female marriage changed markedly across periods in ways not well explained by their age, education, rural-urban status, or current marriage market conditions (chapter 4). None of this means that mainland Chinese women will necessarily follow in the recent partial retreat from marriage of other women in Pacific Asia, but it does mean their marriage behavior has not been static and may continue to change in unpredictable ways.

For men, the results will similarly show they modified their marriage behavior—and likely their preferences—in the face of changing marriage market conditions, and that these

changes varied by age- and education-group (chapter 5). Moreover, at least in the recent past, changes in marriage market conditions were far less influential on changing marriage rates than other period-specific forces operating independently of the availability of potential mates (chapter 4). Education also mattered for variation in the interquartile range of male marriage age (chapter 2) and it was critical for changing patterns of bachelorhood across birth cohorts (chapter 3).

The remainder of this chapter includes sections that contextualize the period under study historically within China and regionally in Pacific Asia. Next, I introduce the primary explanatory variables used in the empirical chapters—education and *hukou*—which leads into a brief review of the major themes in the China marriage literature. After this, I introduce the data employed in the empirical chapters. I conclude with a short discussion on the likely changing role of the family and the state for marriage behavior.

2. Mainland China's marriage regime in historical context

According to the historical demographic data available, both mainland China and Taiwan have traditionally practiced a form of marriage that led to near universal and early marriage for women, while for men marriage occurred at older ages and less than universally (Chen et al. 2014, Lee and Campbell 1997, Lee and Wang 1999, Lin et al. 1994, Wolf and Huang 1980). This pattern also meant the variability of marriage ages was very small for women and large for men (Wang and Tuma 1993). That women married universally and at young ages provides indirect evidence that marriage decisions were not personal ones but, instead, were controlled by the extended family (Lee and Wang 1999). This is an uncontroversial point as the qualitative historical record makes it very clear that marriage was under the purview of the family and not

the individual, and this was equally the case for male and female marriage (Croll 1981, Johnson 1983, Lee and Wang 1999, Wolf and Huang 1980). That men married later and less than universally has not been taken as evidence of personal choice in marriage but, instead, of the difficulty of finding a suitable marriage partner given the prevailing marriage market and socioeconomic conditions (Campbell and Lee 2008a, Chen et al. 2014, Lee and Wang 1999, Wolf and Huang 1980).

Before the 20th century, the available evidence suggests up to 15 percent of men never married (Chen et al. 2014, Lee and Wang 1999, Wang et al. 2010). Higher rates of non-marriage for men have been the norm in China because of two interconnected factors: unbalanced sex ratios on the marriage market, and socioeconomic stratification (Lee and Wang 1999). Because of traditional preferences for sons, a sex ratio imbalance favoring male survival appears to have been endemic in pre-20th century China (Campbell and Lee 2008a, Lee and Campbell 1997, Lee and Wang 1999, Lin et al. 1994). Infant and child sex ratios cannot be accurately calculated for pre-20th century China because girls were often not recorded in population registers. For instance, the calculated infant sex ratios ranged from 180-350 boys per 100 girls in 19th century population registers from Liaoning—a province in northeast China (Wang et al. 2010). Reasonably accurate demographic counts are possible for Taiwan after 1905 and they indicate a surplus of men of between 12 and 26 percent between the ages of 15 and 45 (Barclay 1954, Lin et al. 1994).

At least for Taiwan, what is remarkable given these highly skewed adult sex ratios is how many men still managed to marry. In 1905, 98 percent of men had married by age 40 (Lin et al. 1994). Part of this success was due to high rates of remarriage by divorced or widowed women to never married men—18 percent of first marriages for men in 1905 were to previously married

women, while only 9 percent of first marriages for women were to previously married men (Barclay 1954). The divorce rate in Taiwan was high by international standards at the beginning of the 20th century which, in combination in high mortality, meant marital dissolution at younger ages was frequent and remarriage rates quite high, especially among those under age 30 (Lin et al. 1994, Pasternak 1985). There is no indication that such patterns of divorce and remarriage existed on the mainland so bachelorhood rates for men were likely much higher there, although there is no comparable data for the early 20th century for mainland China (Barclay et al. 1976, Coale 1984, Lee and Wang 1999).

In the traditional marriage regime, marriage chances were affected by the socioeconomic position of the family (Fricke et al. 1994, Lee and Wang 1999, Wolf and Huang 1980). Family socioeconomic circumstances influenced marriage chances because women were scarce, leaving men from poorer families more likely to remain bachelors (Chen et al. 2014, Harrell 1985, Lee and Campbell 1997, Lee and Wang 1999). Men in 19th century Liaoning married earlier and were more likely to remarry after bereavement if they were from better off families, while women from better off families married later and at slightly lower lifetime rates than lower status women (Chen et al. 2014, Wang et al. 2010). Higher status families were more likely to practice the culturally preferred "major marriage" form—where men and women marry in young adulthood and the bride moves to the groom's household—in Taiwan during the Japanese colonial period (Sa 1985, Wolf and Huang 1980). Women with higher levels of education married later in 1930s Taiwan and this trend deepened after World War II (Casterline 1980). On the mainland, the incomplete evidence suggests men born in the early decades of the 20th century were more likely to never marry if they had no schooling (Ebenstein and Sharygin 2009, Wang and Tuma 1993). Position within the extended family mattered as well so that some men,

who may have otherwise been able to find a mate, were prevented from marrying because of their inferior position within the household family hierarchy (Campbell and Lee 2008b).

The coming to power of the Chinese Communist Party (CCP) at the end of 1949 had fundamental consequences for many aspects of society, including marriage (Coale 1989, Croll 1981, Davis and Harrell 1993, Johnson 1983, Wolf 1984, Wolf 1986, Yang and Chen 2004, Yan 2003, Ye 1992). One of the first official directives of the new leadership was the 1950 Marriage Law, which raised the minimum age at marriage to 18 and guaranteed the right of personal choice in marriage decisions to both men and women (Banister 1987, Croll 1981, Johnson 1983, Parish and Whyte 1978). The interest of the CCP in marriage may have had less to do with a concern for personal freedom than with a desire to lessen the general influence of the extended family in Chinese society (Croll 1981, Davis and Harrell 1993, Wolf 1984). In the aftermath of the new law, marriage was still not a matter of personal choice, both because families remained very influential and the new government bureaucracy controlled the process via marriage licenses, access to housing, and job assignments, all of which could be withheld from uncooperative couples (Banister 1987, Croll 1981, Davis and Harrell 1993, Parish and Whyte 1978, Yang and Chen 2004). By the 1970s, the government priority was to delay female marriage to reduce fertility (Scharping 2003, Yang and Chen 2004). Because out of wedlock fertility was rare (Banister 1987), delaying marriage contributed to reducing both period and total fertility (Coale 1989, Coale et al. 1991).

Whether due to increasing personal choice, state control of marriage via licensing, or other social forces, age at marriage rose substantially for both men and women, at least for cohorts born between the mid-1930s and mid-1950s. For mainland Chinese who survived to be enumerated in the 1988 fertility surveys, mean age at first marriage rose nearly four years for

women (18.8 to 22.5 years) between the 1900-1925 and 1955-1959 birth cohorts; while men had a three year rise over the same period, 21.4 to 24.2 years (Wang and Tuma 1993). These estimates are roughly consistent with those made from a large 1930 survey of Chinese farmers in which mean marriage age for women was 17.5 and for men 21.3 (Barclay et al. 1976). The majority of the rise in marriage ages was after 1950, according to Figure 1, which graphs the median marriage age across birth cohorts for individuals who survived until the 2000 census. For men born in 1930-34, the median marriage was 22.5 years and this rose to nearly 25 years for men born 20 years later. Women born in 1930-34 had a median marriage age just under 20, which then rose to more than 22.5 years for women in the 1955-59 birth cohort.

[Figure 1 about here]

Marriage ages declined for Chinese born in the 1960s. This was likely due to the 1980 Marriage Law that in practice reduced the minimum age of marriage (Banister 1987, Tien 1983, Yang and Chen 2004), and, more speculatively, the end of the turmoil of the Cultural Revolution decade (1966-76) and the economic reforms after 1978 that increased incomes, especially in the countryside, which should have made marriage more affordable for younger Chinese (Song 2004). The 1980 Marriage Law also signaled the CCP's severance of marriage policy from fertility policy. Using later marriage to indirectly reduce fertility was evidently not enough for policymakers (Banister 1987, Scharping 2003, Yang and Chen 2004), who changed to a more direct method of mandating the number of children married couples could have with the "one-child" fertility policy.

Along with the secular rise in average marriage age, there was a noticeable increase in the concentration of male marriage age during the middle decades of the 20th century (Smith and Wei 1986, Wang and Tuma 1993). This phenomenon was highlighted by Wang and Tuma (1993) who showed graphically how the distribution of male marriage age changed from a right skewed pattern for cohorts born early in the 20th century to one that was much more normally, and narrowly, distributed around a higher mean age at first marriage for later cohorts.

Men not only married in a narrower range but also in higher proportions after 1950, although the timing of this change, and whether it was sudden or gradual, cannot be pinned down because of the lack of comparable data for the pre-1950 period (Barclay e al. 1976). The comparison with the pre-20th century pattern is clear however. In the earlier epoch, 10-20 percent of men did not marry (Lee and Wang 1999). After 1950 this number dropped to less than five percent. Figure 2 shows the percent of men never married by census year. Across all censuses, 1982-2010, less than five percent of men remained never married at age 50, and only in the 2010 census were more than 10 percent of men still bachelors at age 30.

[Figure 2 about here]

This large increase in lifetime marriage rates for men can only be explained by improved marriage market conditions for men, meaning more women must have survived to marriageable age compared to earlier periods. This improved female survival is one underlying factor distinguishing the post-1949 marriage regime. Although the post-1949 period was especially good for men's marriage opportunities, millions of older men remained unmarried through the period, something that remained a social hardship in a society that continued to emphasize a need

for all men and women to marry (Das Gupta et al. 2010, Johnson 1983, Poston and Glover 2005, Tien 1983).

Similar graphs for never married women show the continuity of universal marriage for women regardless of time period (Figure 3). By the 40-44 age group, more than 99 percent of women were married in each census year. This continued prevalence of universal marriage for women over time is a feature of the mainland Chinese marriage regime (Jones 2007). Many social factors—such as increasing education, urbanization, gender equality, and economic growth—that have correlated with a retreat from marriage in other contexts (Blossfeld 1995, Lesthaeghe 1995, van de Kaa 1987) have not yet had a similar effect on women's marriage patterns in mainland China.

[Figure 3 about here]

Up through the 2010 census, men age 40 or above continued to experience what were likely historically high levels of lifetime marriage at or above 95 percent. But high rates of lifetime marriage do not necessarily preclude rising levels of divorce, widowhood, or living alone. The social welfare concern around marriage is especially tied to fears that increasing numbers of men will live alone and therefore lose valuable connections with family and society more generally (Gu 2009, Jiang et al. 2011a, Poston and Glover 2005, Sharygin et al. 2013); but the recent period has been positive for men in these respects as well. Figure 4 graphs the percentage distribution of never marrying alongside divorce, and widowhood across census years for men age 40 or above. The proportions never marrying or divorced remained flat, while widowhood showed secular declines across the 1982-2010 period. The vast majority of men

married, very few divorced, and fewer experienced the death of a spouse. All of these contributed to low and falling proportions living alone for age 40 or above men, which fell from 10 percent in 1982 to less than four percent by 2005, according to census tabulations.

[Figure 4 about here]

In more macro-historical terms, the period after 1949 was one of contestation between the traditional force of the extended family and the new force of the Chinese state under the CCP (Croll 1981, Davis and Harrell 1993). The battlegrounds included marriage and fertility, as well as a more general contestation over land and other socioeconomic resources. Marriage was, in fact, considered an economic resource because it was traditionally more of an economic transaction between families than a personal affective transaction between individuals (Croll 1981, Johnson 1983, Lee and Wang 1999).

Through land reform, and later the collectivization of agriculture, the CCP sought to remove economic power from the hands of the landholding class, which maintained social and economic power in part through extensive kinship ties (Lee and Wang 1999, Parish and Whyte 1978, Potter 1970, Wolf 1984). Taking marriage decisions, at least formally, out of the hands of family patriarchs weakened the family's control over social reproduction (Croll 1981, Davis and Harrell 1993, Yan 2003). These two revolutionary fronts were intertwined because young people could not resist the marriage decisions made for them by their elders without economic resources of their own (Lee and Wang 1999, Parish and Whyte 1978). After the early 1950s, young people had more of an equal stake in land and other economic resources (Guo 1995, Davis and Harrell 1993, Yan 2003), and they also had *de jure* right to make their own marriage choices (Croll

1981, Parish and Whyte 1978). Of course both of these revolutions, and the legal rights accompanying them, were incomplete (Campbell and Lee 2011, Croll 1981, Davis and Harrell 1993, Johnson 1983, Parish and Whyte 1978, Wolf 1985, Xu and Whyte 1990), but nonetheless still influential for socio-demographic outcomes.

3. Mainland China's marriage regime in regional context

Mainland China's very high rates of marriage for both men and women make it an exception to changes in marriage rates in other parts of Pacific Asia and the west (Jones 2007). Changes that have been characterized as a feature of the "second demographic transition", which concerns the changing social roles and attainments for women with consequences for fertility, marriage and divorce, as well as other socioeconomic and socio-demographic features of society (Lesthaeghe 2010, van de Kaa 1987). Focusing on the marriage aspects of this transition, a decline in marriage rates, especially at younger ages, has been gaining strength since the 1980s across increasing portions of Pacific Asia (Jones 2004). These declines paralleled earlier trends in the U.S. and Europe (Caldwell et al. 1988, Lesthaeghe 1983, 1995; van de Kaa 1987). Increases in unmarried singlehood were especially dramatic in several Pacific Asian countries between 1990 and 2000 (Jones 2004) and continued up through 2005 (Jones and Gubhaju 2009). In 2000, more than a quarter of 30-34 year old Japanese women were still single, nearly a 100 percent increase over the previous decade. Similarly aged women in South Korea also doubled their rate of singlehood in the 1990s to 10.7 percent, and then doubled it again by 2005 (Jones and Gubhaju 2009). By contrast, Figure 3 shows near universal marriage for mainland Chinese women by the time they are in their mid-30s across each of the 1982-2010 censuses.

The recent period saw high levels (30-40 percent) of singlehood for men into their thirties in parts of the Pacific Asian region, and then a comparative rush into marriage, particularly in South Korea, Japan, Taiwan, Hong Kong, and Singapore (Jones and Gubhaju 2009). Nevertheless levels of singlehood remained at or above 14 percent for men in their forties in Japan, Taiwan, Hong Kong, and Singapore (Jones and Gubhaju 2009). Meanwhile in mainland China, in 2010, 97 percent of men were married by age 45 (Figure 2).

Across Pacific Asia, older unmarried men were more socio-economically disadvantaged than their married peers (Jones 2004, Jones and Gubhaju 2009, Nozaki and Matsuura 2010). This was part of a deepening regional pattern wherein older less educated men and more educated women remained unmarried in greater numbers, with unmarried men outnumbering unmarried women at older ages (Jones and Gubhaju 2009). For some mainly lower SES men seeking marriage, importing a foreign-born spouse was a solution. According to recent estimates, nearly a third of men in Taiwan and Singapore and 10 percent in South Korea marry a foreigner (Jones and Gubhaju 2009, Tsay 2004).

Nevertheless, while educational status continued to be a factor, recent marriage change across Pacific Asia was driven more by period forces operating across educational categories than by compositional changes in education at the level of the population. Jones and Gubhaju (2009) decomposed changes in the percent unmarried across age groups into a component due to period effects operating across educational levels and a component attributable to educational change. For women, rising levels of singlehood between 1990 and 2000 *did* result mainly from compositional changes in educational attainment in Thailand, Singapore, and for ethnic Chinese in Peninsular Malaysia, but the overall changes in marriage levels in these countries were small. In countries where marriage rates fell dramatically, educational change did not play a large role.

In South Korea and Japan the rise in singlehood was dramatic and pervasive across all educational groups (Jones and Gubhaju 2009). Raymo (2003) comes to a similar conclusion for Japanese women with only slightly higher rates of delayed and non-marriage for college-educated women, with most of the delay coming directly from increased time in school itself. The small rise in singlehood for women on mainland China is also not explained by changes in educational attainment (Jones and Gubhaju 2009). For men, over these same periods, educational change does not explain the dramatic rise in singlehood in Japan, South Korea, and Taiwan. It also does not explain the less dramatic rise in singlehood in Singapore (2000-2005), among Malaysian Chinese, or 25-29 year olds on mainland China—the only age group there to experience a noticeable rise in singlehood (Jones and Gubhaju 2009).

Kye (2008) has a more nuanced analysis of the importance of education for marriage timing in the Korean case. He finds that compositional change in educational attainment at the population level was not the primary factor delaying marriage for women; instead the changing association between marriage timing and education was most important. In other words, it wasn't the expansion of education to more people that primarily drove changes in timing but the strengthening over time of the delaying effect of education.

4. Primary analytical variables used in the empirical chapters

Rising educational attainment: a key feature of 20th century China

Although Jones and Gubhaju (2009) did not find educational change at the population level to have been decisive in the recent delay and/or retreat from marriage across Pacific Asia, educational advancement has been an important aspect of socio-demographic change across the region, including mainland China (Deng and Treiman 1997, Hermalin et al. 1994, Raymo 2003,

Rindfuss and Hirschman 1984, Smits and Park 2009). Figure 5 shows the rise in education in mainland China was substantial and steady across birth cohorts for both men and women. Average educational attainment was only slightly more than one year for women and four years for men born in the early 1920s. For men and women born in the early 1970s, the average was close to nine years, with the gap between the sexes shrinking to less than a year. Because people with less education are more likely to die early, the actual rise across cohorts was probably even larger than shown in this graph, which is based on survivors to the census year.

[Figure 5 about here]

Because changing educational distributions are especially important for the analysis on the determinants of bachelorhood in chapter 3, Figure 6-7 provide a more detailed breakdown for age 40 or above men. Both *hukou* groups saw large gains in education across birth cohorts, though rural men had consistently lower levels of education. More than half of rural men had less than a primary education until the 1936-40 cohort; and even for the 1961-65 cohort nearly a third had only a primary education or less. Only for rural men born after 1955 do even 10 percent have a high school education. Urban men in the early cohorts also started with low levels of education: more than half of the 1926-30 cohort had only a primary education or less; and nearly a quarter still had this low level of education twenty years later. At the other end of the distribution, a third of urban men had at least a high school education by the 1936-40 cohort, and by the 1956-60 cohort, 60 percent had this level of attainment.

[Figure 6 about here]

[Figure 7 about here]

The transformation of mainland China from low levels of educational attainment to medium levels of educational attainment makes it a good case for studying the social effects of educational change, including its relationship with marriage behavior. Many social science studies of China consider education a key factor in shaping behavior, whether the outcome is economic (Wu and Treiman 2007), political (Li and Walder 2001), or demographic (Ebenstein 2011). Links between education and marriage have been established in a variety of studies for the U.S. (Goldscheider and Waite 1986, Goldstein and Kenney 2001, Thornton et al. 1995), Europe (Blossfeld and Jaenichen 1992, Blossfeld 1995), and Pacific Asia (Kye 2008, Raymo 2003, Raymo and Iwasawa 2005, Qian and Qian 2014, Wang and Tuma 1993). Following this well-established literature, I focus on education as a key variable in all of the remaining chapters.

The empirical chapters will show that educational differences indeed mattered for patterns of marriage behavior, which is not unexpected. Nevertheless, the magnitude of this relationship was not always large or in the expected direction. This may be because the CCP had a peculiar and contested relationship with both educational institutions and the educated classes, particularly during the turbulent 1966-76 Cultural Revolution decade (Deng and Treiman 1997). During this time, educational institutions were disrupted or even closed, and millions of urban youth were sent to the countryside to be taught by their less educated rural countrymen. While expanding educational opportunity is one of the primary achievements of the CCP (Deng and Treiman 1997), its attitude towards the educated elite remained ambivalent. The "red versus expert" debate was one aspect of this distinction between political and human capital that often

gave primacy to the former (Kent 1981, Walder 1989, Zhong 1996), at least before the reforms of the late 1970s (Li and Walder 2001).

The changing importance of human versus political capital in China has been the subject of a large literature (e.g. Bian and Logan 1996, Hauser and Xie 2005, Nee 1989, Walder 1996, Zhou et al. 1997) and goes beyond the scope of this dissertation. I rely on education as a variable in the empirical analyses because it remains an important aspect of social change in all modern societies, including mainland China. It is also a variable that is reasonably well measured in the census and can be retrospectively assigned to cohorts because it occurred at a specific point in the life course. Notwithstanding this, education in mainland China likely meant something different than it did in other societies during this period. This dissertation does not pin down that difference, but it remains part of the context for interpreting the results and in making comparisons with other contexts; including with contemporary China, where education has returned to a position of prominence in sorting people into different socioeconomic strata, at least as evidenced by increasing economic returns to education over time in the post-reform era (Bian and Logan 1996, Hauser and Xie 2005, Wu and Xie 2003).

The household registration (hukou) system: bureaucratic capital and social stratification

Various population registration systems have a long history in China and have been used not only to record people for tax and labor purposes but also to control population movement (Chan 1996, 2009; Lee and Selden 2007, Lee and Wang 1999, Walder 1989). The modern household registration, or *hukou,* system was developed in the mid-1950s and formally codified in a 1958 law (Chan 2009). Every Chinese citizen was assigned both a *hukou* status type—either agricultural or non-agricultural—and a specific *hukou* location based on their family's formal

residence. This was used as part of a strategy to control not only population movement but also the flow of economic resources across the urban-rural divide (Chan 2009, Lee and Selden 2007). As such, it was an integral part of the CCP's economic development strategy to siphon resources from the countryside to support rapid industrial growth in the cities (Walder 1989). This ascribed administrative status became both a *de jure* and *de facto* social and economic barrier between populations, in some ways similar to an international border between countries. It formally inscribed in law the already socioeconomically salient divide between rural and urban China that long predated the policy itself (Chan 2009).

An important feature of the formal policy was that it legally tied people's residence to their place of birth, which greatly curtailed internal migration from the late 1950s until the mid-1980s, when this aspect of the law started to be relaxed (Chan 1996, Liang and White 1996, Wang and Mason 2008). In 1987, for instance, only 1.5 percent of the population reported being away from their *hukou* residence for more than 6 months (Wang and Mason 2008). Movements of people did occur during the interim but these were mostly in response to political events or CCP directives—e.g. the "sent down" young people during the Cultural Revolution—and were at least partially controlled as a result (Liang and White 1996, Zhang 2001). In the mid Moreover, the distribution of *hukou* type did not vary much across birth cohorts born between 1920 and 1975, who were recorded in the 2000 census (Figure 8). For each of these cohorts the percent urban was between 20 and 30 percent, with urban men slightly outnumbering urban women until the 1971-75 cohort. This shows that the policy was effective at suppressing urbanization for several decades.

[Figure 8 about here]

Although internal migration grew more common after 1990, formal *hukou* status remained difficult to change, especially for migrants to bigger cities, so most internal migrants still retained their rural *hukou* designation (Chan 1996, Zhang 2001). For most of the cohorts included in the empirical chapters to follow, internal migration was not common. We know this because they were older than most migrants by the time migration became common after 1985 (Chan 1996, Fan 2000, Liang and White 1996). The partial (five-year) migration histories collected in the census and survey data from 1990 onwards also support the conclusion that migration was not common for these cohorts.

Regardless of migration history or where a person was physically located, *hukou* status continued to determine legal rights to local social services—including education and health care—which made permanent migration problematic, especially for migrants with children (Chan 2009). People with rural *hukou* were guaranteed access to a portion of local village land, while only people with urban *hukou* were guaranteed social welfare including jobs, health, care, and pensions. This made urban *hukou* a form of bureaucratic capital that created usable resources for urbanites not available to rural residents—who even if they migrated to cities could not usually obtain an urban *hukou* (Chan 1996, Zhang 2001). As such, it should have given urban men an advantage on the marriage market.

The fast-paced socioeconomic reform over the last two decades has partially broken down these distinctions. Lifetime social welfare is no longer provided for most urbanites (Chan 2009), and many rural residents have lost or given up access to their land. Nevertheless, *hukou* status remains a salient feature of social stratification, and through much of the latter half of the 20th century was one of the key stratifiers of Chinese society (Chan 2009, Lee and Selden 2007),

with rural *hukou* holders markedly worse off across a host of socioeconomic indicators, including educational attainment, income, and health (Chan 1996, 2009; Treiman and Zhang 2011; Wu and Treiman 2004, 2007; Wu 2010).

In the empirical chapters to follow, I consider *hukou* status as a key factor at both the individual and population level. It partially accounts for urbanization, which is another important social transformation in contemporary China. As discussed, *hukou* accounts for urbanization imperfectly, and does not properly account for the rapid internal migration of rural people over the last 20 years. This internal migration was less salient for the cohorts of Chinese included in these analyses, however, than it was for cohorts who came of age after 2000.

5. Literature review: marriage in China

Marriage timing and education

The preceding sections provide a context for the dominant themes in marriage studies concerning China and, in some cases, the greater East Asian region. Rising levels of education, especially for women, inspired studies concerned with the links between educational attainment and the timing or likelihood of marriage (e.g. Wang and Tuma 1993, Xu et al. 2002). Links between education and marriage have been established in a variety of studies for the U.S. (Goldscheider and Waite 1986, Goldstein and Kenney 2001, Thornton et al. 1995), Europe (Blossfeld and Jaenichen 1992), and Pacific Asia (Kye 2008, Qian and Qian 2014, Raymo 2003, Raymo and Iwasawa 2005, Wang and Tuma 1993). Generally these studies conclude more education for women delays marriage. In the U.S. at least, women with more education now have higher lifetime marriage rates than less educated women (Goldstein and Kenney 2001).

This educational crossover has not yet happened in East Asian societies (Qian and Qian 2014, Raymo 2003, Raymo and Iwasawa 2005).

In mainland China studies, female marriage timing was an important topic because of its link with completed fertility and population growth. Women who married later had lower total fertility, all else being equal, so the secular rise in female marriage age was a factor in the declines in fertility after 1970 (Coale 1984, 1989; Coale et al. 1991; Ye 1992). In Taiwan, Thornton et al. (1994) and Casterline (1980) both found changes in education explained most of the rise in marriage age for women between the 1950s and the 1980s. For mainland China, Xu et al. (2002), using data collected in 1991 from six Chinese provinces, found that education reduced the hazard of marriage for women, as well as for men, with two additional years of education associated with a 7-13 percent reduced hazard of marriage.

Along with Xu et al. (2002), a few studies have examined the relationship between education and marriage for men using census and survey data that first became available in the 1980s. As in the research for pre-20th century populations, a socioeconomic gradient was still evident. According to data from the 1982 census, between a third and a half of unmarried men in the 1935-1955 birth cohorts were illiterate (Ebenstein and Sharygin 2009). According to retrospective marriage and fertility survey data collected in the late 1980s, men with some schooling had higher rates of marriage than illiterate men, at least up through the 1960-64 birth cohort (Wang and Tuma 1993); and this relationship between education and marriage was still evident in studies using data from the 2000 census (Das Gupta et al. 2010).

In addition to their female focus, most studies of marriage timing model the distribution only in the sense that they show how the expected mean of the distribution of marriage age changes as background characteristics (e.g. years of education) of the sample change (e.g. Xu et

al. 2002, Trent and South 2011). These studies do not model how the variability of marriage age itself co-varies with systematic changes in right-hand-side characteristics. A few studies do, however, go beyond the mean to look at changes in the spread or variability of marriage timing. Wang and Tuma (1993) identified changes in the spread of marriage as a key indicator of marriage change, but they did not explicitly model its determinants. Their descriptive graphical analysis up through the 1965 birth cohort showed both men and women converging towards a higher mean age of marriage within a narrow range. This narrowing of the range was especially evident for men, who traditionally married over a wide age range due to variations in family and economic circumstances.

Coale (1984, 1989) applied the Coale-McNeil standard marriage curves (Coale and McNeil 1972) to the 1950-82 marriage histories of mainland Chinese women. He concluded that the standard marriage curve fits the actual distribution of Chinese women very well up until the 1970s when government policy to delay marriage pushed the distribution off of the standard curve. While Coale's analysis is a sophisticated treatment that provides strong evidence that government policy indeed affected marriage timing, he did not directly model the association between other factors—such as education—and the range of marriage ages.

Ye (1992) extended Coale's analysis for mainland Chinese women by first estimating a Coale-McNeil model and then using the fitted spread parameter as the dependent variable in a regression model. He ordinal coded the different historical periods in terms of strength of government pressure on family formation behavior and then regressed the standard deviation of first marriage age for women on this variable. He found the strength of the policy environment is associated with increases in the standard deviation of marriage timing and attributed this increasing variation to the breakdown of the traditional marriage system in which most women

married soon after reaching physical maturity. Another factor, according to Ye, was that regulations encouraging later marriage were not uniformly implemented or accepted by the populace, which increased the variation in marriage timing across provinces.

Smith and Wei (1986) used Coale's marriage indices to examine marriage dynamics, including the variability in timing. They demonstrated that along with a rise in mean age there was a narrowing in the spread of marriage age between 1945 and 1980. They also provided some evidence that the geographic component of marriage timing changed during this period, driven perhaps by changes in economic and social development across provinces.

For Taiwan, Casterline (1980) analyzed variability in marriage timing for the 1905-1976 period. He showed a decline in the variability of marriage across and within sub-regions in concert with a general rise in mean marriage age. This pattern of a rise in the average age with a decline in the variance of that age held for women across the entire period and for men after 1950.

Changing education and patterns of assortative mating

Along with aspects of marriage timing, a second major theme in China and East Asian marriage studies is assortative mating, particularly on education. Rising levels of educational attainment, and relative educational gains for women, creates changing opportunities to mate assortatively that may have implications for social stratification and social closure more generally (Hermalin et al. 1994, Raymo and Xie 2000, Wu 2010). Rising educational attainment for both men and women has created more opportunities for educationally homogamous marriages—i.e. marriages where both spouses have the same educational level. Educationally homogamous marriages as a percent of all marriages rose in mainland China from 50 to 65

percent, while hypergamous marriages (less education for the bride than groom) fell by 20 percentage points between 1970 and 2000 (Han 2010). The strength of "educational homogamy"— a measure of the likelihood of homogamous marriage that controls for changes in the educational distribution with log-linear models—rose substantially (by roughly 50 percent) between 1980 and 2000, and the odds of marrying a partner with less education dropped substantially over the same period (Han 2010). Han saw this as evidence for increasing social closure in Chinese society during a period of rapid economic change.

These results are in contrast to trends in educational homogamy during the 1970s and 1980s where Raymo and Xie (2000) found decreasing levels of educational homogamy in mainland China, Taiwan, and Japan, suggesting decreasing amounts of social closure in these societies. Across a longer time span (1950s-1990s), Smits and Park (2009) also found the strength of educational homogamy was in secular decline across 10 East Asia societies, including mainland China, Taiwan, and Hong Kong. They credit modernizing forces, including educational expansion, with creating more open societies where social boundaries are less salient. These studies all applied similar log-linear models to completed marriages, so differences in the conclusions drawn are possibly due to differences in time period and/or the specific data utilized.

After several decades of increasing age homogamy, Mu and Xie (2014) reported evidence of increasing age hypergamy for women from the late 1990s through 2005. The authors provided some evidence that this increasing preference for older men may have been due to heightened economic uncertainly in the late 1990s, with older men providing more economic security. Qian and Qian (2014) also reported a noticeable trend towards renewed age hypergamy among urban women in the early 2000s. An additional hypothesis Mu and Xie (2014) offered was that women may have replaced educational hypergamy with age hypergamy for social status

reasons. Because women had caught up to men educationally they could no longer, on average, practice educational hypergamy; but social hypergamy was still desirable so they adjusted their preferences accordingly to privilege age in the marriage sorting process.

Authors in the aforementioned assortative studies attributed changes in homogamy to broader social forces that made Chinese society more, or less, open to marriages across social boundaries. A role for broad-based social forces—stemming from changing educational attainments, economic opportunities, and post-1978 political reforms—on marriage patterns is certainly possible. But in addition to these often unnamed social forces, there may have been structural marriage market forces at play. Unmarried Chinese would likely have been sensitive to the numerical availability of potential marriage partners. The log-linear models used in these assortative mating studies control for changes in the marginal distribution of the married population; they do not control for changes in the distribution of the unmarried single population in each time period. Due to past fertility fluctuations, marriage-age women within certain age groups may actually have outnumbered similarly aged men during the recent past (Goodkind 2006). Therefore a return to the more traditional practice of marrying older men may have been in response to relative shortages of men of similar age. Similarly the changes in the distribution of potential spouses by educational attainment—i.e. changes in marriage market conditions by education—also may have been an important factor for changing educational assortative mating (see Figure 23, chapter 4).

Marriage market conditions and marriage timing

Marriage-related studies of China and East Asia that have included some consideration of the marriage market mainly come in two types. One type are one-sex marriage models in an

event history modeling framework. Studies of this type usually include a measure of marriage market conditions by estimating the ratio of men to women at a specific age. For instance, Ono (2003), in her comparative study of marriage in the U.S., Sweden, and Japan, found a favorable sex ratio for women improved their odds of marriage; and Nozaki and Matsuura (2010) showed the sex ratio of 25-year-old Japanese men to 20-year-old women—calculated for the year the subject was that age—had relatively large effects (14 percent increased odds of marriage) on ever married rates for men, but not women, born between 1920 and 1956. For Taiwan during the 1961-76 period, a higher ratio of 25-29 year-old males to 20-24 year-old females predicted higher marriage levels for the latter (Casterline 1980). For Taiwan after 1980, Kuo (2008) found some evidence that the marriage likelihood for women under age 30 increased with the sex availability of men, but fixed effect models show this may have been due to other local conditions correlated with sex ratios.

A few studies of marriage in mainland China have also included a similar variable for marriage market conditions. Trent and South (2011) modeled marriage conditions with the ratio of 18-26 year-old men to 16-24 year-old women. They found this ratio was associated with the likelihood of women marrying before age 25, with higher chances of marriage as the ratio increased. None of the aforementioned studies considered marital status when calculating an adult sex ratio on the marriage market. Fan and Huang (1998) do take marital status into account and look at the relationship between the sex ratio of age 30 or above unmarried singles and migration for marriage. They find a slight positive relationship between a surplus of older unmarried men and in-migration by younger women for the purpose of marriage.

A second group of marriage studies use two-sex models, similar those I employ in chapter 4, to account for the relative availability of unmarried singles on the marriage market

(Schoen 1988). Chu and Yu (2010) analyzed data of recent marriage cohorts in southeast China and found that once marriage market conditions were controlled, social closure increased over time, as evidenced by decreasing odds of marriage across occupational class barriers. Raymo and Iwasawa (2005) showed that a quarter to a third of the decline in marriage for college-educated Japanese women could be explained by the relative declines in the availability of highly educated men of similar ages on the marriage market. Highly educated Japanese women did not respond to age-by-education sex ratio imbalances by adjusting their propensity for social hypergamy. The result was a "marriage market mismatch" with higher rates of non-marriage for more educated women and less educated men. On the other hand, in the U.S. context, changes in availability of potential spouses do not explain the retreat from marriage in the 1970s-80s (Qian and Preston 1993) or the differences in black-white marriage rates (Lichter et al. 1991, Schoen and Kluegel 1988). In these cases, changes in the propensity to marry were more influential than changes in marriage market conditions. In chapter 4, I similarly ask whether changes in marriage market conditions or the propensity to marry is more consistent with changing marriage patterns in the recent past in mainland China.

Marriage market projection studies: marriage squeeze in mainland China's future

The role of sex ratios in social and demographic processes has long been of interest to researchers (Markle 1974, Winston 1931). This interest has been renewed with the recent trend of high sex ratios at birth (i.e. markedly more male than female births) in several countries in East and South Asia—including India, South Korea, Taiwan and mainland China (Echavarri and Ezcurra 2010, Edlund 1999, Gu and Roy 1995, Hesketh and Xing 2006, Poston et al. 2003) The projected role of recent high sex ratios at birth on future socio-demographic trends in mainland

China has particularly garnered scholarly attention (e.g. Cai and Lavely 2003, Poston and Glover 2005, Edlund et al. 2013, Gu 2009, Jiang et al. 2011b, Sharygin et al. 2013).

Sex ratios at birth rose steadily between 1980 and 2000 on mainland China during a period of economic and social reform, fluctuating implementation of the "one-child" fertility policy, as well as widespread adoption of ultrasound technology, which made sex-selective abortion feasible (Bannister 2004, Gu 2009, Gu and Roy 1995, Hull 1990, Li et al. 2012, Scharping 2003, Yang and Chen 2004). Estimates for the 2010 census show just under 120 male births for every 100 female births, which represented a leveling off of the trend over the previous ten years (Goodkind 2011, Guilmoto 2012). Despite improvements across the 20th century (Coale and Bannister 1994), infant and young child mortality remained higher for females (Bannister 2004), and worsened relative to boys after 1985 (Wang and Mason 2008). On top of this, falling fertility since the early 1970s means successively smaller marriage-age cohorts, which in combination with customary marriage age gaps—i.e. the modal pattern of age hypergamy—leads to age structure imbalances on the marriage market, with relatively more older men seeking relatively fewer younger women to marry (Das Gupta and Li 1999, Goodkind 2006). Together these factors affect availability of marriageable persons, resulting in an increasing surplus of men—or more accurately a deficit of women—at customary marriage ages that will become increasingly pronounced over the next generation (Attané 2006, Cai and Lavely 2003, Das Gupta et al. 2010, Ebenstein and Sharygin 2009, Goodkind 2006, Guilmoto 2012, Poston and Glover 1995, Jiang et al. 2011ab, Jiang et al. 2014, Sharygin et al. 2013, Tucker and Van Hook 2013, Tuljapurkar et al. 1995).

The possible effects of skewed sex ratios on future marriage markets, particularly for men, has become the predominate concern of China-related marriage studies (Poston and Glover

2005, Jiang et al 2011b, Guilmoto 2012). Generally, these studies have used population projection life table techniques to forecast the size of future sex imbalances and the effect of these on overall population growth (Cai and Lavely 2003), population aging (Jiang et al. 2011a), and marriage markets, especially the number of excess men at customary marriage ages (Attané 2006, Ebenstein and Sharygin 2009, Jiang et al. 2007, Guilmoto 2012). All of the studies concerned specifically with the marriage market effects forecast a significant marriage squeeze by 2020 based on cohorts born by 2000. The level of predicted permanent bachelorhood after 2040 depends in part on whether the sex ratio returns to balance over the next 10-20 years; but the continuing effects of age structure due to past fertility fluctuations will continue to disrupt the marriage market well past 2050 even under the most favorable sex ratio scenario (Guilmoto 2012, Goodkind 2006). Under the assumption of a continued sex ratio at birth of 117 (the official 2000 census estimate), Attané (2006) estimated a male surplus of 15 percent for all cohorts under age 45 in 2050.

Less obviously embedded in these projection models are also assumptions that key features of marriage patterns are determined exogenously. These include mean ages at marriage (Guilmoto 2012), maximum and average age gaps between spouses (Goodkind 2006), and age of debut on the marriage market (Sharygin et al. 2013). Most of these studies either do not consider marriage rates at all (Attané 2006, Goodkind 2006), hold marriage patterns constant (Tuljapurkar et al. 1995, Jiang 2011a), include an exogenously set linear trend in average age at first marriage and marital age gaps (Guilmoto 2012), or set total marriage rates to one (Jiang et al. 2011b), which is equivalent to not considering changes in marriage. So aside from some variability in the allowable age gaps between spouses and the average age at marriage, these projection models do not consider how preferences might affect the marriage market or vice versa.

Crucially these studies assume men and women all want to marry and that only their numeric imbalance on the marriage market will keep them from doing so. Nevertheless the numbers of men and women on the marriage market are not the only or, under most conditions, the primary factor affecting marriage. While marriage market conditions constrain marriage in certain fundamental ways, patterns of preferences for marriage—on age, but also on other features such as education—remain the most proximate determinant of who and how many people marry. Relatively fixed preferences for age differences between spouses, or other characteristics such as educational attainment, can create marriage squeezes even when sex ratios remain stable within birth cohorts (Foster and Khan 2000). Relatively rapid gains in educational attainment for women can create a marriage squeeze if norms for educational hypergamy remain dominant (Raymo and Iwasawa 2005). Fertility fluctuations across cohorts also can create marriage squeeze conditions if preferences for age hypergamy are unchanging (Foster and Khan 2000, Goodkind 2006, Guilmoto 2012).

In other words, the eventual likelihood of ever marrying is influenced not only by the relative numbers of unmarried males and females, but by their marriage preferences as well. In this context, I am using "marriage preferences" broadly to include not only preferences for certain types of spouses, but also preferences for specific marriage circumstances, including the preference to delay marriage or not marry at all. Preferences and availability also interact with each other in ways not easily accounted for. Reduced availability of certain types of spouses may lead some people to adjust their preferences and broaden their search (Ni Bhrolchain 2001), continue searching with no change in preferences (Oppenheimer 1988) or, at the other extreme, cause them to drop out of the marriage market altogether (McDonald 2009).

Changing preferences will influence future marriage patterns in mainland China in ways not accounted for by the recent marriage literature. This literature has been occupied with trying to estimate the magnitude of the future marriage squeeze in terms of the numbers of men and women of marriage age, regardless of their marital status. For the most part it has not considered how marriage behaviors might change in response to a marriage squeeze, which could have a reciprocal effect on the size of the squeeze (Foster and Khan 2000). This literature also assumes women in mainland China will continue to marry universally and at relatively young ages. This assumption is made despite the dramatic changes in marital timing and rates that have taken place across Pacific Asia over the last two decades (Jones 2007) and across most of the west over the last five or six decades (Blossfeld 1995, Caldwell et al. 1988, Lesthaeghe 1995, van de Kaa 1987)

6. Data used in the empirical analyses

The data for mainland China utilized in this dissertation are drawn from individual-level micro-data samples from the 1982, 1990, and 2000 national censuses, as well as the 2005 "1% China Population Survey", also known as the "China mini-census" (National Bureau of Statistics of China) . The Chinese government carried out two national censuses prior to 1982, in 1953 and 1964, but no individual-level or detailed aggregate data has ever been made available (Ma 1983). One percent micro-data samples for 1982 and 1990 are publically available from IPUMS International through cooperation with the National Bureau of Statistics of China (Minnesota Population Center, Integrated Public Use Microdata Series, International Version 6.1).[1] The data

[1] Microdata from the 2000 census and 2005 mini-census are not publically available. I gained access to these data through contact with researchers in mainland China. The descriptives for 2010 reported in this dissertation were obtained from researchers at the Hong Kong University of Science and Technology as part of a 2013

from the 2000 census are a random 0.1 percent sample from the original full census. The data from the 2005 mini-census are based on the full one percent sample, weighted to account for the multi-stage geographic random sampling procedure. I only was granted access to select variables from the 2005 data, which I utilize only in chapter 3. I do not have access to the additional variables that would allow me to extend the analyses in chapters 2, 4, and 5 up to 2005. Therefore, those chapters are based on the 2000 census microdata only.

7. Concluding remarks: the individual, the family, the state, and marriage change

Linking the post-1949 marriage regime covered in this dissertation with the traditional pre-20th century regime and the impending marriage squeeze regime is difficult, in part because data from first half of the 20th century are lacking and future marriage patterns remain unknown. Throughout the subsequent chapters I will make the argument that this recent past is relevant for thinking about China's current and future marriage regime. These arguments of course remain speculative until more data becomes available for the current marriage cohorts, which face both changing marriage market and broader social circumstances, both of which should affect marriage attitudes and behavior.

Regarding the backward historical linkages, Wang and Tuma (1993) argued that around 1950 there was a fundamental break from the traditional marriage regime. This argument was in line with family modernization theories that posited increasingly homogeneity of family forms across societies (Goode 1963). The subsequent decades have somewhat discredited this macro

conference on the 2010 census. The aggregated 1982-2010 data are also publically available from the National Bureau of Statistics of China in its published China Statistical Yearbook series (China Statistical Press, various years).

theorizing, but the question of whether or not China's 20th century social revolutions really matter for long-term social change remains an interesting one (e.g. Campbell and Lee 2011, Meisner 1999, Walder 1989, Wolf 1985). Marriage and family change is but one part of this larger debate, but an important part given the socioeconomic importance of the family across Chinese history (Lee and Wang 1999), something that was well recognized by the new CCP leadership when it enacted the first marriage law in 1950 (Croll 1981, Johnson 1983). Certainly, better marriage market conditions for men helped them marry at higher rates, but other factors more directly related to the new policies of the CCP also may have played a role. Intensive land reform in the 1949-52 period increased the number of independent households by 50 percent (Guo 1995), perhaps giving young Chinese a more self-sufficient economic basis for marriage and family. Collectivization of the economy a few years later complicated this picture, and real incomes may have fallen (Walder 1989), but the complete control of young people's lives and economic fortunes by their families was permanently disrupted (Yan 2003).

The CCP sought to undermine the social power of the extended family but it remained a strong supporter of marriage (Croll 1981, Tien 1983, Ye 1992). It is uncertain whether continued higher rates of marriage was in concordance with CCP propaganda or, instead, a retreat into the private sphere during decades that veered towards totalitarianism. Probably it was both. Certainly many Chinese must have found shelter in their nuclear families during a time when the public sphere, as embodied by the CCP and its adherents, threatened to overrun the private (Whyte and Parish 1984, Yan 2003).

In any case, behind the post-1949 changes in marriage likely lay a fundamental shift away from the importance of the traditional family in organizing not only marriage but society more generally. As parents and extended kin lost control of the institution of marriage,

individuals and the state gained more control (Coale 1989, Croll 1981, Tien 1983, Wolf 1986, Xu and Whyte 1990, Yang and Chen 2004, Yan 2003, Ye 1992). Rising mean and narrowing variance of marriage age, as well as the higher rates of marriage for men, were all likely related to the relative shift in power between the family, individual marriage aspirants, and the state.

In this dissertation I am not able to directly show these linkages between changing institutional dynamics of power and changing demographic outcomes. Nevertheless, these dynamics likely played an important role in generating the continuity and change in marriage patterns over the latter half of the 20th century examined in the chapters to follow.

Results: figures

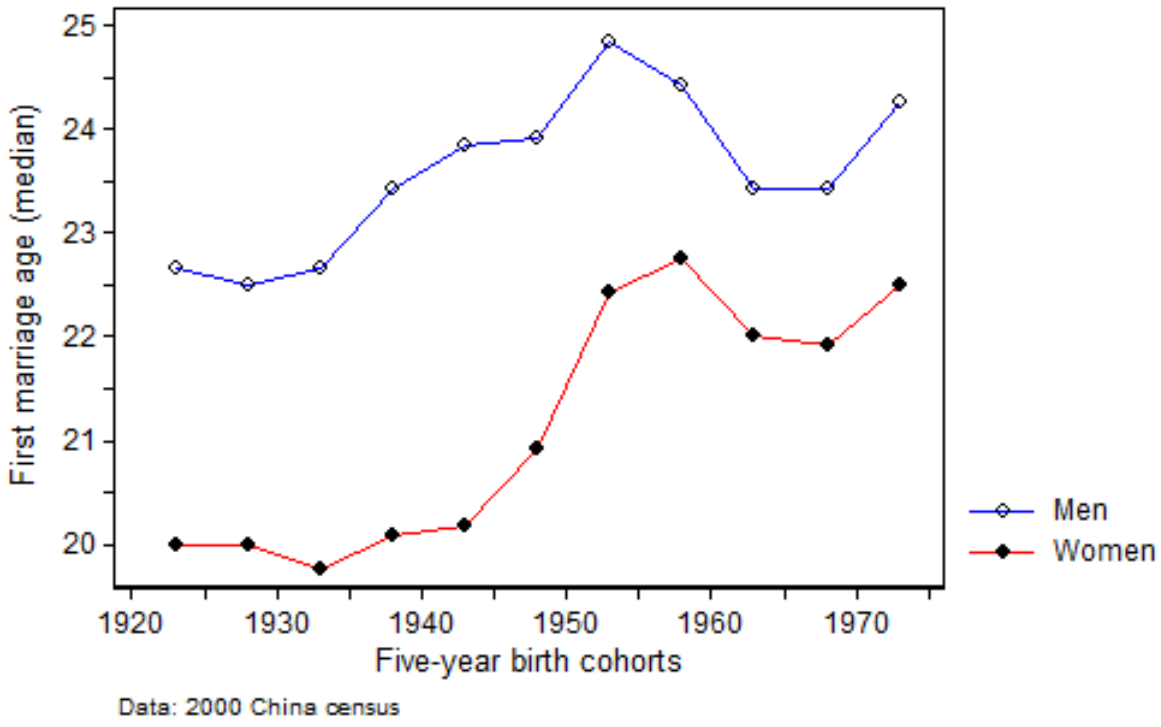


Figure 1. Median First Marriage Age by Birth Cohort

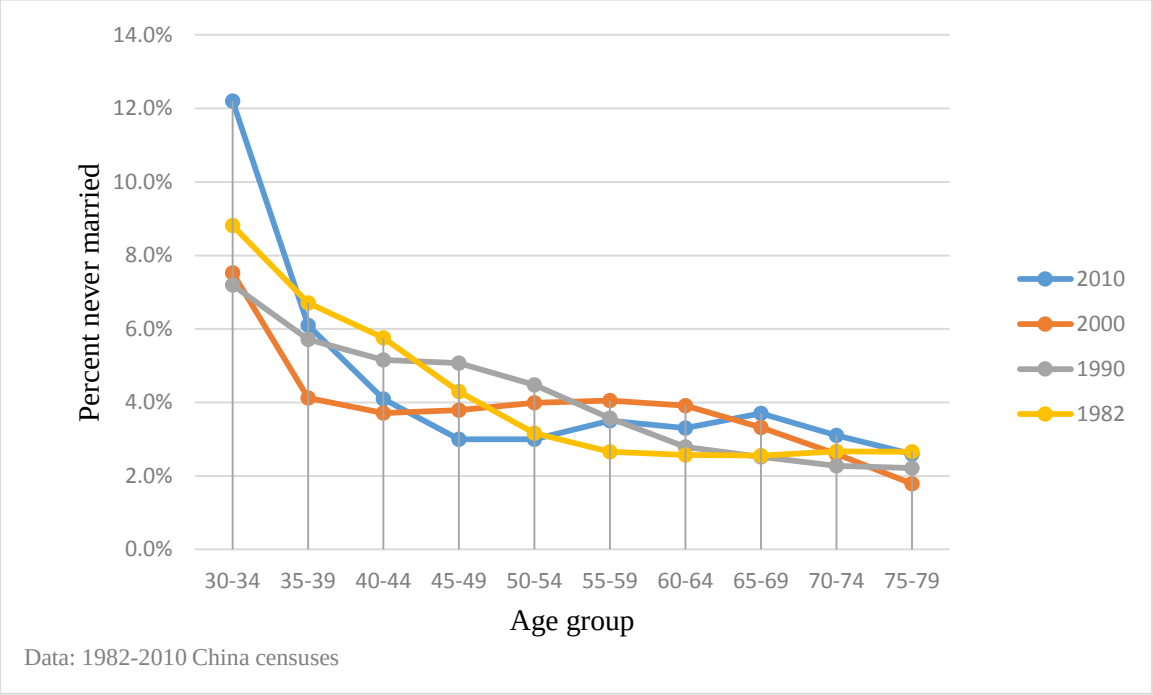


Figure 2. Never Married Men by Age Group and Census Year

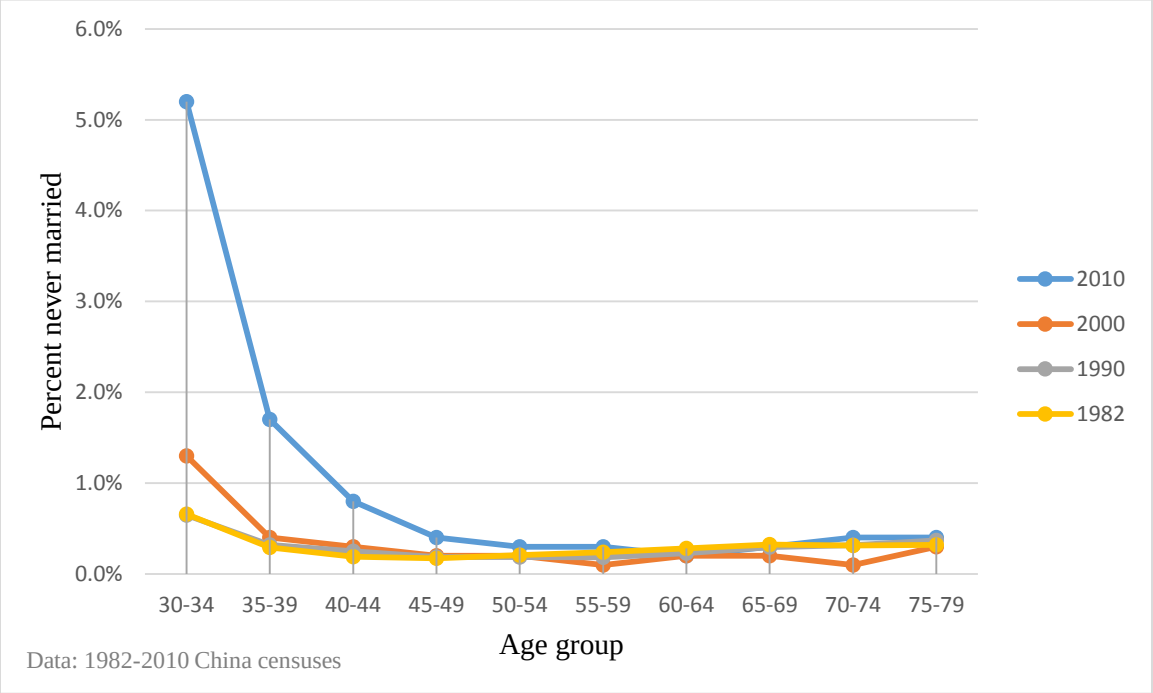


Figure 3. Never Married Women by Age Group and Census Year

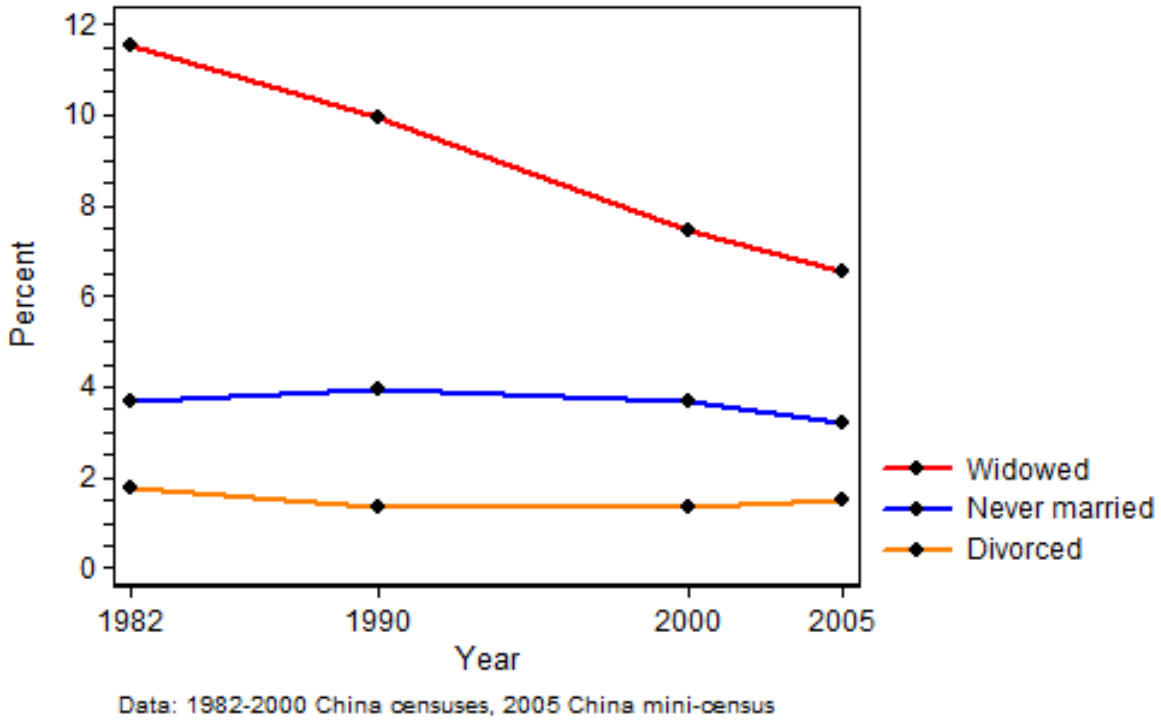


Figure 4. Marital Circumstance for Men, Age 40+, by Census/Survey Year

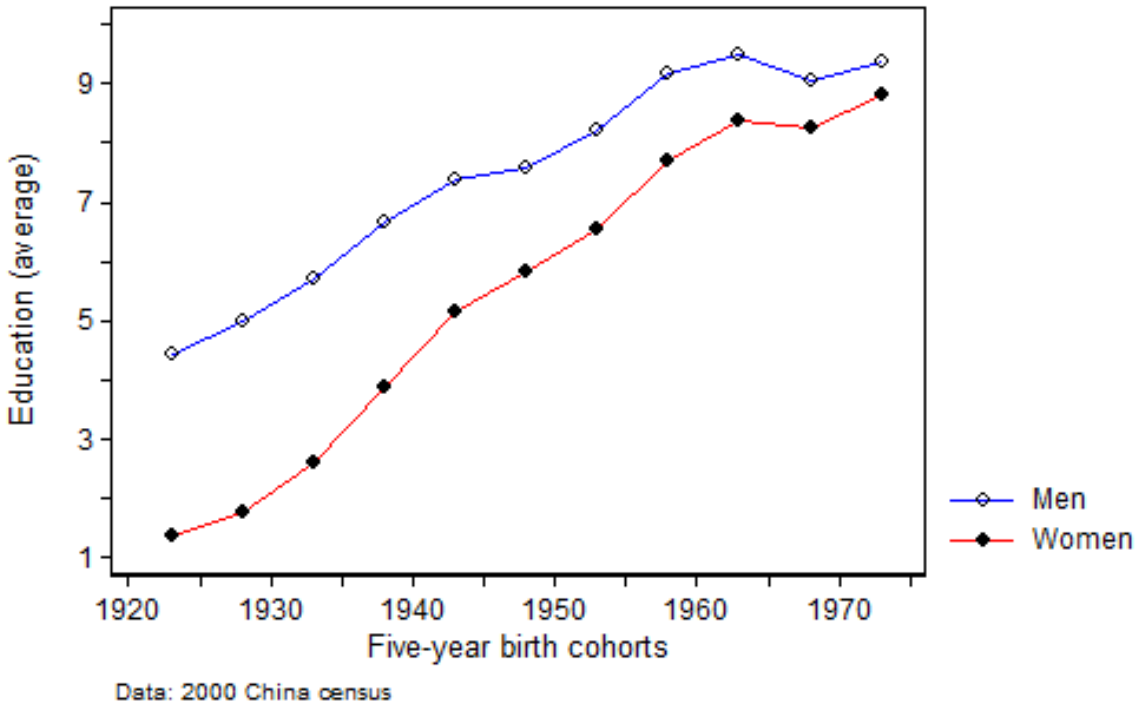
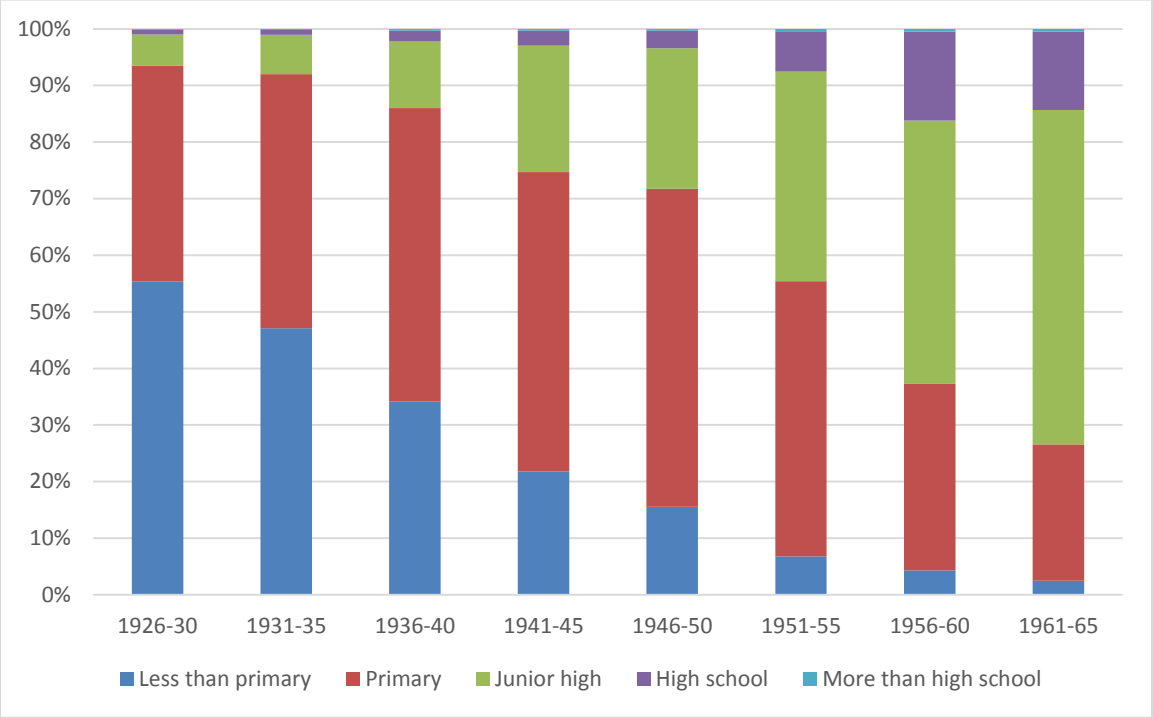
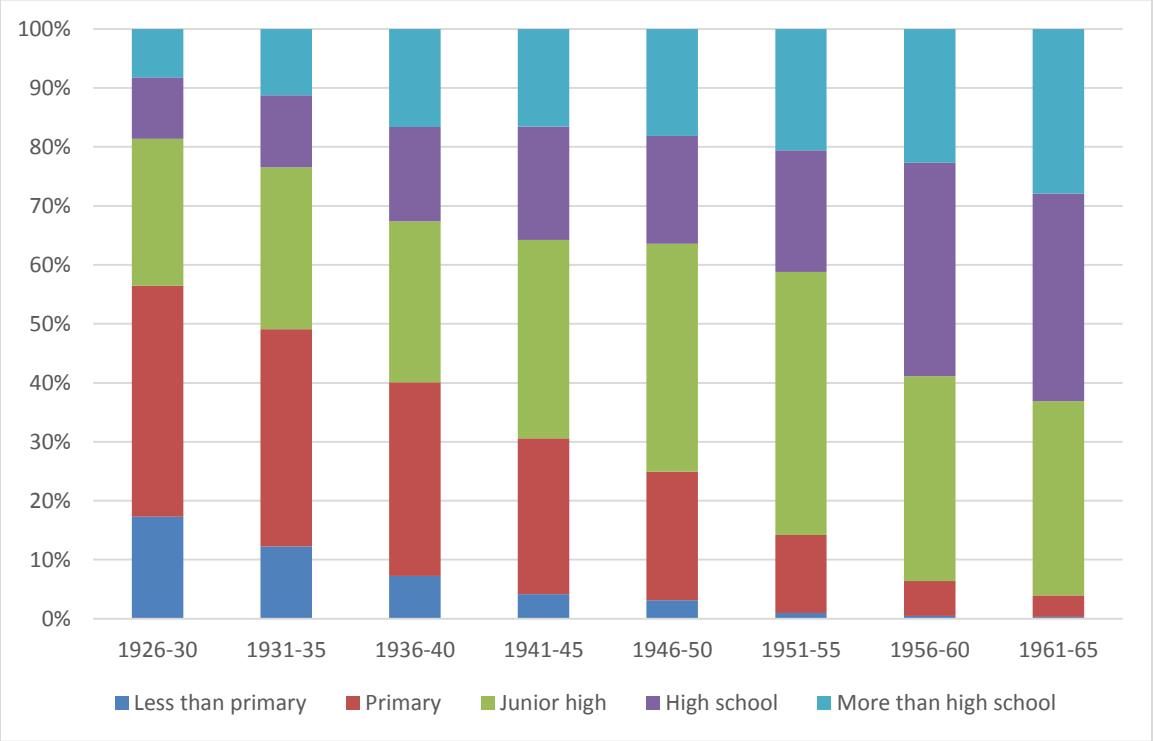


Figure 5. Average Education by Birth Cohort



Data: 1982-2000 China censuses, 2005 China mini-census

Figure 6. Educational Distribution by Birth Cohort, Rural Men, age 40+



Data: 1982-2000 China censuses, 2005 China mini-census

Figure 7. Educational Distribution by Birth Cohort, Urban Men, age 40+

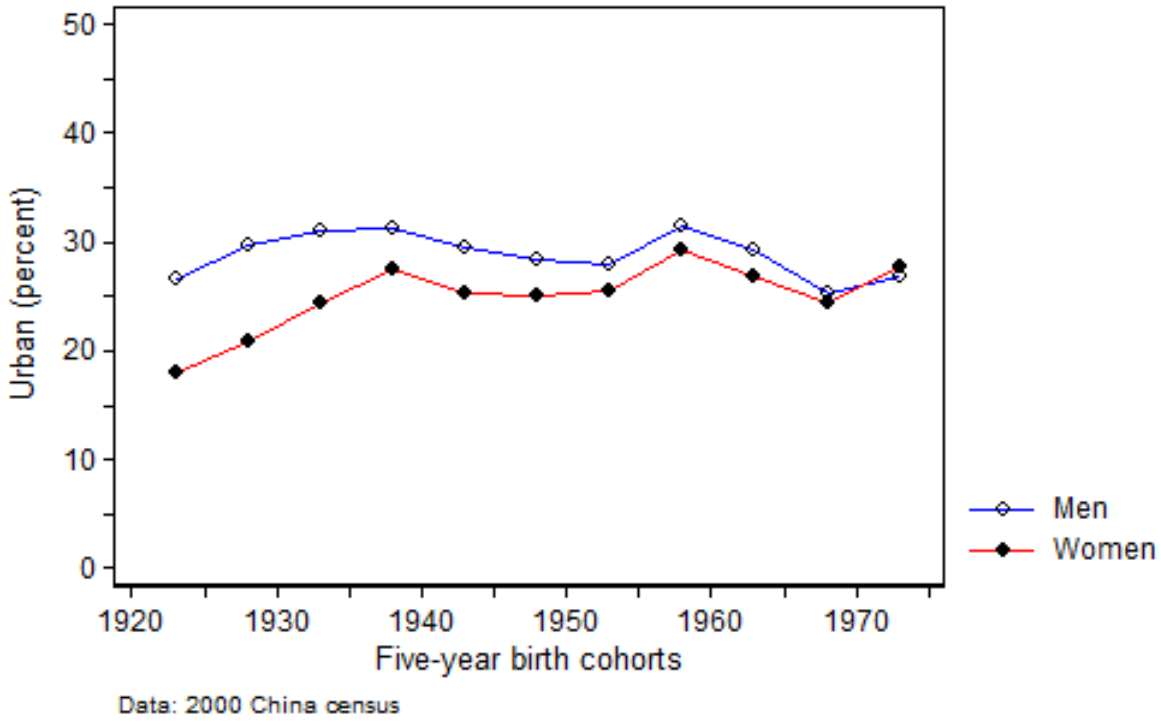


Figure 8. Percent Urban Hukou by Birth Cohort

Chapter 2. *Variation in Age at First Marriage: a Multi-method Analysis*

Introduction

In this chapter, I investigate how the variability of first marriage age in mainland China changed over the latter half of the 20th century, and identify the determinants of that change. Several prior studies have noted that average marriage ages in China have risen without an expansion in the numerical range of marriage ages (Smith and Wei 1986, Wang and Tuma 1993, Zeng et al. 1985). These studies did not investigate the possible determinants of that phenomenon or connect it with possible changing social pressures for marriage. I argue these questions are important because changes in the variability of marriage timing may indirectly indicate changes in the underlying preferences and constraints on marriage. A narrowing in the numerical spread of first marriage age implies either a) an increased social pressure to marry at a particular age or b) a reduction of constraints that keep people from marrying at a particular age in spite of an underlying desire to do, or c) and interaction of these factors. These possibilities speak to changing underlying preferences for marriage timing, although the evidence is indirect and nuanced. Especially net of personal background characteristics such as educational attainment, changes across cohorts in the range of ages most people marry in may indicate increased freedom to express personal marriage preferences.

Rising mean age at marriage, especially for women, is often taken as a sign of social progress and increased freedom of choice. But a rise in the mean without changes in the variability of marriage age, or even a contraction of the variability, may instead be a sign of delayed transition to adulthood and not of increased freedom of choice for marriage. For instance, in even western contexts there has been a debate as to whether education increases the

mean age at marriage over and above the delay it causes in the transition to adulthood through increased years in school (Blossfeld 1995, Blossfeld and Jaenichen 1992). If education merely delays the transition to adulthood because people still in school are not considered eligible for marriage, then more education does not necessarily have an independent effect on marriage timing beyond of this delay (Blossfeld and Jaenichen 1992). For the Japanese case, Raymo (2003) found that most the delay for highly educated women was indeed due to increased time physically in school and not due to an independent effect of education over and above this delay.

Undoubtedly, increasing demands for schooling and economic resources prior to marriage has delayed marriage for both men and women in a variety of contexts (Blossfeld 1995, Goldstein and Kenney 2001, Hirschman 1985, Ono 2003, Raymo 2003, Thornton et al. 1994, Xu et al. 2002, Xie et al. 2003). CCP policies to encourage, or even require, later marriage for various reasons, including fertility reduction, has also contributed to delays in marriage (Coale 1984, Yang and Chen 2004, Ye 1992). But none of these factors necessarily indicate increased opportunities for the expression of personal marriage preferences. In fact, the delays in marriage mandated by the state were often very likely in opposition to personal preferences (Croll 1981). This is evidenced by the rush into marriage after the *de facto* reduction in marriage ages in 1980 (Tien 1983, Ye 1992).

Instead, I argue that changes in the variability in marriage ages is a better indicator of changes in the ability to express preferences, especially for women who have faced strong social pressure to marry soon after they reach the appropriate marriage age (Croll 1981, Johnson 1983, Lee and Wang 1999, Parish and Whyte 1978, Tien 1983, Wolf 1985)—an age that has changed over time without, I would argue, losing much of its external social force. I further hypothesize that urban *hukou* and education should be personal attributes that give individuals more leeway

to express their own varying personal preference for marriage and marriage timing. If these factors do not influence the shape of the marriage distribution, or influence it counter to this expectation, I argue this is a sign that powerful external forces to marriage at a particular age, or point in the life course, still operate.

At a more general level, examining changes in the variability of marriage timing begins to address a larger question: have the multiple social revolutions in mainland China led to more uniformity or more heterogeneity in social behavior? Marriage behavior is one of the most socially and personally important behaviors in most societies, but especially so in China. It is a behavior that is at least formally a matter of personal choice, but one that likely remains heavily influenced by family and social norms (Croll 1981, Fan and Huang 1998, Johnson 1983, Jones 2007, Parish and Whyte 1978, Tien 1983, Whyte and Parish 1984, Wolf 1985). Accordingly, marriage timing is useful for studying the relationship between macro social factors and the micro personal behavior.

Finally, change in the variability of marriage age is germane for the study of mainland China's impending marriage squeeze. Men and women continuing to marry within narrow age ranges, combined with persistent preferences for age hypergamy (Mu and Xie 2014), could exacerbate the squeeze regardless of what other changes occur in the relative supply of men and women on the marriage market (Bergstrom and Lam 1994, Foster and Khan 2000, Goodkind 2006, Guilmoto 2012, Kochin and Knox 2012).

Relatively few China marriage studies have gone beyond modeling the mean of marriage age to give direct consideration to the numerical spread of marriage age. Studies that have include Casterline (1980), Smith and Wei (1986), and Wang and Tuma (1993). However many studies only considered women because of the connection between women's marriage behavior

and fertility (Coale 1989, Smith and Wei 1986, Ye 1992). This literature on marriage timing is described in more detail in chapter one (page 25). Here I will extend the literature by modeling the interquartile range—i.e. the middle 50 percent of the distribution—of marriage age at both the individual and aggregate level using data from the 2000 China census. This will be the first study of which I am aware to model the numerical spread of first marriage age for both men and women in mainland China.

Using the interquartile range means I can include the entire population at risk of marriage and not just those already married. This is the case because for all cohorts included here more than 75 percent were already married, thus each individual's place in the 25-75 percentile distribution is already fixed. For convenience I will continue to refer to the outcome variable a distribution of first marriage ages but in fact it includes the entire population at risk of marriage.

The specific research question is to what extent is the interquartile range of first marriage age accounted for by educational attainment and urbanization, measured by *hukou* status. While other factors such as the changing role of the extended family and the state likely played important roles, education and urban status certainly remain two of the most salient factors for demographic and/or social change in mainland China across the latter half of the 20th century (Chan 2009, Deng and Treiman 1997, Lee and Selden 2007, Wu and Treiman 2007, Wu 2010). In this case, the role of the family and the state in determining the timing of marriage may have differed across the urban-rural divide and by level of education. Family pressure may have remained stronger in rural areas because of the structure of the rural economy and the probably more limited opportunities for young people to form their own social networks compared to urban residents.

This distinction remains speculative on my part as I am not aware of studies that specifically compare the level of family pressure or the size of personal networks between rural and urban areas. Yan (1996) showed that personal networks in a rural village were very extensive; and Martin and Whyte (1984) found that urban social networks were curtailed under the heavy hand of CCP urban policies. The state's ability to control marriage timing may have been greater in urban China because it controlled the *danwei* work units that issued (or withheld) not only marriage licenses but housing to prospective couples (Croll 1981, Yang and Chen 2004).

All else being equal, more education should have given young people more economic and personal independence to choose their own marriage circumstances, particularly in urban areas. Supporting this idea, Chu and Yu (2010) found that a significantly higher percentage (50 percent higher) of urban marriages were freely chosen by the couples themselves compared to rural marriages. Still, the power of the Chinese state to override personal autonomy may mean this relationship is not always evident, particularly before the 1980s reform period (Whyte and Parish 1984). Given the unique context of Chinese socialism during this period, the role of urban residence and educational attainment may remain ambiguous and/or difficult to discern.

As a supplementary analysis, I use multi-level models to estimate the importance of geographic place for the variability in first marriage age across birth cohorts. Modernizing forces such as education and urbanization may have changed the salience of geography for cultural practices, including marriage timing (Goode 1963, Smith and Wei 1986, Thornton and Fricke 1987). Changes over time in the importance of geographic place for predicting the spread of first marriage age may indirectly indicate changing levels of external social pressure on individual marriage timing preferences.

Hypotheses

Hypothesis 1: The interquartile range of male marriage age will contract for men born between 1925 and 1965 (who mostly married between 1950 and 1990) and then expand again after that.

Because of high levels of economic inequality in pre-1949 mainland China, the traditional marriage regime was consistent with a large spread in marriage age for men (Lee and Wang 1999, Wang and Tuma 1993). In the traditional marriage regime men only married when family socioeconomic circumstances allowed (Lee and Campbell 1997, Lee and Wang 1999). Although economic data for the mainland for most of the 20th century are sparse, the CCP probably reduced economic inequality via land reform and collectivization and other social programs (Guo 1995, Walder 1989). It also increased health and life expectancy for both men and women (Wolf 1986). This reduction in socioeconomic inequality and improvement in health status may have allowed more men to marry at the socially preferred marriage age, an age that was rising gradually throughout this period. The post-1990 economic reforms, which favored certain regions and human capital attainments in a rapidly modernizing economy reversed this trend and socioeconomic inequality started to rise again (Fan and Sun 2008, Kanbur and Zhang 1999, Park 2008). Rising inequality may have made it more difficult for poorer men to marry (Das Gupta et al. 2010, Fan and Huang 1998).

Hypothesis 2: For women born after 1930 (who mostly married after 1950) the interquartile range of marriage age will expand.

The traditional marriage regime was characterized by little marriage autonomy for women (Johnson 1983). They married early and under family direction (Lee and Wang 1999,

Wolf and Huang 1980). Post-1949 CCP reforms, especially the 1950 Marriage Law, were aimed at reducing the influence of the family and extended kinship groups in society at large (Croll 1981). For women, this meant personal marriage choice became protected by law for the first time in history (Croll 1981, Johnson 1983, Banister 1987). On top of this, CCP economic reforms should have given women more economic independence than they had under the traditional family system (Johnson 1983). Given at least *de jure* protection to marry when and to whom they desired and more economic independence, women's marriage timing should have become more a matter of personal choice and therefore no longer concentrated in a narrow, and very young, age range.

Hypothesis 3: Educational attainment will be positively associated with the interquartile range of marriage age for both men and women, and this association will increase across birth cohorts.

Hypothesis 4: Urban status will be positively associated with the interquartile range of marriage age for both men and women.

Consistent with family modernization and second demographic transition theories, education and urbanization should both open up more space for personal choice, which should lead to more variation in marriage timing as people better express their own variable underlying preferences (Goode 1963, Lesthaeghe 2010, Thornton and Fricke 1987). The effect of education on marriage timing should increase across cohorts because of its increasing relevance for income and social stratification as the economy modernized in the 1980s and 1990s (Li 2003, Zhang et al. 2005). At the macro level, mass education and urbanization may influence demographic behaviors via social diffusion processes (Caldwell 1980, Casterline 2001). For example, studies

have shown independent effects of community education level on fertility behavior over and above women's individual characteristics (Axinn and Barber 2001, Kravdal 2002).

Hypothesis 5: Rising median marriage age will be positively associated with the interquartile range of first marriage age, especially for women.

Rising median marriage ages should also be associated with more variability in marriage timing because very early marriage is likely due to strong family influence on marriage choice, especially for women (Chen et al. 2014, Johnson 1983, Lee and Wang 1999, Wolf and Huang 1980). Rising marriage ages, therefore, may be indirect evidence of the weakening of this traditional family influence on marriage decisions with more space for personal choice as a result. Increasing personal choice should lead to greater variability in marriage behavior, all else being equal.

Hypothesis 6: The influence of geography on marriage timing will decrease across birth cohorts.

Theories of demographic transition predict a convergence across and within societies as modernizing forces of education, urbanization, and economic development take hold (Goode 1963, Lesthaeghe 2010, Thornton and Fricke 1987, Whyte and Parish 1984). Rising levels of educational attainment, economic transition, and internal migration leading to urbanization may be modernizing forces in China that have reduced the idiosyncratic role of geographic difference for marriage behavior (Smith and Wei 1986).

Empirical strategy

The variability in marriage age is a property of populations not individuals, so the

modeling framework must be appropriate for this type of response variable. In this chapter I model marriage variability in three ways: weighted ordinary least squares (OLS) regression, quantile regression, and multi-level regression models.

Data

All of the models use data from the 2000 China census, one-per-thousand micro-data file (N= 1,311,806, China National Bureau of Statistics). Descriptive statistics for the weighted OLS (panel 1) and quantile regression (panel 2) models are displayed in Table 1. The details of these models are described below. Panel 1 statistics are (unweighted) means and standard deviations of province-by-cohort means and percentages—meaning they are averages of averages—generated from the individual-level data. These variables are created separately by gender using, first, the individual-level male observations and, second, the individual-level female observations located within a particular birth cohort and province. Each of these gender-specific samples generates 340 aggregate observations. The mean of the various average male marriage ages is 23.6 years and the mean of the various interquartile ranges of marriage ages is 5.1 years; while for female marriage age, the mean age across aggregate observations is 21.0 years and the mean interquartile range is 3.8 years. Similarly, the means of the aggregate observations for male education is 7.2 years and for female education 5.3 years. The average level urban across male observations is 29.5 percent and for female observations it is 25.9 percent.

Panel 2 describes the individual-level data used directly in the interquartile range quantile regression models. Less than 30 percent of the individual-level sample are urban and nearly 40 percent of men and 60 percent of women have a primary education or less.

[Table 1 about here]

Weighted OLS regression models

The OLS regression models use aggregations as the unit of analysis. These aggregate observations are defined by province of residence and birth cohort. I organize the cross-sectional census data into five-year birth cohorts from 1920 through 1975. I drop individuals who as of enumeration in 2000 no longer lived in their province of birth. This insures that the aggregate marriage experience of a province is calculated using individuals who married in that province. This constraint eliminates 6.2 percent of the individual-level data.

For the response variable, I estimate the province-by-cohort spread of first marriage age using the interquartile range, or the width of the middle 50 percent of the distribution. This measure allows me to keep members of cohorts who were never married as of 2000 but whose place in the upper 25 percent of the distribution was already fixed by the large percentage of cohort members already married. Even in the 1966-70 cohort more than 90 percent of women and 74 percent of men were married by 2000. Within each cohort-by-province aggregation, I also calculate several aggregate predictor variables: mean educational attainment, percent urban *hukou*, and median age at first marriage. Models include controls for five-year birth cohort and region.[2] Birth cohort controls for period effects so that the conditional association between the interquartile range and the other variables in the model are plausibly independent of period effects that jointly influenced marriage timing and, for instance, educational attainment.

[2] The northeast region comprises Liaoning, Heilongjiang and Jilin provinces; the north region is Hebei, Shanxi, Inner Mongolia, Henan, and Shaanxi; the coast region is Beijing, Tianjin, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, and Guangdong; the south central region is Anhui, Jiangxi, Hubei, and Hunan; the southwest is Guangxi, Chongqing, Sichuan, Guizhou, Hainan, and Yunnan; and the west region is Tibet, Gansu, Qinghai, Ningxia, and Xinjiang.

These models do not allow me to draw conclusions about the relationship between variables at the individual level. However aggregate-level models are appropriate for studying the population-level variability of first marriage ages. The importance of education and urbanization for marriage timing may be due in part to their population-level effects (Caldwell 1980, Cochrane 1983). Higher aggregate levels of urbanization and education may help provide an environment for the creation of new norms and the social channels to diffuse them across individuals (Thornton and Fricke 1987).

When regression models are estimated on aggregate observations the differences in precision across aggregates should be accounted for with weights. Using the cell population of each aggregate—i.e. the number of individual-level data points used to calculate the aggregate—is an appropriate basis for the weights (Kohler and Kreuter 2005). Using Stata's analytic weights with the cell population as the input creates a weight that is proportional to the inverse of the variance of the response variable (Baum 2006). However these weights are highly correlated (above 0.5) with birth cohort for both men and women because later cohorts have many more individual-level observations than earlier ones. This means the weighted OLS models emphasize the later cohorts over the earlier ones when estimating average effects.

Interquartile range quantile regression models

Determinants of marriage timing also work through the characteristics of individuals themselves (Blossfeld 1995, Goldstein and Kenney 2001). Having more education or an urban *hukou* may mean more personal economic independence, which facilitates more personal choice in marriage. Quantile regression techniques allow the analyst to model directly the influence of changes in the distribution of individual-level data on the numerical spread of a population-level

outcome, in this case the interquartile range of first marriage age. Unlike standard OLS regression, which models the determinants of means, quantile regression allows the analyst to model parameters of the distribution other than the mean (Hao and Naiman 2007). Another difference from standard OLS is standard errors cannot be calculated parametrically but instead need to be estimated through repeated resampling, or bootstrapping (Hao and Naiman 2007).

Interquartile range quantile regression is an arithmetic combination of two separate quantile regressions. In this analysis I model the interquartile range of marriage ages as the difference between the 75^{th} and 25^{th} quantile regressions. The beta coefficients in the final output are simply the difference between the coefficients estimated at the 75^{th} and 25^{th} percentiles (or quantiles) of the response variable distribution. Taking the difference between quantile regressions evaluated at the 75^{th} and 25^{th} percentiles gives a picture of how the interquartile range of the response variable changes as predictor variables change around the 75^{th} and 25^{th} percentiles of their own distributions.

The main predictor variables are educational attainment and urban residential status. I also include controls for birth cohort and region. Education is dichotomized into "low" and "high" education categories. Low education means primary school or less and high education means junior high education or more. Other parameterizations of education were explored but this two-category version sufficiently captured the variation in the data while allowing for the main interaction with cohort to be included in the results tables. The analysis question remains how do changes in education and residential (*hukou*) status influence the spread of marriage ages and do these change over time. More specifically these models show how changes at the 25^{th} and 75^{th} percentile of for instance education change the size of the interquartile range of first marriage age. The estimated education coefficient is the difference of the unit-change

associations between education and marriage age at the 25th and 75th percentile of the education distribution. In practice the interpretation is similar to OLS regression, except with quantiles replacing means as the place in the distribution where the linear relationship is calculated. The coefficients still represent the effect of unit changes in right-hand-side variables on the size of the response variable, in this case the interquartile range of marriage age.

Multi-level regression models

Finally in a supplementary analysis, I use simple multi-level models to quantify the trend over time in the amount of variance in first marriage ages accounted for by geographic place—either province, prefecture, or county. In these models the response variable, *Y,* is the first marriage age of individual *i* nested in level-two geographic variable *g*. I estimate a no-predictor two-level model $Y_{ig} = B_o + u_{ig} + r_g$ to distinguish the intra-class correlation from the inter-class correlation, with class defined by the multi-level model level-two geographic variable. The intra-class correlation, measured by $r_{g,}$ is the proportion of variance accounted for by the level-two geography. These models do not include any other controls in level one of the model; this type of model is often called the null or unconstrained model (Luke 2004). Controlling for education or *hukou* (results not shown) does not change the pattern of results. I show the most basic models because they directly estimate how much of the zero-order variance in marriage timing is accounted for by geography. I estimate separate models for each birth cohort and then graph the trend across cohorts in the level-two variance component, or the intra-class correlation. I calculate the amount of variance accounted for by county, prefecture, and province, respectively, in separate two-level models, but I only show the prefecture results. Results for county and province were very similar to the prefectural results.

Results

Descriptive statistics: interquartile range of first marriage age by birth cohort

The spread of marriage for women remained in a much narrower range (3-4 years) than for men—which dropped from more than seven to less than four years across the period (Figure 9). From the 1950s, cohorts of men and women married within a similarly narrow three to four year range. This graph provides some support for hypothesis 1. The interquartile range shrank markedly for men born between 1930 and 1965, however this trend pre-dates the 1930s cohorts—which married after 1950—so the economic leveling policies of the CCP may not have been an important factor. The trend for women does not provide strong support for hypothesis 2. There is a slight rise for women born between 1935 and 1955, which is consistent with the hypothesis, but then a sharp contraction in the interquartile range over the next two cohorts. The turbulence of the late 1970s, the 1980 Marriage Law (which lowered the *de facto* marriage age), as well as the 1979 promulgation of the "one child" fertility restriction may all have contributed to women rushing into marriage. This rush would cause the interquartile range of marriage age to temporally contract. Women born in the early 1970s had about the same interquartile range as women born in the early 1930s, which by itself is not consistent with increasing freedom of choice for women in the decades after 1950.

[Figure 9 about here]

Weighted OLS regressions: provincial-by-cohort variation in first marriage age

The weighted OLS regression results—which treat birth-cohort-by-province as the unit of analysis—provide only mixed support for the hypotheses (see Table 2 for weighted OLS results). In a main effects model (results not shown) the average effect of improving mean provincial education by one year was to shrink the province-by-cohort interquartile range of male marriage ages by 0.11 years, although this was not statistically significant. Interacting mean education with birth cohort yields coefficients that range from -0.37 to 0.13 years, but this interaction is also not jointly statistically significant. These results do not support hypothesis 3, which posited a positive relationship between education and the interquartile range.

For female marriage, an additional year of education reduced the interquartile range of female marriage ages by 0.04 years, which was also not statistically significant (results not shown). This relationship did vary significantly across cohorts: before 1951 the association was positive, for the 1941-45 cohort an additional year of mean education was associated with a 0.22 year expansion of the interquartile range, and other early cohorts did not have educational effects statistically distinguishable from this. After 1951 the association was negative, an additional year of mean education was associated with a 0.05-0.31 year narrower interquartile range of first marriage age. That the association was negative for later cohorts and was not significant in a main effects model both do not support hypothesis 3.

The percent urban in a province was not statistically associated with the interquartile range of male marriage ages for men. This does not support hypothesis 4, which posited a positive association between percent urban and the interquartile range. For female marriage there was a small statistically significant positive association: a ten percent increase in urban residents increases the interquartile range by 0.15 years on average. This provides some support for

hypothesis 4.

Hypothesis 5 does receive support from these estimations: province-by-cohort median marriage age is positively associated the province-by-cohort interquartile range of marriage ages. A year increase in median marriage age implies a widening of the interquartile range of marriage age by 0.14 years for female and 0.43 years for male marriage. Finally there were statistically significant differences between regions with the interquartile range of marriage age for both male and female marriage. Interquartile ranges were larger in the southwest and west compared to other regions for both male and female marriage, net of the other variables in the model.

[Table 2 about here]

Interquartile range quantile regressions: individual-level data and variation in first marriage age

Table 3 shows the results from education-by-cohort interacted interquartile range quantile regression models. In main effects models (results not shown) education and marriage spread are negatively associated for both men and women. Low education (primary school or less) is associated with a larger interquartile range of first marriage age: estimated at 0.48 years larger for men and 0.13 years for women with low education. These results do not support hypothesis 3. This relationship varies across birth cohorts however. For male cohorts born before 1941 low education was associated with narrower interquartile ranges, up to a year narrower for 1920s cohorts, which is consistent with hypothesis 3. After 1941 the relationship reverses, the association between low education and the interquartile range is positive although not monotonic. The largest associations were for men born in the 1950s when low educated cohorts

of men had on average interquartile ranges roughly a year wider than cohorts with more education. These results do not support hypothesis 3.

Hypothesis 3 receives mixed support in female marriage models. Low education was associated with narrower interquartile ranges for women born before 1950 and wider interquartile ranges for women born after 1950. The largest associations are for women born in the 1920s when low educated cohorts had an estimated interquartile range 1.5 to 2 years narrower than their more educated peers; and for women born in the 1950s when low education had the opposite association—interquartile ranges of around half a year wider for low educated cohorts. These results for women born after 1950 do not support hypothesis 3.

Hukou status is also significantly associated with marriage spread in this model. Comparing urban to rural *hukou* men, the former had wider interquartile ranges by 0.42 years on average while the difference for women was in the same direction but smaller at 0.21 years. Both of these results support hypothesis 4.

Net differences across cohorts and regions were also statistically significant for both men and women. The trend across birth cohorts is from larger to smaller interquartile ranges, with the 1941-45 cohort as the baseline comparison. This holds true for both the high education group (represented with the main effect birth cohort coefficients in Table 3) and, for men, the low education group (main effect plus interaction coefficients). For women with low education the cohort trend was closer to zero for many cohorts and not monotonic. This indicates that education, *hukou* status, and region do not fully explain the descriptive temporal pattern (Figure 9) in the interquartile range that remains partially mirrored in the birth cohort coefficients. These variables also do not fully explain differences across regions, which vary by almost a year for men and two-thirds of a year for women between the west and the northeast.

[Table 3 about here]

Multilevel models: geographic variance and first marriage age

Multi-level models (Figure 10) indicate the variation in first marriage timing explained by geographic place is not especially large for most birth cohorts of men and women. Figure 10 graphs the level-two prefectural intra-class correlation for each birth cohort of men and women. The amount of variance explained by the distribution of prefectures across individuals did rise steadily for women born between 1921 and 1955, peaking around 14 percent. This means that 14 percent of the variability in marriage timing for women born during the 1951-55 period is accounted for by the variation in prefecture of residence. After this peak, the prefectural intra-class correlation fell back under 10 percent for birth cohorts born after 1960. These results provide only partial support for hypothesis 6. In the first decades after 1950 (i.e. for women born after 1930) geographic correlation of marriage ages did not decline but instead rose. Only for cohorts of women born after 1955 did geographic correlation decline as hypothesized.

The prefectural-level correlation of marriage ages rose very slowly for male marriage before the 1965 birth cohort; after this date there was a sharp rise in prefecture-level correlation to more than 10 percent for the 1971-75 birth cohort. These results for male marriage do not support hypothesis 6, as geographic correlation did not decline for any cohort born after 1930.

[Figure 10 about here]

County- and provincial-level models (results not shown) follow the same pattern of

results. Slightly more variance is accounted for at the county level than at larger geographic units but the differences are relatively minor. Controlling for the level-one differences in education across individuals does not change these level-two patterns. Across these three units of geography the story is the same: relatively small amounts of the variance in first marriage timing is accounted for by geographic place.

Discussion and conclusion

This chapter examines the determinants of variability in marriage timing for both men and women using 2000 China census data. The variability in the timing of marriage, especially in a country where marriage remains nearly universal and socially valued, provides a lens through which to examine the relationship between macro social change and micro personal behavior. Put another way, it sheds light on how broader social forces may influence the expression of personal preferences. Theories of modernization both predict more choice within societies but more conformity across them in, for instance, family forms and economic systems (Goode 1963, Thornton and Fricke 1987). In this chapter, I focus on the role of two powerful modernizing forces—education, and urbanization—in providing either more or less space for variability in behavior. Changes across geographic place also provide evidence concerning the changing role of macro social forces in personal marriage behavior. Marriage is a behavior that is both intensely personal and very social, and change in the variability of the timing of marriage provides both direct and indirect evidence about the relationship between broader social change and personal behavior.

Changing socioeconomic circumstances, along with the new 1950 Marriage Law, may have driven what Wang and Tuma (1993) characterized as a transition from a traditional to a

modern marriage regime in which men and women marry at higher ages but within a similarly narrow age range. The reduction of the interquartile range of male first marriage ages I document here supports this story. There was a gradual drop in the interquartile range of marriage ages for cohorts of men born between 1920 and 1950, then a steep drop for the 1950s cohorts. These are men who would have mostly married in the 1970s and early 1980s, a socially turbulent period that included the reversal of earlier pronatalist policies (Scharping 2003, Yang and Chen 2004).

Cohorts of women born in the late 1950s also saw a sudden contraction in the interquartile range of marriage age. The turbulence of the late 1970s, the 1980 Marriage Law that lowered the legal marriage age, as well as the 1979 promulgation of the "one-child" policy may have all contributed to women rushing into marriage within a relatively younger and narrower age range. This period directly followed a relatively steep rise in women's age at marriage and a sharp drop in fertility in the 1970s (Coale 1984), which occurred during the government's first major anti-natalist campaign. This campaign encouraged later marriage, longer birth intervals, and fewer overall births (Scharping 2003, Ye 1992).

There was some support for the hypothesis that increased urbanization led to more variability in marriage timing, although this effect was not statistically significant for men in the aggregate models and not especially large in individual-level quantile regression models. This result does support theories of family change that posit more personal choice due to modernizing factors such as urbanization (Goode 1963, Lesthaeghe 2010, Thornton and Fricke 1987, Whyte and Parish 1984). One reason this effect may not have been stronger was that urbanization is measured imperfectly in this analysis. Using urban *hukou* as a proxy for urban resident undercounts actual urban residents who still had rural *hukou*. Changing *hukou* status remained very difficult throughout this period (Chan 1996), therefore at least some of the individuals

included in the analyses were living in urban areas at the time of marriage but retained their rural *hukou* status. This measurement error likely biases the urban coefficient downwards. Nevertheless, the amount of measurement error was likely small for most of the cohorts included here.

In addition, the multi-level models, which more properly control for differences across geographic place, provide evidence that most of the variability in marriage timing was not due to unmeasured geographic factors, or factors that correlate strongly with geography, at least at the province, prefecture, or county level. Clearly social forces were at play beyond those accounted for in these models, but those forces appear to have mostly operated broadly across the society and not idiosyncratically at lower levels of geographic organization.

Although the overall amount of variance accounting for by geographic variability remained relatively small, the changing pattern across cohorts, particularly for women, likely indicates changes in the salience of particularistic local cultural influences on marriage. That the importance of geography rose and then fell sharply after the early 1950s birth cohorts complicates any simple modernization story. Suffice it to say, women who married after the mid-1970s appeared to be less influenced by local geography, and this difference was not due to compositional differences in educational attainment. If geographic place proxies for the influence of extended families, which perhaps varied across regions, this result may indicate a decreasing influence of the family on the marriage timing of women after the mid-1970s. For men, the influence of geographic place was smaller compared with women until the 1971-75 birth cohort. The steady rise in the influence of geographic place for marriage timing for men after 1965 may indicate an increasing importance of the extended family or other factors that correlate with geography, such as economic opportunity, for marriage timing. Smith and Wei (1986) provide

some evidence that the changing importance of geography for marriage variability followed provincial trends in socioeconomic development. That marriage became more expensive in the 1990s for men might mean that family and economic factors became more salient for men's chances of marrying in a timely fashion. This, however, remains speculative given the limited number of variables included in these analyses.

The influence of educational attainment varied across birth cohorts as education became more salient in China's modernizing society for both men and women. The direction of this relationship was not as hypothesized however. Higher levels of education were usually associated with narrower interquartile ranges of marriage age, especially for later cohorts, implying more education did not open up more space for personal choice in the timing of marriage for either men or women, although other interpretations of this result are possible. For instance, more personal choice may have revealed a narrower band of ideal marriage ages, especially for men who were previously blocked from expressing this preference due to socioeconomic circumstances and cultural practices. Higher levels of education for men may have allowed them to better express their underlying preferences to marry at a specific age—an age that gradually rose over time but remained within a narrow age range.

Ceiling effects may also have played a role in the estimated relationship between education and the interquartile range of first marriage age. Delays in the transition to adulthood brought about by increased educational attainment may have pushed Chinese young people of both sexes closer to a socially constructed ideal marriage age that did not change proportionally with the educational or economic delays in the transition to adulthood. If the ideal age was close to 25 for recent cohorts, the increase in education may mean the window to marry became

narrowed as young people entered the marriage market at older ages, due to increasing years spent in school or amassing enough economic resources to be eligible marriage partners.

Returning to one of the broad themes of this dissertation, the evidence supplied in this chapter on the whole does not support the supposition that social changes—whether these were the 1950 and 1980 marriage laws, the economic restructuring, the increases in education, or urbanization—created more space for the expression of personal marriage preferences. I would argue that this point holds more strongly for women than men, but it likely holds for both to some degree. The interpretation that a narrowing variability in marriage age for men actually is a sign of an increased ability to express marriage preferences gains some support when comparing this period to the pre-20th century epoch. The wide variability of marriage ages in the traditional marriage regime has not been interpreted as a sign of personal choice but instead of personal hardship forced on poorer men due to the twin factors of socioeconomic inequality and deficits of marriage-age women (Lee and Wang 1999). Given this context, the coincident leveling of economic opportunities and of sex ratios after 1950 may indeed have meant men could finally express a fairly uniform preference to marry universally and relatively early, with modest rises in the mean of this narrow preference range over time due to broader social forces. Whether or not this interpretation has merit, men likely continued to face enormous social pressure to marry in a timely fashion regardless of their personal preferences (Tien 1983).

For women even this debatable interpretation probably does not hold. Women married in a narrow age range in the pre-20th century period and at young ages. While there may have been an increase in the interquartile range at some point before the 1920s birth cohorts, at least for the cohorts included here there is little evidence of increasing variability of marriage timing. On top of this, women with more education married in a narrower range than women with less if they

were born after 1950. Urban *hukou* was associated with slightly wider interquartile ranges but this effect was not large. Instead these results support the idea that social pressures for women to marry remained strong and educational advancement, counterintuitively, may have increased the salience of those pressures, while living in urban areas only created marginally more space to express personal preferences for marriage timing.

Results: figures and tables

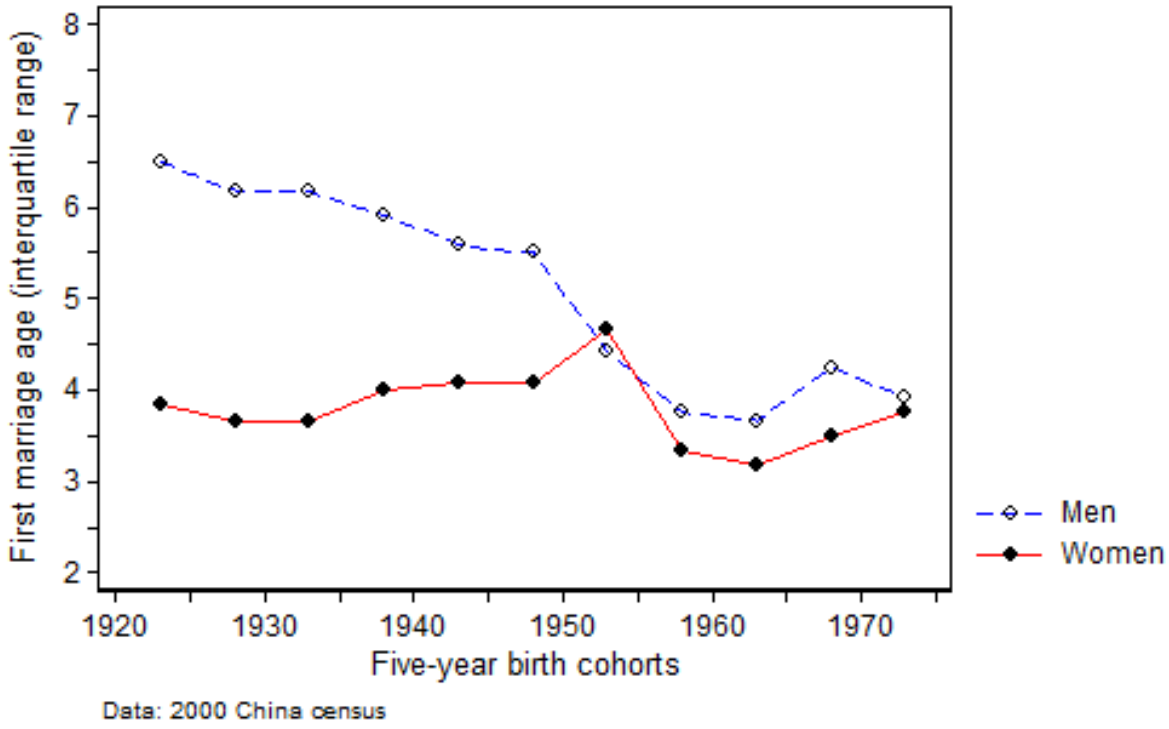


Figure 9. Interquartile Range of First Marriage Age by Birth Cohort

Table 1. Descriptive Statistics (unweighted) for Weighted OLS and Quantile Regression Models

Panel 1. Weighted OLS Regression Models (N=340 province-by-cohort aggregates)				
Men	Mean	S.D.	Min	Max
Interquartile range marriage age	5.11	1.36	2.67	11.54
Mean education	7.21	2.21	0.11	12.00
Percent urban	29.45	13.93	0.00	76.95
Median marriage age	23.56	1.31	20.42	27.92
Women				
Interquartile range marriage age	3.83	1.12	2.25	11.50
Mean education level	5.29	3.00	0.00	12.31
Percent urban	25.88	15.24	0.00	76.15
Median marriage age	21.00	1.64	17.50	25.96

Panel 2. Quantile Regression Models (N=372,955 men, 385,463 women)		
	Men (%)	Women (%)
Low education	38.67	57.24
Urban hukou	28.75	25.49
Birth cohort		
1921-25	2.08	2.48
1926-30	3.61	3.76
1931-35	5.02	4.97
1936-40	6.14	5.73
1941-45	6.79	6.35
1946-50	9.22	8.74
1951-55	12.28	11.88
1956-60	11.47	10.84
1961-65	15.39	15.03
1966-70	16.36	16.57
1971-75	11.64	13.65
Region		
Northeast	9.26	9.15
North	22.58	22.45
Coast	28.30	28.59
South central	17.48	17.59
Southwest	17.98	17.89
West	4.39	4.33

Data: 2000 China census.

Table 2. Weighted OLS Models, Interquartile Range of Marriage Age

	Men		Women	
	Beta	S.E.	Beta	S.E.
Mean education level	-0.132	0.155	0.220	0.105
Percent urban	0.007	0.005	0.015	0.005
Median marriage age	0.427	0.052	0.141	0.048
Birth cohort (reference: 1941-45)				
1921-25	0.681	1.653	0.663	0.773
1926-30	-0.179	1.515	0.828	0.683
1931-35	0.334	1.405	0.835	0.690
1936-40	-1.462	1.424	1.058	0.685
1946-50	-0.008	1.417	0.059	0.720
1951-55	0.529	1.451	2.198	0.723
1956-60	-1.524	1.631	2.502	0.811
1961-65	-2.323	1.769	1.616	0.877
1966-70	-2.738	1.606	0.763	0.843
1971-75	-0.613	1.508	1.148	0.873
Education*birth cohort				
Ed*1921-25	0.029	0.328	0.240	0.442
Ed*1926-30	0.183	0.268	-0.203	0.275
Ed*1931-35	0.079	0.222	-0.119	0.211
Ed*1936-40	0.266	0.207	-0.197	0.157
Ed*1946-50	-0.021	0.192	-0.062	0.132
Ed*1951-55	-0.233	0.189	-0.383	0.127
Ed*1956-60	-0.030	0.197	-0.533	0.128
Ed*1961-65	0.095	0.207	-0.406	0.129
Ed*1966-70	0.197	0.196	-0.269	0.126
Ed*1971-75	-0.110	0.184	-0.302	0.126
Region (reference: Northeast)				
North	0.137	0.164	0.085	0.153
Coast	-0.123	0.172	0.191	0.143
South central	0.331	0.171	0.263	0.151
Southwest	0.616	0.184	0.420	0.160
West	0.921	0.221	1.125	0.206
Constant	-4.125	1.455	-0.745	1.045

Data: 2000 China Census. N=340 province-by-cohort aggregate observations.

Table 3. Interquartile Range Quantile Regression, First Marriage Age

	Men		Women	
	Beta	S.E.	Beta	S.E.
Low education	0.528	0.099	-0.875	0.082
Urban hukou	0.361	0.029	0.250	0.050
Birth cohorts (reference: 1941-45)				
1921-25	2.111	0.268	1.125	0.461
1926-30	1.806	0.131	0.625	0.291
1931-35	1.111	0.150	0.167	0.175
1936-40	0.750	0.108	0.000	0.113
1946-50	0.167	0.067	-0.083	0.074
1951-55	-1.056	0.060	-0.917	0.088
1956-60	-1.556	0.076	-1.750	0.080
1961-65	-1.583	0.065	-1.708	0.100
1966-70	-1.278	0.088	-1.375	0.097
1971-75	-1.972	0.079	-1.583	0.086
Low Ed*Birth cohort				
Low Ed*1921-25	-1.306	0.309	-1.042	0.487
Low Ed*1926-30	-1.500	0.195	-0.667	0.325
Low Ed*1931-35	-0.833	0.194	-0.167	0.194
Low Ed*1936-40	-0.694	0.114	0.083	0.106
Low Ed*1946-50	-0.361	0.108	0.125	0.108
Low Ed*1951-55	0.472	0.115	1.500	0.095
Low Ed*1956-60	0.472	0.097	1.417	0.099
Low Ed*1961-65	0.139	0.098	1.250	0.113
Low Ed*1966-70	-0.333	0.113	0.958	0.096
Low Ed*1971-75	-0.139	0.118	1.125	0.095
Region (reference: Northeast)				
North	0.139	0.055	0.042	0.038
Coast	0.528	0.041	0.208	0.036
South Central	0.389	0.046	0.083	0.048
Southwest	0.472	0.062	0.083	0.047
West	0.806	0.062	0.542	0.042
Constant	4.111	0.082	4.250	0.087

Data: 2000 China Census. N= 372,955 men, 385,463 women.

Bootstrapped standard errors.

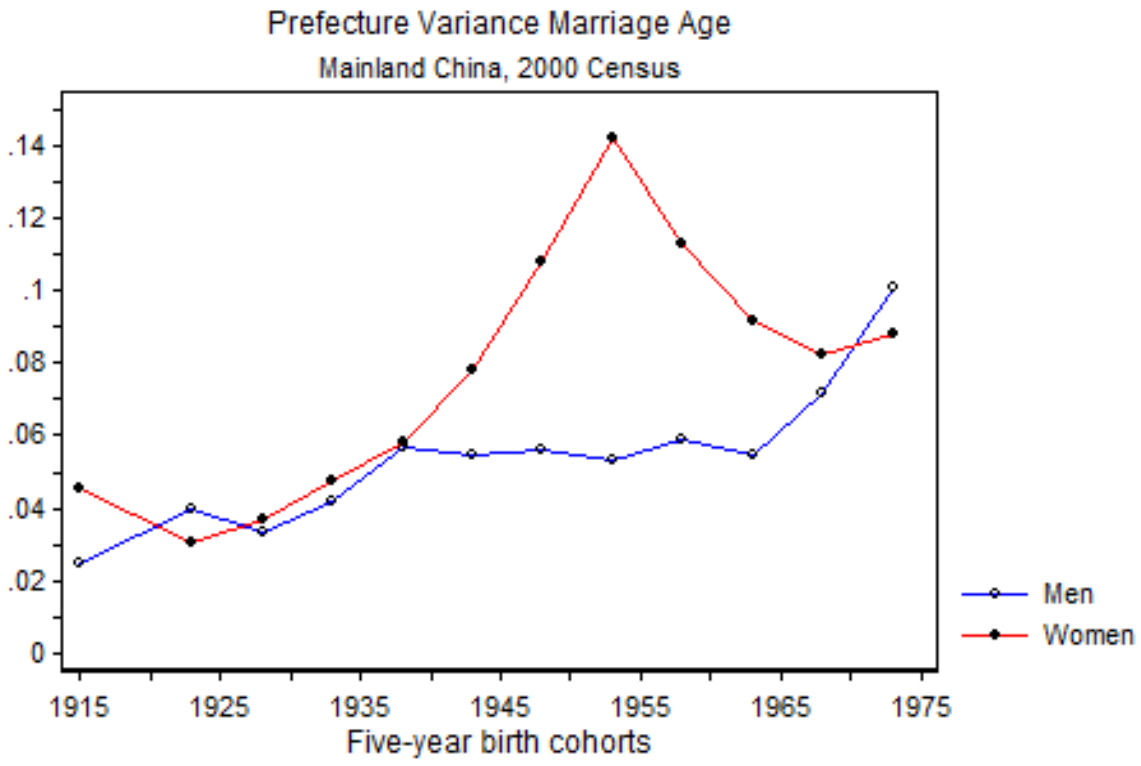


Figure 10. Geographic (Prefecture) Variance of First Marriage Age by Birth Cohort

Chapter 3. Determinants of Long-term Bachelorhood: a Birth Cohort Analysis, 1926-1965

Introduction

This chapter examines the relationship between education and long-term bachelorhood for men born during a period of great educational expansion in mainland China. Average education more than doubled from less than four years for men born in the 1920s to more than nine years for men born in the early 1960s (see Figure 5 in chapter 1). The chapter also puts the relationship between education and bachelorhood in the context of other important socioeconomic characteristics, including *hukou* status, a particularly Chinese bureaucratic institution that remains important up to the present and greatly influenced the lives of mainland Chinese across the latter of half of the 20th century. Past work on the relationship between education and marriage (p. 25) as well as a more detailed description of the *hukou* institution is included in chapter one (p. 22). The importance of these background characteristics for marriage may have changed over time as men confronted the many social transformations of China's turbulent recent past including the coming to power of Communist Party in 1949, the collectivization of society and the creation of the *hukou* system in the late 1950s, the Great Leap Forward and Cultural Revolution of the 1960s, and the several stages of economic and political opening to the rest of the world in the 1980s and 1990s.

Understanding the historical contours of these relationships is important for a number of reasons including better understanding the changing influences of key aspects of human capital (educational attainment) and bureaucratic capital (*hukou* status) for an important demographic outcome in a modernizing society. As China transitioned to a capitalist economy, a literature on

the changing role of bureaucratic and human capital developed with questions mainly on economic outcomes (Bian and Logan 1996; Hauser and Xie 2005; Nee 1989, 1991; Parish and Michelson 1996; Walder 1996, 2002; Xie and Hannum 1996, Zhou et al. 1997). This chapter expands these questions into the demographic realm by showing how, in particular, education and *hukou* have interacted over time to pattern marriage outcomes for cohorts of Chinese men. Moreover, a better understanding of how bachelorhood has varied in the recent past may help policymakers address the social implications of forecasted increases in bachelorhood in the near future as part of the forecasted male marriage squeeze (Jiang et al. 2014, Sharygin et al. 2013). Finally patterns of bachelorhood across cohorts and by SES may provide more indirect evidence on changing patterns of marriage preferences. These connections remain speculative in part because the analysis in this chapter uses one-sex models that discount the two-sex nature of the marital sorting process. In chapter 4 I return to these issues using two-sex models to analyze assortative mating directly.

The results below indicate education and *hukou* status stratified society not only along economic dimensions but along demographic ones as well and these effects varied over time. In particular, they show men at the low end of the educational spectrum were at much greater risk of long-term or permanent bachelorhood and that this disadvantage grew over time for men born between 1926 and 1965 (i.e. for men who were at least 40 years old by 2005). Having an urban *hukou* partially suppressed this educational disadvantage, especially for men born before the mid-1950s. These historical patterns should have ramifications for projecting future patterns of bachelorhood across different markers of socioeconomic status.

Empirical Strategy

Data

This chapter pools data from the 1982, 1990, and 2000 censuses with sample data from the 2005 "mini-census", a national one-percent two-stage probability survey (Minnesota Population Center. Integrated Public Use Microdata Series, International: Version 6.1; National Bureau of Statistics of China). The data samples for 1982 and 1990 from the Minnesota Population Center are one-percent random samples from the original census data. The 2000 data is a 0.1 percent random sample which is then inflation weighted (each observation was given a probability weight of 10) to represent one percent of the population. The 2005 survey data includes probability weights to account for the multi-stage sampling design and oversampling built into the original one-percent survey.

Cases are limited to men age 40 years or older at the time of enumeration. I further limit the regression analysis to people age 56 or younger in the 1982 census to minimize survivorship bias. This means the 1926-30 birth cohort is the oldest cohort included in the regression models. The pooled (unweighted) data of age 40 or above men born between 1926 and 1965 comprises 2,498,420 individuals. *Hukou* status was not included in the 1982 data so this variable is imputed using residential location and farming occupation. Cases missing on *hukou* in later years are imputed in a similar manner. Given the likely very low levels of migration and *hukou* conversion for the older men included in the sample (Chan 1996, Fan 2000), this is a reasonable imputation strategy. After this imputation, men still missing on *hukou* are list-wise deleted. *Hukou* status is the only variable in the analytic sample with missing data. After these cases were deleted, the final analytic sample comprises 2,459,813 individuals. Table 4 describes the weighted analytic sample by *hukou* and marital status. These data are weighted to represent one percent of the

population at the time of the census or survey. Rural men comprise 69.5 percent of the pooled data across all survey years. Being never married after age 39 is relatively rare: 5.73 percent of rural and only 1.20 percent of urban men in the data are never married. There is a noticeable education gradient with urban married men having the highest levels of education, followed by urban bachelors, married rural men, and finally rural bachelors. All four groups are mostly of Han ethnicity, above 90 percent; and average age is similar ranging from 49 to 52 years at the time of enumeration. Urban men, and especially urban bachelors, are more concentrated in the coastal region, while rural men are more evenly spread across regions.[3] There are fewer observations in the geographically smaller northeast region and the sparsely populated west region. The data are fairly evenly spread across five-year birth cohorts except for the oldest cohort, 1926-30, and the youngest rural cohort, 1961-65, which have significantly fewer cases. After weighting, the data are more concentrated in the later survey years, especially in the urban sample.

[Table 4 about here]

Method

The analytic models in this chapter estimate the odds of never marrying for men age 40 or above using binomial logistic regression. Logistic regression models are more appropriate for modeling permanent or long-term bachelorhood than standard survival models, such as Cox

[3] The northeast region comprises Liaoning, Heilongjiang and Jilin provinces; the north region is Hebei, Shanxi, Inner Mongolia, Henan, and Shaanxi; the coast region is Beijing, Tianjin, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, and Guangdong; the south central region is Anhui, Jiangxi, Hubei, and Hunan; the southwest is Guangxi, Chongqing, Sichuan, Guizhou, Hainan, and Yunnan; and the west region is Tibet, Gansu, Qinghai, Ningxia, and Xinjiang.

proportional hazard models, that do not distinguish between features that delay marriage from those that make ever marrying less likely. "Proportional" hazards mean the effect of, for instance, education on marriage chances is the same regardless of age. Recent studies in a variety of contexts show that education delays marriage timing but increases the overall chances of eventually marrying for both men and women (Goldstein and Kenney 2001). Logistic regression directly models the association between predictor variables like education and the binary marriage outcome, thus it is more appropriate for the questions asked in this analysis. However by not modeling the timing of marriage the analyst must choose an appropriate age at which to create the necessary dichotomy between those who have "eventually" married and those who have not and will for the sake of the model be considered "permanent bachelors".

I use age 40 as the cutoff age, meaning men younger than this at the time of each census or survey are dropped from the analysis. I consider this an appropriate cutoff age both from a data perspective—most men who will ever marry have done so by this age—and from a socio-cultural perspective in that men are expected to have started families by this age, if not well before. I argue this means men who reach this age without marrying plausibly face hardship due to this condition whether or not they eventually marry at a more advanced age. Changing this bachelorhood cutoff age to age 35, 45, or 50 does not change the pattern of results (see section on sensitivity below).

The logistic regression models used in this chapter relate the natural log of the odds of a "positive" dichotomous outcome, in this case having never married, to a linear combination of predictor variables. The equation takes the following form:

$$\ln\left(\frac{P_i}{1-P_i}\right) = \alpha + \sum \beta_i X_i \qquad (1)$$

Where P_i is the probability that observation i is never married (outcome = 1). Observations either take on a 0 value, which indicates a man age 40 or above who has been ever married, or a 1 value, which indicates a man age 40 or above who has never been married. Some of the men coded as married are not currently married due to divorce (very rare) or widowhood (less rare especially for older cohorts). The probability of ever being married is conditional on the right-hand-side predictors, the X_i*'s*, in the model. The B_i*'s* show the estimated average effects of unit changes in the X_i*'s* on the log-odds of the outcome equaling one, i.e. the subject being never married. Probability weights are included in all models and the robust standard errors are estimated to account for the non-independence of (weighted) observations.

Variable Construction

Descriptive statistics for the variables used in the regression analysis are displayed in Table 4. I create five-year birth cohorts starting in 1926 using the census information on birthdate. I take *hukou* status at the time of the census as an accurate measure of a basically "permanent" status. Changing *hukou* status in adulthood was possible, but relatively rare (Chan 1996). A common pathway for changing *hukou* is attending university (Chan 1996), which normally occurs before someone is old enough to marry. Additionally, while the early cohorts entered the marriage market before the final formalization of the *hukou* policy itself in 1958, I take their eventual ascribed *hukou* status as an accurate proxy for the longstanding difference between the socioeconomic standing of rural and urban residents.

Regional variation is controlled with a six-category region variable. This specification assumes that individuals did not move across regions between marriage and the time of the census. Throughout most of the period under study migration was very limited, especially during the prime marriage years of the cohorts included here, so this assumption is reasonable (Fan 2000, Liang and White 1996, Wang and Mason 2008). In the sensitivity analysis I examine the consequences of this assumption as well as the assumption that region sufficiently controls for geographic variation in bachelorhood. Ethnicity is similarly dichotomized between the Han majority (more than 93 percent of the data) and the various officially recognized minorities.

In the main effects models, I use the full seven-category information on education enumerated in the census, which ranges from no school/illiterate to 4-year college degree or graduate school. The highest educational category does not distinguish between four years of college and graduate school. Obtaining more than a college degree during this time period was extremely rare, so this category comprises the educated elite during this time period.

In the reduced-form interaction models, I limit the measured variation in education to four categories that differ slightly by *hukou*. For urban *hukou* models the categories are primary education or less, junior high school, senior high school, and more than senior high school. For rural *hukou* models the categories are no schooling/illiterate, primary, junior high school, and senior high school or more. Looking at the educational distributions for rural (Figure 6) and urban *hukou (*Figure 7*)* across cohorts makes clear why this modification is necessary. There are barely any illiterate urban *hukou* holders in the later birth cohorts and there are very few college educated rural *hukou* holders in any birth cohort.

In the full interaction models (Table 6) I dichotomize education into primary or less and junior high or more. In these models, this specification of education is the same for rural and

urban populations. Even though these categorizations keep some cases in each category across birth cohorts the problem of changing educational selectivity across cohorts remains. I consider this problem in the sensitivity analysis by re-estimating all models using a relative (within birth cohort) measure for education.

Analysis plan

I estimate the binomial logistic regression models to predict the probability of bachelorhood at age 40 or above across five-year birth cohorts for men born between 1926 and 1965. I start with a full main effects model that shows the relationship between remaining single after age 40 and various predictors including age, cohort, and education, region of residence, *hukou* status, and ethnicity (Table 5). For comparison, I report several statistics in the main effects logit model including the log odds or coefficients, the standard errors, p-values, odds ratios, and risk ratios. Odds ratios show the multiplicative change in the odds and risk ratios show the multiplicative change in the probability of the outcome for a unit change in a right-hand-side predictor. These two ratios are conceptually distinct but are of similar magnitude in most cases, although the ratio of odds is always more extreme (farther from unity) than the ratio of probabilities for a similar change across predictor variables.

To explore temporal changes, I estimate reduced-form interaction models to assess changes across birth cohorts in the association between education and bachelorhood. These models only include education, birth cohort, and the interaction between them as right hand side variables. These models do not include other variables because the levels of these variables would have to be set at specific values, making the probability specific to a particular region, ethnicity, or age group. The interaction patterns revealed by these reduced-form models are

robust to the inclusion of other variables (see section on sensitivity below). These reduced-form models are stratified by *hukou* status, which is equivalent to interacting *hukou* with all the variables in the model. Due to space limitations I do not display these full interaction models in tabular form, but instead graph the interactions as predicted probabilities (converted from the predicted logits) of bachelorhood in Figure 11 and Figure 12. These probabilities are displayed on the y-axis across the range of birth cohorts on the x-axis. Note that the y-axis scale varies across figures so that the range of the differences in predicted probabilities across groups is visually distinct. These figures show the most salient divergences across cohorts are between the lowest educational groups and the rest.

The patterns in these figures show the most distinct difference is between those with low education and the rest. Table 6 further explores this distinction with models that include covariates for age, ethnicity, and region, as well as an interaction between low education and birth cohort. I also explore changing the specification of birth cohort to see if there is statistical evidence for a specific historical turning point in the marriage chances of Chinese men. These models continue to be stratified by *hukou* status.

Results from these models are reported as odds ratios. Odds ratios are always in relation to a baseline category so they give changes in the odds of the outcome relative to changes in the baseline category. On the other hand, predicted probabilities give the absolute (as opposed to relative) probabilities of the outcome for a specific combination of covariate values. Whether the relative change in the difference in odds between categories or the absolute change in probabilities are being considered changes the interpretation in subtle ways. These differences are discussed more below. Finally, I run a set of additional models as a sensitivity analysis to

assess some of the assumptions and selection issues. Most of these sensitivity models are not displayed but the relevant results are discussed.

Results

Table 5 shows the results from a logistic regression model predicting bachelorhood for men age 40 and over at the time of survey. For comparison, the table reports all relevant statistics including the coefficients (log odds), standard errors, *p*-values, odds ratios, and risk ratios. Wald tests (not shown) indicate that all of the multi-category variables included in this model are jointly significant predictors of bachelorhood at the 0.01 level. Wald tests also indicate all regions are significantly different from each other. Odds of bachelorhood were highest in the north region and lowest in the west. Men in the west had 45 percent lower odds and men in the north region 71 percent higher odds of bachelorhood than men living in the northeast. Rural *hukou* holders had more than twice the odds (odds ratio 2.2) of bachelorhood compared to urban *hukou* men. Registering as ethnically Han also meant higher odds (53 percent higher) of bachelorhood.

[Table 5 about here]

Wald tests also show there is a significant monotonic gradient across birth cohorts, except for the 1941-50 cohorts which have statistically indistinguishable effects. For other cohorts, the statistically significant trend shows bachelorhood more likely for later cohorts. Compared to the baseline 1926-30 cohort, men born ten years later had 2.28 times the odds (or 2.15 times the risk) of being never married. In the 1940s cohorts this rose to more than three

times the odds and in the 1960s more than five times the odds compared to the 1926-30 baseline cohort. The odds of being never married go down with age, but after age 40 these associations are small, each additional year of age drops the odds of bachelorhood by 0.5 percent.

Turning to education, men with no education had 4.24 times higher odds of bachelorhood and men with less than six years had 3.03 times the odds of bachelorhood than the baseline group of men with a primary (six years) education. Differences among men with more than a primary education were much smaller. Men with a junior high education had 69 percent lower odds, with high school 77 percent lower odds, and with more than high school 79 to 84 percent lower odds of bachelorhood compared to the baseline group. Differences between educational categories are all statistically significant (at the 0.01 level) except for two comparisons: between those with a high school only and four-years of college or more; and between those with junior college and four years of college or more.

Table 5 shows the main effects only and does not consider possible interactions among variables. For one, the urban-rural divide was a very salient social feature throughout most of the period. Not only was the main effect of *hukou* status large but most other variables statistically differed in their associations with bachelorhood depending on whether rural or urban populations are considered (results not shown) and model fit was significantly improved when interactions with *hukou* are included in the models (statistical tests not shown). More substantively, the relationship between education and marriage may change over time and across *hukou* status. Therefore in the next section I stratify the models on *hukou* status by running separate estimations for the rural and urban populations.

Does the effect of education differ across birth cohorts by hukou status?

Figure 11 and Figure 12 show predicted probabilities from reduced-form models that focus on the variation across cohorts in the association between educational attainment and bachelorhood. These figures also highlight that the associations differ substantially across the rural-urban divide. Figure 11 shows this relationship for cohorts of rural men age 40 or above. The striking feature of this graph is the separation of men with lower levels of education from the rest over time. For men defined as illiterate (no schooling or less than primary) the rise in the probability of bachelorhood was monotonic across the entire period. In total, the rise for this group across the period was more than six-fold: from around five percent for the 1926-30 cohort to more than 30 percent for the 1961-65 cohorts. There was a smaller separation for men born after 1935 who only had a primary education: their probability of bachelorhood more than doubled from roughly three percent to more than seven percent. Rural men with at least a junior high school education had very low probabilities of bachelorhood—mostly under two percent—regardless of birth cohort.

[Figure 11 about here]

The pattern of predicted probabilities across birth cohorts by education was markedly different for urban *hukou* men (Figure 12, note the modification in educational categories). Regardless of education level, urban men had very low levels of bachelorhood across most birth cohorts. For urban men born before 1955 the predicted probability of bachelorhood was well below three percent for even the least educated—primary education or less—group; while for those with at least a junior high education the probability of bachelorhood was less than one

percent. For men born after 1955, the probability of remaining bachelors after age 40 rose for all educational groups and rose sharply for the least educated urban men. Men with a primary education or less born during 1956-60 saw their probability of bachelorhood more than double to 5.5 percent; and then nearly double again for the 1961-65 cohort to nearly nine percent.

[Figure 12 about here]

Are these differences by education statistically significant across birth cohorts in a model with additional controls?

The graphed predicted probabilities show a visually distinct divergence between men with low education and the rest that grew across birth cohorts, especially for rural men. Table 6 returns to the odds ratio scale for a full model that stratifies on *hukou*, interacts education with birth cohort, and includes controls for ethnicity, age, and region. For ease of display, and to focus on what appears from the figures to be the key divergence between low educated men and the rest, these models dichotomize educational attainment between those with a primary education or less—note primary is used as the cutoff for both urban and rural men—and those with at least a junior high education.

[Table 6 about here]

For rural men, the disadvantage of having a primary education or less was large from the earliest cohort: these less educated men born in 1926-30 had 2.27 times higher odds of bachelorhood than peers in the same cohort who had at least a junior high education (Table 6

Model 2). This disadvantage grew monotonically across cohorts, with less educated rural men born in the late 1940s having 4.48 times the odds of bachelorhood, and men born in the early 1960s 7.42 times the odds of more educated rural men. The interaction effect between birth cohort and low education was statistically significant (at the 0.01 level) across adjoining cohorts after 1935, except for the 1951-55 verses 1956-60 comparison where the interaction coefficients were not statistically distinguishable from each other. Thus, for the most part, this model confirms the picture from Figure 3 and shows that even if the educational bar is moved up to primary education—which encompassed more than half of every birth cohort of rural men up through 1955—the differences in marriage chances are significant across cohorts.

For urban men, the difference in the odds of marriage between those with a primary education and those with more education was also large. These less educated urban men born in the 1926-30 period had 2.64 times the odds of bachelorhood of their more educated cohort peers (Table 6 Model 3). Less educated men born in the 1930s had similar disadvantages that were not statistically distinguishable from each other. After 1940, there was a statistically significant jump in the odds ratio leaving less educated men with 4.70 times the odds of bachelorhood of their more educated peers. In the 1950s and 1960s the odds of bachelorhood continued to rise but these differences were not always statistically different across cohorts: less educated men born in 1956-60 had 5.00 times the odds and the subsequent cohort 6.11 times the odds of bachelorhood of more educated men.

The divergence between the primary or less education group and more educated urban men is not as large in the odds ratio scale compared to the predicted probabilities (Figure 12). This is because men with more than a primary education born after 1955 also had increases in bachelorhood odds that were small in absolute terms but proportionally similar to the lowest

education group. So while in absolute probability terms the cohorts of least educated urban men born after 1955 diverged noticeably from their more educated peers, on the relative odds ratio scale this divergence was less severe. The odds ratios still highlight that, relative to their more educated peers, primary or less educated men always had much higher odds of bachelorhood that fluctuated non-monotonically across birth cohorts.

Are there differences by hukou status in other variables?

The models in Table 6 also show differences across the rural-urban divide for the relationship between bachelorhood and region of residence, age, ethnicity, and birth cohort. Patterns are similar to the main effect model in Table 5 but these stratified models show some potentially important differences by *hukou* status. Compared to the baseline northeast region, rural men in the north had nearly twice the odds of bachelorhood (O.R. 1.99) while urban men in the north had 19 percent lower odds. Both urban and rural men had relatively high odds of bachelorhood in the more prosperous coastal region with urban men especially disadvantaged: 70 percent higher odds of bachelorhood compared to urban men in the northeast. The disadvantage of being in the ethnic majority Han group was mostly driven by rural men who faced 41.4 percent higher odds of bachelorhood than ethnic minorities, while for urban ethnic Han the increase was only 2.7 percent. Rural men had smaller age effects after age 40 than urban men: aging by one year dropped the odds of bachelorhood by 1.4 percent for them, while for urban men their odds dropped by 3.0 each year.

A more parsimonious model of cohort effects

Tests of statistical significance across birth cohorts and cohort-by-education interactions, along with the visual evidence of graphed predicted probabilities, provide some indication of whether the cohort-bachelorhood association is likely due to continuous social forces or discrete historical events. The monotonic increases in educational attainment across cohorts for both urban and rural men provide *prima facie* evidence for continuous social forces operating via education on marriage chances. As men with very low levels of education became an increasing minority, their position on the marriage market likely deteriorated in turn. For rural men, this process was relatively continuous and monotonic across cohorts. Statistical tests of the significance of education-by-cohort associations across successive rural cohorts support this interpretation; as do model fit tests, which easily prefer the full interacted model over any reduced-form models that reduce the categories of the cohort variable (tests not shown).

For urban men the evidence is mixed. Visual inspection of predicted probabilities indicate a sharp increase in the probability of bachelorhood for urban men born after 1955. A model that replaces the eight-category cohort variable with a single term dividing the data at 1955 has a similar Bayes Information Criterion (BIC) model fit statistic to the full model, although BIC still supports the full model with a 200 point smaller (more negative) BIC (Table 6 Model 4). BIC is very likely to prefer the full model under most circumstances given the very large sample sizes (N= 749,943 urban men). To reduce the influence of sample size, I take a 10 percent sample of the data and re-run the models and BIC statistics. With this smaller sample, BIC does support the more parsimonious model with only one cohort parameter for urban men. On a 10 percent rural sample, BIC still overwhelmingly supports the full model (tests not shown). This means that most but not all of the statistically significant variation across urban

cohorts is due to an inflection around 1955. Urban men born between 1956 and 1965 were mostly educated during the turbulent Cultural Revolution decade, which especially affected urban youth (Deng and Treiman 1997). They then were on the marriage market during the early post-Mao period and the beginning of economic reforms in the late 1970s and early 1980s. Another potential influence on their marriage behavior was the new marriage law in 1980, which lowered *de facto* minimum marriage age, resulting in a rush into marriage for Chinese men and women in their early 20s (Coale et al. 1991, Tien 1983, Ye 1992).

Sensitivity analysis

Several assumptions made in the main analysis can at least be partially tested. For one, the geographic location variables used in the analyses enumerate residential location at the time of the census, not the time of marriage. To assess the importance of this possible measurement error, I redo the analyses using just the 2000 data, which includes a variable for lifetime migration. Using this variable I do two things: 1) create a dummy variable indicating whether an individual still lived in his province of birth in 2000 and include this in the main effects models predicting bachelorhood; 2) re-run all models restricting to the 93.7 percent of age 40 or above men still living in their province of birth in 2000. Neither of these constraints changes the pattern of results for the main variables of interest. Interestingly, provincial migration is a significant predictor of marriage—migrants are 18 percent less likely to be bachelors—but the direction of causation is unclear. Men may move because of poor marriage market conditions or marriage may spur them to move. The lack of detail on the timing of moves made before 1995 does not allow this ordering to be established in most cases.

The reduced-form models of interactions between birth cohort and education displayed in Figure 11 and Figure 12 do not control for age, Han ethnicity, or region. To test whether this constraint noticeably affects the temporal pattern of results, I run a series of interaction models with these controls in various combinations. The pattern of interactions across cohorts for either urban or rural men does not change in these models. While other unobserved factors may still be influencing the observed patterns, differences by age, region, or Han ethnicity do not appear to among those factors.

To examine whether the six-category region variable sufficiently accounts for variation in marriage across geographic space, I re-run the main effect and interaction models with a set of 31 provincial categorical variables, then using only the 2000 data a set of 345 prefecture-level (the administrative unit below the province) categorical variables. Neither of these alternative specifications changes the pattern of results for the main variables of interest. Unmeasured variation due to geographic differences therefore does not appear to be biasing the results. Provincial variation over time in the proportion of men who are bachelors after age 40 is more fully described in appendix 2.

The expansion of education across the period made those men with very low levels of education an increasingly select group and those with high levels of education a less select group over time (see Figure 6-7 in chapter 1). To address changes in the selectivity of education, I operationalize education as a relative measure and re-run all main effects and interaction models with this specification (Figure 13-14 display the reduced-form interaction results). Within each five-year birth cohort, men are ordered by years of education and then grouped into five quintiles and, alternatively, four quartiles as an additional specification. This places men within an educational attainment hierarchy that is relative to other men of the same cohort. This also makes

the proportional size of educational groups stable over time; each quintile contains 20 percent of the cases both within and across birth cohorts.

These relative quintiles are measured with error. Educational attainment is not measured as a continuous variable in the census. Instead it is measured as an ordered set of categories that vary slightly across census years. There is not enough variation across educational categories within each birth cohort to neatly separate men into educational quintiles at the quintile margins. This measurement error likely means the distinctions between educational quintiles are under-estimated and that a measure without this error would show differences across quintiles larger than the ones estimated in these models.

[Figure 13 about here]

The overall pattern of results is similar in this relative education specification, both in full models with interaction effects (results not shown) and in terms of predicted probabilities from reduced-form models. For rural men, the striking pattern is still driven by those men with the lowest education (Figure 13). The bottom quintile diverged from the rest after 1930 and by the 1961-65 period had a predicted probability of bachelorhood roughly five times higher than the rest of their cohort peers. The story for urban *hukou* men was similar in that those in the bottom quintile of the educational distribution had higher probabilities of bachelorhood across the period, although divergence was less stark or monotonic (Figure 14). Men in the lowest quintile diverged from the rest after 1935, which was earlier than the absolute education analysis. However the pattern of increased divergence after 1955 was similar. The "protective" effect of urban *hukou* disappeared for men born after 1955 as their probabilities of bachelorhood

converged with similarly educated rural men—both groups had nearly a 10 percent probability of bachelorhood by the 1961-65 birth cohort. The same pattern held when relative quartiles were used instead of quintiles.

[Figure 14 about here]

To test the importance of using age 40 as the cutoff age for the analysis, I re-run the models with different cutoff ages, including age 35, 45, and 50. The pattern of results does not change in any of these additional models. In the main analysis above, I always use age 40 as the cutoff age for inclusion in the analytic sample. Including men younger than this might conflate the experience of single men who are likely to marry in the future with those who are much less likely to ever marry. Including only much older men, age 60 and above for instance, would greatly reduce the number of cohorts included in this cohort analysis of marriage and preclude saying anything about the men who came of age in the post-1970s reform period. With these issues in mind I chose age 40 as a compromise between these two sets of problems. The additional models with different age cutoffs demonstrate that the main results are not driven by this age restriction.

Pooling the data across census years and retrospectively creating birth cohorts means some cohorts are included more times in the pooled data. As a result they contribute more observations to the models than they would otherwise. On the other hand, later cohorts include more individuals, due to mortality across cohorts, so they contribute relatively more observations for this reason. Still, if associations among variables, or patterns of mortality after age 40, differ across data sets, this may bias the results. In light of these concerns, I run an additional set of

models for men age 40-44, meaning there is only one cohort per census year but no overlap in the data across census years. This captures the period effect across census years for men age 40-44 at the time of the census. A period—i.e. the census year—variable instead of a cohort variable is included in these models. These results are shown in appendix 1.

Discussion and Conclusion

Using a large pooled large dataset pooled across the 1982-2000 censuses and 2005 mini-census, this chapter analyzes the determinants of bachelorhood for cohorts of men born between 1926 and 1965. This was a period of great social change in mainland China, including large increases in average educational attainment. Men born before 1930 averaged less than four years of completed education while men born in the early 1960s averaged more than 9 years. During this period bachelorhood after age 40 was quite uncommon as more than 95 percent of men above this age had married, and nearly 99 percent of men with an urban *hukou* had married if they were 40 years or older. This represented a significant change from pre-20th century China when a significant portion of men failed to marry due to sex ratio imbalances and socioeconomic inequality (Campbell and Lee 2008a, Chen et al. 2014, Lee and Wang 1999, Wang and Tuma 1993).

So while most men born after 1925 did marry, levels of bachelorhood still varied systematically by background characteristics: rural *hukou* holders, Han Chinese, northerners, and those with low educational attainment all had markedly higher odds of bachelorhood. The stratifying effect of education increased across birth cohorts. Low levels of education were not very harmful for marriage chances in the oldest cohorts but became increasingly predictive of non-marriage over time. This differentiation by educational attainment was large whether

education was measured in absolute or relative terms. These educational patterns varied by household registration status. In terms of probabilities of bachelorhood after age 40, urban *hukou* was somewhat protective for men with low education born before 1956; but for men born after this date, urban and rural *hukou* holders with primary education or less both had much higher probabilities of bachelorhood than their more educated peers.

The high rates of marriage for men over the last half century or more have obscured the changing role of education in determining who marries, or at least who marries in a timely fashion. While policymakers may hope to reduce social inequality by expanding educational opportunity, the results of this expansion are often ambiguous. The expansion of education can be a double-edged sword for those at the bottom tail of the distribution as expanding educational opportunity may make educational attainment more important for life chances overall. In a society where only a few have any formal education, education is not determinative of social outcomes for the vast majority of the population. But in a society where education is expanding rapidly, which is both a result of and cause of other social transformations, the result may be increasing inequality, at least for those at the two ends of the educational spectrum.

This phenomenon is illustrated for marriage for cohorts of Chinese men born across the middle decades of the last century as education became increasingly important for determining whether men married or not by age 40. For men born before 1930, educational differences were not very important for determining who got married, but these differences became increasingly important thereafter, so that men born in the early 1960s in the lowest educational strata had probabilities of bachelorhood five times higher than their cohort peers.

Governmental policies are also implicated in the changing role of *hukou* status in determining marriage chances. An urban *hukou* was somewhat protective against bachelorhood

for men born before the mid-1950s regardless of educational attainment, at least in terms of the predicted probabilities of bachelorhood. Urban men with less education had consistently higher odds of bachelorhood than their more educated peers, but these differences did not strikingly diverge until the later 1950s cohorts. Urban men born before the mid-1950s were the prime beneficiaries of the CCP's discriminatory *hukou* system, which redirected resources to the urban sector in its drive for Soviet-style industrial modernization (Walder 1989). This system guaranteed urban men socioeconomic resources and jobs (the so-called "iron rice bowl") while rural men were legally tied to the land they farmed (Lee and Selden 2007). For rural men at the bottom of the socioeconomic hierarchy, there was little opportunity for either physical or economic mobility and this may have been reflected in their higher bachelorhood levels (Fan and Huang 1998).

The salience of the *hukou* system started to decline with implementation of economic and political reforms in the 1980s and this change may be reflected in changing marriage differentials by *hukou* status. For less educated men born in the 1960s, who were on the marriage market during the 1980s and 1990s, the probability of bachelorhood was relatively high for both rural and urban residents. The cracking of the iron rice bowl hit less educated urban men first and they were the least prepared to take advantage of the new market-based economic opportunities. Having an urban *hukou* by itself became less economically relevant and less educated urban men increasingly suffered on the marriage market as a result. Even in the rural sector, the modernization of the economy favored those with more education, so less educated rural men continued to suffer on the marriage market even though they were no longer physically tied to their economically under-performing rural plots of land.

Together these patterns of bachelorhood across cohorts by educational and *hukou* status argue for the force of broad social forces like educational expansion, not more discrete historical circumstances. The rise in bachelorhood for rural men was almost linear across cohorts despite the many important historical events that intersected with their prime marriage years. For instance, rural collectivization of the early 1950s greatly increased the number of independent household units (Guo 1995), which should have increased the marriage rate for young Chinese couples who now had more control of their own economic circumstances. However the effects of this important social revolution are not apparent in this cohort analysis of bachelorhood. Neither are the mortality and fertility shocks brought about by the Great Leap Famine (1958-61) or the turmoil of the late 1960s during the peak Cultural Revolution period. It may be that the five-year birth cohorts are too coarse to pick up all the nuances of historical events; or, I would argue, that these events are more influential for timing of marriage than likelihood of ever marrying. The exception to this may be the rather sudden jump in bachelorhood probabilities for less educated urban men born after 1955. But even in that case, the pattern is consistent with the cumulative interactive effects of governmental *hukou* policy and broad-based socioeconomic reforms not more discrete historical events.

Broad-based and long-term socioeconomic development policies are also implicated in the uneven development across regions favoring the eastern coastal regions over the poorer interior and western provinces (Fan and Sun 2008, Kanbur and Zhang 2005). Notwithstanding these regional patterns, in my analyses the odds of bachelorhood for men age 40 or above are lower in the poorer western region and higher in the richer coastal region for both urban and rural men. Likely this counterintuitive finding is due to these older men mostly marrying before the loosening of migration restrictions and economic development policies of the 1990s, which

funneled both people and resources towards the coastal region. This relatively recent trend includes the out migration of unmarried women from these poorer regions, leaving men there facing a tighter marriage market (Bannister 2004, Fan and Huang 1998, Sharygin et al. 2013).

This recent evidence for younger cohorts highlights that the older cohorts included in this analysis entered the marriage market during a time that was quite favorable to them from a demographic perspective. Falling fertility and continued persistence of age gaps at marriage may have meant that there were actually more men than women on the marriage market in certain years (Goodkind 2006). However the deficit in female births over the last 20 years signals a reversal of this demographic advantage for men over the next generation regardless of region (Poston and Glover 2005, Attané 2006, Ebenstein and Sharygin 2009, Jiang et al. 2014). Delays in marriage will be for some men—most likely the higher educated—a strategic choice for making a better match later, while for others marriage delays will be a harbinger of permanent bachelorhood. These results highlight the fact that even during a favorable demographic period for men patterns of socioeconomic disadvantage in marriage chances were visible and grew over time. For one thing, the era of socio-demographic advantage for urban *hukou* holders, regardless of educational level, appears to be over. Instead, educationally disadvantaged men regardless of whether they are urban or rural will likely bear the brunt of the marriage squeeze over the next generation.

Given this scenario, effective policy responses may be limited. The discriminatory *hukou* system still limits the life chances of rural residents (Chan 2009). Completely eliminating the *hukou* system would at least remove the official distinction between rural and urban residents and allow rural men to more easily migrate for either economic or marriage reasons. The continuing expansion of education, including the rapid expansion of tertiary education over the

last decade (Li et al. 2011), should have positive social benefits; but as this analysis has shown the expansion of education does not necessarily equalize marriage chances across groups. Continued uneven economic development and policies that favor it continue to put groups of men—such as poor farmers living in western provinces—at a severe disadvantage on the marriage market. Complete elimination of the "one-child" fertility policy and the stabilization of the sex ratio at birth likely would be the most important policy responses to help China eventually return to the historically low levels of bachelorhood enjoyed over the past half century. Renewed efforts to balance economic investments across regions to reduce socioeconomic inequality would also improve men's marriage opportunities.

These results also provide more indirect evidence on how preferences for marriage may have changed over time. Although the cohorts included in this analysis married at historically high rates, the patterning of bachelorhood by socioeconomic factors indicates bachelorhood was still mostly reserved for the socioeconomically disadvantaged. If personal preferences for marriage were being fully expressed, the risk of bachelorhood should have been more equally distributed across SES groups. Unless a case can be made that being better off makes one more desirous of marriage, and that this interaction increased over time, the increasing relative odds of bachelorhood for less educated men implies social not personal preferences for marriage. On the other end of the SES scale, the levels of marriage among higher SES urban men—more than 99 percent of them married—are perhaps too high to sustain the idea that all of these marriages were due to a personal preference to marry and not in response to continuing social pressures for men to marry regardless of their underlying preferences.

Appendix 1: Additional models: men age 40-44

The models included in this chapter include men of many different ages, who are observed, retrospectively, for different lengths of time. Although the linear effect of individual birth cohorts and age are controlled—and other specifications of the age variable were also tested—the mixing of men of different ages and observation periods in the models may still be problematic. Including men of older ages introduces potential survivorship bias as older bachelors are more likely to have died before being enumerated than similarly aged married men. Moreover, older men were exposed to the risk of marriage for longer periods than relatively younger men. On the other hand, older men may no longer have been at risk of marriage at all and should be excluded from marriage models for that reason.

To address these concerns, I estimate additional models limited to men of similar age (age 40-44) at the time of enumeration (Table 7). I choose this age group because it covers a period in the life course that may be critical for separating men who marry late from those who do not marry at all. By age 40, the vast majority of men had already married (Figure 2) but over the following five years of age some men continued to marry for the first time. So men in this age group were still at risk of marriage. With four census years to work with, I still can do an analysis across several birth cohorts, or better put, across several periods for the same age cohort of age 40-44 men.

[Table 7 about here]

The disadvantage of low education remained severe for men age 40-44 regardless of *hukou* status. In 1982, rural men with a primary education or less had 2.5 times the odds of

bachelorhood of men with more education (Table 7, model 5); the odds differential for age 40-44 urban men was nearly identical (O.R. 2.41, model 6). For both *hukou* groups, compared to 1982, this educational disadvantage worsened monotonically across the 1990-2005 period: 4.4 (1990) to 4.9 (2000) to 7.2 (2005) higher odds for less educated rural men; 3.1 (1990) to 4.4 (2000) to 6.1 (2005) higher odds for less educated urban men.

Figure 15-16 graph the predicted probability of bachelorhood for age 40-44 men by educational category. Illiterate rural men had much higher probabilities of bachelorhood at each year, but especially in 2000-2005 when the predicted probability of bachelorhood for illiterate men was greater than 25 percent. Rural men with only a primary education had at least twice the probability of bachelorhood as their more educated peers from 1990-2005 (Figure 15) with an 8 percent probability in 2005.

[Figure 15 about here]

Urban men with a primary or less education had a predicted probability of bachelorhood that grew from 2.5 percent in 1982-90 to 5.5 percent in 2000 and nearly 9 percent in 2005 (

Figure 16). For other educational categories, the probability of bachelorhood was less than 2 percent in each year, although those with a junior high or high school education saw slightly higher probabilities in 200-2005 compared to early years.

[Figure 16 about here]

These results show that the pattern of bachelorhood for men in their early 40s was similar to the pattern for all men age 40 or above. Men with low levels of education were at a distinct disadvantage in both urban and rural China and this disadvantage grew across census years. Because these results consider men of the same ages across specific years, the growing disadvantage of education shows clearly that there was strong and growing "period effect" of educational attainment on the chances of long-term bachelorhood for men in their early 40s over the 1982-2005 period.

Appendix 2: Provincial variation in bachelorhood

Logistic regression models using pooled 1982-2005 census microdata suggest that geography indeed matters for marriage chances. Regional variables show differences in bachelorhood odds by region with age 40 or above men more likely to be bachelors if they live in the north or the eastern coastal region than in the interior or western areas. These broad regional patterns may hide heterogeneity among provinces. Given economic inequality across provinces (Fan and Sun 2008) and differences in adult-age sex ratios (Banister 2004), it is reasonable to expect differences between provinces in marriage outcomes.

Given the relatively small number of age 40 or above bachelors in the data, I did not report results from models that include province or lower level of administrative unit either as main effects or interactions. Instead I show here a province-level mapping of levels and changes in the never married, age 40 and over population of men. Specifically, these maps show the percentage of 40 or above men who have never married by province for 1982 (Figure 17) and 2010 (Figure 18), as well as the percentage change between those two census years (Figure 19);

2010 data is available for these descriptions because only aggregate province-level totals by age and marital status are needed to make these maps.

Overall, these maps show relative homogeneity across provinces and over time for the prevalence of long-term bachelorhood. Tibet is the main exception to this pattern, for reasons that may have to do with data quality and/or changing patterns of Han migration to this relatively sparsely populated area. The pattern of bachelorhood displayed in the maps is different from the patterns implied from the logistic regression models. Regional variables in those models estimated that men living in the relatively richer northern or coastal regions had higher odds of bachelorhood than did men living elsewhere. The map for 1982 is roughly consistent with these results but not the map for 2010. Compositional differences in education across regions likely are a key factor in this regional sorting, with these descriptive maps not accounting for the role of education in determining long-term bachelorhood. Rather the maps just give the actual proportion of bachelors by province.

[Figure 17 about here]

In 1982, no province had even six percent of men, age 40+, who were still never-married bachelors; and the western provinces, along with the southwestern provinces of Yunnan and Guizhou, and the south-central province of Jiangxi, had the lowest levels of bachelorhood at less than two percent. While in 1982 the entire country was very poor by western standards these provinces were among the poorest regions of China, so these patterns suggest SES was not highly associated with long-term bachelorhood at the provincial level.

[Figure 18 about here]

Three decades later in 2010, the percentage distribution continued to highlight the relative homogeneity of bachelorhood levels across provinces. In 2010 every province had bachelorhood levels of between two and four percent, except the western provinces of Ningxia and Xinjiang, which were less than two percent, and three southwestern provinces—Sichuan, Guangxi, and Hainan—and one eastern province, Anhui, which were between four and five percent. Only two provinces, Tibet (9.54 percent) and Guangxi (5.40 percent), had bachelorhood levels above five percent.

[Figure 19 about here]

Figure 19 compares 2010 levels directly to 1982 levels and shows the percent change between these two periods. Here a clear regional pattern in discernible and we see evidence for a possible role of SES differentials across provinces. There is a clear dividing line between the richer eastern coastal provinces, which had declines in levels of bachelorhood, and the interior and western provinces, which all had percentage gains in bachelorhood. Aside from Tibet, these gains and losses were all within two percentage points of zero, making any firm conclusions about the salience of this regional pattern premature.

Nevertheless, this regional pattern may be suggestive of changes to come in the near future and it supports previous work by scholars who show that internal migration from west to east, including by women looking for both marriage and work opportunities, may be making it that much more difficult for those left behind to find marriage partners (Banister 2004, Fan and

Huang 1998, Sharygin et al. 2013). This internal migration more than compensates for the fact that sex ratios at birth are much more skewed towards male births in the richer coastal provinces than in the western provinces (Bannister 2004). These geographic trends indicate men stuck in the interior and western provinces may be losing out demographically as well as economically as China's uneven economic development continues.

Results: figures and tables

Table 4. Descriptive Statistics (Weighted), Mainland China, Men age 40+

	Rural		Urban	
	Bachelor	Married	Bachelor	Married
Age (mean)	51.53	52.22	49.27	52.08
Han (% of variable)	94.40	91.95	95.86	95.06
Education (% of variable)				
None	21.10	8.54	8.45	1.65
Less than primary	24.67	12.96	15.64	3.47
Primary	42.60	45.50	24.32	22.38
Junior high	10.19	26.96	27.43	33.45
High school	1.35	5.71	17.03	21.07
Jr. college	0.08	0.30	4.43	12.14
University	0.01	0.02	2.71	5.83
Region (% of variable)				
Northeast	4.32	6.62	11.83	14.85
North	25.49	20.79	11.22	17.27
Coast	28.71	28.90	47.89	34.14
South central	18.40	18.94	11.99	15.42
Southwest	20.92	20.69	14.40	14.10
West	2.17	4.05	2.67	4.22
Birth cohort (% of variable)				
1926-30	6.53	9.53	6.40	8.43
1931-35	11.15	12.09	10.26	12.67
1936-40	16.25	13.76	13.77	15.27
1941-45	16.36	13.28	12.53	13.17
1946-50	17.54	15.58	12.23	13.96
1951-55	14.04	14.42	11.29	13.29
1956-60	11.73	12.99	18.09	14.07
1961-65	6.39	8.34	15.43	9.14
Census year (% of variable)				
1982	12.06	10.68	16.81	13.18
1990	22.95	20.20	17.00	16.83
2000	33.16	32.68	25.45	30.93
2005	31.83	36.44	40.74	39.06
N	92,680	1,617,190	8,928	741,015

Data: 1982-2000 China Censuses, and 2005 China mini census. N=2,459,813.
Weighted to represent one percent of the population at each census year.

Table 5. Logistic Regression Model, Odds of Long-Term Bachelorhood, Age 40+

Model 1	Coef.	S.E.	P-value	Odds Ratio	Risk Ratio
Education (reference: Primary)[a]					
No school	1.445	0.016	0.000	4.243	3.792
Less than primary	1.109	0.017	0.000	3.031	2.814
Jr. high	-1.169	0.023	0.000	0.311	0.323
High school	-1.466	0.040	0.000	0.231	0.240
Jr. college	-1.833	0.089	0.000	0.160	0.165
4-year or graduate degree	-1.564	0.118	0.000	0.209	0.214
Rural	0.788	0.022	0.000	2.199	2.131
Age	-0.005	0.001	0.000	0.995	0.996
Han	0.424	0.028	0.000	1.528	1.495
Region (reference: Northeast)[a]					
North	0.534	0.028	0.000	1.707	1.647
Coast	0.353	0.028	0.000	1.424	1.380
South central	0.160	0.029	0.000	1.173	1.166
Southwest	0.222	0.029	0.000	1.249	1.223
West	-0.601	0.043	0.000	0.548	0.568
Birth cohort (reference: 1926-30)[a]					
1931-35	0.381	0.023	0.000	1.464	1.432
1936-40	0.823	0.023	0.000	2.277	2.154
1941-45	1.120	0.025	0.000	3.065	2.836
1946-50	1.140	0.027	0.000	3.128	2.920
1951-55	1.331	0.030	0.000	3.784	3.525
1956-60	1.546	0.033	0.000	4.691	4.323
1961-65	1.637	0.040	0.000	5.138	4.789
Constant	-5.317	0.072	0.000	0.005	0.005

Data: 1982-2000 China censuses, 2005 China mini-census. N=2,459,813.

[a] Jointly significant at 0.001 level.

Table 6. Logistic Regression Models, Odds of Long-Term Bachelorhood, Age 40+

	Rural		Urban		Urban	
	Model 2		Model 3		Model 4	
	O.R.	P-val	O.R.	P-val	O.R.	P-val
Educ: Primary or less	2.276	0.000	2.644	0.000	3.245	0.000
Age	0.986	0.000	0.970	0.800	0.965	0.000
Han	1.414	0.000	1.027	0.000	1.021	0.845
Region[a] (reference: Northeast)						
North	1.988	0.000	0.807	0.012	0.810	0.014
Coast	1.481	0.000	1.695	0.000	1.701	0.000
South central	1.378	0.000	0.906	0.219	0.917	0.281
Southwest	1.398	0.000	1.119	0.170	1.140	0.108
West	0.756	0.000	0.695	0.002	0.704	0.003
Birth cohort[a] (reference: 1926-30)						
1931-35	1.110	0.408	0.916	0.501	—	—
1936-40	1.310	0.019	1.010	0.936	—	—
1941-45	1.175	0.158	0.821	0.138	—	—
1946-50	0.879	0.261	0.902	0.444	—	—
1951-55	0.776	0.028	1.075	0.601	—	—
1956-60	0.889	0.296	1.484	0.002	—	—
1961-65	0.736	0.010	1.909	0.000	—	—
Born after 1955					1.659	0.000
Education*birth cohort[a]						
1931-35	1.169	0.224	1.111	0.484	—	—
1936-40	1.271	0.041	1.072	0.620	—	—
1941-45	1.612	0.000	1.779	0.000	—	—
1946-50	1.967	0.000	1.402	0.032	—	—
1951-55	2.377	0.000	1.260	0.226	—	—
1956-60	2.403	0.000	1.892	0.000	—	—
1961-65	3.262	0.000	2.310	0.000	—	—
Education*born after 1955					1.609	0.000
Constant	0.019	0.000	0.024	0.000	0.030	0.000
BIC	-80,957		-11,682		-11,482	
BIC (10% sample)	-8,787		-819		-883	
N	1,709,870		749,943		749,943	

Data: 1982-2000 China censuses, 2005 China mini-census.

[a] Jointly significant at 0.001 level in all models.

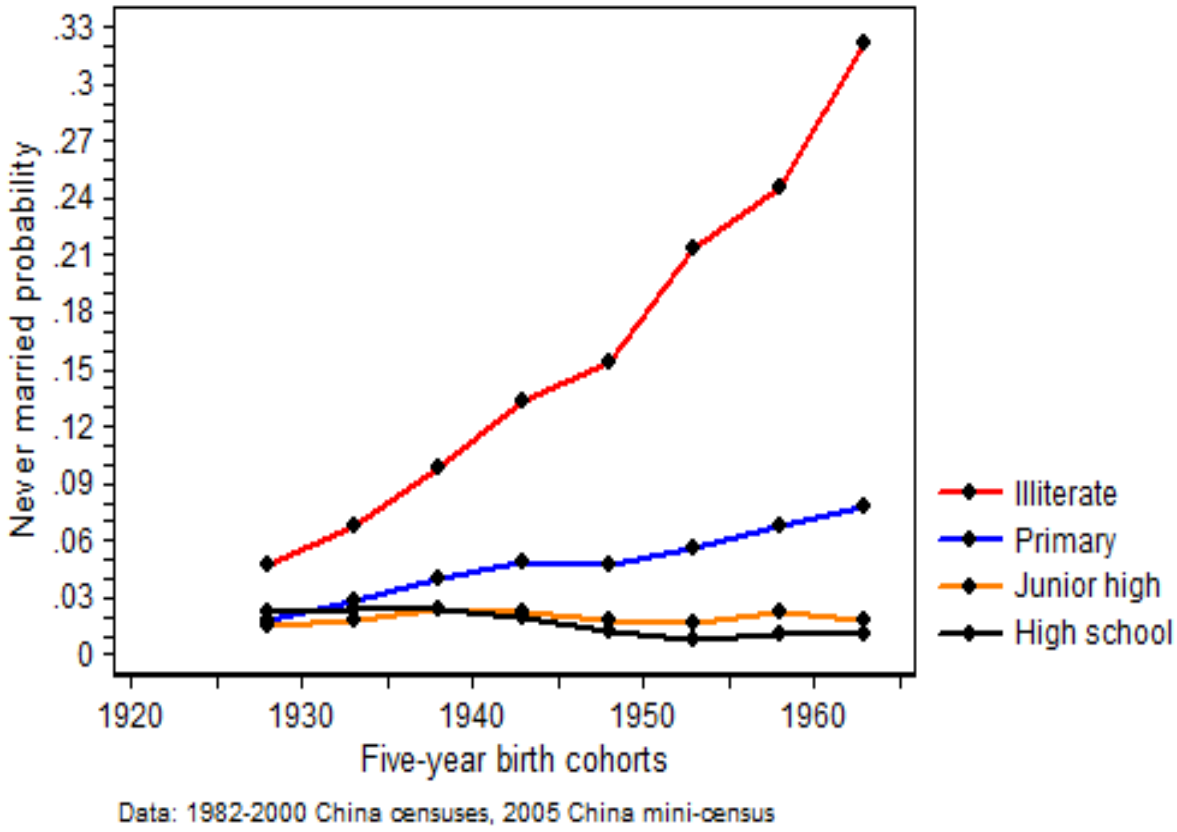


Figure 11. Predicted Probability of Long-Term Bachelorhood by Education, Age 40+, Rural

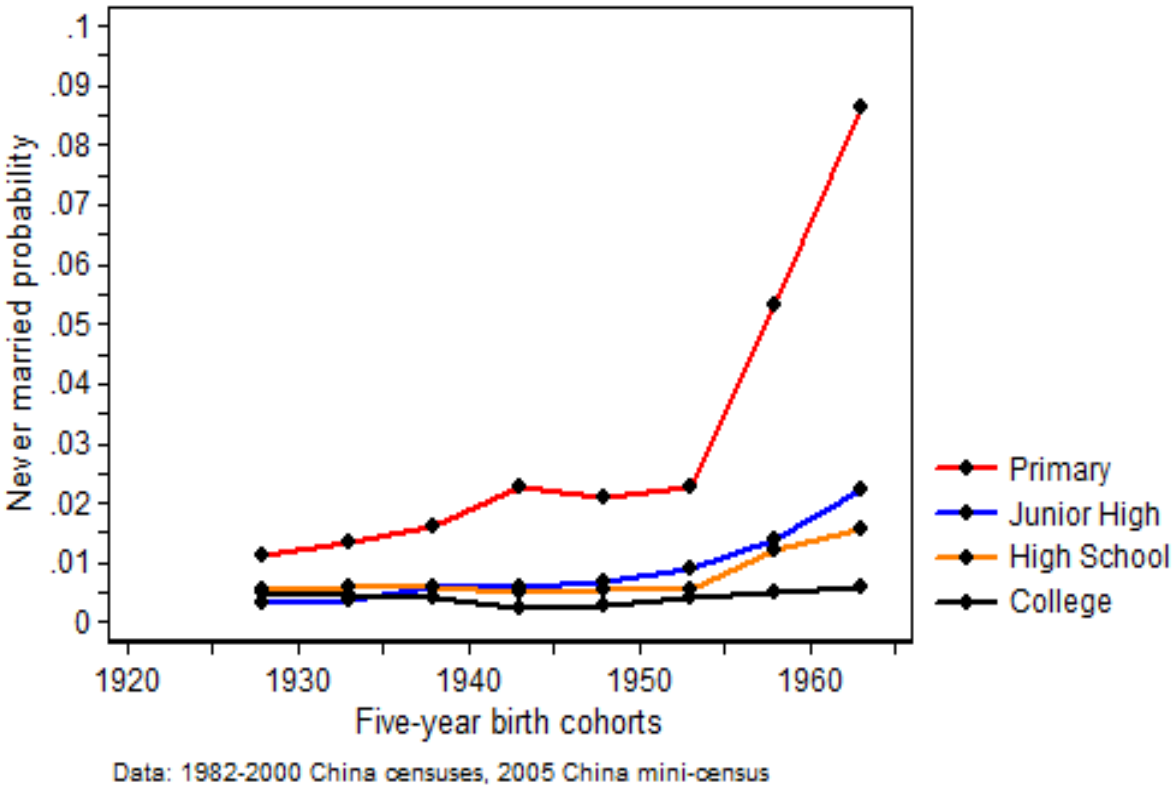


Figure 12. Predicted Probability of Long-Term Bachelorhood by Education, Age 40+, Urban

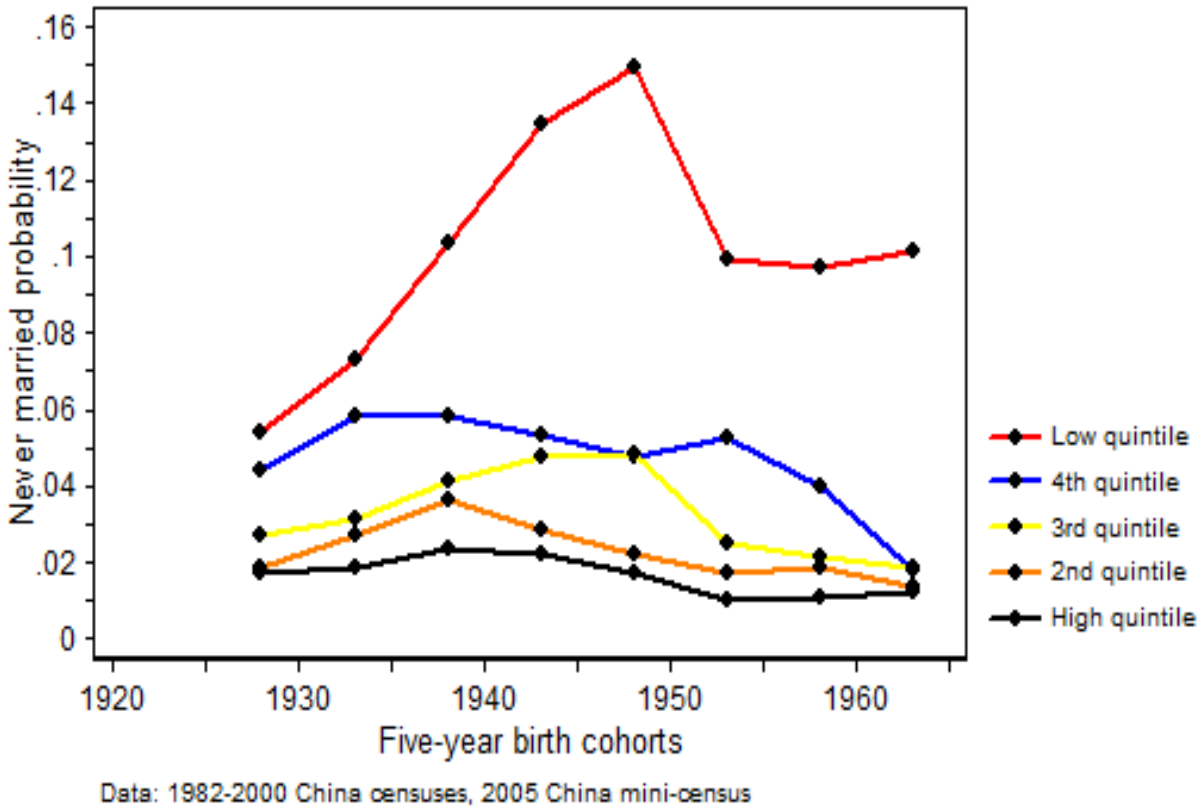


Figure 13. Predicted Probability of Long-Term Bachelorhood by (Relative) Education, Age 40+, Rural

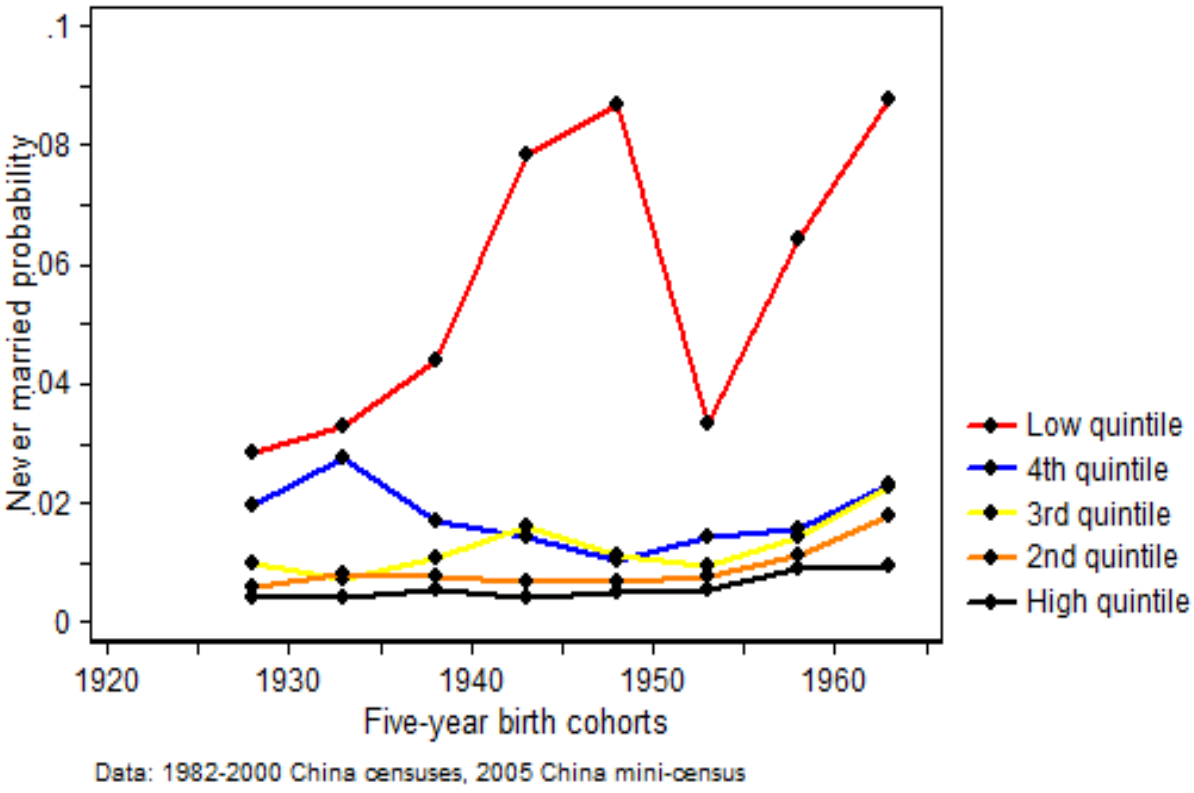


Figure 14. Predicted Probability of Long-Term Bachelorhood by (Relative) Education, Age 40+, Urban

Table 7. Logistic Regression Models, Odds of Long-Term Bachelorhood, Age 40-44

	Rural		Urban	
	Model 5		Model 6	
	O.R.	P-value	O.R.	P-value
Educ: Primary or less	2.481	0.000	2.409	0.000
Age	0.972	0.000	0.915	0.030
Han	1.230	0.000	1.036	0.826
Region (reference Northeast)				
North	1.900	0.000	0.587	0.000
Coast	1.450	0.000	1.330	0.004
South central	1.424	0.000	0.749	0.021
Southwest	1.492	0.000	0.862	0.251
West	0.733	0.000	0.526	0.002
Year (reference 1982)				
1990	0.518	0.000	0.816	0.001
2000	0.571	0.000	1.299	0.003
2005	0.423	0.000	1.489	0.000
Education*year				
1990	1.768	0.000	1.302	0.001
2000	1.973	0.000	1.831	0.001
2005	2.920	0.000	2.531	0.000
Constant	0.070	0.000	0.419	0.352
N	474,211		222,642	

Data: 1982-2000 China censuses, 2005 China mini-census.

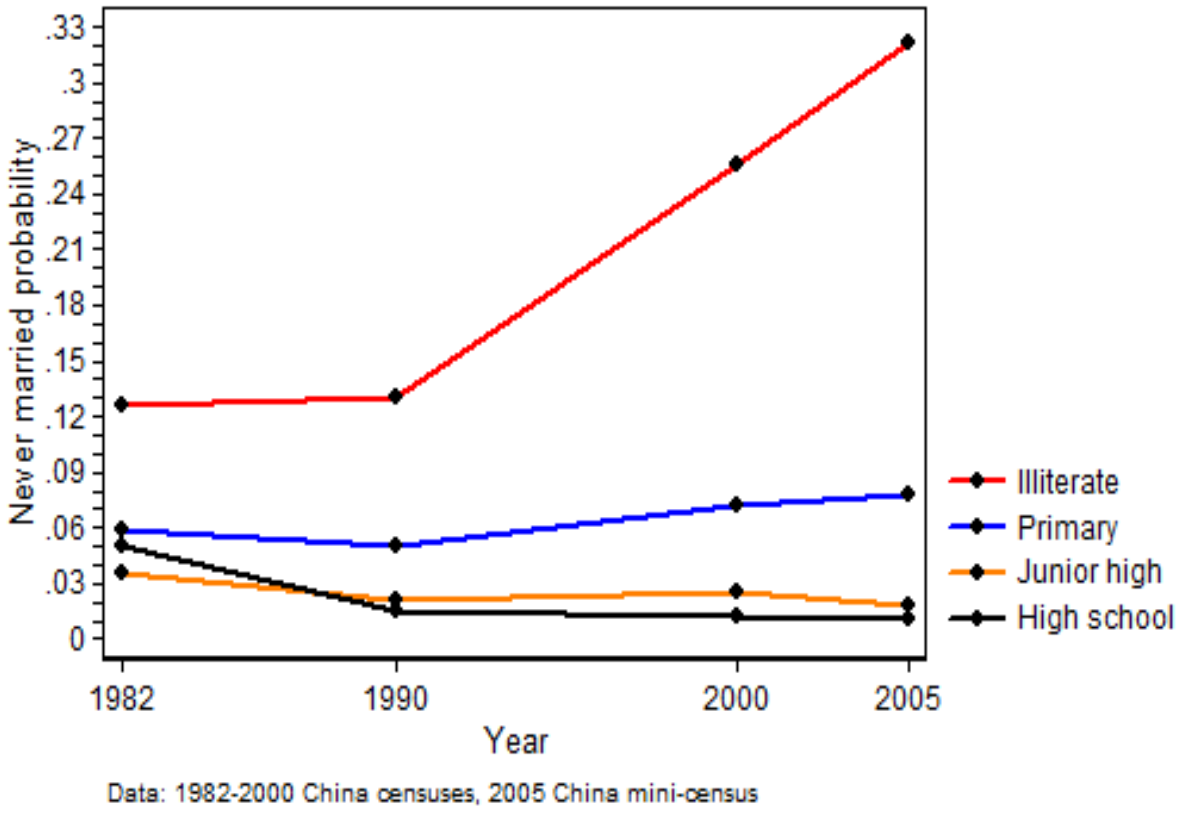


Figure 15. Predicted Probability of Long-Term Bachelorhood by Education, Age 40-44, Rural

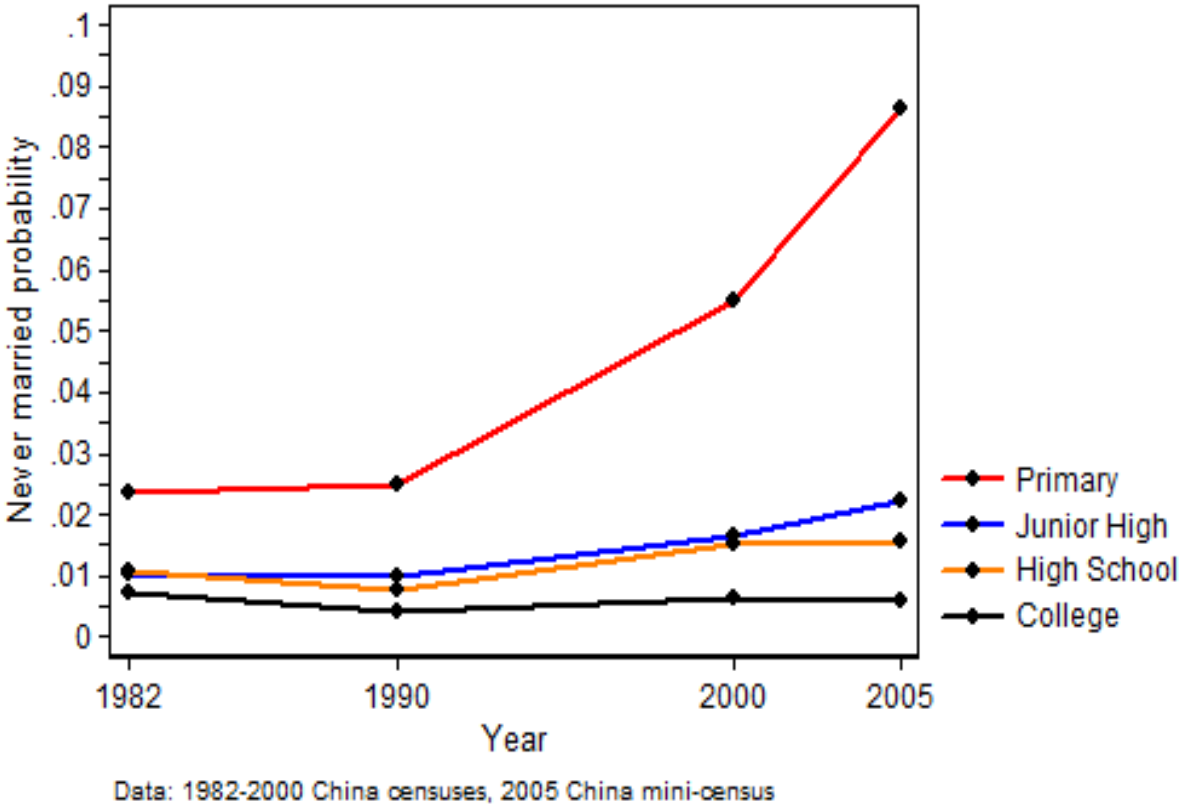
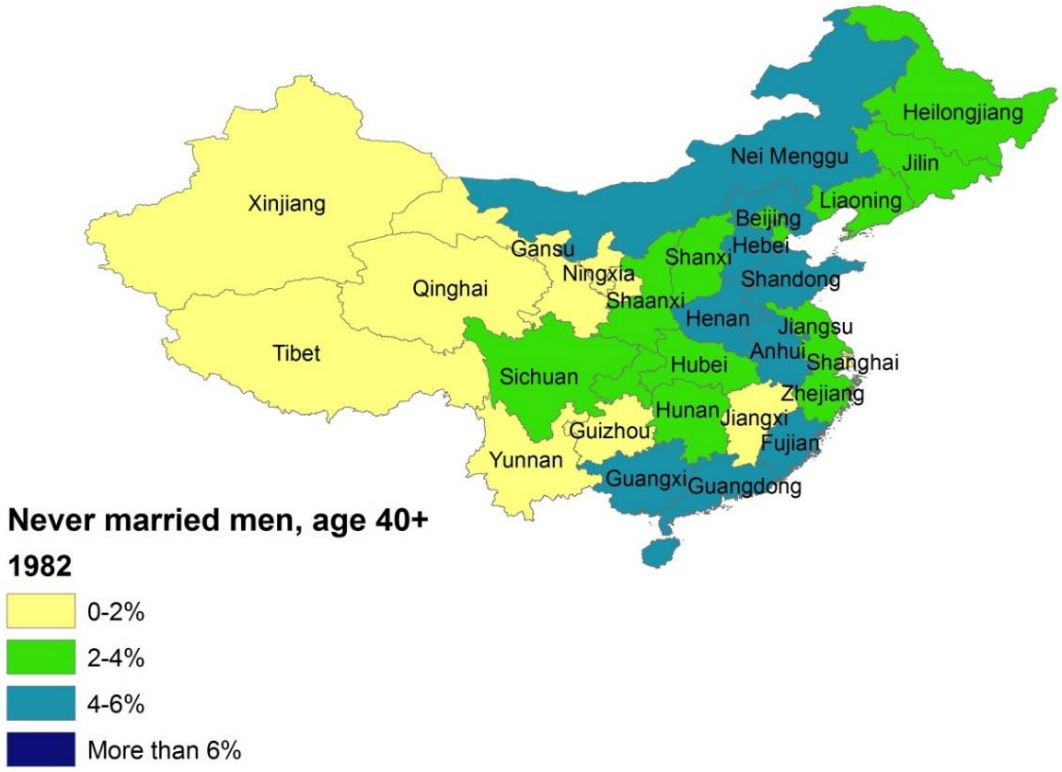
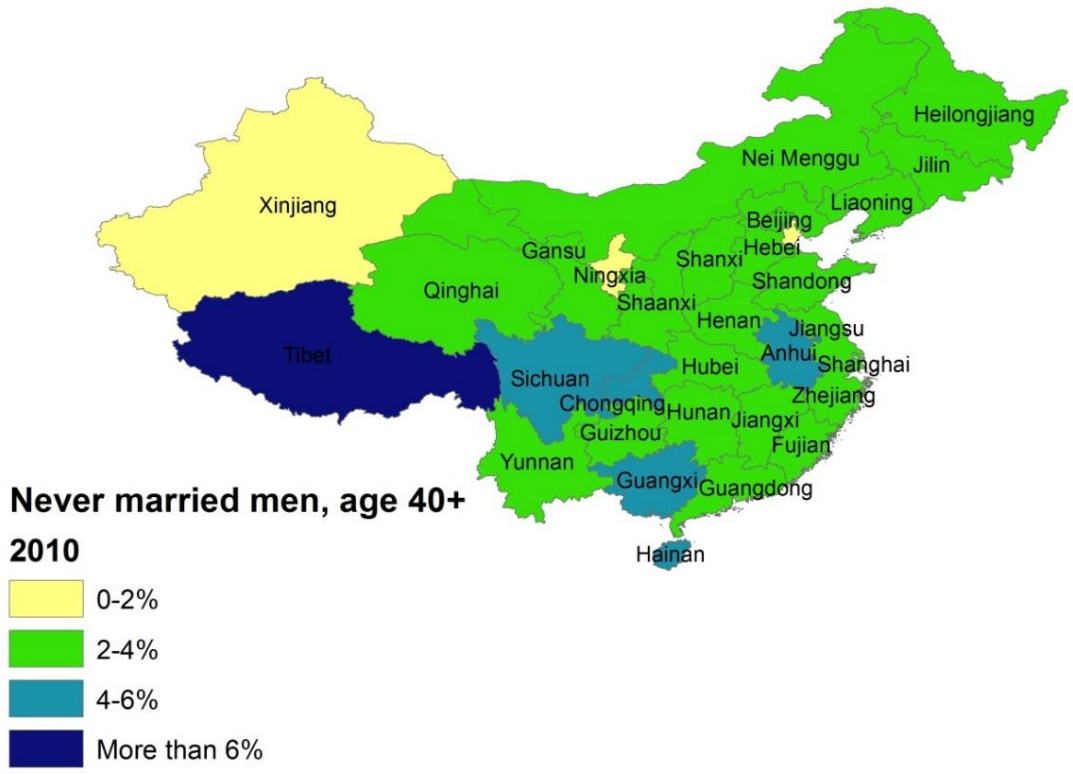


Figure 16. Predicted Probability of Long-Term Bachelorhood by Education, Age 40-44, Urban



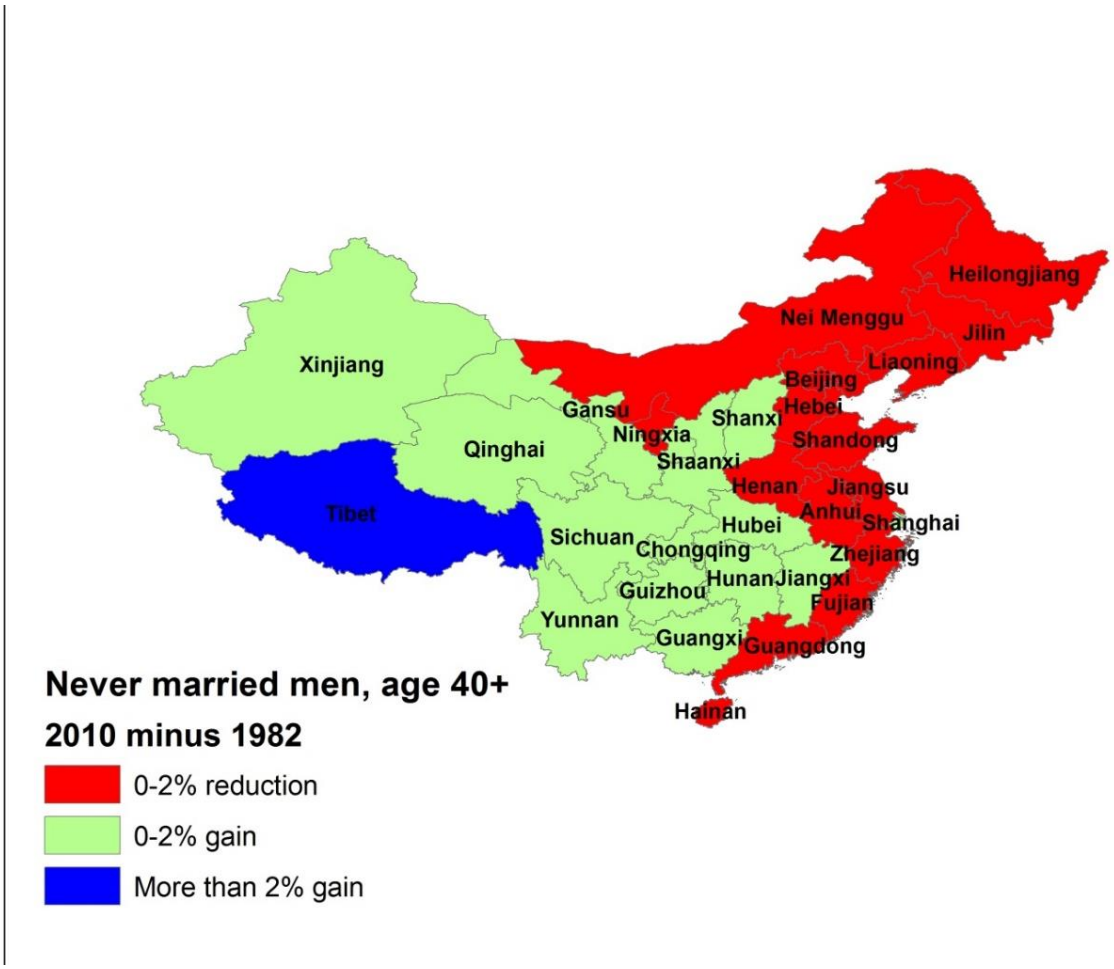
Data: 1982 China Census

Figure 17. Never married men by province, age 40+, 1982



Data: 2010 China census

Figure 18. Never married men by province, age 40+, 2010



Data: 1982, 2010 China censuses

Figure 19. Never married men by province, age 40+, difference 2010-1982

Chapter 4. The Role of Marriage Market Conditions and Propensity to Marry in Changing Marriage Rates, 1970-2000

Introduction

Chapters 4 and 5 turn to patterns of assortative mating during the period from 1970 to 2000 in mainland China. From a demographic perspective, the people who married in this period were cohorts born when fertility was rising in the 1950s, fluctuating in the 1960s, or precipitously falling in the 1970s (Coale 1984, Coale et al. 1991). These cohorts also experienced rising educational attainment (see Figure 5 in chapter 1), particularly the female cohorts (Hannum and Xie 1994). The swings in fertility levels across birth cohorts, along with continued age gaps at marriage, created age structure effects on the marriage market 20-25 years later that produced either a scarcity of males or females depending on whether fertility was rising or falling (Goodkind 2006, also see Figure 22). The relative gains in female education also altered the availability of marriage partners for educational assortative mating.

These conditions, along with the chronic deficit of females due to sex-selective fertility and infant mortality (Banister 2004, Coale and Banister 1994, Cai and Lavely 2003, Das Gupta and Li 1999), created variability in marriage market conditions that can be compared to changing patterns of completed marriages. The interplay of these two quantities looked at across discrete periods provides another angle to look for evidence of changing marriage behavior and preferences. Comparing changes in marriage rates alongside changes in other factors can tell us something about the influence of these factors on marriage, and indirectly on the underlying preferences that drive marriage behavior. This remains true even during an epoch where lifetime marriage rates remained extremely high.

Chapters 4 and 5 both utilize the harmonic mean marriage matching function developed by Schoen (1988). This brings a two-sex approach to what, at least for marriage timing in China, has primarily been a one-sex modeling literature (e.g. Trent and South 2011) and brings a consideration of marriage market conditions to assortative mating studies (e.g. Han 2010). These two-sex models allow for a joint consideration of patterns of assortative mating and marriage market conditions.

Specifically, I consider two factors that directly determine the number of completed marriages in any period: the availability for marriage of men and women and their "propensity" to marry. "Marriage propensity" can be interpreted as a risk of marriage independent of population composition (Schoen and Cheng 2006). I define it more formally below. In this chapter I take this definition at face value and use it to decompose changes in marriage rates over time in a manner similar to what Qian and Preston (1993) did for U.S marriage rates between the 1970s and 1980s, and Raymo and Iwasawa (2005) did for Japan a decade later. In chapter 5, I relax this definition of independence and specifically look for the possible influence of changes in marriage market conditions on changes in the propensity to marry using regression models.

This chapter begins to address the disconnect in the China marriage squeeze literature between marriage market conditions and assortative mating, described in more detail in chapter 1 (see p. 32). That literature considers the availability of unmarried singles of marriageable age as the primary, if not the sole, determinant of future marriage rates, particularly for men who are forecasted to face a sizable deficit of similarly aged women. In this chapter, I examine whether changes in marriage market conditions were indeed highly consequential for marriage rates in the recent past; or whether, instead, changes in marriage behavior net of market conditions—i.e. marriage propensity—mattered more. Changes in propensity imply either a change in

preferences, or, at a minimum, changes in structural circumstances for marriage that go beyond changes in the availability of unmarried singles. The results in this chapter are relevant for both the marriage literature on China and the historical marriage squeeze literature because they show recent patterns of assortative mating for a large population that has chronically faced marriage squeeze conditions; and for which a large, potentially socially disruptive, marriage squeeze is forecasted for the near future (Attané 2006, Guilmoto 2012, Jiang et al. 2014, Sharygin et al. 2013, Tucker and Van Hook 2013). In doing so, this chapter also provides new descriptive results of recent assortative mating patterns by age, education, and *hukou* status.

Empirical strategy

Data and analytic sample

In this chapter I use data from the 2000 China census, one-per-thousand microdata file (N= 1,311,806, National Bureau of Statistics of China). This was the first national census in mainland China to include information on age at first marriage. These data also include each household member's gender, birthdate, partial migration history, as well as current marital status, educational attainment, occupation, and *hukou* status.

From this nationally representative sample I restrict the analytical sample in several ways to facilitate the analysis. To minimize survivorship basis in retrospective data, I only use marriages from 1970 or later. I only use first marriages because they make up the vast majority of all marriages and also may be qualitatively different in terms of the matching process than higher order marriages. The very low levels of divorce during this period makes higher order marriages of relatively little importance from a population perspective. Increasing survival odds across this period also made widowhood decreasingly common at the ages considered here.

Nevertheless there remains a numerically sizable number of widowed women and men whose marriage experience is not included in this analysis.

In this analysis, people older than 39 and younger than 18 are not considered at risk of first marriage. Even though according to government regulation men and women younger than 21 were not supposed to be able to obtain marriage licenses, a sizable number of people in the census still reported their ages at first marriage to be less than 21 across the entire period under consideration. Very few, however, reported marriage ages younger than 18. Some people also married for the first time after age 39, but these cases are relatively rare. In any case they are not numerous enough to reliably calculate group-specific marriage propensity statistics. As of 2000, more than 99 percent of women and 95 percent of men were married before age 40 (see Figure 2-3 in chapter 1).

Using first marriage timing also facilitates the linking of individuals to produce observations of married couples. I match spouses on marriage timing and household location. Only couples enumerated in the same household who share the same first marriage year and month are matched. This means some couples who were still married but lived apart are not included, but this is likely a small number. Although some spouses were physically absent due to temporary migration at the time of the census, the counting rules used in 2000 should have placed them in their pre-migration household for purposes of enumeration. Couples who married across the rural-urban *hukou* divide are also dropped because the relevant unmarried population (whether rural or urban) is ambiguous in these cases. Around five percent of marriages fall into this group, most of which involved urban *hukou* men and rural *hukou* women. Given these restrictions, there are 212,575 rural and 75,012 urban married couples available for analysis. To

estimate marriage market parameters, all 884,332 individuals in the census age 18 to 69 contribute at some point to the estimated population of unmarried singles at risk of marriage.

Marriage propensities from marriage matching functions

In this chapter, I describe and analyze trends in assortative mating on age and education using harmonic mean marriage matching functions (Schoen 1988). I use these functions because they directly account for the availability of unmarried singles in each sub-group and time period. These models are an alternative to the log-linear models commonly used in assortative mating studies (e.g. Raymo and Xie 2000). Log-linear analyses consider married couples and generally do not consider the availability of unmarried singles on the marriage market. While an offset term can be included to control for availability of unmarried singles in log-linear models (Qian 1994), marriage matching models are better suited for the type of counterfactual analysis performed in this chapter.

Put another way, standard log-linear models analyze assortative mating patterns conditional on marriage, the distribution of unmarried people is irrelevant in those models. Log-linear models with offset terms can control for the distribution of unmarried people and provide estimates of assortative mating parameters net of these distributional marriage market effects (Qian 1994). Nevertheless, while log-linear models can control for marriage market conditions they do not provide a direct way to model changes in those conditions over time. Using a counterfactual framework marriage matching functions do provide a straightforward method to analyze both changes in assortative mating behavior and structural marriage market conditions.

These marriage matching models use observed marriages and estimations of the number of unmarried men and women on the marriage market at the time of marriage to calculate

marriage propensities. The "propensity" to marry is a risk or likelihood of marriage that conditions on the number of unmarried men and women on the marriage market (Schoen 1988, Schoen and Cheng 2006). It can also be conceptualized as an instantaneous "force of attraction" (Qian and Preston 1993, Schoen 1988) similar to other forces of decrement such as mortality. The marriage matching framework can both describe patterns of assortative mating by age and education, as well as decompose changes over time in marriage patterns to either changes in the marriage propensity or changes in the availability of unmarried singles on the marriage market (Qian and Preston 1993, Raymo and Iwasawa 2005, Schoen and Kluegel 1988).

Following Schoen (1988), I use a harmonic mean marriage matching function of the following form:

$$N_{ijt} = \alpha_{ijt} \frac{M_{it}F_{jt}}{M_{it}+F_{jt}} \quad (1)$$

Where N_{ijt} is the number of marriages between men of type *i* and women of type *j* during time period t—which are single year periods in this analysis. The propensity for i-type men to marry *j*-type women in time t is α_{ijt}. The final term in equation 1 is the harmonic mean of the unmarried populations of men and women. In this form it gives an estimation of the average number of potential partners of type *i(j)* available for individuals of type j*(i)*. M_{it} is the number of type *i* unmarried men and F_{jt} is the number of type j unmarried women estimated at the midpoint of the indexed time period *t*. For example, if there are 100 unmarried men of type *i* and 100 unmarried women of type *j* the harmonic mean term would estimate an average of fifty potential partners of type *i(j)* for each type *j(i)* individual, from 100*100/(100+100)=50.

In practice, the unmarried populations are estimated by taking the number of unmarried singles in each sub-group on January 1 of year *t* and adding back to that number half of the members of that sub-group who married during year *t*. Given engagement periods, when presumably these individuals who married during the year were practically speaking out of market, this calculation of the at-risk population likely slightly overestimates the availability of unmarried singles in each period.

The indices *i* and *j* represent categories of characteristics of men and women, respectively. In this study the indexed characteristics are age group at the time of marriage and educational attainment. Age at marriage is broken up into five groups: 18-21, 22-25, 26-29, 30-34, and 35-39. Educational attainment is divided into three categories based on highest level of education completed: primary school or less, junior high school, high school or more. Given that relatively few Chinese went to college before 2000 this is an appropriate coding of the education variable. Separate marriage matching models are estimated for rural and urban *hukou* populations.

Marriage markets are estimated with large amounts of error. The size of any individual's actual marriage market is much smaller than the national markets—separated only by urban-rural *hukou*—estimated here. While I could estimate the same models using smaller geographic boundaries the data intensity of propensity estimations means these smaller marriage markets provide too few marriages for many sub-groups to plausibly estimate the model parameters. Given this choice, I choose to make the marriage markets national with the assumption that changes in these national markets were reflected at the local level as well. Other studies using marriage matching models have had to make similar assumptions (e.g. Qian and Preston 1993, Raymo and Iwasawa 2005).

Marriage rates from marriage matching functions

Dividing both sides of equation 1 by the population of single men of type *i* (M_{it}) and single women of type *j* (F_{jt}), respectively, generates the type-specific marriage rates for men (N_{ijt}/M_{it}) and women (N_{ijt}/F_{jt}) for period *t* (Raymo and Iwasawa 2005).

Marriage rate male: $N_{ijt}/M_{it} = \alpha_{ijt}\,[F_{jt}/(M_{it} + F_{jt})]$ (2)

Marriage rate female: $N_{ijt}/F_{jt} = \alpha_{ijt}\,[M_{it}/(M_{it} + F_{jt})]$ (3)

Dividing the right side of equation 1 by the unmarried population of men (M_{it}) transforms the harmonic mean term into an estimation of the "availability ratio" of women ($F_{jt}/(M_i+F_j)$) that unmarried men face (see equation 2); and dividing equation 1 by the unmarried female population (F_{jt}) similarly estimates the availability ratio of men ($M_{it}/(M_{it}+F_{jt})$), faced by women (see equation 3). Changes in availability of unmarried singles can be conceptualized in terms of these availability ratios that show directly how changes in the relative numbers of unmarried men and women affect the calculation of marriage rates and propensities. This formulation also shows the relationship between marriage rates and marriage propensities, which can be equated by dividing both sides of equations 2 and 3 by the inverse of these availability ratios.

The harmonic mean marriage matching function does not directly consider the marriage propensities, or the number of unmarried singles, in other groups besides the specific indexed groups. Therefore from a direct estimation perspective, the alternatives in other groups are not part of the calculated propensity, which only uses the number of marriages and unmarried singles

at risk of marriage in the particular paired groups of men and women in a particular time period. The method has been criticized for this reason by some researchers and alternative approaches for the two-sex marriage matching problem have been offered (e.g. Choo and Siow 2006, Henry 1972, Keyfitz 1971, McFarland 1975).

Schoen (1988) disputes the assertion that the harmonic mean solution does not account for competition from others groups. He argues that changes in marriage propensity and marriage market composition brought about by either previous changes in population composition or marriage propensities cascade across groups and so are indirectly captured by the harmonic mean estimation. The key distinction is between single point in time estimations (which single period estimations are reduced to), which at that moment do not reflect competition from other groups, and a broader population stock and flow perspective that at least conceptually places marriage market conditions and propensities back in the empirical world where competition between groups does exist. From this population stock and flow perspective prevailing marriage propensities and distributions of unmarried singles do indeed reflect the forces of competition across sub-groups from preceding periods.

Schoen and other researchers who have used similar models give behavioral interpretations of marriage propensity and structural interpretations of marriage market conditions (Qian and Preston 1993, Raymo and Iwasawa 2005, Schoen 1988). Nevertheless, they stop short of equating propensities with preferences. Given that completed marriage matches are observed but not the actual set of choices of either marriage partner, actual preferences remain elusive. Including populations of unmarried singles by age and education, or other potentially relevant background characteristics, controls for changes in population composition, but this is not equivalent to delineating the actual choice set of potential spouses. Which background

characteristics are relevant, as well as how large or small is the actual marriage market, varies across individuals in ways that are unobservable in the data.

In spite of these limitations, marriage matching functions provide a good way to translate a population at risk of marriage into a population of married couples and remaining unmarried singles. They can take into account both the patterns of actual marriages and the changing population of unmarried men and women at risk of marriage; and therefore delineate systematic patterns of marriage behavior that have useful behavioral and structural interpretations at the population level.

Counterfactual marriage rate scenarios

The estimations of marriage propensities and unmarried sex ratios can be used in a counterfactual framework that holds either the marriage propensity or marriage market conditions constant across time periods, while allowing the other factor to vary as it did empirically (Qian and Preston 1993, Raymo and Iwasawa 2005, Schoen and Kluegel 1988). I compare actual and counterfactual changes across time periods in age-by-education marriage rates separately by gender and *hukou* status. These counterfactuals are similar to decompositions in that they attribute changes between groups or across time periods to differences in one or more varying factors (Raymo and Iwasawa 2005). In this case, these counterfactuals hold in turn the propensity to marry or the availability of unmarried singles constant at period one levels. The counterfactuals use the same marriage matching function (equation 1) but vary the inputted values between the actual and counterfactual values by period.

These counterfactuals ask two questions: 1), what would the change in marriage rates have been had availability of unmarried singles by age and education not changed between time

periods; and 2) what would the change in marriage rates have been had propensity to marry by age and education not changed between time periods.

Results

Descriptive 1: Marriage market conditions: ratio of unmarried men to women

I start by showing graphs of the ratios of unmarried men to unmarried women by year, separately for urban and rural China (Figure 20-23). While no picture can capture the actual marriage market conditions faced by individual men and women, these graphs give a sense of the macro level temporal changes in marriage market conditions. Over the 1960-2000 period, every year-specific ratio of unmarried men to unmarried women of the same age groups shows large surpluses of single men. This was likely due to endemic sex ratio imbalances and younger average marriage ages for women—this latter factor was probably the dominant one after age 21 during the 1970-2000 period. In these graphs, I extend the description of marriage market conditions back to 1960 to give more historical context to the marriage market faced by unmarried singles after 1970. This shows the relative decline in surplus men evident in the early 1970s was a trend extending back to at least the mid-1960s (Figure 20).

[Figure 20 about here]

In urban China, the ratio of unmarried men to women in the prime marriage ages of 22-29 more than halved between 1960 and 1980, from nearly 3.5 to 1.5 (Figure 21). The secular drop in the relative surplus of single men coincided with a sharp relative rise in female marriage ages in the roughly 1965-75 period (i.e. for women born 1945-55), which translated into more

years of contributing singlehood for women at each age interval. In rural China, the decline started later and bottomed out at slightly more than two unmarried men per unmarried woman. This was quickly followed by a spike in unmarried men after 1980, back to nearly three per unmarried woman, but this was short-lived and after 1985 levels hovered between 2.2 and 2.4. After 1995, the rural ratio started to increase slowly again. Urban men saw a much more gradual and smaller increase in the 1980s, followed by a gradual decline in the early 1990s back towards 1.5 unmarried men per woman.

[Figure 21 about here]

In spite of these apparently bleak marriage market conditions, men married at historically high rates across the entire period, at or above 95 percent by age 40. This was possible because older cohorts of men could access relatively larger cohorts of younger women in the decades after fertility rises. Because of rapid population growth during most of the 1950-70 period, men born in later cohorts had a marriage market advantage as long the cultural norm of age hypergamy remained accepted.

Figure 22 gives one picture of the possible age-mismatched marriage market by showing the ratio of unmarried older men age 22-29 to unmarried younger women age 18-25. This picture shows there was a relative surplus of unmarried younger women in all years, except a few years in the early 1960s for the urban population. The fluctuations in the relative numbers of these age-mismatched groups show the age structure effects brought about by the rapid rise in fertility post-1945 and post-1962, and the rapid fall during the Great Leap Famine period (1959-1961) and after 1970.

[Figure 22 about here]

This picture assumes that men in the 22-29 age interval faced no competition for brides from men in the 18-21 or 30+ age intervals. This was certainly not the case as many pairings that led to marriage later likely occurred during college or right after high school, and men in their 30s also competed successfully for women in this younger age group, especially in the urban market (see Figure 27). So this picture overestimates the relative surplus of women; nevertheless it does go part way to explain how most men managed to find brides despite the chronic deficit of unmarried women at each age.

Relative changes in education by gender and *hukou* also changed marriage market conditions over this period. Especially in the rural market, the ratio of unmarried men to women with at least a high school education was extremely lopsided during the 1960s, more than 10 to 1 for the 22-29 age group. The convergence to less than two unmarried men to women by 2000 in both rural and urban markets shows the relative educational gains both by women and rural residents (Figure 23). In urban markets, the change was relatively smaller, but still represents a drop of more than 50 percent in the ratio of highly educated unmarried men to women.

[Figure 23 about here]

In the end, these graphs are only suggestive of what conditions men and women experienced in their marriage markets. Most critically, the market is local in ways that vary across individuals, i.e. some people have access to a larger pool of unmarried singles than others.

It also is contoured by other factors besides age, education, and *hukou*. These statistics also assume no differential mortality or external migration by gender up to 2000 for the age cohorts included here. External migration was very limited during this period but mortality is likely a slight biasing factor. That men died at higher rates at each age, and that unmarried men likely died at higher rates than married ones (Hu and Goldman 1990), means these ratios underestimate the relative deficit of females, especially in the earlier years.

Descriptive 2: Average marriage propensity by gender, age, education, and hukou status

Figure 24-27 provide a baseline of average assortative mating behavior over the 1970-2000 period. As marriage propensities, they are measures of marriage behavior that control for marriage market conditions. This provides the context for the counterfactual analysis to follow. They show whether average levels of age and educational assortative marriage propensity varied by gender and *hukou* status. Women's age or education is along the x-axis and men's age or education is represented by the colored bars. The average marriage propensity between a specific combinations of men's and women's categories is on the y-axis. These statistics are averages across yearly propensities and are not weighted by the underlying numbers of marriages or unmarried singles by year or sub-group. Lower average propensities do not necessarily mean lower likelihoods of ever marrying, as these statistics are averages of yearly propensities not measures of any cohort's lifetime marriage propensity. In spite of these caveats, these figures still make several points.

[Figure 24 about here]

First, they show age and educational homogamy were the most common but not the dominant patterns. Educational homogamy was particularly strong among rural Chinese with a junior high education (Figure 24) and urban Chinese with at least a high school education (Figure 25). Rural women with the least education had relatively high propensities to marry hypergamously (i.e. marry men with more education) while the least educated urban women did not. Highly educated rural women had lower overall propensities to marry than their highly educated urban counterparts and were relatively more likely to marry hypogamously (marry less educated men). For men with the least education, having a rural *hukou* meant very high propensities for educational homogamy and low levels of hypogamy (to keep terminology consistent, this means marrying women with more education). In contrast to this, the least educated urban men had similar levels of propensity regardless of the education of their potential spouses. Note, differences in propensities are not due to urban-rural differences in educational distributions because the propensity level is conditional on the availability of unmarried singles within sub-groups.

[Figure 25 about here]

Age patterns also differed across the rural-urban divide. Young rural men and women (age 18-25) had higher propensities than similarly aged urbanites; while urbanities showed higher propensities for most age-group combinations after age 25 (Figure 26-27). Marriage propensities were generally lower after age 30, especially for women and in rural China. Because these propensity measures account for the level of availability, these low numbers don't just

reflect few opportunities to marry, but low levels of completed marriages given those opportunities.

[Figure 26 about here]

In spite of official rules discouraging it, marriage before age 22 remained common in rural China, especially for women. Age hypergamy—at least as measured by these particular age groupings—was also common, but it was still less common than age homogamy for most sub-group combinations. Only the sub-groups of 18-21 year old women and 22-25 year old urban women had a greater average propensity to marry hypergamously than homogamously. Age hypogamy had consistently lower propensity, but this type of marriage was not particularly uncommon either, especially after women turned 26.

[Figure 27 about here]

Counterfactual marriage rates: propensity- vs. availability-related change

Table 8 and Table 9 display the results of the counterfactual analysis for three specific "years": 1979, 1989, and 1999, separately by gender and *hukou* status. To lessen idiosyncratic fluctuations, calculations are made on counts of marriages and unmarried singles summed over two-year periods (1978-79, 1988-89, and 1998-99), but for convenience I will refer to them as single year periods. The calculations show the actual and counterfactual change in age-by-education marriage rates between these specific periods. They do not include any consideration

of data in the intervening periods. Table 8 shows results for men, and Table 9 for women. Panels 1-3 in each table show results for rural and panels 4-6 for urban *hukou* populations.

Panel 1(4) in each table gives the actual ratios of 1989/1979 and 1999/1989 marriage rates for all 15 age-by-education sub-groups. The ratio of these rates is a picture of the change between periods in actual marriage levels by age and education, separately by gender and *hukou* status. In each panel, the ratio of 1999/1979 is not reported but can be recovered by multiplying the 1999/89 and 1989/79 corresponding values.

Panels 2(5) and 3(6) of each table present the counterfactual scenarios of the marriage rate ratios. These show whether the changes in marriage rates are more consistent with changes in availability of potential marriage partners or with changes in the propensity to marry partners of various age-by-education sub-groups. Panel 2(5) holds the propensity constant at time one levels (1979 or 1989) while allowing availability to vary as it did between time one and two. This counterfactual shows the influence of changing marriage market conditions on changing marriage rates. Panel 3(6) holds availability constant at time two levels while allowing propensities to vary as they did across time periods in order to show the influence of changing propensities on changing rates.

[Table 8 about here]

[Table 9 about here]

The primary results from the counterfactual analyses can be summarized succinctly for both men (Table 8) and women (Table 9). The dominant pattern for age-groups younger than 26

was markedly higher marriage rates in 1989 vs. 1979 (Panels 1 and 4) mainly due to higher propensities to marry (Panels 3 and 6) and then a reversal with lower propensities and marriage rates in 1999 compared to 1989. This later period pattern was the dominant one for older age groups as well. Marriage market conditions worsened for the majority of sub-groups across both time periods, but these changes in structural conditions did not drive changes in marriage rates (Panels 2 and 5).

These results show a) there was indeed significant variation in marriage rates over time and b) this variation was driven more by changes in the propensity for marriage than by structural marriage market conditions. Keeping these primary findings in mind, there are a few additional points to emphasize from the counterfactual analyses.

First, the pattern of changing marriage rates—and therefore of marriage propensities, which mostly drove these changes—did not show a strong educational pattern in either urban or rural China. Across the earlier period (1989 vs. 1979) marriage rates and propensities were much higher for all educational sub-groups younger than 26 in both urban and rural areas. Changes in the later period (1999 vs. 1989) also did not show a clear educational gradient, as marriage rates and propensities were lower for most sub-groups, and the exceptions to this pattern were as likely to have lower levels education as higher. Rural women in the later period were an exception to this generalization. Declines in marriage rates across the 1990s were larger in all age groups for rural women with a high school education than for their less educated peers (Table 9 Panel 1).

Second, given the educational upgrading of single women over the period, less educated men and more educated women may have faced deteriorating marriage market conditions—i.e. an educational mismatch on the marriage market—if educational hypergamy remained a strong

underlying preference. There is some evidence for these marriage market effects in the counterfactual models. The least educated men in their 20s saw marriage markets deteriorate more over the later period (the 1990s) than did their high school educated peers (Table 8, Panels 2 and 5); and highly educated rural women, age 18-34, also saw marriage market conditions worsen relative to women with only primary school during the same period (Table 9, Panel 2). Not supporting this educational mismatch hypothesis, the least educated urban women less than age 30 saw marriage market conditions deteriorate more than other education groups across the later period (Table 9, Panel 5).

Two additional points highlight the nature of the models themselves. At the descriptive level, marriage market conditions by gender are mirrored (e.g. Figure 20)—or zero-sum, meaning gains for one gender require losses for the other within a specific age-by-education group — but this is not the case in marriage matching functions. Once propensities are accounted for, marriage market conditions can worsen or improve for men and women at the same time within the same age-by-education groups. For instance rural high school educated men and women, age 30-34, both saw deteriorating marriage markets across the 1990s.

Finally, propensities sometimes change in ways that compensate for changes in availabilities and sometimes do not. For instance comparing 1989 and 1999, the marriage propensity for age 35-39, junior high school educated, rural men went up more than 2.5 times (Table 8 Panel 3), which partially compensated for marriage market conditions that worsened sharply (Panel 2). In many instances, however, changes in propensities did not compensate for changes on the marriage market: marriage market conditions worsened for age 22-29 rural men between 1989 and 1999 (Table 9 Panel 2) but their propensities were also lower or unchanged (Panel 3), so marriage rates were noticeably lower in the later year (Panel 1).

The necessary assumption of these models is that propensity and availability are independent of each other, i.e. they do not mutually influence each other. This may not be the case in reality. The potential direct influence of changes in marriage market conditions on changes in the propensity to marry— and not on their respective conditional influences on marriage rates as analyzed here—will be the focus of chapter 5.

Discussion and conclusion

This chapter provides a new picture of recent marriage market conditions and marriage behavior in mainland China. Past studies of marriage there have mostly assumed constant marriage preferences in order to forecast future marriage levels, or have ignored changes in marriage market conditions. This chapter shows that marriage market conditions and behavior varied by age and educational sub-group across the 1970-2000 period. It contributes to the marriage literature by providing specific descriptive results on the relative numbers of unmarried men and women by year; and, more analytically, by showing the relative role in changing marriage rates of changes in marriage market conditions and changes in the propensity to marry, respectively.

The descriptive results in this chapter show that within the same age groups the marriage market situation for men was consistently poor, as unmarried men outnumbered unmarried women by at least 30 percent—and usually by much more—throughout the 1970-2000 period. But if a sizable percentage of men were able to marry younger women, the picture is much improved, with unmarried women age 18-25 always outnumbering unmarried men age 22-29 during this period.

The propensity for men to marry younger women, including age 18-21 women in rural areas, was a significant but not dominant pattern. This practice of age hypergamy especially in rural markets where the sex imbalances were worse, along with a growing population—which meant younger cohorts of women outnumbered older cohorts of men—allowed most men to marry in spite of marriage market imbalances within age groups.

Educational upgrading, especially in rural areas and for women, also changed the marriage market picture markedly over this period. The large drop in the relative number of high school educated men to women created a changing marriage market that gave more opportunity for educationally homogamous marriages. But despite these increasing opportunities for educational homogamy, both rural and urban men with at least a high school education married at markedly lower rates in the late 1990s compared to a decade earlier. This was mostly due to lower marriage propensities and not to changes in the availability of unmarried women.

More educated men were not alone in this pattern. In fact for most sub-groups, marriage rates were lower in the late 1990s compared to ten years earlier, primarily due to lower propensities to marry. For some sub-groups marriage market conditions also worsened between the late 1980s and 1990s, which amplified the effects of lower propensities. These changes followed a period of higher marriage rates, especially for younger Chinese, in the late 1980s compared to the late 1970s. These relatively higher marriage rates in the late 1980s were also primarily due to higher marriage propensities and not increased availability of unmarried singles, although some sub-groups did see marriage market conditions improve. There was not a clear educational or rural-urban gradient in these patterns.

Marriage market conditions, on the other hand, did deteriorate for some educational groups more than others, especially in the later period (1999 vs. 1989). In rural areas, women at

the top and men at the bottom of the educational distribution both saw deteriorating marriage market conditions across the later period. This meant both groups had fewer suitable matches—based on their own sets of prior propensities—compared with ten years earlier. On top of this, less educated rural men had very low average propensities to marry women with more education across the entire 1970-2000 period.

This pattern may be problematic for these groups of men going forward if women continue to educationally upgrade at a faster rate. If women continue to shun hypogamous marriage as they surpass men in education, both highly educated women and low educated men will find it increasingly difficult to marry. This marriage mismatch scenario has been shown for Japan (Raymo and Iwasawa 2005). The low average propensities for high school educated rural women support this possibility, although these averages cannot distinguish delays in marriage from permanent singlehood. Qian and Qian (2014) provide evidence that urban women in the early 2000s were increasingly delaying marriage into their 30s.

The marriage market mismatch situation in Japan illustrates that cultural norm-driven preferences and marriage market conditions are intertwined. There were enough unmarried men and women to clear the marriage market, but the cultural norm that Japanese women marry hypergamously appeared to change the boundaries of the marriage market, leaving many highly educated women and less educated men unable to find "suitable" marriage matches (Raymo and Iwasawa 2005).

While this chapter provides evidence that more educated women were delaying marriage, as of 2010 more than 99 percent of women and 95 percent of men had still married by age 40, regardless of educational attainment (see Figure 3 in chapter 1). Therefore, this type of marriage mismatch did not affect ever married rates for mainland Chinese, at least above age 40. In other

words, changes in the relative numbers of more educated women to less educated men did not have clear implications for changes in marriage behavior over the 1970-2000 period. Apparently marriage patterns fluctuated due to period-specific social forces that affected most age and educational groups in similar ways and did not lead to reductions in lifetime marriage rates.

Identifying these specific social forces is beyond the scope of this dissertation. The 1980 Marriage Law—which in practice lowered the *de facto* minimum marriage age and precipitated a rush into marriage—improved economic circumstances due to economic reforms, as well as post-1979 political stability all likely played a role in pushing up marriage rates for younger Chinese in the 1980s. The reversal over the 1990s, especially for men, may have been due to the increasing amount of time necessary to accrue the educational and economic capital necessary for marriage. The increasing cost of marriage has been documented and analyzed in both the popular and academic press (e.g. Jiang and Sánchez-Barricarte 2012, Wei and Zhang 2011, Zhang 2010). The lower rates and propensities to marry in the late 1990s for most sub-groups of men and women, especially those with a high school education or more, perhaps provides indirect evidence for this increasingly high bar for marriage, at least at younger ages.

More generally, these results highlight the importance of changing behavioral patterns of assortative mating that are influenced by social forces beyond the structural availability of potential spouses on the marriage market. They also highlight that period preferences for marriage can change rapidly for reasons not easily explained by age, education, or urban-rural status. For the China marriage squeeze literature, these results are a reminder that preferences for marriage are not static, even among groups who mostly end up marrying. Whether fluctuating period propensities will have a lasting effect on China's marriage squeeze remains to be seen. It may still be the case that marriage market conditions measured for specific cohorts over longer

time periods will still be very influential for cohort lifetime marriage levels (i.e. not period levels) as asserted by many studies (Attané 2006, Ebenstein and Sharygin 2009, Guilmoto 2012, Jiang et al. 2011ab, Sharygin et al. 2013, Tucker and Van Hook 2013).

Nevertheless, delays in marriage for women, due to their changing period preferences for marriage, may leave older cohorts of men unable to find a spouse until they have aged out of the marriage market. Delays in marriage, especially for women but also for men, have implications for fertility as well during a time when declining fertility is increasingly a public policy concern (Gu 2009, Morgan et al. 2009, Jones 2007, Wang 2005). Delayed marriage will likely mean foregone marriage for at least a portion of women going forward in concert with recent changes in other societies in Pacific Asia (Jones 2004, Jones and Gubhaju 2009). This will of course have implications for male marriage in terms of period rates, but also for lifetime cohort rates as well. As women's preferences for marriage change, men's marriage outcomes will change as well in ways that cannot be forecasted directly from changes in marriage market conditions.

Similar to studies of marriage market conditions and marriage patterns in the U.S. (Qian and Preston 1993, Schoen and Kluegel 1988) this study shows that changes in behavioral propensity were more influential than changes in structural marriage market conditions for marriage dynamics over time. The consistency of this finding across different contexts and time periods perhaps indicates the primacy of behavioral change over structural marriage market change. Except in exceptional circumstances—for instance war-induced mortality or migration, or sudden fertility change—the structural availability of unmarried singles usually does not change rapidly, while cultural norms and values perhaps do (Jones 2004, Lesthaeghe 2010). While the changes in marriage market conditions in mainland China over the next decades will perhaps be exceptional (Attané 2006) changes in norms and values may still outpace that

structural change with large, and unforeseen, consequences for how the “marriage squeeze” is actually experienced by Chinese men and women.

Results: figures and tables

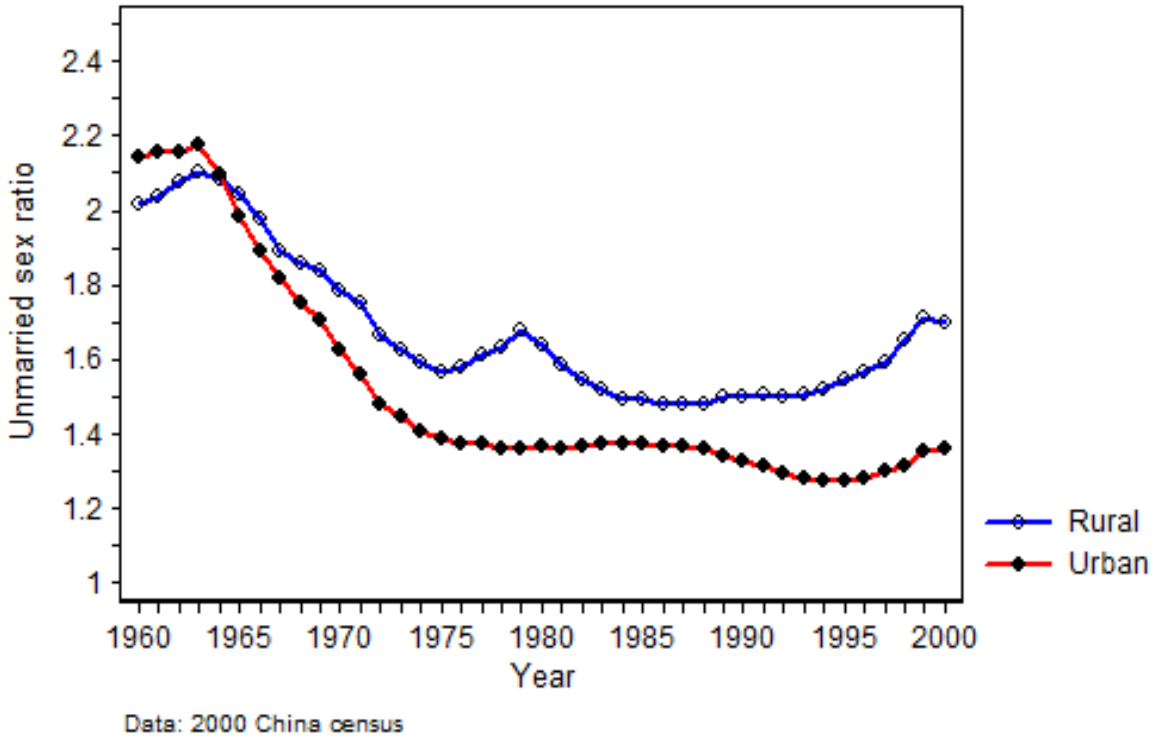


Figure 20. Ratio of Unmarried Men to Unmarried Women, Age 18-39

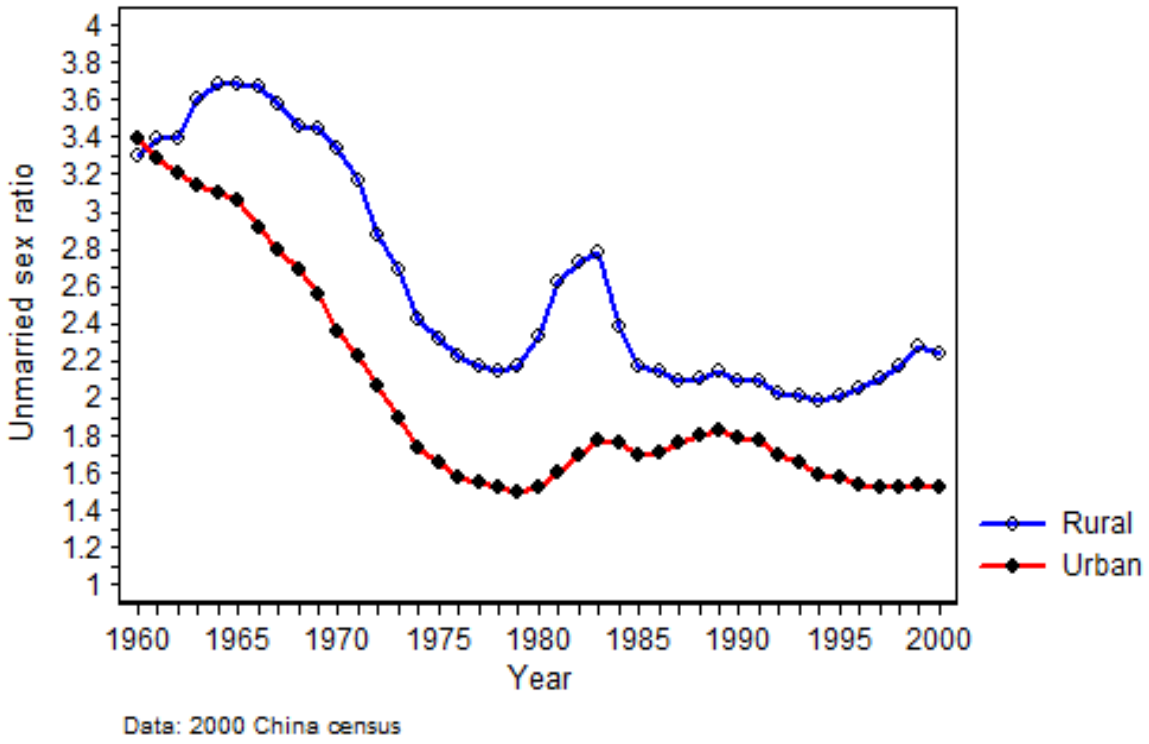


Figure 21. Ratio of Unmarried Men to Unmarried Women, Age 22-29

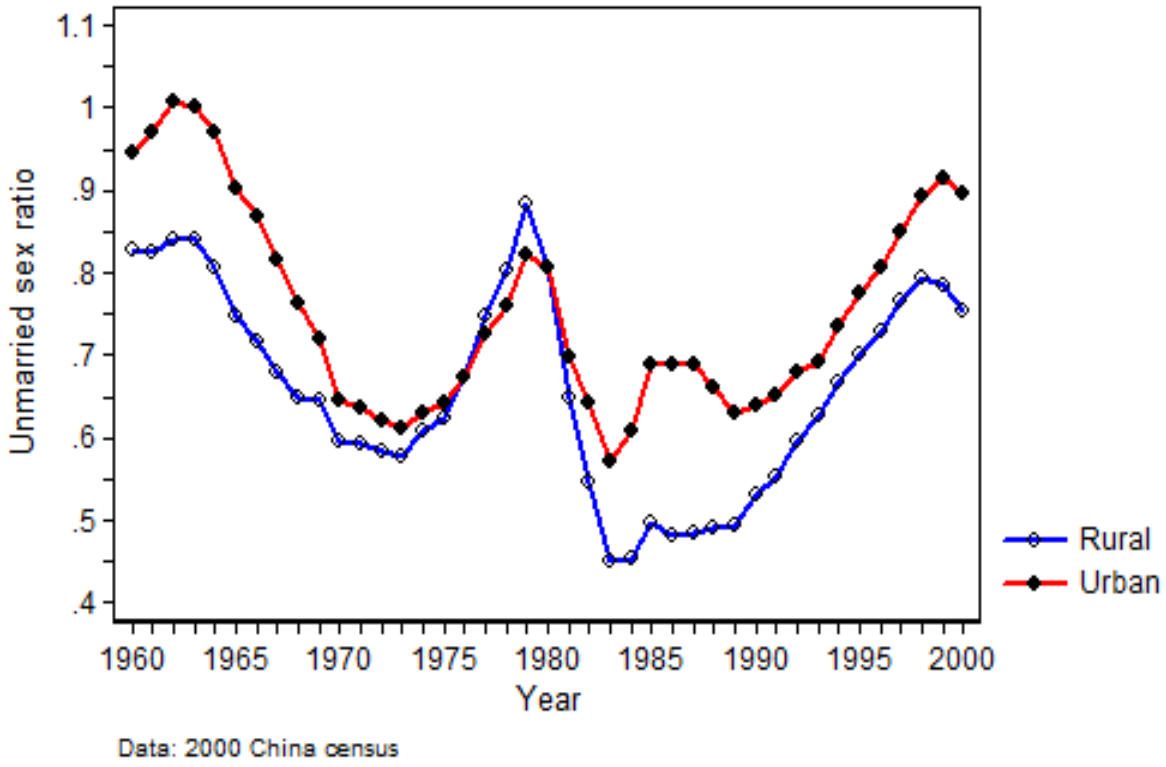


Figure 22. Ratio of Unmarried Men (Age 22-29) to Unmarried Women (Age 18-25)

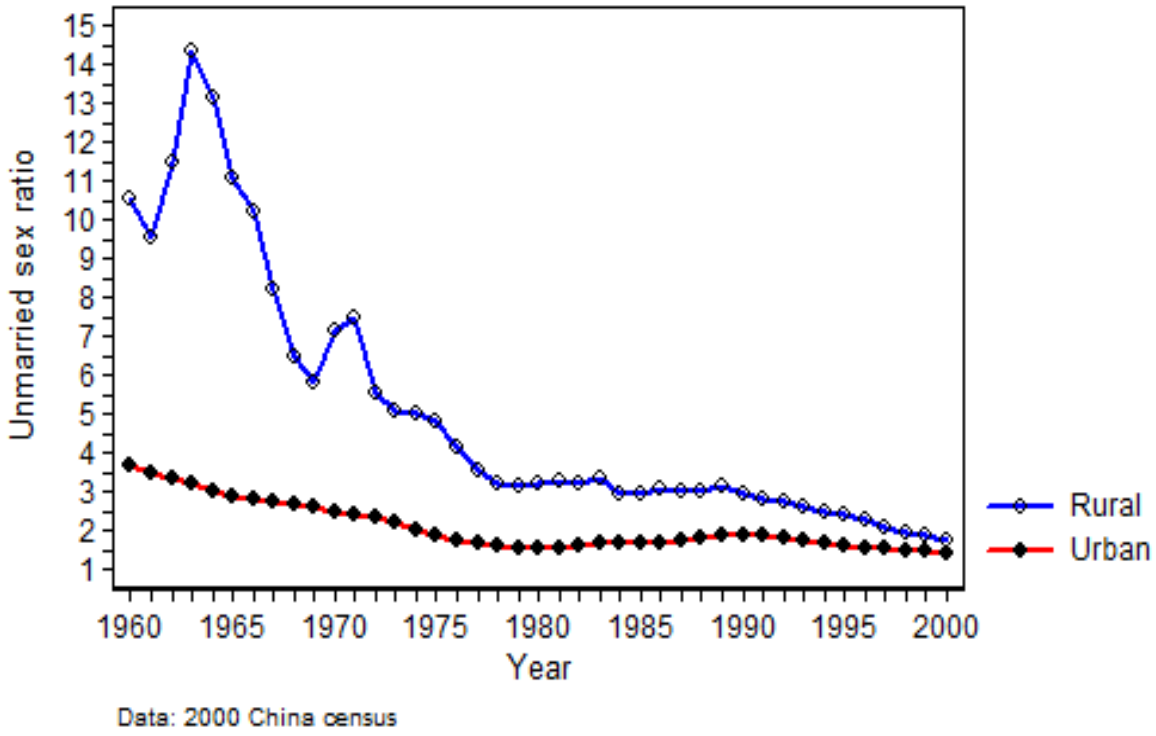


Figure 23. Ratio of Unmarried Men to Unmarried Women, Age 22-29, High School or Above

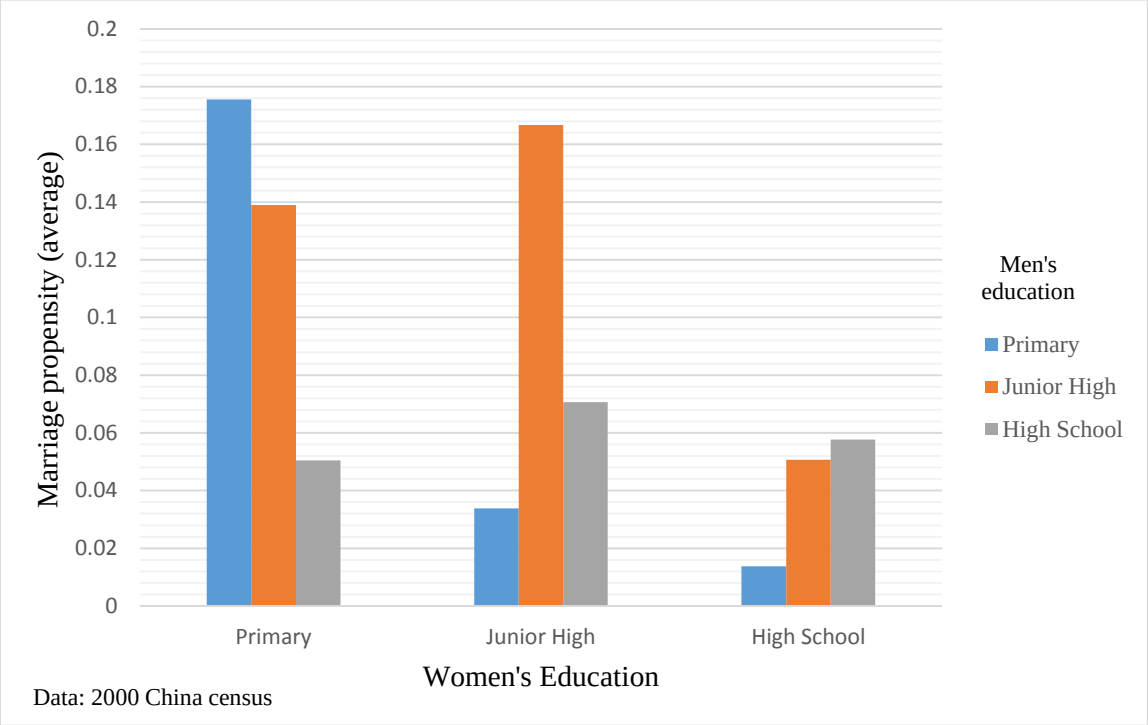


Figure 24. Average Rural Educational Marriage Propensity, Age 18-39, 1970-2000

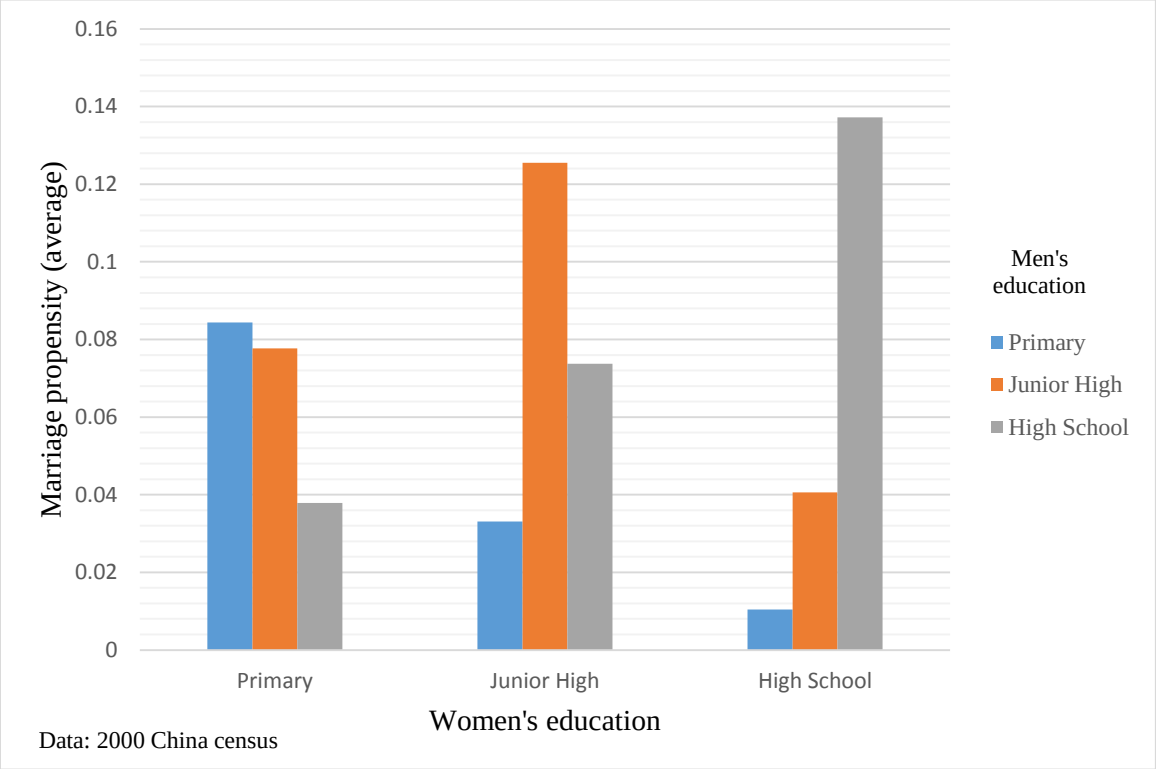


Figure 25. Average Urban Educational Marriage Propensity, Age 18-39, 1970-2000

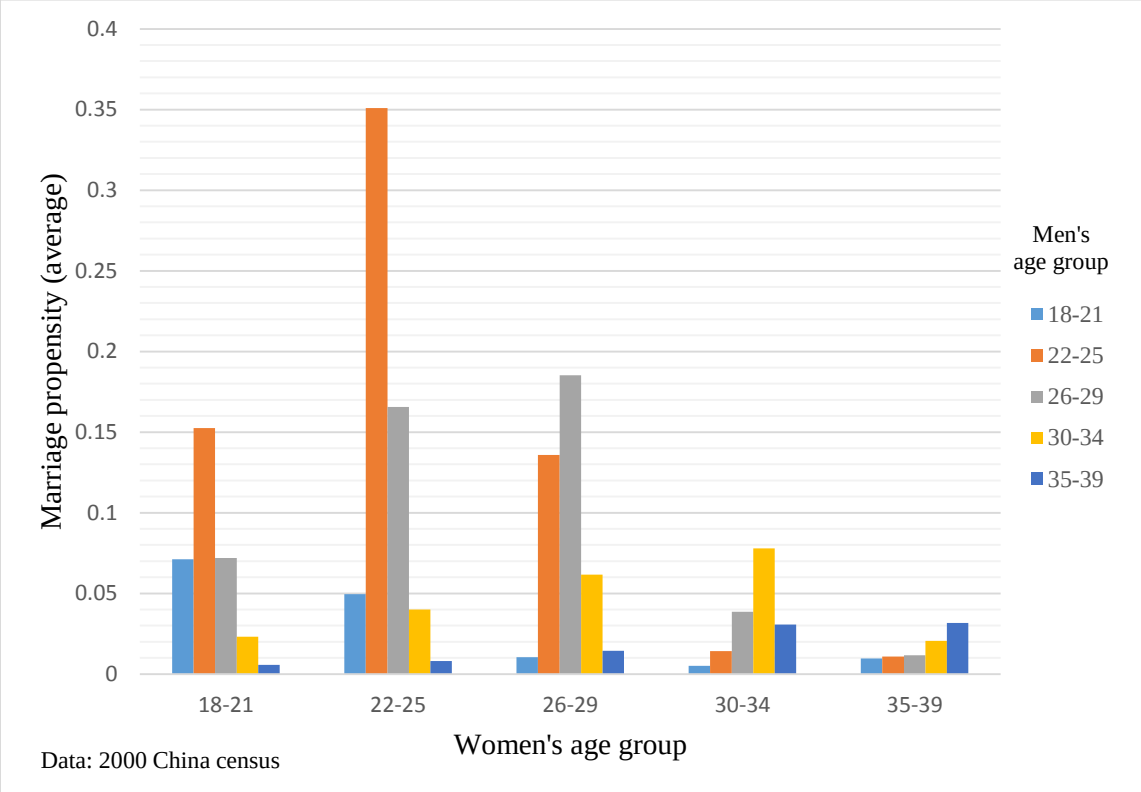


Figure 26. Average Rural Age Group Marriage Propensity, Age 18-39, 1970-2000

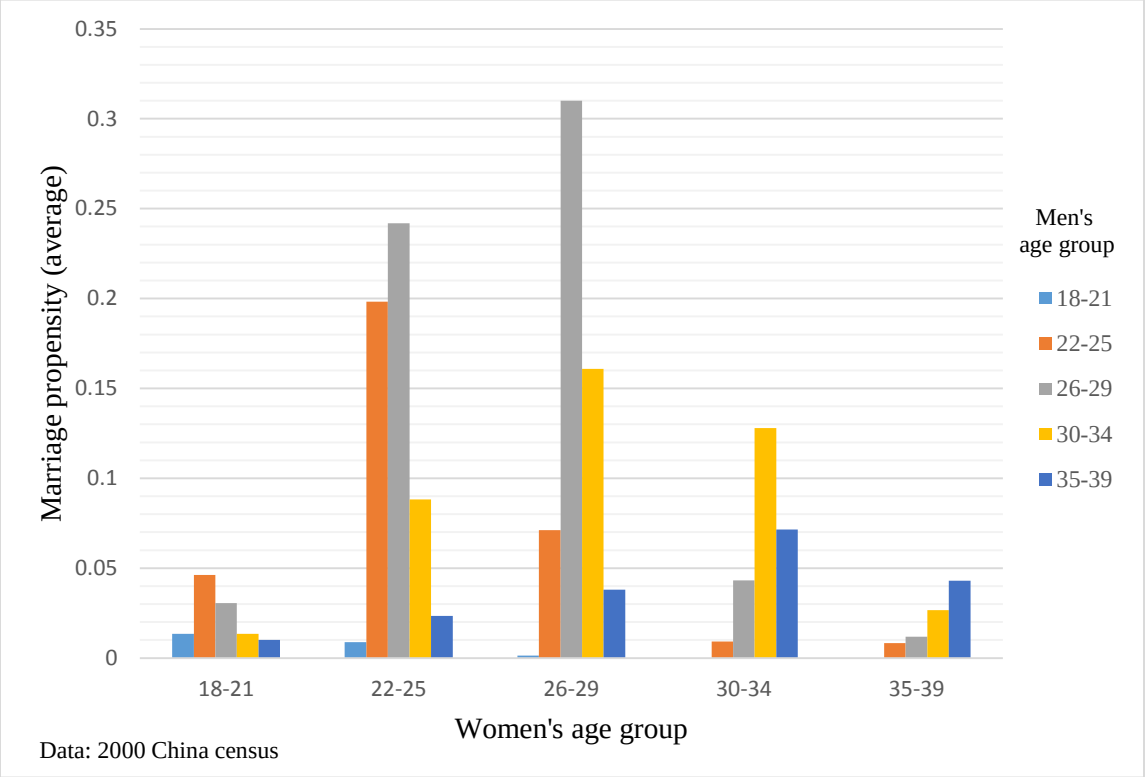


Figure 27. Average Urban Age Group Marriage Propensity, Age 18-39, 1970-2000

Table 8. Men: Change in Actual and Counterfactual Marriage Rates Due to Changes in Availability of Unmarried Singles and Marriage Propensity, Mainland China, 1979, 1989, 1999

Education and Age	1989/1979			1999/1989		
	Primary	Junior High	High School	Primary	Junior High	High School
Panel 1 Rural: Change in Marriage Rate [Actual 99(89)/Actual 89(79)]						
18-21	1.72	2.30	1.43	0.71	0.40	0.31
22-25	1.60	1.60	1.44	0.68	0.77	0.58
26-29	0.84	0.90	0.93	0.90	0.77	0.77
30-34	0.66	0.77	0.42	0.85	0.77	1.17
35-39	0.81	0.64	—	1.14	0.70	—
Panel 2 Rural: Change in Availability Marriage Rate [Predicted 99(89)/Actual 89(79)]						
18-21	0.87	0.88	1.14	1.16	1.06	0.97
22-25	1.17	0.99	1.12	0.90	0.87	1.02
26-29	1.26	0.97	0.93	0.82	0.78	1.03
30-34	0.89	0.78	0.57	0.96	1.00	0.89
35-39	0.64	0.09	—	1.12	0.42	—
Panel 3 Rural: Change in Propensity Marriage Rate [Actual 99(89)/Predicted 99(89)]						
18-21	1.99	2.62	1.25	0.61	0.38	0.32
22-25	1.36	1.62	1.29	0.75	0.88	0.56
26-29	0.67	0.93	1.00	1.09	0.99	0.75
30-34	0.75	1.00	0.74	0.89	0.77	1.32
35-39	1.27	7.10	—	1.02	1.66	—
Panel 4 Urban: Change in Marriage Rate [Actual 99(89)/Actual 89(79)]						
18-21	1.78	2.95	1.79	0.98	0.82	0.39
22-25	1.75	2.10	2.66	0.87	0.71	0.93
26-29	1.04	0.95	1.28	0.65	0.73	0.79
30-34	0.97	0.74	0.64	—	0.69	0.81
35-39	—	0.55	1.08	—	0.84	0.43
Panel 5 Urban: Change in Availability Marriage Rate [Predicted 99(89)/Actual 89(79)]						
18-21	0.61	0.75	0.90	0.71	0.99	0.95
22-25	0.99	0.83	0.79	0.76	0.96	1.20
26-29	0.99	1.04	0.85	0.76	0.84	0.89
30-34	0.42	0.74	0.81	—	0.99	0.86
35-39	—	0.58	0.51	—	0.33	0.39
Panel 6 Urban: Change in Propensity Marriage Rate [Actual 99(89)/Predicted 99(89)]						
18-21	2.90	3.93	1.98	1.39	0.83	0.41
22-25	1.77	2.53	3.37	1.15	0.74	0.77
26-29	1.05	0.91	1.51	0.87	0.88	0.89
30-34	2.33	1.01	0.79	—	0.70	0.94
35-39	—	0.94	2.12	—	2.56	1.09

Data: 2000 China census

Table 9. Women: Change in Actual and Counterfactual Marriage Rates Due to Changes in Availability of Unmarried Singles and Marriage Propensity, Mainland China, 1979, 1989, 1999

Education and Age	1989/1979 Primary	1989/1979 Junior High	1989/1979 High School	1999/1989 Primary	1999/1989 Junior High	1999/1989 High School
Panel 1 Rural: Change in Marriage Rate [Actual 99(89)/Actual 89(79)]						
18-21	1.09	1.76	1.86	0.98	0.86	0.50
22-25	1.13	1.16	1.42	0.82	0.96	0.75
26-29	0.83	0.85	0.94	1.07	0.98	0.56
30-34	0.72	0.77	—	1.71	0.60	0.48
35-39	0.98	—	—	1.44	1.03	—
Panel 2 Rural: Change in Availability Marriage Rate [Predicted 99(89)/Actual 89(79)]						
18-21	0.65	0.61	1.08	1.84	1.15	0.81
22-25	1.22	0.69	0.95	1.20	1.02	0.88
26-29	1.21	0.93	0.97	0.96	0.88	0.77
30-34	1.06	0.43	—	0.89	0.46	0.20
35-39	0.86	—	—	0.76	0.40	—
Panel 3 Rural: Change in Propensity Marriage Rate [Actual 99(89)/Predicted 99(89)]						
18-21	1.67	2.91	1.73	0.53	0.74	0.62
22-25	0.93	1.67	1.49	0.68	0.95	0.85
26-29	0.68	0.91	0.97	1.12	1.11	0.72
30-34	0.68	1.81	—	1.92	1.30	2.41
35-39	1.14	—	—	1.89	2.56	—
Panel 4 Urban: Change in Marriage Rate [Actual 99(89)/Actual 89(79)]						
18-21	1.12	2.60	3.07	3.01	1.09	0.72
22-25	1.21	1.75	2.91	0.97	0.89	0.74
26-29	1.32	1.06	0.87	0.76	0.91	0.76
30-34	1.68	0.79	0.62	—	0.60	0.83
35-39	0.67	—	0.44	—	—	0.89
Panel 5 Urban: Change in Availability Marriage Rate [Predicted 99(89)/Actual 89(79)]						
18-21	0.76	0.68	0.78	0.43	1.54	1.01
22-25	1.05	1.03	1.01	0.85	1.16	0.87
26-29	0.86	1.39	0.91	0.66	0.88	0.95
30-34	0.11	0.51	0.75	—	0.62	1.11
35-39	0.75	—	0.98	—	—	0.24
Panel 6 Urban: Change in Propensity Marriage Rate [Actual 99(89)/Predicted 99(89)]						
18-21	1.48	3.82	3.95	7.02	0.71	0.71
22-25	1.15	1.70	2.89	1.14	0.77	0.85
26-29	1.53	0.76	0.95	1.16	1.02	0.80
30-34	15.22	1.54	0.83	—	0.97	0.76
35-39	0.89	—	0.45	—	—	3.73

Data: 2000 China census

Chapter 5. Modeling the Relationship between Marriage Propensity and Marriage Market Conditions, 1970-2000

Introduction

If marriage market conditions matter, it is not only because they constrain behavior, but because people may modify their marriage preferences in anticipation of those constraints. Previous marriage market studies that have estimated propensities (e.g. Qian and Preston 1994, Schoen and Kluegel 1988, chapter 4 in this dissertation) discount this possibility, as do assortative mating studies that use log-linear models (e.g. Han 2010). Both types of studies interpret the derived propensities or odds ratios as independent of the distribution of unmarried singles on the marriage market. This independence assumption ignores the possible interactions between marriage market conditions and revealed marriage behavior.

While most China marriage squeeze studies ignore the link between assortative mating and marriage market conditions, some recent ones do acknowledge the possibility and simulate how changes in age assortative mating might affect marriage rates. Guilmoto (2012) shows that increasing the average age gap to four years—i.e. if younger women marry men four years older on average—could reduce the magnitude of the squeeze by 50 percent at its peak. Kochin and Knox (2012) come to similar conclusions and estimate that allowing the marital age gap to vary with the sex ratio could reduce the number of excess males by as much as 10 million. Reducing the age gap to zero should similarly lead to a 50 percent reduction in number of bachelors at the peak of the squeeze, according to Tucker and Van Hook (2013).

These results indicate that even in the case of high sex ratio China, the effects of assortative mating on age alone will play a large role in future marriage levels. It is an open

question, however, whether current and future cohorts of Chinese young people will modify their assortative mating preferences in a manner concordant with these simulation models. These projection studies show what types of behavioral modifications would be necessary to bring the marriage market closer to balance, but they do not bring any evidence to bear on whether these behavior changes are likely to occur.

This said, historical marriage squeeze studies in other settings do suggest that people will modify their preferences for the relative age or socioeconomic status of a spouse if finding a marriage partner is important enough to them (e.g. Bergstrom and Lam 1994). These studies have usually focused on responses to sudden changes in the sex ratio—often brought about by war or rapid fertility change—as an identification strategy. The general conclusion of these studies is where there is a will there is a way: people adjust their preferences for the characteristics of their partner to increase their chances of marrying. These adjustments can be on acceptable age differences at marriage (Bergstrom and Lam 1994, Brandt et al. 2008, Goodkind 1997, Ni Bhrolchain 2001), differences in social class (Abramitzky et al. 2011), or previous marital status of partners (Barclay 1954). Because of the changes in behavior apparent in changes in assortative mating during marriage squeezes, actual marriage shortfalls are much smaller than they would have been if people did not modify their preferences for types of partner.

Guttentag and Secord (1983) have offered an alternate marriage squeeze theory that for certain scenarios suggests greater availability of prospective partners may delay marriage or even decrease lifetime marriage levels. They posit behavioral adjustments only for men in the face of marriage market changes. The logic for this hypothesis is that men have much more structural power and therefore control the marriage process. This theory states that not only will men marry

at higher rates and at younger ages when faced with marriage squeeze conditions, but they will marry at lower rates and older ages when marriage conditions are favorable for them (i.e. a relative surplus of unmarried women). Guttentag and Secord (1983) provide empirical support with a series of historical case studies, the key one being the 1960-70s U.S. where women faced a relative shortage of men and marriage rates declined.

These historical marriage squeeze studies provide a basis for generating hypotheses about how unmarried people will react to shortages of potential partners on the marriage market. Most fundamentally, these studies indicate that in the face of tight marriage market conditions (i.e. a relative shortage of potential marriage partners) unmarried singles modify their prior preferences in order to make more people acceptable marriage partners.

In this chapter, I use this insight from historical marriage squeeze studies as a starting point to examine the relationship between marriage behavior and marriage market conditions. I do this using the marriage propensity and unmarried sex ratio quantities derived in chapter 4 as the measures of marriage behavior and market, respectively. I estimate the association between marriage propensity and the unmarried sex ratio by putting them in a regression model, which therefore relaxes the assumption that they are independent (Schoen 1988). I estimate this association for age-by-education sub-groups of mainland Chinese over the 1970-2000 period, separately by *hukou* status. The estimated model parameters can be interpreted as the average behavioral response of age-by-education sub-groups to changes in marriage market availability.

These models provide a novel way to quantify the direction and size of the behavioral response to changes in marriage markets. This makes the results of interest to both the historical marriage squeeze literature and to the literature making projections about China's marriage future. How unmarried young people have responded to marriage market fluctuations in the

recent past is, I argue, the best indication of how they might respond in the near future. Whether or not this is the case, the results provide relevant empirical evidence for the broader question that animates the historical marriage squeeze literature. Namely, do people modify their preferences in order to marry under difficult conditions? And it does so for a large country that has chronically suffered from sex ratio imbalances making marriage squeeze conditions probably endemic throughout most of its history (Lee and Wang 1999), including the recent past.

Hypotheses

The results below include more than 60 potentially relevant coefficients for determining whether and how marriage market conditions and marriage behavior interact. As such, the sheer number of results could provide support for many theoretical positions, depending on which particular results are emphasized. To try and minimize any post-hoc theorizing and to provide some theoretical expectations for the reader, I generate specific hypotheses based on my prior theoretical expectations. These expectations are based, in some cases, on my reading of marriage squeeze theory and results. In other cases, marriage squeeze theory does not provide direction, so I hypothesize based on my own theoretical expectations, providing brief justification where relevant.

Hypothesis 1a: There will be a positive relationship between marriage propensity and the unmarried sex ratio for most age-by-education sub-groups of men.
Hypothesis 1b: There will be a negative relationship between marriage propensity and the unmarried sex ratio for most age-by-education sub-groups of women.

Hypothesis 1c: This relationship will be stronger for male than for female sub-groups, in most cases.

According to marriage squeeze theory, tightening marriage markets will cause people to lower their preference threshold for a minimally acceptable match. Translated to marriage propensity, marriage squeeze theory predicts higher average marriage propensity in response to tightening market conditions as people convert more of their limited choices into completed marriages. Hypotheses 1a and 1b, therefore, posit the same relationship between marriage behavior and marriage market conditions based on the findings of the historical marriage squeeze literature. The opposite direction of the model association is only due to the way the unmarried sex ratio is constructed with unmarried men always in the numerator and unmarried women in the denominator.

The relationship should be stronger for men if they indeed have more control over the marriage process, as Guttentag and Secord (1983) maintain. In that case, improving marriage markets for men (low sex ratios) may lead them to raise their preference thresholds for a minimally acceptable match to the point that fewer marriages occur, which translates into lower male marriage propensity. Even if men do not behave in this way, the fact that they have usually faced more shortages on the marriage market may mean they are more sensitive to market signals of scarcity. If so, the relationship between propensity and marriage market conditions should be stronger for men.

Hypothesis 2a: The relationship between marriage propensity and the unmarried sex ratio will be stronger for younger (vs. older) age groups of men.

Hypothesis 2b: The relationship between marriage propensity and the unmarried sex ratio will be stronger for younger (vs. older) age groups of women.

Hypothesis 2c: The relationship between marriage propensity and the unmarried sex ratio will be stronger for more educated (vs. less educated) groups of men.

To clarify the language used here, the expectation of a "stronger" relationship implicitly includes the directions hypothesized above: positive for male sub-groups, and negative for female sub-groups. For hypotheses 2a-c to be confirmed, the direction of the association must therefore also be concordant with the expectations of the relevant part of hypothesis 1.

Most marriage squeeze studies are ambiguous on which sub-groups of unmarried people will be more motivated, and more able, to respond to marriage squeeze conditions. Due to this ambiguity, this group of hypotheses is based on my own intuitions on people with different sets of attributes may have responded to tightening marriage market conditions.

A conceptual issue is that motivation and ability to respond to changes in marriage market conditions may run in opposite directions. More "attractive" unmarried people should be better able to respond to marriage market change, but less "attractive" people should be more motivated to respond because their options are already relatively limited. I take the position here that ability to respond is more important than motivation to respond. My intuition is that almost all unmarried people in China are highly motivated to marry, and marry early, due to social injunctions against both non-marriage and late marriage (Johnson 1983, Jones 2007, Tien 1983, Wang and Tuma 1993). If motivation is high for everyone overall, then the ability to respond to changing conditions should trump small differences in motivation.

Who is more "attractive" on the marriage market is potentially ambiguous. Here I assume that younger people are more attractive potential spouses, all else being equal. Arguments are

sometimes made that older men are more attractive because they have higher levels of income on average (e.g. Sharygin et al. 2013). However some factors may work in the favor of younger men: average age gaps at marriage are small, women marry at younger ages, and younger men likely have more income and human capital potential than similarly educated older men.

More educated men are unambiguously more attractive marriage partners given the strengthening relationship between education and socioeconomic status (Bian and Logan 1996, Hauser and Xie 2005, Wu and Xie 2003). For women, the relationship between education and marriage market position is less clear. If preferences for educational hypergamy are relatively strong, more educated women may continue to have be less "attractive" potential spouses (e.g. Qian and Qian 2014). They may also be less motivated to marry because of their own relatively superior economic position. Given these ambiguities, I do not have a specific hypothesis regarding the marriage response of more educated women to changing marriage market conditions.

Hypothesis 3: As the unmarried sex ratio increases, the propensity for hypogamous marriage on age, education, or both, will increase relative to other types of assortative mating.

Hypogamous marriage—where women marry younger and/or less educated men—was the least popular type of assortative mating (see Figure 24-27). As such, they represent a way to expand the marriage market for men seeking otherwise scarce marriage partners. Therefore, this type of assortative mating may become relatively more popular when men face tight marriage markets. This hypothesis assumes that men are more sensitive to changes in marriage market conditions for the reasons outlined above. The opposite relationship between hypogamy and the

unmarried sex ratio could mean women modify their preferences in a similar manner. The nature of the variables means I cannot distinguish statistically between these two possibilities.

Empirical Strategy

Weighted OLS regressions: marriage propensities and unmarried sex ratios

The analysis in this chapter is an extension of the analysis from chapter 4 using the same analytic sample. The regression models use the marriage propensities and unmarried sex ratios estimated in chapter 4 as inputs. It uses yearly estimations of these quantities over the 1970-2000 period. These regression models, with propensity as a dependent variable, relax the assumption that this quantity is independent of the composition of the marriage market (i.e. the unmarried sex ratio) in order to assess the association between marriage behavior and marriage market conditions. These regressions take age-by-education-by-year groups, stratified by *hukou*, as the unit of analysis because propensities are a property of groups not individuals. The rural *hukou* models are based on 3,624 and the urban models 3,297 aggregate observations.

Table 10 gives the distribution of the dependent and key independent variables before the log transformations. I categorize sub-groups of men and women by age and education in the same manner as the previous chapter: age groups comprise five categories: 18-21, 22-25, 26-29, 30-34, and 35-39. This means people less than 18 and older than 39 are not included in the analysis. Education is divided into three categories, according on highest level of schooling completed: primary school or less, junior high school, and high school or more. The assortative mating variable distinguishes homogamous, hypergamous, and hypogamous marriages by age and education group, respectively. Hypergamy and hypogamy are from the perspective of women, meaning a hypergamous marriage is one where a woman marries up either by age or

education, and a hypogamous marriage is one where she marries down in one or both of these categories.

[Table 10 about here]

Table 10 also gives the distribution of the underlying counts of marriages and unmarried singles that are used to calculate the marriage propensity and unmarried sex ratio. The untransformed variables are not normally distributed, the means and medians differ quite a bit and the standard deviations are large. This highlights the fact that marriage matching is not a random process across gender, age, education, and year. Most marriages occur within a few age groups and educational assortative mating pays an influential roles as well. This non-random matching process means the variability in propensities and unmarried sex ratios will be very large. Transforming these two variables and weighting (see below) the regressions addresses these issues. After a natural log transformation, marriage propensity and unmarried sex ratio are reasonably normally distributed.

The weighted ordinary least squares regression is of the following form:

$$Y_{ijt} = \beta_0 + \beta_1 X_{ijt} + \beta_2 Z_{it} + \beta_3 Z_{jt} + \beta_4 P_t + \beta_5 \left(X_{ijt} * Z_{.t} * Z_{.t}\right) + \varepsilon_{ijt} \quad (1)$$

Where Y_{ijt} is the log of the marriage propensity between *i*-group men and *j*-group women in year *t*. The formula for marriage propensity is displayed in chapter 4. These assortative mating groups are defined by age and education. Z_{it} and Z_{jt} are vectors of variables representing these age and education groups, separately by gender; or in a set of additional models the $Z_{.t}$ vectors

also include assortative mating type by age and education. All models include the main effects of age and education group but only some of the models include terms for assortative mating type. P_t controls for 5-year period between 1970 and 2000. The error term is ε_{ijt}. The models are estimated separately for rural and urban *hukou* populations.

X_{ijt} is the log of the unmarried sex ratio for *i*-group men and *j*-group women in year *t*. This ratio is defined, as in chapter 4, as the number of unmarried men divided by unmarried women in each year-by-age-by-education category, estimated separately for urban and rural *hukou* populations. As this ratio increases from unity (i.e. high sex ratios) the availability of *j*-group women declines relative to *i*-group men; and as the ratio declines from unity the availability of *j*-group women increases relative to *i*-group men (i.e. low sex ratios). The interaction term $X_{ijt}*Z_{.t}*Z_{.t}$ represents the three-way interaction between the unmarried sex ratio, age-group, and education-group. This three-way interaction is estimated separately for male and female groups. In an additional set of models $X_{ijt}*Z_{.t}*Z_{.t}$ represents the three-way interaction between the unmarried sex ratio and the type of age and educational assortative mating.

Finally, each term in equation 1 is multiplied by a weight, w_{ijt}. I do not include this weight term in equation 1 for readability.

Because marriage propensity and unmarried sex ratio are themselves based on yearly aggregates of individual level data, they are weighted to account for differences in precision across observations. The weights are based on the cell size of each aggregate variable, which is a standard weighting strategy when aggregate variables are put into a regression model (Kohler and Kreuter 2005). These "analytic weights" use this count to create a weight that is proportional to the inverse of the variance of the response variable (Baum 2006). Recall the propensity variable is based on the underlying count of unmarried singles and completed marriages. I use

the number of completed marriages between each sub-group of men and women as the "cell count" and, therefore, as the basis of the weights. This accounts for differences in precision between propensity estimates based on many marriages (i.e. large cell sizes) from those estimates based on very few marriages.

In this case, the fix is probably insufficient because the outcome variable—the marriage propensity—is not just an aggregation but itself a parameter estimated from a prior marriage matching model. A better solution for properly estimating the standard errors is beyond the scope of the current version of this chapter. A multi-stage model may give more precise estimates. For now, the reader is reminded that the standard errors should be interpreted cautiously.

A second goal of weighting is more substantive and also potentially problematic, but nonetheless necessary. In weighting by cell size, the weights give more importance to sub-group combinations where most of the marriages occur and de-emphasize assortative mating categories that contribute few marriages, for instance 22-25 year old, primary school educated men and 30-34 year old, high school educated women is a very rare assortative mating combination. An unavoidable side effect of this type of weighting is that weighted estimates differ substantially from unweighted estimates that treat all sub-groups as equally influential—which from a substantive and statistical point of view would lead to misleading results.

Regressions capture one-sex, period quantities from original two-sex data

Although propensities are originally two-sex quantities, putting them in a regression model as the response variable allows me to estimate the average change in propensities for sub-groups of men and women, separately, by reading off the partial coefficients of the regression model. That the underlying data are still two-sex marriage matches means the regressions cannot

isolate the effect of gender itself, but only gender sub-groups that include some other factor, such as age and/or education.

The unmarried sex ratio and marriage propensity are both yearly period measures, not lifetime measures. Even if women marry nearly universally, as they did during this period, period propensities could still vary, which has implications for completed fertility (Coale 1989, Coale et al. 1991), and perhaps other social measures such as average education, labor force participation, political participation, etc. (Blossfeld 1995, Guttentag and Secord 1983, Heer and Grossbard-Shechtman 1981). Going forward, lower period propensities could lower lifetime married rates because delayed marriage should eventually lead to foregone marriage for a portion of the population. For men who marry less than universally, and who will face a skewed marriage market in the near future, the effect of changes in period propensities is more straightforward: lower period propensities likely increase the risk of permanent non-marriage.

The main effects models, displayed in Table 11, summarize the additive relationship between marriage propensity and unmarried sex ratio, while controlling for sub-group membership, five-year period, and, in additional models, assortative mating type. The control variables show which sub-groups had, on average, higher propensities to marry and which types of assortative mating—e.g. homogamous marriage on age—were more common during the 1970-2000 period.

Central to this analysis, the unmarried sex ratio can be interacted with other covariates to show how different sub-groups responded to changes in the availability of singles on the marriage market. Those interaction results are displayed in Table 12. Both the unmarried sex ratio and marriage propensity account for age and education group in their calculation, thus making a three-way interaction between age, education, and unmarried sex ratio the proper

interaction to estimate. These three-way interaction terms are the primary parameters of interest in this analysis and they show how the average propensity response to changes in the unmarried sex ratio varied by age, education, and gender sub-group.

Because propensity and unmarried sex ratio are natural log transformed, the estimated coefficient is an elasticity, the coefficient for unmarried sex ratio gives the percent change in the propensity variable for a hypothetical percent change in the unmarried sex ratio. The main effect coefficient is modified by the additive interaction terms, which show the changes in the association across sub-groups. Recall that all of these models estimate the associations among age-by-education-by-period sub-groups of men and women, separately by *hukou* status. As such, the model coefficients show the average marginal effects for sub-groups of men and women, not the average marginal effects for individuals. To save space the main effect coefficients of sub-group, assortative mating type, and five-year period are not reported in Table 12.

Results

Main effect models

Main effects models are included for context, although they are limited theoretically and do not directly address the marriage market hypotheses listed above (Table 11). These models do provide a summary of average marriage behavior over the 1970-2000 period that controls for marriage market conditions (models 1 and 3). They show which age or education sub-groups of men and women, by *hukou* status, had relatively higher or lower average propensities to marry. Additional models show the relative popularity of assortative mating type on age or education (models 2 and 4).

[Table 11 about here]

Patterns of relative propensities across educational groups show that in a typical year sub-groups of women with high school or more had a lower propensity to marry than their less educated peers (models 1 and 3). This difference was much more pronounced in rural areas. To illustrate the size of the relative effect, rural high school educated sub-groups of women had, on average, a 79 percent lower propensity to marry than rural sub-groups with a primary education or less (model 1). This does not mean that these women had lower lifetime rates of marriage, only that in a typical year they had a lower propensity to marry. For men, the relative differences by education were less patterned. On average, rural sub-groups with high school had a lower marriage propensity than their less educated peers (model 1); but in urban areas they had a higher average propensity (model 3).

Not surprisingly, sub-groups of younger men age 22-29 had relatively higher propensities than either younger or older groups in both urban and rural areas. For women, marriage propensities were consistently high across all age groups; but older sub-groups still had relatively higher propensities, meaning in a typical year an older unmarried women was more likely to marry than a younger one. This result confirms that older unmarried women did not leave the marriage market but instead married at very high rates. The very low proportion of never married women after age 40 also demonstrates this fact (see Figure 3).

Models 2 and 4 (Table 11) also show that the propensity for homogamous marriage was, on average, higher than was the propensity for either hypergamous or hypogamous marriage. The relative unpopularity of hypogamous marriage on either age or education is especially evident. The main effects of age and educational group in these models should be ignored due to

unexplored patterns of multicollinearity between age and education sub-group and assortative mating type. The pattern of relative propensities by sub-group is better captured in models 1 and 3 that do not include assortative mating variables.

These models also estimate the main effect relationship between marriage propensity and unmarried sex ratio; however these coefficients are ambiguous because they do not distinguish propensity changes by gender sub-groups. Keeping this fact in mind, the estimated coefficients do show marriage propensities were, on average, lower in years with higher unmarried sex ratios, controlling for age and education sub-group (models 1 and 3), and assortative mating type (models 2 and 4). This association was much larger in the urban marriage market: a 10 percent rise in the unmarried sex ratio implied a 1.6-1.8 percent decline in marriage propensity; while in the rural market the response to a 10 percent rise in the unmarried sex ratio was a decline in propensity of 0.5-0.7 percent.

Interaction models

The interaction models summarized in Table 12 show the three-way interaction patterns of association across age and education sub-groups, or type of assortative mating, separately by gender and *hukou* status. The inability to estimate the effect of marriage market conditions separately by gender in the main effect models is partially overcome in these interaction models. The overall effect of gender still cannot be estimated, but variation in the association between propensity and unmarried sex ratio across age-by-education sub-groups of men and women can be estimated. These models show there were often significant interaction effects that differed by gendered sub-group membership and assortative mating type. I organize the interaction results below by gender, instead of, for instance, *hukou* status, because gender remains the most salient

variable in marriage market theories and empirical studies. Following this, I summarize the results from the models that interact assortative mating type with unmarried sex ratio and, finally, I discuss the results in the context of the specific hypotheses generated above.

[Table 12 about here]

Interaction models: male patterns

The relationship between marriage propensity and unmarried sex ratio changed monotonically by age group for rural primary school or less men (Table 12 model 5). Age 18-21 male sub-groups had a strong negative relationship between unmarried sex ratio and marriage propensity, with a 10 percent rise in the unmarried sex ratio (i.e. a tightening marriage market) associated with a 7.0 percent decline in marriage propensity. For groups of men older than 29 the relationship was positive, 10 percent rises in the unmarried sex ratio increased, on average, propensity by 2.1-4.1 percent.

Rural men with a junior high education had a similar monotonic relationship by age group, although the range of response was not as large. The basic pattern remained that very young male sub-groups (age 18-21) responded to higher unmarried sex ratios with lower propensity—a ten percent rise was associated with a 3.9 decline in propensity—while groups of men older than 25 had positive associations of 1.5-3.0 percent for a similar change in the ratio.

Rural male sub-groups with a high school education or more had associations that ran in opposite directions: younger sub-groups showed a positive propensity response to tightening market conditions, and older sub-groups a negative response. Specifically, sub-groups younger than 26 had, on average, a 0.8-1.4 percent increase in marriage propensity for a 10 percent rise in

the unmarried sex ratio; while groups age 30-39 saw declines in propensity ranging from 0.8-2.7 percent (Table 12 model 5).

Patterns of association between marriage propensity and marriage market conditions were also monotonic by age group within educational categories for urban sub-groups of men (Table 12 model 8). The range of variation was smaller for urban groups, at least among groups with a junior high education or less. Associations between marriage propensity and unmarried sex ratio were not statistically significant for primary school educated sub-groups or for junior high educated groups under age 30. For groups in their 30s, there was a small statistically significant positive association between unmarried sex ratio and marriage propensity, 10 percent rises in the ratio were associated with 0.8-1.6 higher propensity.

High school educated and above, urban sub-groups showed more variation in response across age groups. Age 18-21 year old sub-groups had the largest average response of any sub-group, ten percent increases in the sex ratio were associated with 12.5 percent declines in marriage propensity. The next older age group, 22-25, had 4.8 percent declines in propensity, on average, for 10 percent rises in sex ratios. Groups of high school educated men in their 30s had small positive associations, ten percent rises in the unmarried sex ratio were associated with 1.2-2.7 increases in marriage propensity.

Interaction models: female patterns

Above age 21, rural sub-groups of women with a primary or less education had lower propensities to marry, on average, as unmarried sex ratios rose (Table 12 model 6). Recall for women, rising sex ratios means more availability of potential marriage partners. These effect sizes ranged from 1.5-3.9 percent for groups in their 20s to 5.7 percent for groups in their 30s in

response to 10 percent increases in the unmarried sex ratio. The same direction of association is seen for sub-groups of younger women, age 18-25, with a high school education or more, and for age 26-34 women with a junior high education.

No sub-groups of rural women showed statistically significant positive associations between marriage propensity and unmarried sex ratio. In addition, there were no significant associations in either direction for urban or rural women above age 34. This is the case because in many years there are very few unmarried women at these ages in the data, so the sometimes quite large point estimations are based on very few observations.

Urban women with primary school or less also showed consistently large negative associations with the unmarried sex ratio (Table 12 model 9) that increased with age group up through the 20s. The size of these effects, for 10 percent increases in the unmarried sex ratio, ranged from three percent for the youngest age group to more than five percent for groups age 26-34. Sub-groups of urban women with a junior high education also showed negative associations between propensity and sex ratio, although the magnitude of the response was quite small before age 26. For sub-groups age 26-34, the association was similar in size to that for similarly aged women with less education.

The sub-groups of urban women with the most education had less consistent associations between sex ratios and marriage propensities. Those age 30-34 had a very strong negative association, ten percent increases in the sex ratio were associated with 8.1 percent declines in marriage propensity (Table 12 model 9). But younger sub-groups of high school educated women were the only groups of women in either the urban or rural market who showed a positive association between their propensity to marry and the unmarried sex ratio. A 10 percent

increase in the sex ratio was associated with a 6.3 percent increase in marriage propensity, on average, for 18-21 year olds and a more modest 1.0 percent rise for 22-25 year olds.

Interaction models: assortative mating

Turning to changes in assortative mating patterns, the propensity for jointly homogamous marriage on age and education fell slightly in the rural marriage market as unmarried sex ratios rose (Table 12 model 7), and was statistically insignificant in the urban market (Table 12 model 10). The propensity for hypogamous marriage on age group increased as the unmarried sex ratio rose in both urban and rural markets, although these effects were not always statistically significant in the urban market. The largest response in the rural market was for marriages jointly hypogamous on age and education, a ten percent rise in the unmarried sex ratio was associated with a 3.3 percent rise in the propensity for this type of marriage. In the urban market, the propensity for age hypergamy decreased at higher unmarried sex ratios, a 10 percent rise in the ratio was associated with declines in propensity of 2.5-3.3 percent.

Are the hypotheses supported by the results reported in Table 12?

Marriage squeeze theories predict that both men and women will modify their prior preferences when faced with tight marriage markets. In terms of revealed marriage behavior, this translates into a positive relationship between marriage propensity and unmarried sex ratio for men and a negative relationship for women. The results for men provide some support for this pattern (hypothesis 1a); as 18 out of 30 age-by-education-by-*hukou* sub-groups showed a positive relationship between propensity and unmarried sex ratio. For women, 23 out of 30 sub-

groups had a negative relationship between marriage propensity and the unmarried sex ratio, which provides support for hypothesis 1b (Table 12).

The relationship between marriage propensity and the unmarried sex ratio was not stronger for men than for women, meaning hypothesis 1c is not supported. More sub-groups of women (23 vs. 18 for men) have coefficients consistent with the theorized direction of the relationship, meaning they showed higher average propensities in tighter marriage markets (low unmarried sex ratios). Comparing the individual coefficients across gender also does not show a systematic pattern of larger male responses. This goes against the expectations of Guttentag and Secord's (1983) version of marriage squeeze theory that men are the ones who respond to changes in marriage market conditions.

Hypotheses 2a-c concern which age or education sub-groups should be more responsive to changes on the marriage market. I hypothesized that more "attractive" sub-groups would respond more forcefully. The results generally do not support this hypothesis. More often older—not younger—sub-groups of men (hypothesis 2a) and women (hypothesis 2b) responded to tighter marriage markets with higher propensities. More educated sub-groups of men (hypothesis 2c) also did not usually respond to tighter marriage markets with higher propensities. Highly educated, urban sub-groups showed a strong association at younger ages, but the direction was not as hypothesized. For other sub-groups of men, comparing similar age groups across educational categories also does not show a systematic pattern consistent with hypothesis 2c.

Hypotheses 2a-c were each based on the intuition that younger and/or more educated people, all else being equal, are more attractive marriage partners and therefore should be in a better position to respond to signals of scarcity with higher marriage propensities. This turned

out not to be the case here. Instead the results, while mixed, are more consistent with a motivation to marry story. Older sub-groups of men and women, as well as less educated sub-groups of men, may have been more motivated to turn their increasingly limited marriage options into marriages, or, relatedly, have been more attuned to signals of scarcity from the market. Given these results, it appears this motivational advantage overcame their relatively poorer position on the marriage market. One way to do this would be by lowering their threshold preferences more than their more "attractive" marriage market peers in order to marry.

Patterns of assortative mating type provide additional evidence for adaptive change to marriage market fluctuations, which is consistent with marriage squeeze theory and with hypothesis 3. The propensity for age hypogamous marriage increased noticeably in the rural market as unmarried sex ratios increased. This is consistent with men expanding the boundaries of their search to marry older women under squeeze conditions. The propensity for age hypergamous marriage declined under similar conditions in the urban market. For men, both of these potential behavioral adaptations to tightening marriage markets could help mitigate a male marriage squeeze, especially one that includes age structure effects brought about by recent fertility declines (Goodkind 2006, Morgan et al. 2009). The age structure component of the squeeze will make the culturally dominant norm for age hypergamy especially difficult to maintain in the future (Tucker and Van Hook 2013).

Discussion and conclusion

The 1970-2000 period witnessed rapid socioeconomic and demographic change brought on at least in part by intrusive government policies on many aspects of society including marriage and fertility (Banister 1987, Coale 1984, Scharping 2003, Wang 2005, Yang and Chen

2004, Ye 1992). Marriage market conditions varied during this period due to previous fluctuations in fertility (Goodkind 2006), as well as improved survival and educational outcomes for women (Bannister 2004, Wolf 1986), and towards the end of the period, internal migration (Fan and Huang 1998). In spite of these changes, rates of marriage remained very high and most Chinese regardless of social circumstance found a way to marry before they turned 35 (Figure 2-3). Nevertheless, the pattern of association between marriage propensity and unmarried sex ratio across age-by-education sub-groups provides new evidence of how people may have responded to relative shortages of potential spouses in the recent past.

This is a useful question because previous studies of historical marriage squeezes indicate populations of men and women apparently modified their previous assortative mating behavior in order to marry under squeeze conditions (Ni Bhrolchain 2001). Moreover, studies that project into mainland China's marriage future find that modifying previously dominant patterns of assortative mating will be necessary to mitigate the negative effects of the impending skewed sex ratios on male marriage chances (Guilmoto 2012, Kochin and Knox 2012, Tucker and Van Hook 2013). These marriage squeeze conditions are projected to be especially severe for men in poorer, rural areas due to gendered patterns of migration (Banister 2004, Fan and Huang 1998, Sharygin et al. 2013).

With this in mind, the responses to changes in marriage market conditions of rural men and men with low levels of education may be especially relevant. Sub-groups of less educated rural men in their 30s did respond as predicted by marriage squeeze theory; as did sub-groups of rural men older than 25, with a junior high education, and younger than 26 with a high school education. Urban male sub-groups in their 30s regardless of education showed a positive association, as did urban males with the least education older than 21. However in most cases

these positive associations were relatively small, usually less than a two percent increase in marriage propensity for a 10 percent increase in the unmarried sex ratio. Other sub-groups of men, including most sub-groups in the prime marriage years of 22-25 did not respond to tightening marriage market conditions with higher marriage propensities. Therefore, the overall support for the predictions made by marriage squeeze theory is mixed.

All sub-groups of rural women and most urban sub-groups either showed a negative or a null association between their marriage propensity and the unmarried sex ratio. This means sub-groups of women either responded to—from their perspective—tightening marriage market conditions with higher propensity to marry or showed no response to market conditions. This overall pattern supports the predictions made by marriage squeeze theory. Only sub-groups of highly educated, younger urban women countered these theoretical predictions with statistically significant positive associations between their marriage propensity and the unmarried sex ratio—meaning they married with higher propensity as the availability of unmarried men increased.

Again, these estimates are for period not lifetime marriage propensities, so declining period propensities for women does not mean these women remained unmarried permanently. Aggregate census statistics for 2010 indicate near universal marriage for women continues to be the norm despite period fluctuations in marriage propensity. Nevertheless, delays in marriage for women could preclude some men from ever marrying depending on the local age structure conditions of the marriage market. On top of this, given the declines in lifetime marriage rates in the Pacific Asian region, including among ethnically Chinese women (Jones and Gubhaju 2009), these types of delays in marriage may become permanent for a portion of these mainland Chinese women in the near future.

More importantly, while universal marriage remained the norm for both men and women during the recent past, the possible responses to changes in marriage markets are still relevant, both for understanding marriage dynamics historically and for projecting them into the future. The fact that nearly everyone eventually married does not mean young people did not respond to signals of relative scarcity from the marriage market. The results in this chapter imply that at least some of them in fact did. Just because nearly everyone eventually marries does not mean unmarried young people know this when they are still single. In a society that expects universal marriage, the threat of failure in the marriage arena may, paradoxically, be especially strong and the signals coming from the marriage market especially influential on period marriage behavior.

From a modeling perspective, the results do partially contradict the independence assumption made in most marriage matching analyses (e.g. Schoen and Kluegel 1988). Nevertheless, the associations between these parameters are often not large on the scale of an elasticity percentage, and some are not statistically significant according to standard inference tests. Moreover, a linear association between two variables does not by itself disprove independence, especially in models that do not include all of the variables that might mediate their bivariate association. Like most models, Schoen's marriage matching function is likely incomplete, but still analytically useful. The associations between its elements, demonstrated here for the 1970-2000 period in mainland China, do not contradict this point. Instead they give one set of estimates of the degree to which the independence assumption does not fully hold.

The goal of this chapter is not, in the end, to question the analytical usefulness of marriage matching functions, nor is it to provide clear predictions about how unmarried Chinese will respond in the future to changing marriage markets. Instead, the primary goal has been to show that there were measurable marriage responses to past marriage market fluctuations. The

results do indeed show that marriage behavior likely changed in the face of changing marriage market conditions. This may also be evidence that people modified their partner preferences in order to marry. Taken as a whole, the results in this and the previous chapter indicate marriage behavior was not static in the recent past in mainland China. People likely changed their propensity to marry due to broader social forces (chapter 4) and to changes in marriage market conditions (chapter 5). Together these chapters provide additional context for evaluating mainland China's current and future marriage regime, including but not limited to studies that forecast future marriage levels.

Results: tables

Table 10. Descriptive Statistics

Panel 1: Rural	Mean	S.D.	Median	Min	Max
Propensity	0.04	0.05	0.02	0.00	0.58
Unmarried sex ratio	18.45	159.30	1.92	0.00	8515.50
Marriages	48.06	119.97	7	1	1221
Single men	3467.40	4303.11	1778	13	20346
Single women	3162.51	4361.93	805	2	15389
Panel 2: Urban					
Propensity	0.04	0.05	0.03	0.00	0.40
Unmarried sex ratio	4.63	10.06	1.11	0.01	124.57
Marriages	18.47	47.24	4	1	630
Single men	1492.76	1936.23	563	19	9237
Single women	1490.66	1794.46	572	5	7456

Data: 2000 China Census. N= 3,624 rural and 3,297 urban aggregate observations.

Table 11. Weighted OLS Regression, Main Effect Models, Predicting (Logged) Marriage Propensity, 1970-2000, Mainland China

	Rural				Urban			
Model number	1		2		3		4	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
(Ln) Sex ratio	-0.052	0.022	-0.074	0.015	-0.159	0.032	-0.183	0.020
Education group men (reference: primary or less)								
Junior high	0.256	0.023	0.056	0.044	0.460	0.068	0.144	0.057
High School	-0.433	0.051	-0.733	0.076	0.715	0.080	-0.041	0.100
Education group women (reference: primary or less)								
Junior high	-0.117	0.023	0.067	0.042	-0.204	0.063	-0.076	0.053
High School	-0.791	0.068	0.118	0.086	-0.233	0.077	0.158	0.098
Age group men (reference: age 18-21)								
22-25	1.040	0.031	0.758	0.034	1.493	0.057	0.777	0.047
26-29	0.449	0.056	0.064	0.059	1.565	0.076	0.360	0.075
30-34	-0.561	0.080	-1.045	0.075	0.675	0.115	-0.803	0.104
35-39	-1.435	0.141	-2.039	0.111	0.078	0.180	-1.693	0.143
Age group women (reference: age 18-21)								
22-25	0.647	0.036	0.855	0.034	1.469	0.042	1.903	0.037
26-29	0.447	0.085	1.105	0.071	1.854	0.091	2.918	0.078
30-34	0.576	0.154	1.266	0.114	1.760	0.157	3.256	0.122
35-39	0.881	0.329	1.734	0.226	2.072	0.334	4.154	0.230
Educational assortative mating (reference: homogamy)								
Hypergamy	—	—	-0.236	0.045	—	—	-0.332	0.057
Hypogamy	—	—	-1.533	0.049	—	—	-1.464	0.058
Age assortative mating (reference: homogamy)								
Hypergamy	—	—	-0.070	0.032	—	—	0.333	0.036
Hypogamy	—	—	-1.148	0.037	—	—	-1.800	0.045

Data: 2000 China Census. N= 3,624 (rural), 3,297 (urban) aggregate observations. Models include 5-year period.

Table 12. Weighted OLS Regression, Interaction Models, Predicting (Logged) Marriage Propensity, 1970-2000, Mainland China

	rural						urban					
Model number	5. men		6. women		7. assort.		8. men		9. women		10. assort.	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
(Ln) Sex ratio	-0.698	0.053	0.028	0.130	-0.110	0.029	-0.212	0.134	-0.304	0.054	-0.033	0.050
3-way interaction: Sex ratio*education*age (reference: age 18-21 with primary or less)												
Primary or less and												
22-25	0.470	0.054	-0.173	0.031	—	—	0.329	0.142	-0.106	0.058	—	—
26-29	0.713	0.057	-0.415	0.050	—	—	0.272	0.141	-0.210	0.066	—	—
30-34	0.911	0.066	-0.596	0.124	—	—	0.270	0.152	-0.220	0.137	—	—
35-39	1.107	0.094	-0.592	0.339	—	—	0.279	0.206	0.107	0.558	—	—
Junior high and												
18-21	0.307	0.055	0.206	0.030	—	—	-0.005	0.158	0.247	0.063	—	—
22-25	0.726	0.051	-0.008	0.030	—	—	-0.024	0.136	0.226	0.055	—	—
26-29	0.854	0.055	-0.263	0.046	—	—	0.226	0.137	-0.148	0.063	—	—
30-34	0.956	0.068	-0.402	0.111	—	—	0.298	0.142	-0.320	0.105	—	—
35-39	0.993	0.113	-0.146	0.257	—	—	0.374	0.169	-0.031	0.335	—	—
High school or more and												
18-21	0.834	0.077	-0.520	0.079	—	—	-1.034	0.169	0.935	0.072	—	—
22-25	0.774	0.057	-0.102	0.051	—	—	-0.269	0.136	0.408	0.055	—	—
26-29	0.644	0.059	-0.057	0.056	—	—	0.125	0.136	-0.011	0.061	—	—
30-34	0.616	0.082	0.155	0.128	—	—	0.330	0.140	-0.510	0.107	—	—
35-39	0.430	0.164	0.309	0.409	—	—	0.484	0.162	-0.385	0.306	—	—
3-way interaction: Sex ratio*educ assortative*age assortative (reference: homogamous on educ and age)												
Educational homogamy and												
Age hypergamy	—	—	—	—	0.069	0.039	—	—	—	—	-0.212	0.062
Age hypogamy	—	—	—	—	0.198	0.033	—	—	—	—	0.117	0.054
Educational hypergamy and												
Age homogamy	—	—	—	—	0.091	0.032	—	—	—	—	-0.165	0.045
Age hypergamy	—	—	—	—	-0.107	0.029	—	—	—	—	-0.297	0.057
Age hypogamy	—	—	—	—	0.221	0.040	—	—	—	—	0.080	0.056
Educational hypogamy and												
Age homogamy	—	—	—	—	0.275	0.033	—	—	—	—	0.091	0.059
Age hypergamy	—	—	—	—	0.065	0.041	—	—	—	—	-0.297	0.047
Age hypogamy	—	—	—	—	0.437	0.038	—	—	—	—	0.122	0.083

Data: 2000 China Census. N= 3,624 rural, 3,297 urban aggregate observations. Main effects of age and education group and assortative mating not reported. Models include 5-year period.

Chapter 6. Conclusion

1. ***Mainland China's recent marriage history redux: continuity and change***

From a broad historical and regional perspective, the post-1949 marriage regime in mainland China has, in fact, been exceptional: lifetime rates of marriage for men were much higher than they likely ever were before the 20th century (Chen et al. 2014, Lee and Wang 1999, Wang and Tuma 1993); while marriage rates for men and women were significantly higher than in other countries in the region and most countries in the west (Caldwell et al. 1988, Goldstein and Kenney 2001, Jones and Gubhaju 2009, Lesthaeghe 1995, van de Kaa 1987). This near universality of marriage in mainland China may have masked its exceptionalism and contributed to a relative lack of academic interest in its recent history.

On the surface and without considering a longer historical view, this recent marriage history has indeed appeared to be static and unremarkable, especially when seen through a lens focusing on the changing roles of women and the recent retreat from marriage in many countries east and west (Blossfeld and Jaenichen 1992, Blossfeld 1995, Bracher and Santow 1998, Goldscheider et al. 1986, Jones 2004, Lesthaeghe 2010, Raymo 2003, Ono 2003, Oppenheimer 1988). Marriage studies were relatively few, and among them many were primarily concerned with female marriage timing and its connection to total fertility, which dropped precipitously during the 1970s (Coale 1984, 1989; Coale et al. 1991, Smith and Wei 1986, Ye 1992). Only with the recent rise in sex ratios at birth has there been a renewed interest in marriage itself, with many studies forecasting a male "marriage squeeze" with large deficits in the availability of women on the marriage market over the next generation (Attané 2006, Ebenstein and Sharygin 2009, Goodkind 2006, Guilmoto 2012, Jiang et al 2007, Jiang et al. 2011ab, Jiang et al. 2014,

Kochin and Knox 2012, Poston and Glover 1995, Sharygin et al. 2013, Tucker and Van Hook 2013, Tuljapurkar et al. 1995).

This recent flurry of interest in both the popular and academic press in China's marriage situation reminds us of the continuing importance of marriage, both as a social institution and individual life course event. Any discussion of marriage with a Chinese person over the age of 17 will also confirm the continued importance of marriage in that society. A particular interest in the institution of marriage has also been one of the distinguishing features of the central state under the Chinese Communist Party (Banister 1987, Croll 1981, Johnson 1983, Wolf 1984, Ye 1992).

From the beginning of its control of the central state, the CCP has been concerned with the institution of marriage (Croll 1981, Wolf 1984). The 1950 Marriage Law signaled the intrusion of the state into an institution that had traditionally been controlled by the family (Croll 1981, Lee and Wang 1999, Wolf 1984). The new law raised the minimum age at marriage to 18 and legally guaranteed the right of personal choice in marriage decisions to both men and women (Croll 1981). As parents and extended kin lost control of the institution of marriage, individuals and the state gained more control (Coale 1989, Croll 1981, Tien 1983, Wolf 1984, Wolf 1986, Yang and Chen 2004, Ye 1992). Educational advancement and the state-led industrialization of the economy also should have helped shift the balance of power away from extended families towards the individuals and the state (Croll 1981, Walder 1989, Whyte and Parish 1984, Wolf 1984, Yan 2003). As young people gained more control over their own marriage decisions, the role for personal preferences must have increased (Yan 2003). Indirect evidence of this is visible in the revealed marriage behavior of post-1949 marriage cohorts. This behavior included not only the timing of marriage but also the patterns of assortative mating. At the same time,

qualitative studies of marriage make clear that individual control of marriage remained incomplete at best (Croll 1981, Johnson 1983, Wolf 1985). The family and the state continued to exert both direct and indirect social pressure on young people that certainly affected both the timing and overall proportions marrying (Croll 1981, Tien 1983, Wolf 1985). That nearly everyone married during this period is itself evidence of external pressure to marry.

Further evidence of the continued external pressure to marry, and to marry at a specific point in the life course, is provided in chapter 2 of this dissertation. Variation in marriage timing, as reflected in the interquartile range of first marriage age, declined steadily for men and periodically for women. Cohorts of men and women born after 1955 had interquartile ranges mostly less than four years wide. While many factors certainly contributed to this pattern, I argue that this narrowing range of marriage ages, in combination with nearly universal lifetime marriage, is strong evidence of external pressure to marry that overrode personal preferences. More education did not ameliorate this pressure, but if anything intensified it, at least according to interquartile range regression models.

The very high levels of male marriage during recent decades have obscured the fact that marriage chances for men have always been strongly influenced by socioeconomic position (Chen et al. 2014, Ebenstein and Sharygin 2009, Harrell 1985, Lee and Campbell 1997, Lee and Wang 1999, Wang and Tuma 1993). This was true in pre-20th century China (Chen et al. 2014), and it remained true in the post-1949 period as well (Ebenstein and Sharygin 2009, Wang and Tuma 1993). That marriage is a matter of social equity is one of the several good points made by the recent marriage squeeze literature (e.g. Sharygin et al. 2013). The fact that a very high percentage of men married in this period means the men who did not marry were likely more distinct and selected on both observable and unobservable attributes.

Chapter 3 shows that bachelorhood indeed became increasingly selective on observable attributes for birth cohorts of men born between the mid-1920s and mid-1960s. Men of low socioeconomic position became increasingly likely to remain unmarried after age 39. For instance, men born after 1955 with only a primary education had 5-7 times higher odds of long-term bachelorhood than men with at least a junior high school education. These results imply the most disadvantaged men continued to be denied the opportunity to marry primarily for structural reasons.

One structural factor was likely the availability of potential female marriage partners. According to numerous marriage squeeze studies, this structural constraint will become much more influential over the coming decades, (e.g. Guilmoto 2012, Jiang et al. 2014, Tucker and Van Hook 2013). But the results in chapter 3 are more consistent with a marriage mismatch story, like Raymo and Iwasawa (2005) told for Japan. Although the post-1949 period saw slightly faster educational upgrading for women than for men, that does not explain the sharply lower odds of marriage for less educated men. Only changes in patterns of assortative mating, and the underlying preferences that drove them, can explain this pattern. Low educated men became less attractive marriage partners for low educated women, who were able to find more attractive marriage partners elsewhere on the marriage market, sometimes by migrating to other areas for the purpose of marriage (Bannister 2004, Fan and Huang 1998).

According to the results in chapter 4, numerical changes in the availability of potential marriage partners also does not explain fluctuations in period marriage rates between the late 1970s, 1980s, and 1990s. Instead, changes in the propensity to marry, plausibly independent of marriage market conditions, primarily drove changes in marriage rates across these periods. Compared with either the late 1970s or 1990s, the late 1980s had higher period marriage rates for

most age-by-education groups. This was mostly not due to changes in marriage market conditions but, instead, to higher marriage propensity for most sub-groups. The specific reasons behind these changes in the popularity of marriage at particular ages and educational levels are not readily evident, but the analysis in chapter 4 indicates these reasons were not primarily the relative availability of potential spouses. Instead the changes in propensities across periods is consistent with changing personal preferences to marry, which made marriage relatively popular in the late 1980s across most age-by-education sub-groups of men and women.

Most Chinese who did not marry in the late 1970s or 1990s did eventually marry, so the lessons for China's impending marriage squeeze may be limited. The emerging marriage market shortage of marriage age women may indeed mean millions of men will be unable to marry across their lives. Nevertheless the results in chapter 4, and in marriage market studies for other contexts (e.g. Qian and Preston 1993, Raymo and Iwasawa 2005, Schoen and Kluegel 1988) show the availability of unmarried people by age and education is but one of many factors affecting marriage behavior. In those studies, marriage market conditions were not the primary cause of changes in marriage patterns. Instead the reasons were more likely due to changes in patterns of assortative mating and the underlying changes in preferences that implied.

Whether the size of mainland China's marriage market imbalance creates conditions that override other considerations such as assortative mating preferences remains to be seen. It is likely that changes in preferences will play an additional role in mainland China's marriage future in any case. The recent China marriage squeeze literature largely discounts the possible role of changing preferences in affecting marriage outcomes. In particular, the likely interaction between preferences and marriage market conditions is not considered. This means that the projections in this literature are useful but incomplete. While their incompleteness is

unavoidable, the lack of consideration for the role of changing preferences means they are missing an important part of the story.

Most studies of assortative mating also do not consider the likely interactions between marriage market conditions and marriage behavior. This is equally the case whether log-linear or marriage matching models are employed (e.g. Qian and Preston 1993, Han 2010). That marriage behavior and marriage markets interact is an important finding of the historical marriage squeeze literature (Abramitzky et al. 2011, Bergstrom and Lam 1994, Ni Bhrolchain 2001). Those studies use data from a variety of historical contexts and usually find that marriage market conditions probably influenced personal marriage preferences. When faced with tight marriage markets, people were willing to modify their preferences for partner type in order to marry. This means that levels of marriage were usually higher than would have been expected based on the change in the availability of potential marriage partners alone.

Chapter 5 provides some evidence that this type of behavioral modification occurred in mainland China during the 1970-2000 period. Results show that people may have modified their preferences for marriage in response to changes in marriage market conditions. Many age-by-education sub-groups showed changes in their propensity to marry in concert with changes in the unmarried sex ratio, according to weighted OLS regression models. In many cases, although not all, these associations were consistent with the findings from historical marriage squeeze studies. Regardless of the direction of these associations, the more basic point is that they provide suggestive evidence that sub-groups of Chinese may have indeed responded behaviorally to changes in marriage market conditions even during periods when those conditions were relatively favorable. Changes in marriage propensities should be even more evident during a severe marriage squeeze, as is widely forecasted to occur in the near-term in mainland China

(Guilmoto 2012, Jiang et al. 2014). These responses will alter observed patterns of assortative mating and overall levels of marriage in ways that we cannot foresee.

To recapitulate, this dissertation has looked for evidence of marriage change amidst the demographic markers of stability. In the preceding chapters, I have shown some of the activity going on below the surface during this period of historically high marriage rates. The results show continuity with China's pre-20th century past in that male marriage continued to be patterned by socioeconomic status (chapter 3) and marriage behavior for both men and women continued to show evidence of external pressure to marry at a socially preferred age (chapter 2). While lifetime marriage rates remained high, period marriage rates fluctuated noticeably and the importance of marriage market conditions was nuanced. Marriage market conditions appear to have affected marriage behavior (chapter 5), but they were not responsible for most of the changes in marriage rates across periods (chapter 4).

Each of the preceding empirical chapters contributes new empirical results and as such each makes a contribution to the academic literature concerned with mainland China's recent demographic history. Of more general interest, the empirical results in chapter 5 contribute to the historical marriage squeeze literature by showing new evidence of behavioral responses to marriage market conditions, something that has been shown for a variety of contexts but not for mainland China. The results in chapters 4 and 5 also contribute to China's forward-looking marriage squeeze literature by showing the relative contribution of marriage market conditions and marriage propensity for changing marriage rates, which provides both context and warning for a literature that considers the role of marriage market sex ratios mostly in isolation from patterns of assortative mating and the changing marriage preferences. These results also contribute to the assortative mating literature by examining assortative mating in the context of

marriage markets, something that most previous studies for mainland China have not done. The estimated relationships between education and marriage timing in chapter 2 and long-term bachelorhood in chapter 3 are also new empirical results that contribute to the China-related social stratification and demographic literature. Finally, the consideration of *hukou* across all the chapters provides new empirical evidence for the importance of that uniquely Chinese institution for marriage patterns.

Looking to the future, these results have implications for possible patterns of social stratification, especially for men, patterns of assortative mating, and for the size of the impending male marriage squeeze. Men and women continuing to marry in a narrow age range has implications for the ability of men to find marriage partners in tight marriage markets. A lack of flexibility in marriage timing among both men and/or women will exacerbate the marriage squeeze, leaving more men unable to find spouses.

Relatively fixed preferences for age and educational assortative mating would also make it more difficult for men to marry, especially under scenarios where women continue to upgrade educationally faster than men. Urban women with at least a high school education had very low propensities to marry down educationally in the recent past. Recent work examining the marriage behavior of educated urban women during the early 2000s finds that they are continuing to marry hypergamously on both age and education (Mu and Xie 2014, Qian and Qian 2014). A continuation of these trends in the future will make it increasingly difficult for relatively less educated men to marry.

As China continues to upgrade educationally, less educated men will become an increasingly select group, probably on both observable and unobservable attributes. The gap in the odds of marrying between the least educated men and the rest widened considerably across

the last decades of the 20th century. Because marriage is still tightly linked with family formation and reproduction (Gu 2009, McDonald 2009), this pattern means less educated men are increasingly likely to be excluded from mainstream society in a country that is still largely organized around the family (Chu and Yu 2010, Xu et al. 2007).

While the recent past has seen bachelors become a more selective group, the impending marriage squeeze may reverse this trend and make bachelorhood more common, and therefore less selective. What effect this broadening of the risk of bachelorhood has on men at the bottom of the socioeconomic spectrum is hard to predict. It may push them even further out of the marriage market as they will have even more competition from better off still unmarried men. On the other hand, broadening the risk of bachelorhood may push the state to improve the social safety net and reduce the role of the family to provide long-term care for its members (Gu 2009). That the children of the "one-child" policy generation will soon have two, or for a married couple, four elderly parents to care for should also push the state towards policies that reduce the social welfare burden on families—and especially on women who still supply the majority of home care (Gu 2009).

The swings in the propensity to marry across the late 1970s-90s indicate that preferences for marriage can change quickly. At least during the recent past, these changes have turned out to be tempo effects and not permanent reductions in lifetime marriage rates. In the future, however, these period preference changes may become permanent for an increasing share of the population. The retreat from marriage by educated women in other parts of Pacific Asia supports this prediction (Jones 2007); as does the small but perhaps growing trend for urban, educated women in China to remain unmarried into at least their 30s (Qian and Qian 2014). A retreat from marriage by women would have large implications for men's ability to marry, unless a similar

number of them also voluntarily left the marriage market, something that does not appear likely given the many advantages of marriage for men (Light 2004, Waite 1995, Williams 2003). Most China marriage squeeze studies have assumed that women will continue to marry universally over the next generation. This dissertation does not disprove that assumption and marriage continued to be nearly universal for women up to 2010. Nevertheless, the changes in marriage propensity documented here are suggestive that this universal pattern could change quickly. Given the retreat from marriage in many neighboring countries, a retreat from marriage by mainland Chinese women is at least a possibility.

The willingness of unmarried people to modify their preferences for marriage in tight marriage markets in order to marry will be especially important over the next generation in mainland China. Modifications of typical age gaps in marriage could reduce the size of the squeeze for cohorts of men facing large deficits of women at similar ages due to past sex selective fertility (Guilmoto 2012, Kochin and Knox 2012, Trent and South 2011). The recent past, however, provides only mixed evidence that various sub-groups of Chinese will indeed modify their preferences in order to improve their marriage odds. Nevertheless, the historical marriage squeeze literature does support the idea that unmarried people will modify their preferences in order to marry when conditions become severe. If men and, importantly, women are willing to modify preferences for assortative mating, the size of the impending marriage squeeze in China would be reduced (Tucker and Van Hook 2013). Given the findings from the historical marriage squeeze literature, and the importance of marriage in Chinese society, I think these changes in preferences are likely to occur, particularly on age assortative mating.

2. Study limitations

The relevance of these results are limited by a number of factors, some of which are related to the nature of the data employed. The quantitative data used in the empirical analyses are all based on census samples and therefore have the strengths and weaknesses of that type of data. One limitation is census data are cross-sectional not panel data. Therefore, true longitudinal analysis cannot be performed with these data. While there are now several high quality panel datasets available for mainland China, none provide the geographic and temporal scope of these census data. For the 1950-2000 period covered, here there are no panel data sets to turn to, with the possible exception of the China Health and Nutrition Survey (CHNS) for the 1990s (Liu 2008). Thus, while these census data are imperfect for modeling the determinants of marriage, they remain the best available data for most of the post-1949 period.

Among the consequences of using census data is that several relevant variables could not be included in the analyses. Among these is labor force participation, which is central to many empirical and theoretical examinations of marriage (e.g. Becker 1981, Blossfeld 1995, Oppenheimer 1988, Sweeney 2002). Current work status is usually available in the census, but the critical question of the temporal ordering of work spells with marriage timing could not be answered in most cases. The relationship between work and marriage, particularly for women, has a very large literature but this dissertation cannot say much about that relationship for mainland China. This is unfortunate because women in particular had unusually high levels of labor force participation throughout most of this period.

Internal migration is another important factor missing from these analyses. Again while partial five-year migration histories are included in some of the censuses, these events could not be reliably ordered with marriage occurrences in most cases. The rise in internal migration after

the mid-1980s was one of the most important socio-demographic events in mainland China over the last generation. Some important work involving marriage and migration has been done using Chinese census data (e.g. Fan and Huang 1998), however I did not find instances where I could make relevant additional contributions to that literature using these data.

New panel data will make it much easier to include variables such and migration and work because they include more relevant predictor variables and can get the temporal ordering of events right. These data will provide new insights into relationship between marriage, work, migration, education, etc., mostly for the post-2000 period. They will not, in most cases, provide new insight for the earlier periods covered here. In theory, data for this period could be retrospectively collected. I know of no such effort to do this; moreover, that data would suffer from all the defects of retrospectively collected data based on memories of increasingly distant events.

The weakness of the relationship between marriage propensity and other parameters estimated in these chapters and actual personal preferences for marriage has been discussed sufficiently in the previous chapters and I will not belabor those points further here. Making strong connections between preferences and measures collected in censuses and surveys is very difficult. A stronger preference model awaits not only more complete data but perhaps better theory to drive new data collection strategies.

3. Concluding thoughts

Men's preferences may not have changed very much across historical periods. Like in the pre-20th century marriage regime (Lee and Wang 1999), changes in marriage outcomes for them could, in fact, still be due mostly to structural constraints, particularly marriage market

conditions and socioeconomic position. The results of the previous chapters do not disprove this statement. For women, on the other hand, the ability to express personal marriage preferences may still be developing. If the experience of women in other Pacific Asian countries is a reasonable guide (Jones 2007), mainland Chinese women may soon translate improved socioeconomic position and changing socio-cultural norms (Lesthaeghe 2010) into later and less marriage. On the other hand, persistence of traditional socio-cultural norms could also drive down marriage rates for women because of an increasing disconnect between their socioeconomic position and societal expectations of married women's social roles (Raymo 2003, McDonald 2009).

A retreat from marriage by women is not necessarily a negative societal development. As a sign of increased personal independence, made possible by improving socioeconomic status and changing cultural norms, later and less marriage for some women is evidence of social progress. Compared with men, marriage is less ambiguously good for women's socioeconomic status, at least according to studies done in the U.S. (Budig and England 2001, Waite 1995). However, a retreat from marriage has its social and personal costs in conservative familial societies, where love, sex, and childbearing are still tightly bound up with marriage.

On the societal level, declining marriage rates may further depress fertility in societies like Japan that are suffering from a rapidly aging population structure (Jones et al. 2009). Mainland China will soon experience a very rapid societal aging—rapid because its fertility decline was so sudden (Wang and Mason 2008)—with no promise yet of a rebound in fertility to ameliorate it (Morgan et al. 2009). Declining fertility and population aging go hand in hand, leaving governments both east and west attempting to stem the tide of population decline with marriage and fertility inducements that have had limited success (Jones et al. 2009). While

mainland China continues to enjoy very high marriage rates, falling fertility and population aging are of increasing concern for policymakers (Gu 2009, Wang 2005).

On an individual level, while more young people now have the socioeconomic standing to resist marriage, they remain in limbo in a societies that remain slow to change traditional ideas about the role of marriage in various transitions to adulthood. McDonald (2009) argues that strong familism traditions in East Asia are in conflict with globalizing forces that have changed the position of women throughout the region. These changes in both values and circumstances—which can be interpreted as the continuing spread of the "second demographic transition," (Lesthaeghe 2010)—have changed women's views of themselves more than they have changed these societies' views of women, especially as wives and mothers. This conflict between social role expectations and women's changing personal aspirations may drive women away from marriage and motherhood, both of which remained tightly linked in these societies. It remains an open question whether large numbers of women in mainland China will soon follow this path or forge a different one that betters solves the potential conflict between personal autonomy and traditional social expectations. Studying their solutions will be very rewarding academically and important from a comparative social policy perspective.

For men, access to marriage will certainly remain an important component of social equity (Poston and Glover 2005, Das Gupta et al. 2010, Jiang et al. 2011a, Sharygin et al. 2013). High levels of permanent bachelorhood were evidence of social inequality in traditional China (Chen et al. 2014, Harrell 1985, Lee and Campbell 1997, Lee and Wang 1999) and the impending male marriage squeeze will go hand in hand with rising levels of inequality in contemporary China (Park 2008, Xie and Zhou 2014, Yang 1999) A strong warrant for the renewed interest in marriage is the concern for the social welfare of men who do not marry in a

society that has traditionally relied on the family to provide for the social welfare of its members (Gu 2009, Lee and Wang 1999, Poston and Glover 2005, Xu et al. 2007, Zimmer and Kwong 2003). Looking to the near future, as China moves back into a period of relative marriage scarcity for men, the extended family will likely have less of an impact in ameliorating the social and personal effects of this change than it did in the past; both because kinship networks are smaller (Zimmer and Kwong 2003), and because extended families control less socioeconomic resources than in past eras (Lee and Wang 1999). Instead, individual characteristics such as educational attainment and geographic location will continue to play a decisive role in determining marriage chances and the resulting social welfare consequences. Older men may suffer a "care gap" in part due to the increasing risk of bachelorhood over the next generation (Jiang et al. 2011a, Poston and Glover 2005, Zimmer and Kwong 2003). Older women will also be at increasing risk of isolation as they continue to outplace males in gains to life expectancy (Gu 2009). The crisis of an aging society (Wang 2005), especially one that is not yet rich, will become an increasingly important research and social policy agenda going forward, with marriage but one of several important dimensions.

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