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Trends in Educational Assortative Marriage in China

From 1970 to 2000

By

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Abstract

I examine trends in educational assortative marriage among newlywed cohorts from 1970 to 2000 in China using the 2000 China Population Census and 2001 Chinese Demographic Reproductive Health Survey. I find decreasing educational homogamy at national level from 1970 to 1980, which is consistent with previous research. However, odds of educational homogamy increased substantially during the late 1980s and the early 1990s when China's GDP per capita boomed, and then slowed in the late 1990s. Correspondingly, increasing educational homogamy since the late 1980s indicates that people with high level of education are less likely to cross barriers. Specifically, people with middle educational levels tend to marry one another or those with more education, leaving those people with very low educational level behind. In sum, the increasing trends in educational homogamy after the early 1980s provide supporting evidence that modernization is associated with increasing spousal educational resemblance.

Introduction

Scholars of social mobility pay great attention to "who marry whom" because marriage patterns are not only an indicator of social openness, but also may be a source of social inequality and intergenerational inequality (Kalmijn 1994; Smits 2000). First, if there are many martial ties between the members of different groups in a society, there must also be other social contacts between them. So, the members of these groups accept each other as social equals (Kalmijn 1998). Second, if individuals with advantages in education,

occupation or other indicators of social status choose spouses only within their own groups, individuals with fewer advantages will have fewer opportunities to marry up. In addition, since children inherit certain traits from their parents and live with their parents during most of their development period, parents' assortative marriage patterns may contribute to the intergenerational transmission of inequality at the aggregate level. Therefore, we rarely gain deep insight on the social mobility in one specific society without examining the patterns in assortative marriage.

In modern society, people choose their spouses based on various concerns, such as educational attainment, occupation, love, money and so on. Education plays a significant role in marriage pairing, because education serves as a strong predictor for good income or general economic security (Smits et al.1998), as a proxy for shared cultural interests and lifestyles (Kalmijn 1994), and because educational institutions provide an opportunity for young people to mingle (Mare 1991). In addition, education has replaced family background as the major determinants of marriages in the course of industrialization (Kalmijn 1991). Therefore, trends in educational assortative marriage can shed light on the effect of modernization process, specifically economic growth, on the social structure.

The tendency to marry someone with the same educational level is called educational homogamy. Smits and colleagues (1998) proposed an inverted-U-curve hypothesis regarding the effect of economic development on the trends in educational assortative marriages. This hypothesis states that educational homogamy will increase in the first

phase of the industrialization process, because social status still plays an important role in partner choice; Yet educational homogamy will drop in the later phase of the industrialization process since rising wages and social security laws will have decreased the dependency between parents and children, and individuals will have more freedom to marry whom they choose (Smits et al.1998). Since historical data on marriages for current industrialized countries are not available, Smits and colleagues used developing countries as the proxy for the first stage of industrialization and compared the differences in educational homogamy between these developing countries and industrialized countries, to test the inverted-U-curve hypothesis. However, their use of cross-section data to predict the trends undermined their conclusion (Raymo and Xie 2000).

China's recent booming economic development provides an opportunity to test this inverted-U-curve hypothesis. In 1978, China's central government implemented a "reform and open up" policy to launch economic growth. During the first ten years of economic development, China's Gross Domestic Product (GDP) per capita tripled. The growth in GDP per capita accelerated in the remaining twelve years and consequently reached 1,000 dollars in 2000, almost ten times more than 1978. Substantial demographic shifts have also taken place over this period. For example, women's educational attainment has increased dramatically, the median age at first marriage climbed four years for women, and two years for men. The percentage of single women aged 15-49 also raised during the twenty years of rapid economic development. Young people tend to choose partners based on love, instead of following parental arrangement (Tang and

Parish 2000). However, it remains unknown whether the booming economic development was accompanied by increasing educational homogamy in these recent twenty years

Previous research has not reached a consistent conclusion on the trends in educational homogamy in China over the recent twenty years. In the comparative studies, Smits et al. (2000) and Raymo & Xie (2000) both showed a decreasing educational homogamy from the early 1970s to the early 1980s at the national level. However, no study has examined the trends after the early 1980s. In addition, in small scale studies, Smits (2003) has identified increasing homogamy among couples with high levels of education in the 1980s, but Xu and colleagues (2001) found no significant changes in homogamy in two urban areas from 1950 to 1990. Furthermore, the social mobility literature in China has mainly focused on earning inequality at individual level (e.g. party member vs. non-member, men vs. women), yet failed to paid attention to the effect of family formation on the social mobility during the market transition period (Nee 1989, Walder 1996, Hauser and Xie2005). As a result, it is the trend in educational assortative marriages in China over the past twenty years is unclear.

This study makes a contribution to existing literature on educational homogamy by extending the time period to 2000 at national level. This study uses two large sample datasets to examine the patterns in educational assortative marriage for newlywed cohorts. Log-linear models are employed to measure the social distance among different educational attainment groups. The rest of this paper is organized as follows: part 2

reviews the existing literature, part 3 describes the data and methods, part 4 presents the results, and part 5 summarizes and concludes the paper.

Changing Economic Context and Returns to Education

China's modernization was characterized by unprecedented economic growth and consequential social changes. China has implemented an "Open Door and Marketization" in 1979, which aimed to foster economic development and social changes. The reform policy allowed international trade, foreign direct investment, and transformed government controlled market in goods, labor and capital into free competition market. The reform policy also empowered the local government and enterprises and created new, non-state-owned modes of organization for production (Lau 2002). This economic reform has brought about substantial changes to the Chinese economy and society. In the 1970s, Chinese real GDP experienced slight increase from $ 82 billion to 217 billion, and real GDP per capita grew from $101 to $229.   The pace of economic growth in China changed sharply after the Cultural Revolution in the late 1970s. Between 1979 and 2000, Chinese real GDP grew from $ 229 billion to $1.16 trillion (2000 price) and real GDP per capita grew from $217 to $920 (IMF WEO 2000). Figure 1 shows the growing GDP per capita in China from 1970 to 2000. The GDP per capita increased slightly from 1970 to 1980, and keep rather constant in the first half of the 1980s, and then accelerated the growth rate between 1985 and 2000, with two recesses in 1989 and 1993. In general, the average annual growth rates in GDP per capita are 8.24 between 1979 and 2000, which are 4 points larger than the annual growth rates pre-reform period (Lau 2002). In sum,

the well-defined point of change in China (Hannum 2002) offers an unusual opportunity to investigate the changing trends in educational assortative marriages.

The rapid economic growth is coupled with remarkable shift from redistributive power to market based power and returns to education. This transition was proposed to alter the mechanisms of social stratification in China and bring about extensive household income mobility (Nee 1996, Shu and Bian 2003). Nee (1989, 1996, 2000) argued that in state socialist societies, rewards were tied to one's position in the party. As these societies marketize, rewards will increasingly come from entrepreneurship and investments in human capital (i.e. education). However, the empirical evidences showed mixed results about Nee's proposition on higher economic returns to education during markettransition. The supporting evidences came from Nee's several studies in rural areas between the late 1980s and the late 1990s, and other studies in urban areas (Bian and Logan 1996, Shu ban Bian2003, Zhou 2000). The challenging evidences resulted from the empirical research by Walder (1996), Hannum and Xie (1996) and Hauser and Xie (2005). Hannum and Xie (1996) showed that the rates of return to education did not increase with economic growth, and the return to party membership kept invariant. Later on, Hauser and Xie (2005) found doubled net returns to schooling for both men and women, yet more than doubled returns to party membership. Walder (1996) showed persist privileges of party members during the market reform period in urban China.

The inconsistent evidences on returns to education have great implications on the patterns of educational assortative marriages. If people find higher returns to education in the

reform era, they are more likely to compete for people with higher level of education (i.e. greater economic prospect), and a more homogamous patterns among higher educated people will appear. On the other hand, if the return to education is uncertain, and political capital still matter, people might less focused on potential spouse's educational attainment or make trade-off between the political capital and educational attainment, which may result in more educational heterogamous marriages. Since marketransition literature did not investigate the social mobility through marriage and provided no evidences on the changing patterns in educational assortative marriage, this study may provide some indirect evidences on the returns to education in China between 1970 and 2000. In addition, several studies have shown that pattern in assortative marriages may strengthen the earnings inequality between groups (Fernandez and Rogerson 2001, Fernandez, Gunder and Knowles 2005) and intergenerational mobility (Ermisch, Francesconi and Siedler 2006), the patterns in educational assortative marriages might contribute to the increasing earnings inequalities between groups in China as well. Therefore, investigation on the changing patterns of educational assortative marriages may shed light on the sources of earnings inequality in China.

Changing Context of Marriage and Education in China

Substantial demographic shifts have also accompanied with the remarkable economic growth between 1970 and 2000. There are decline in arranged marriages (Xu and Whyte 1990) and increase in free-choice marriages; Youngsters are more likely to meet their potential partners at school, work unit and through agencies; Youngsters choose their spouse based upon age, appearance, income and education. (Pochagina 2004). The crude

marriage rates dropped from 0.17 percent to 0.125 between 1986 and 2000, while the crude divorce rates increased slightly from 0.01 to 0.02 at the same period.

The most significant shift is the increase in the mean age at first marriage for both men and women. The mean age at first marriage increased from 20.2 in 1970 to 22.4 in 1979. In the early 1980s, the mean age at first marriage declined about 2 years (Peng 1991). Yet after the mid 1980s, the mean age at first marriage increased from 20 to 23.2 in 2000 (UN 2000). Men have a larger mean age at first marriage than women in general. Figure 2 shows the parallel increase in median age at first marriage for men and women in this study. Men's median age at first marriage increased from 22 to 24 between 1970 and 2000, while women' median age grew from 19 to 22.9, around 4 years increase. The calculated Singulate Mean Age at Marriage (SMAM) from 1990 to 2000 showed a similar pattern, although the SMAM were 1 years larger for both men and women (Goodkind and Branch 2006). The rapid increases in the 1970s may be due to (1) the strict pursued "Wan, Xi, Shao" (later marriage, longer birth interval, and fewer children), women were encouraged to postpone marriage; (2) around 17 million urban youths were sent to countryside, lead to postpone the marriages among the urban females (Peng 1991). In 1980 new marriage law was enacted and set 20 as the legal age at marriage for female, and 22 for male, which might contribute to the temporal decline in mean age at first marriage. The steady increase in mean age at first marriage during the mid-1980s and the late 1990s, may be associated with increasing educational attainment for both men and women (Jin, Li and Feldman 2003, Mensch, Singh and Casterline 2005), higher wage

and regional economic growth appears to slow down the tendency to get married for both men and women and in both cities and the countryside (Xu et al. 2003).

Chinese educational attainments have also experienced remarkable changes between 1970 and 2000. The average years of schooling[1] in the 1970s was shortened by the destruction of the Cultural Revolution (1966-76) since most secondary institutions and colleges remained closed until 1972 (Deng and Treiman 1997). After 1976, education was reconceptualized as an instrument more of economic development than of socialist political ends (Hannum 2005). The growth in China's education was concentrated at the college level, with the number of colleges more than doubling and the enrollment of students more than tripling by the end of the 1980s (Shu Xiaoling 2004). Take the population as a whole, the percentage of school-aged children enrolled increased substantially from 5 percent to 24 percent in the 1970s, leveled off in the 1980s, and reached 27 percent throughout the 1990s. Between 1970 and 2000, the percentages of graduate at junior high schools and above show a similar increase pattern over the past 30 years, yet the percentage of elementary school graduates dropped remarkably. The mean year of schooling for men rose from 6 to 9 between 1970 and 2000. Women's educational levels were much lower than men, yet caught up in the late 1980s. However, the general increasing trend in educational attainment should not mask the variations between gender, urbanity, and regions.

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[1] China's school system has a 6-3-34/5 structure, that is, six years of elementary school, three years of junior high school, three years of senior high school), and four or five years of college education. The senior high school is divided into academic and vocational tracks (Deng and Treiman 1997)

Educational Assortative Marriages in China

Research on the effects of economic development on educational assortative marriages rest their analyses on either on comparative perspective treating China as one of the Eastern Asian Countries (Smits 1998, Raymo and Xie 2000, Park 2004) or particular area studies with small sample sizes (Smits 2000, Xu et al. 2000).

The comparative studies have yielded a consistent conclusion on the decreasing trends in educational homogamy from the early 1970s to the early 1980s. Smits et al. (1998) generally laid out the inverted U-curve hypothesis on the association between levels of economic development and its degree of educational homogamy and treated China as one of the developing counties in terms of per capital energy consumption. The inverted U-curve proposed that as the level of development increases, educational homogamy increases, subsequently peaks, and then decreases. Since China was in the development stage in the early 1980s, Smits et al (1998) estimated a higher level of educational homogamy for China, which indicated that with increasing industrialization, the economic importance of education and hence it importance as a criteria in marriage choice would increase. Smits el al (1998) suggested that high level of educational homogamy in Confucian countries were probably due to a traditional family orientation with a strong emphasis as a channel of social mobility in these countries. However, this conclusion was challenged by Raymo and Xie (2000)'s studies on four Asian countries. Raymo and Xie (2000) concluded a decreasing trend in educational homogamy from the early 1970s to the early 1980s. They constructed two newlywed cohorts: 1970-1974 and 1984-1985 using 1982 China In-depth Fertility Survey. Their use of trends data and

newlyweds cohorts provided strong methodological support for the trends in educational homogamy in China. Consequently, Smits and colleagues used the similar methods and showed similar decreasing patterns in the early 1980s (Smits et al. 2000). As a result, two studies showed that people were less likely to marry those with the same education level in the early 1980s than in the early 1970s. However, no studies have ever examined the trends in educational homgamy after the early 1980s at the national level.

Furthermore, small scales studies have provided sporadic, yet inconsistent evidence on trends in educational homogamy in the late 1980s. Smits (2003) identified more educational homogamy among younger cohorts (1980s) than older cohorts (1970s) with higher educational attainment in China. In addition, Xu et al. (2001) studied the trends in educational homogamy and status homogmay in two urban areas from the early 1950s to the late 1980s. Although their descriptive analysis showed the percentage of educational homogamous marriages climbed in the later 1977-1991 cohorts, their regression analysis showed that changes in odds of homogamy were not statistically significant. Therefore, Xu et al. (2000) concluded that neither the socialist transformation in the 1950s and the Cultural Revolution in the 1960s nor the recent economic reforms have changed the patterns of assortative mating in urban China. However, the nature of small scale studies may undermine the strength of their conclusions. For instance, Xu et al. (2003) use a sample with around 1,100 observations for two cities over fifty years. Few cases in each decade fail to provide sufficient interaction among explanatory variables in their analysis. In this paper I use nationally representative datasets with much larger sample sizes to examine the trends in educational homogamy in China from 1970 to 2000.

In addition, research on the trends in educational homogamy in former socialist countries in East and Central Europe has provided evidences on the effect of economic changes on the marriage patterns during post-socialist transformation. Compared with rapid economic growth in China, most of East and Central Europe socialist countries experienced economic setbacks in the early 1990s with their GDP dropping as low as to about 80 percent of their 1989 value and all of them, except Poland, failed to exceed their pre-1989 GDP level before 2000 (Katrnak, Martin Kreidl and Fonadova 2006). Katrnak and colleges (2006) found that the estimated educational homogamy remained low and constant in the Czech Republic and high and constant in Poland, whereas it increased slightly in Hungary and rather significantly in Slovakia between 1989 and 2000. The educational homogamy intensified among people with the lowest (elementary) and the highest (university) education. It is necessary to note that the constant trends in educational homogamy in Poland did not respond to its increasing GDP.

In sum, past research has shown that the educational resemblance of spouse in China decreased from 1970 to 1980, however, trends after 1980s are still unclear. This study aims to test the inverted-U-curve hypothesis and describe trends in educational assortative marriage in China from 1970 to 2000. We expect that people increasingly tend to marry those with the same educational attainments after the early 1980s because status seeking is likely to rely on education as a good approximating of economic potential at the early stage of industrialization.

Methodology

Data

The China Population Census 2000 ("Census 2000") and Demographic Reproductive Health Survey 2001 ("Survey 2001") are the two nationally representative datasets used in this study. Census 2000 is collected by the Statistics Bureau in 1999. This study uses 0.1% sample. Census 2000 provides information on household member's gender, date of birth, marital status, date of first marriage (year and month), educational attainment, occupation, and residency. This study used women aged 15-49 to make comparable analysis with Survey 2001. This study uses information of "date of first marriage" to pair wife and husband within a single household since one household may include more than two married couples[2].

Demographic Reproductive Health Survey 2001 is the latest survey of a series of fertility surveys conducted by State Fertility Planning Commission ("SFPC"). The 2001 survey is nationally representative with a sample of 39,586 women aged 15-49. These samples are drawn from about 0.18 million persons in sampled households. Using all the women of reproductive age in sample households as a new sampling frame, each province sampled women proportionally based on their distribution across provinces in the country. A post-enumeration survey was also organized and the estimated underreporting rate was around 5% (Ding 2003). The individual-level questionnaire included the following information

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[2] For household with more than one married couples, the relationship category with head of household in the 2000 Census is vaguely defined as "sons and daughters", and it does not differentiate daughter-in-law or son-in-law from the sons or daughters. Therefore, if a older head of household lives with their adult children, it is possible to pair his own son with his own daughter. To avoid this bias, I match couples through two steps: (1) select peoples who is "first marriage", (2) compare date of first marriage in month and year, (3) keep only couples whose dates of first marriage are in the same month.

on women: date of birth, ethnic group, highest degree attained, marital status, date of first marriage, and husband's ethnicity and educational attainment.

For each dataset, I examine six marriage cohorts for according to their date of first marriage. For instance, couples married between January 1st 1970 and December 31st 1974 were treated as the first marriage cohort 1970-1974. Consequently, the six marriages cohorts are 1970-1974, 1975-1979, 1980-1984, 1985-1989, 1990-1994 and 1995-2001. This study pooled Census 2000 and Survey 2001 together to maximize the sample size. Consequently, the pooled data yielded a total sample of 260,216 first marriages. The detailed numbers of marriages for each data source are presented in Table 1 of Appendix.

Methods

Prevailing Marriage vs. Newlyweds

One approach to examining the trends in educational assortative marriage is to use cross-sectional marriage data made up of multiple birth cohorts, i.e., groups of married people of similar ages, or "prevailing marriages." However, since each cohort's life is structured in ways that potentially affect the degree of resemblance between spouses, variation in marriage timing, in divorce rates, and in the extent to which spouses increase their education after marriage may all affect the degree of resemblance between spouses in a cohort (Schwartz and Mare 2004). Thus, use of prevailing marriage might lead to estimate bias in trends on educational assortative marriage.

It is agreed that use of recently contracted marriage, or newlyweds can avoid bias from selective marital dissolution, educational upgrading after marriage, and remarriage in studying the trends in educational assortative marriage (Kalmijin 1994, Mare 1991, Qian 1998, Preston and Qian 1993, Raymo and Xie 2000). Also, newlyweds are an appropriate unit of analysis for identifying the effects of historical changes on who marries whom (Raymo and Xie 2000). In addition, data on newlyweds are clearly better than cross-national data in testing hypothesis about effects of modernization if all other factors are equal (Smits et al. 2000). Therefore, this study uses newlyweds to examine the trends in educational assortative marriage in China in the recent twenty years.

Measurement of Educational Attainment

Educational attainment is classified into five groups: illiterate (<=1 years of schooling), elementary school (2-6 year of schooling), junior high school (7-9 years of schooling), senior high school (10-12 year of schooling), and college and up (>=13 years of schooling). The marginal percentages in Table 1 show the changes in educational attainment for husbands and wives in this study. In general, husbands have achieved higher levels of education than wives in each cohort, but wives' education has exceeded husbands' at the lower levels. Rising educational attainment is driven by the substantial increase in junior high school graduates and decrease in illiterates and elementary graduates. For instance, the percentage of husbands with less than junior high school drops from 63 percent to 22 percent within thirty years, the similar, yet larger drop for wives is from 89 percent to 34 percent. In addition, the percentage of people with more then senior high school climbs for both husbands and wives, but much slower than the

growth of junior high school graduates. In the first 1970-74 cohort, only 27 percent of the husbands have completed junior high school, and the percent of junior high school graduates reaches 53 percent, nearly doubled in the last 1995-2000 cohort; But the percentage of junior high school graduates among wives increased from 9 percent to 46 percent, about quipped at the same period. Finally, the percentages of college graduates among couples also show a steady increase over the past thirty years.

Log-Linear Models

This study describes the changes in patterns of educational assortative mating using log-linear models for contingency tables. Log-linear models provide estimates of the changing association between couples' educational characteristics while controlling for shifts in their marginal distributions (Schwartz and Mare 2005). Homogamy models measure general trends in educational homogamy, and crossings models reveal which educational differences between prospective spouses are serious barriers to intermarriage and which barriers are relatively permeable (Mare 1991). This study produces a contingency table with 300 cells (6×5×5×2) by cross-tabulating husband's education with wife's education for six cohorts and two data sources. Each cell represents the numbers of marriages occurred between specific levels of couples' education. The diagonal cells in the contingency table represent the homogamous marriages, while the off-diagonal cells represent the heterogamous marriages.

In estimating the log-linear models, I start with a baseline model, allowing three-way interactions among couples' education by cohort and data sources.

$$\log F_{ijkl} = \beta_0 + \beta_i^H + \beta_j^W + \beta_k^C + \beta_l^D + \beta_{ik}^{HC} + \beta_{jk}^{WC} + \beta_{ij}^{HW} + \beta_{il}^{HD} + \beta_{jl}^{WD} + \beta_{ikl}^{HCD} + \beta_{jkl}^{WCD} + \beta_{ijl}^{HWD}$$

, where F_{ijkl} is the expected frequency for cell *ijk* in the contingency table, H, W, C and

D are the variables, i, j, k,l = the categories within the variables H, W,C and D. β_0 is the

grand mean of the natural log of the expected frequencies; β_i^H, β_j^W, β_k^C and β_l^D are the

respective main effect for husband's education, wife's education, cohort and data source.

β_{ik}^{HC} and β_{jk}^{WC} are the interaction effect of cohort respectively with husband's and wife's

education. β_{il}^{HD}, β_{jl}^{WD} are the interaction effect of data source respectively with husband's

and wife's education.

In order to estimate the general trends in educational homogamy, a homogamy

parameters is added to the baseline model.

$$\log F_{ijkl} = \beta_0 + \beta_i^H + \beta_j^W + \beta_k^C + \beta_l^D + \beta_{ik}^{HC} + \beta_{jk}^{WC} + \beta_{ij}^{HW} + \beta_{il}^{HD} + \beta_{jl}^{WD} + \beta_{ikl}^{HCD} + \beta_{jkl}^{WCD} + \beta_{ijl}^{HWD}$$
$+ \beta_O^{CO}$, where β_O^{CO} allows the homogamy parameter vary by cohorts. This homogamy

parameter is a 5×5 matrix with 1 in the diagonal cells and 0 otherwise. Larger homogamy

parameters indicate couples are more likely to marry those with the same educational

attainment.

The crossings models are specified in accordance with the clear applications of crossings

models in Mare (1991) and Schwartz and Mare (2005). A series of crossing parameters

Ds are added to the baseline models.

$$\log F_{ijkl} = \beta_0 + \beta_i^H + \beta_j^W + \beta_k^C + \beta_l^D + \beta_{ik}^{HC} + \beta_{jk}^{WC} + \beta_{ij}^{HW} + \beta_{il}^{HD} + \beta_{jl}^{WD} + \beta_{ikl}^{HCD} + \beta_{jkl}^{WCD} + \beta_{ijl}^{HWD}$$
$+ \beta_{kp}^{CD}$, where β_{kp}^{CD} represent the odds of crossing educational barriers. The odds of

crossing the several barriers to marriage between men and women from different

educational strata are functions of the β parameters (Mare 1991). Controlling for the marginal distribution of spouses' education, the odds that a marriage observed in cohort k crosses barrier p is $\lambda_{kp} = \exp(\beta_p^D + \beta_{kp}^{CD})$. Table 2 presents the contribution of each of these odds of intermarriage to the expected number of marriages. The crossing parameters indicate the couples with greater distance in education have more barriers to cross. The estimated changes in crossing parameters provide evidences on the driving forces of educational homogamy.

Table2: Parameters for Crossings Effects on Educational Assortative Marriage

Husband's education	Wife's education				
	Illiterate	Elementary	Junior high school	Senior high school	College and up
Illiterate	1	λ_2	$\lambda_2\lambda_3$	$\lambda_2\lambda_3\lambda_4$	$\lambda_2\lambda_3\lambda_4\lambda_5$
Elementary	λ_2	1	λ_3	$\lambda_3\lambda_4$	$\lambda_3\lambda_4\lambda_5$
Junior high school	$\lambda_2\lambda_3$	λ_3	1	λ_4	$\lambda_4\lambda_5$
Senior high school	$\lambda_2\lambda_3\lambda_4$	$\lambda_3\lambda_4$	λ_4	1	λ_5
College and up	$\lambda_2\lambda_3\lambda_4\lambda_5$	$\lambda_3\lambda_4\lambda_5$	$\lambda_4\lambda_5$	λ_5	1

Source: Mare (1991)

Results

Trends in Educational Assortative Marriage

Figure 3 presents the changes in percentage of educational assortative marriage for women aged 15-49 in China over the recent twenty years. First, the decreasing percentage of hypergamous marriage (women marry up) among the total heterogamous marriages indicates an increasing educational homogamy in general. For instance, among the total heterogamous first marriages occurred in 1970-1974, 87.5 percent of husbands

have a greater level of education than their wives, yet only 70.2 percent of husbands marry down in 1995-2001. Although the percentage of wives marrying down continued to be on a rise over the twenty years, this increase is not sufficient to counteract the drop in the total heterogamous marriage.

Second, the decreasing proportion of heterogamous marriages results from the generally rising percentage of homogamous marriages. In general, the percentage of homogamous marriages among the total marriages dropped slightly between the first two cohorts, and then climbed straightly in the remaining four cohorts. Among couples married during 1970-74, 50.2 percent of them shared the same educational attainment with their spouses. The percentage of educational homogamous marriages decreased to 49.2 percent for couples in 1980-84. After the early 1980s, the percentage of couples with the same years of schooling monotonically increased among the younger marriage cohorts from 55 percent among the 1985-89 marriage cohort to 61.8 percent among 1995-2000 marriage cohort. In sum, there is 12-point increase in the percentage of educational homogamous among these six marriage cohorts from 1970 to 2000.

In addition, examination of the changes in the percentage of heterogamous marriages by crossing educational barriers in Figure 4 provides additional evidence of a rising trend in educational homogamy. Among the intermarriages, couples are more likely to cross one or two educational barriers, yet are very unlikely to cross three or more barriers. Although the percentage of intermarriages slightly increased about 1.5 percent during the first ten years, it dropped around 5.8 percent in the remaining 10 years. Similarly,

intermarriages crossing two or more educational barriers continued to decrease over the twenty years, which indicate more people choose their spouses within their own groups and couples share the same educational attainment over cohorts.

Figure1 China's Gross Domestic Product (GDP) per capita (U.S Dollars) from 1970 to 2000.

Per Capita Gross Domestic Product (U.S. dollars) in China 1970-2000

Source: IMF World Economic Outlook Database September 2000
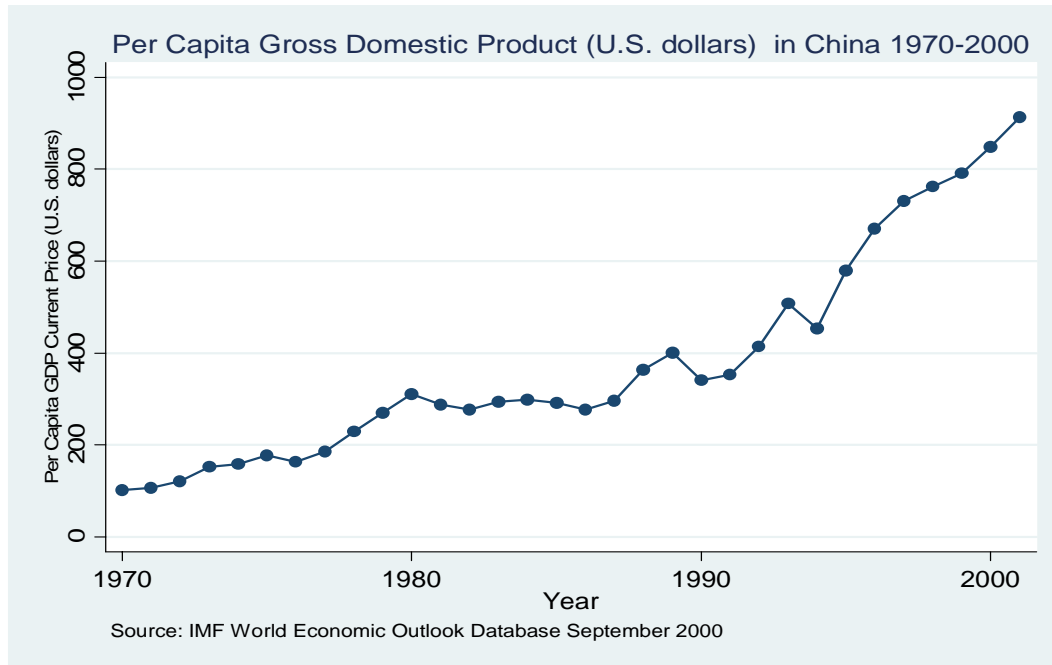
 Figure2 Mean age at first marriage for women and men in China from 1970 to 2000.

Mean Age at First Marriage (women aged 15-49) : China 1970-2000

Source: 2001 China Demographic Reproductive Health Survey
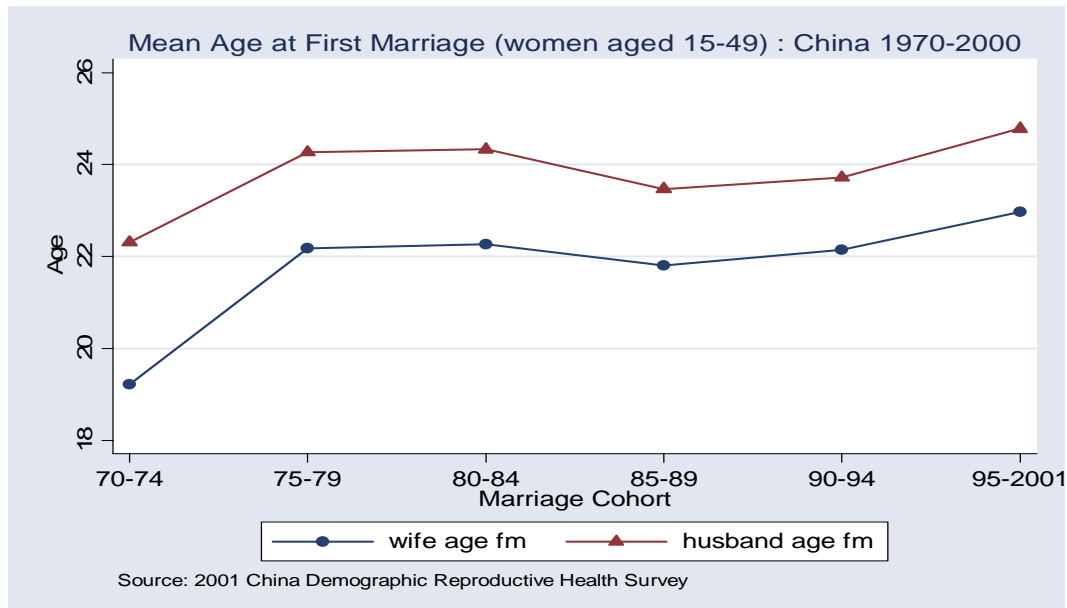
Figure 3: Changes in percentage of educational assortative marriages for women aged 15-49 in China:

1970-2001

Percentage of educational assotative marriages (women 15-49): China 1970-2001

Source: China Population Censun 2000
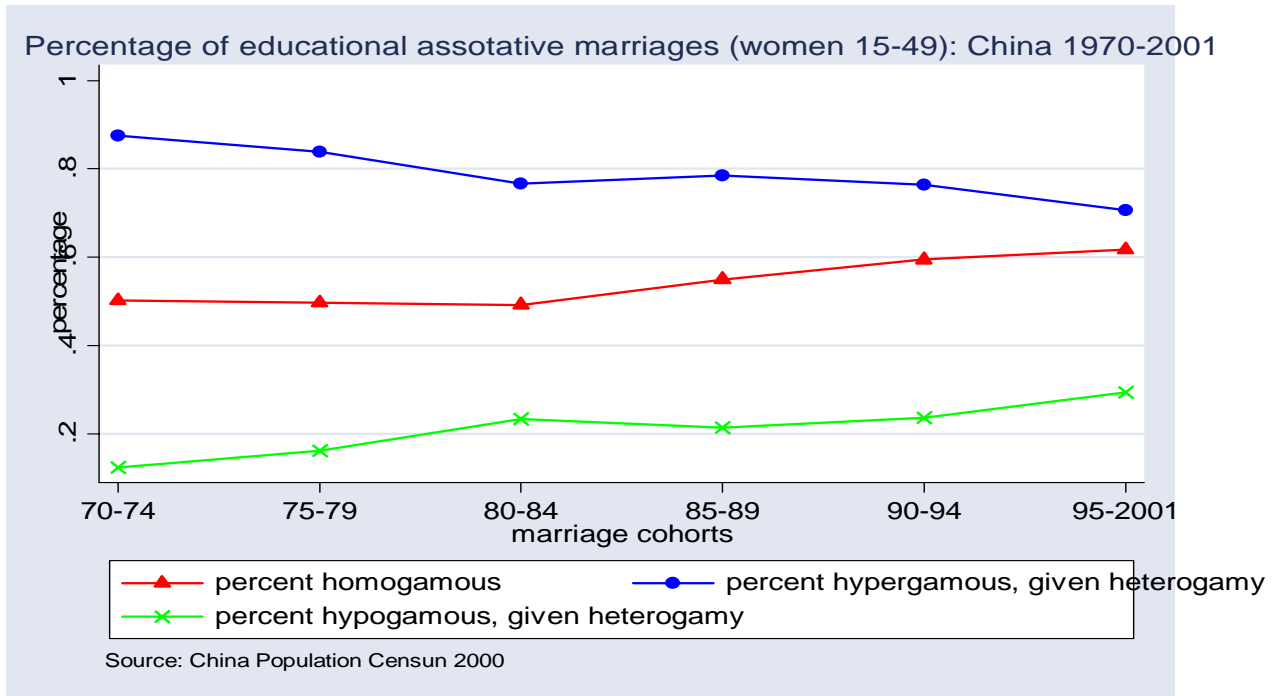
Figure 4: Percentage of heterogamous marriages by crossing levels for women aged 15-49 in China:

1970-2001

Percentage of heterogamous marriages (women 15-49): China 1970-2001

Source: China Population Censun 2000

Table 1: Educational Attainment for women and Men from 1970 to 2000 (percentage)

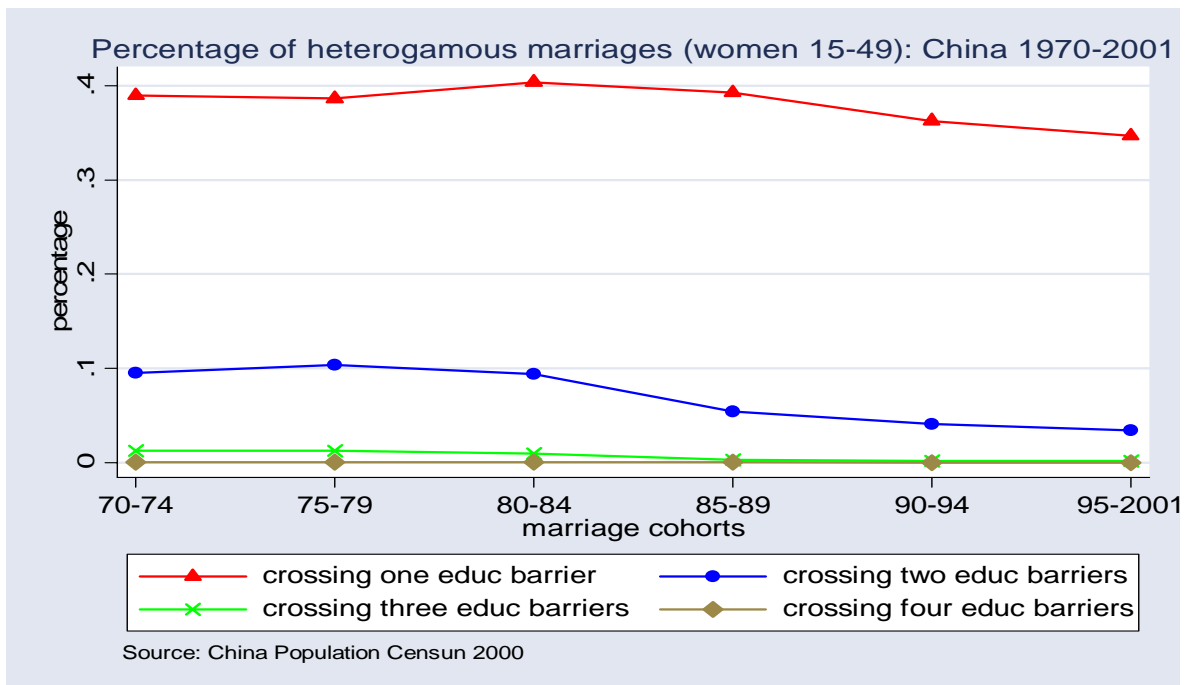| Husband's Education	Wife's Education					
	Illiterate	Elementary	Junior HS	Senior HS(VocHS)	College and up	Total
70-74						
Illiterate	13.94	1.92	0.19	0.00	0.00	16.05
Elementary	25.96	18.28	2.60	0.31	0.06	47.21
Junior HS	10.84	11.52	4.40	0.19	0.00	26.95
Senior HS (Voc HS)	3.22	3.28	1.30	0.25	0.00	8.05
College and up	0.25	0.50	0.68	0.25	0.06	1.73
Total	54.21	35.50	9.17	0.99	0.12	100.00
						(1,614)
75-79						
Illiterate	7.92	1.38	0.21	0.11	0.00	9.62
Elementary	16.90	16.53	3.44	0.74	0.00	37.62
Junior HS	10.60	12.24	10.17	1.93	0.19	35.13
Senior HS (Voc HS)	3.97	3.52	3.79	2.54	0.32	14.15
College and up	0.11	0.34	1.22	0.82	1.01	3.50
Total	39.50	34.01	18.83	6.15	1.51	100.00
						(3,775)
80-84						
Illiterate	4.11	1.12	0.22	0.10	0.03	5.58
Elementary	7.97	11.13	4.38	0.83	0.00	24.32
Junior HS	7.12	12.16	17.57	5.39	0.18	42.42
Senior HS (Voc HS)	3.08	4.80	7.22	7.06	0.58	22.73
College and up	0.11	0.10	0.87	2.09	1.78	4.94
Total	22.40	29.31	30.26	15.47	2.57	100.00
						(6,233)
85-89						
Illiterate	2.26	0.67	0.28	0.03	0.01	3.25
Elementary	5.71	12.91	4.23	0.40	0.01	23.27
Junior HS	5.18	16.14	23.83	3.72	0.10	48.96
Senior HS (Voc HS)	1.17	3.51	7.21	5.81	0.65	18.35
College and up	0.00	0.06	0.67	2.31	3.13	6.17
Total	14.32	33.29	36.22	12.27	3.90	100.00
						(7,263)
90-94						
Illiterate	2.54	0.67	0.19	0.02	0.00	3.42
Elementary	5.06	14.44	5.01	0.22	0.02	24.75
Junior HS	3.69	18.01	26.45	3.08	0.22	51.45
Senior HS (Voc HS)	0.40	1.76	5.54	4.20	0.97	12.87
College and up	0.03	0.06	0.64	2.04	4.73	7.51
Total	11.72	34.94	37.83	9.57	5.94	100.00
						(6,262)
95-2001						
Illiterate	1.90	0.63	0.22	0.03	0.00	2.78
Elementary	3.69	10.40	5.11	0.39	0.02	19.60
Junior HS	2.53	13.53	32.93	3.66	0.28	52.93
Senior HS (Voc HS)	0.15	1.47	6.94	5.65	1.53	15.74
College and up	0.03	0.08	0.83	2.58	5.42	8.94
Total	8.31	26.10	46.03	12.31	7.24	100.00
						(6,474)

In sum, these crude measures showed that people tend to marry spouses with similar educational attainments in China. However, since the average educational attainment of both men and women also increased, comparison of the percentage in various categories in the joint distribution of spouse's schooling confound changes due to trends in association between husbands' and wives' schooling with trends in the marginal distribution of schooling for each sex (Mare 1991). Therefore, in order to tease out the distortion brought by the changes in marginal distribution, this study use log-linear model to estimate the trends in educational homogamy in China over the recent twenty years.

Selection of Models

Table 3 reports the deviance G^2 (-2*log-likelihood) and BIC statistics for log-linear models of trends in assortative marriage between 1970 and 2000. Models with the smallest G^2 and most negative BIC fit the data best.

Model 1 is a saturated baseline model, which assumes that the marginal distribution of couples' educational attainment and the association of couples' education vary by data sources. The G^2 and BIC indicate that this model does not fit the data well. Model 2 adds the homogamy parameters, assuming the homogamous association of couples' education varies by cohorts. This homogamy model increases the fit of the model by reduction in G^2 and BIC. Since the BIC for Model 2 is still positive, I add diagonal parameters to the baseline model in Model 3, relaxing the assumption of a single association for all five education categories. Model 3 increases the model fit by large decline in G^2 and negative BIC(-176). But Model with homogamy parameters provides better summary measure of

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the trends in educational homogamy in other studies (Schwartz and Mare 2005). Therefore, this study uses results from Model 2 to generate the general trend in educational homogamy, although it is fit less well than Model 3. Furthermore, in order to estimate the driving force for the educational homogamy, we add crossing parameters for four educational barriers to the baseline model in Model 4, allowing crossing parameters cohort-specific. Crossing model is proved to fit the data better than Model 3, with a significant reduction in G^2 ($G^2[3]$- $G^2[4]$=877. d.f.=-5) and BIC (BIC[3]-BIC[4] =939). Therefore, the time-varying crossings model captures variations in patterns of educational assortative mating well.

Models 5-7 test the hypothesis that the association and crossing parameters vary by data source. By the criteria of G^2 and BIC, these models fail to generate a better fit than Model 2-4. This result suggests that the estimated association and crossing parameters do not vary by data source. So, we present the remaining results using the pooled data[3].

Models 8-11 relax the assumptions that the homogamy, diagonal and hypergamy are all time in variants in crossing models. All of these models fit better than Model 4 with restrictions. Model 8 (crossing with homogamy) fits the data best with the fewest negative BIC (BIC[4]-BIC[8] =403, d.f.=5) . These results suggest that (1) patterns of educational assortative marriages changed between 1970-74 and 1995-2001 cohorts; (2) changes in couples' abilities to marry across educational barriers are sufficient to capture the temporal variations in the pooled data.

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[3] Estimates for the first cohort are obtained using a modified model, the odds of homogamy and crossings for this cohort are estimated holding source constant at the census level.

Table 3: Log-linear models of the educational assortative marriages (N=260,216)

	Model		d.f.	G²	BIC
1	Baseline	HCD WCD HWC	160	2569	577
2	Homogamy	Baseline + A*C	155	2106	176
3	Diagonal	Baseline + Ai *C	135	1580	-101
4	Crossings	Baseline + DCi * C	140	703	-1040
5	Homogamy*Source	Baseline + A*C*D	150	2101	234
6	Diagonal*Source	Baseline + Ai *C*D	110	1562	193
7	Crossings *Source	Baseline + DCi * C*D	120	685	-809
8	**Crossings, Homogamy**	**Baseline + DCi * C A*C**	**135**	**237**	**-1443**
9	Crossings, Diagonal	Baseline + DCi * C Ai*C	125	169	-1387
10	Crossings, Homogamy, Hypergamy	Baseline + Dci*C A*C P*C	130	233	-1386
11	Crossings, Diagonal, Hypergamy	Baseline + Dci*C Ai*C P*C	120	164	-1329

Note:

H	Husband's education	1--5
W	Wife's education	1--5
C	Cohort	1--6
D	Data source	0,1
A	Homogamy	0,1
Ai	Diagonal	i=1…5
Dci	Crossing parameter	i=1…4
P	Hypergamy	

Explanatory Analysis

Figure 5 reports the predicted odds of homogamy, relative to heterogamy for women aged 15-49 in China over the recent twenty years. The changes in odds of homogamy show a similar pattern as the descriptive analysis in Figure 1. Among the first two marriage cohorts, the odds of homogamy declined from 1.8 to 1.7, indicating people is less likely to marry a spouse with the same level of education in the early 1980s than in the early 1970s. This decreasing trend in educational homogamy for the first two cohorts is consistent with previous research results reported by Raymo and Xie (2000) and Smits et al.(2000). However, the odds of homogamy shifted its direction after the early 1980s.

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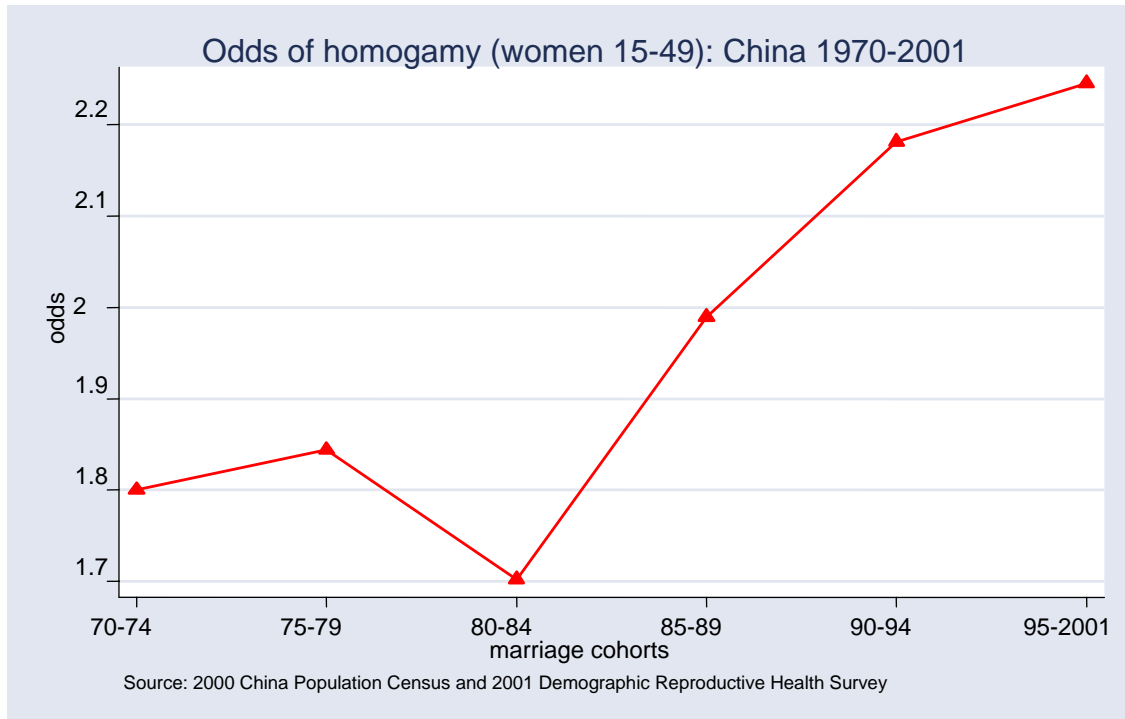**Figure 5: Estimated odds of educational homogamy, relative to heterogamy for women aged 15-49 in China: 1970-2001**

Odds of homogamy (women 15-49): China 1970-2001

Source: 2000 China Population Census and 2001 Demographic Reproductive Health Survey

Figure 6: Estimated odds of crossing one educational barrier, relative to homogamy for women aged 15-49 in China: 1970-2001

Odds of crossing one educational barrier (women 15-49): China 1970-2001

illiterate/elementary — elementary/junior high — junior high/senior high — senior high/college&up

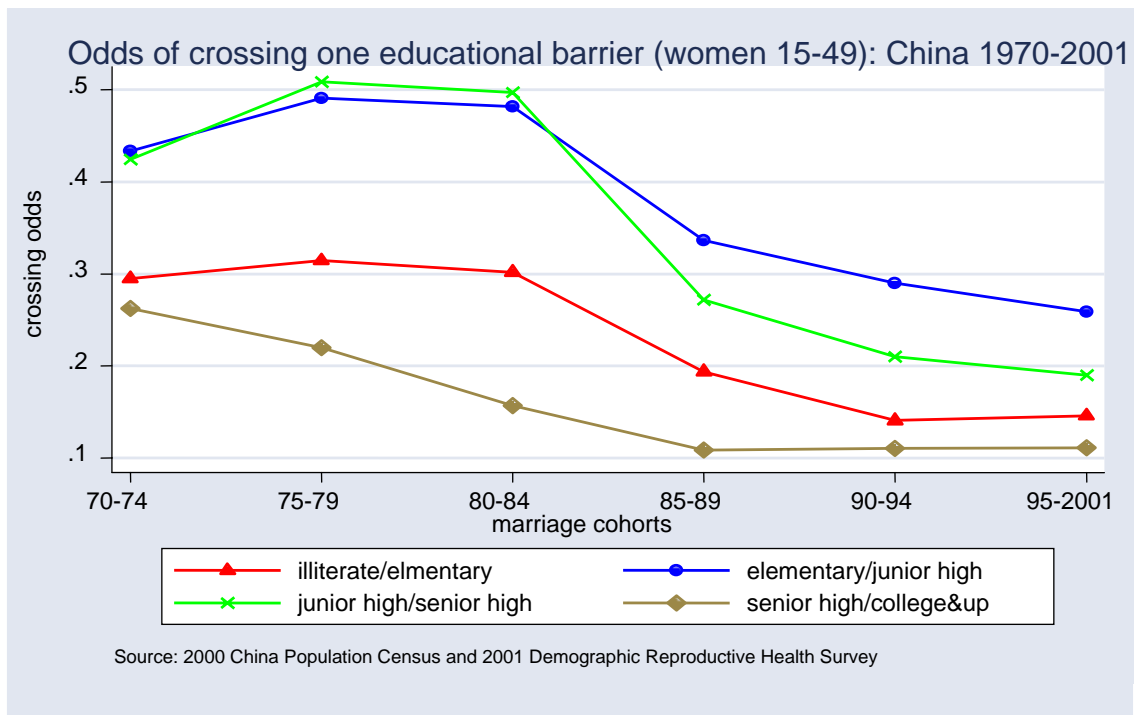Source: 2000 China Population Census and 2001 Demographic Reproductive Health Survey

Table 4: Estimated odds of crossing educational barriers for women aged 15-49 in China: 1970-2001

Husband's education	Wife's education			
	Illiterate	Elementary	Junior high school	Senior high school
1970-74				
Elementary	0.295			
Junior high school	0.128	0.434		
Senior high school	0.054	0.184	0.424	
College and up	0.014	0.048	0.111	0.262
1975-79				
Elementary	0.314			
Junior high school	0.154	0.491		
Senior high school	0.079	0.250	0.509	
College and up	0.017	0.055	0.112	0.220
1980-84				
Elementary	0.302			
Junior high school	0.145	0.482		
Senior high school	0.072	0.240	0.497	
College and up	0.011	0.038	0.078	0.157
1985-89				
Elementary	0.194			
Junior high school	0.065	0.336		
Senior high school	0.018	0.091	0.272	
College and up	0.002	0.010	0.029	0.109
1990-94				
Elementary	0.140			
Junior high school	0.041	0.290		
Senior high school	0.009	0.061	0.210	
College and up	0.001	0.007	0.023	0.110
1995-2001				
Elementary	0.146			
Junior high school	0.038	0.259		
Senior high school	0.007	0.049	0.190	
College and up	0.001	0.005	0.021	0.111

Note: N=260,216

The odds of homogamy for 1980-84 cohort are 1.7, it climbs to around 2.2 for 1990-84 cohort, yet slows its growth rate in the 1995-2001 cohort. The dramatic increase in odds of homogamy takes place between 1985 and 1994. These results suggest that the association between spouses' educational attainments has strengthened from 1985 to 2001.

Figure 6 present the predicted parameters for crossing one educational barrier for women aged 15-49 in China over the recent twenty years. In general, the odds of crossing educational levels are generally higher for couples with middle level of educational attainment, and lower for those college graduates. Furthermore, the general patterns for all intermarriages are the same at this period: first increase slightly among the first two cohorts, then decline remarkably between the early 1980s and the late 1990s and slow down in the last cohort. In addition, declines in odds of intermarriages are greater for high school graduates than college graduates. Therefore, these patterns are consistent with pervious description of decreasing percentage of intermarriages and rising educational homogamy.

However, the patterns of decrease in odds of crossing educational barriers are not uniform for all intermarriages at all periods. Figure 4 reports the predicted odds of crossing one educational barrier, relative to homogamy. First, during the early 1970s and the early 1980s, the odds of intermarriages between high school graduates and those with less schoolings has slightly increased, yet the odds of intermarriages between college graduates and senior high school graduates declined substantially. In addition, the

increase in odds of intermarriage for junior high school graduates is greater than those for senior high school graduates.

Second, between 1985 and 1994, the odds of intermarriage uniformly fell for all educational barriers. Again, the greater drop takes place among the intermarriages between junior and senior high school graduates. These results suggest that men with higher level of education are less likely to marry down, leaving women with low education behind in the marriage market. In addition, because of large volume of men with middle level of education and their higher odds of intermarriage crossing one educational barrier, the greater drops in odds of intermarriages among them between 1985 and 1994 can serve as the driving force for increasing educational homogamy at the same period. Third, during the late 1990s, the odds of intermarriages continue to fall for couples with middle level of schooling, yet level off for couples with very low education and college graduates.

The changes in odds of intermarriages crossing two or more educational barriers show the similar pattern with those of crossing one barriers in Figure 6. For college graduates, the odds of crossing any educational barriers are the smallest and follow the same decrease pattern over the twenty years, indicating more social closure among college graduates than other groups. In addition, for people with very low level of education (illiterate and elementary graduates), the odds of crossing two or more educational barriers to marry up have significantly fallen since 1984, suggesting that it is increasingly difficult for them to move up the social strata through marriage. In addition, the declining,

yet rather higher odds of intermarriages between high school graduates indicate that senior high school is a serious barrier to cross.

In short, the decreasing odds of crossing barriers for all educational categories provide strong evidence that the educational homogamy has strengthened between 1984 and 2001, when GDP per capita starts to the remarkable increase in China.

Summary and Conclusion

Using data from the China Population Census 2000 and Demographic Reproductive Health Survey 2001, this study examines the trends in educational assortative marriages and their driving forces in China from 1970 to 2001, when remarkable economic growth has been achieved. The results show that people has increasingly married those with the same education level. For instance, the odds of educational homogamy are 1.8 in the early 1970s and rise to 2.25 in the late 1990s. Furthermore, temporal variations take place along this general trend. Between the early 1970s and 1980s, the odds of educational homogamy experiences a slight decrease, which confirms the findings presented previously by Raymo and Xie (2000) and Smits et al. (2000). In addition, the growth in odds of educational homogamy slows down in the late 1990s, largely due to smaller decrease in odds of crossing one and two educational barriers. Therefore, this study goes beyond previous studies by identifying the increasing homogamy after the early 1980s in China, which is consistent with the modernization hypothesis.

In order to find the driving force to this increasing educational homogamy, crossing models are used to estimate the differences in odds of crossing barriers for people with different levels of education. First, higher odds of intermarriages take place between people with middle level of education than people both at the top and bottom. In addition, greater drops in odds of intermarriages also occurred among people with the middle level of education, which indicates that people at the bottom of educational strata increasingly have fewer chances to marry up. Second, the consistent decrease in odds of crossing any barriers for college graduates suggests that a more social closure among college graduate since they are less likely to marry outside their groups. Therefore, the substantial decline in the odds of crossing barriers for people with middle level of education after the early 1980s is the driven force of the increasing educational homogamy in China.

In short, the declines in odds of crossing any educational barriers after the early 1980s confirm the previous findings in increasing educational homogamy, and also indicate a greater social distance between the people with higher level of education and those with less education. Furthermore, the increasing educational homogamy may have implications for inequality within and between generations. Since college and high school graduates are more likely to marry within their own groups, and are unlikely to cross two or more educational barriers, it becomes more difficult for people with very low educational attainment to upgrade their social status through marrying up. Consequently, we may expect the concentrated homomgaous marriages among people with lower educational attainment. In addition, when increasing returns to education and political capital occur as market transition theory suggested, these household formed by people

with lower education would be more disadvantaged, because they lack the access either to education or political capital. As a consequence, the concentrations of marriage within lower level people generate the continuous inequalities for themselves and their next generations.

Further research is necessary to take into account the following factors. Firstly, the effect of economic development will differ in rural from urban areas because residence register system in China forms a barrier for people to choose their spouses. Secondly, the regional variations of economic development in China may confound the trends for people with similar education, as market transition literature suggested. If further study considers the effect of rural/urban and regional variations, a better understanding of underlying mechanisms of educational assortative mating would be achieved.

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Appendix

Table 1. Number of observations in pooled sample with six cohorts for women aged 15-49 in China

cohorts	survey	census	Total
1970-74	1,614	23,175	24,789
1975-79	3,775	35,739	39,514
1980-84	6,233	34,730	40,963
1985-89	7,263	50,104	57,367
1990-94	6,262	43,133	49,395
1995-2001	6,474	41,714	48,188
Total	31,621	228,595	260,216

Source: China Population Census 2000 and Demographic Reproductive Health Survey 2001

Table 2: Design matrix for homogamy models and crossing models

Homogamy

h

1	0	0	0	0
0	1	0	0	0
0	0	1	0	0
0	0	0	1	0
0	0	0	0	1

Crossings

dc1

I	E	J	S	C
0	1	1	1	1
1	0	0	0	0
1	0	0	0	0
1	0	0	0	0
1	0	0	0	0

dc2

I	E	J	S	C
0	0	1	1	1
0	0	1	1	1
1	1	0	0	0
1	1	0	0	0
1	1	0	0	0

dc3

I	E	J	S	C
0	0	0	1	1
0	0	0	1	1
0	0	0	1	1
1	1	1	0	0
1	1	1	0	0

dc4

I	E	J	S	C
0	0	0	0	1
0	0	0	0	1
0	0	0	0	1
0	0	0	0	1
1	1	1	1	0