Trends of Proportion Never Married for Chinese Women: Based on Cohort Analysis

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1 Introduction

Globally, the mean age at first marriage for women has generally been delayed, and the proportion of lifelong never married women has risen. For instance[3], the mean age at first marriage for women increased in the United States from 22.2 to 28.4 years between 2000 and 2020; in Japan, it increased from 27.0 to 29.4 years, and in South Korea, it increased from 27.1 to 30.8 years. At the same time, the proportion of women never married in the 45-49 age group has been increasing in these countries, particularly in Japan (Esteve et al., 2020), where it has risen sharply from 6.3% to 17.8%. Numerous country experiences indicate that a sustained delay in the mean age at first marriage for women directly leads to higher proportion of women never married(Watkins, 1984; Ortega, 2014; Raymo et al., 2021).

The proportion of lifelong never married Chinese women is gradually increasing, which has aroused widespread social concern. This paper uses data from the 2017 China Fertility Survey to calculate the age-specific proportion of women never married in each birth cohort and the differences between urban and rural areas, as well as across educational levels based on the cohort perspective; analyzes the situation of women's marriage postponement and recuperation; examines the impact of changes in the age-specific never marriage conditional probability on changes in the age-specific proportion never married; and predicts the proportion of lifelong never married women of the late-birth cohort using the Hernes model; the effects of changes in female educational structure on changes in the cohort's age-specific proportion never married were analyzed; and the tempo effect of female marriage postponement on the period never marriage rate was measured.

2 Data and Methods

2.1 Data

The data used in this study were collected from 2017 China Fertility Survey (CFS2017). In this paper, we exclude the sample size of 472 persons whose age at first marriage is less than 15 years old and whose age at first marriage is equal to 9999 (answered “can't remember”), and the final sample size is 249,474 persons. By comparing the data from the CFS2017 survey, which treated never married cohabitation as married during data processing, with that of National Population Census, we observe smaller discrepancies between the proportion never married as reported by the survey and the proportion derived from census data. So in this paper, the samples who answered “never married but cohabitation” in question Q102 are categorized into “married” status for processing. This study also uses the weights provided by the survey in the calculation

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[3] Marriage data from https://www.un.org/development/desa/pd/data/world-marriage-data, U.S. marriage data from https://www.census.gov/, Japanese marriage data from https://www.stat.go.jp/, Korean marriage data from https://kosis.kr/index/index.do.

process.

2.2 Methods

2.2.1 The proportion never married

Let TP^a refers to the total number of people in cohort a, FM_i^a refers to the number of first marriages at aged i ($[i, i+1)$), $\frac{FM_i^a}{TP^a}$ refers to the proportion of first marriages in cohort a at age i. Assuming the calculation starts from age 15, the proportion never married in cohort a at age x (inclusive x) is denoted as P_x^a, thus:

$$P_x^a = 1 - \sum_{i=15}^{x} \frac{FM_i^a}{TP^a}$$

2.2.2 Marriage postponement and recuperation

Let m refers to the age at which the absolute value of the difference in age-specific proportion never married between the observation and the benchmark reaches the maximum. Then, the degree of delay in marriage of the observation cohort a relative to the benchmark cohort b is represented by the difference D_m^a in the proportion never married at age m:

$$D_m^a = P_m^a - P_m^b$$

The recuperation at the age of n is represented by R_n^a:

$$R_n^a = P_n^a - P_n^b - D_m^a$$

2.2.3 Decomposition of differences in proportion never married between cohorts

Let p_x refers to the never marriage conditional probability between ages $[x, x+1)$ who were never married at age $x-1$ within a cohort, $P_x = \prod_{i=15}^{x} p_i$ refers to the proportion never married at age x within a cohort. Taking cohort b as the benchmark, we stepwise replacement from age 15 to x of cohort a into cohort b.

The effect of changes in the never marriage conditional probability at a specific age x to the total difference value in the proportion never married within a cohort up to age ω can be expressed as:

$$\delta_x^{a-b} = \prod_{15}^{x} p_i^a \times \prod_{x+1}^{\omega} p_i^b - \prod_{15}^{x-1} p_i^a \times \prod_{x}^{\omega} p_i^b$$

$$= \prod_{15}^{x-1} p_i^a \times (p_x^a - p_x^b) \times \prod_{x+1}^{\omega} p_i^b$$

The overall difference in the proportion never married people aged ω between the two cohorts is:

$$P_{\omega}^{a} - P_{\omega}^{b} = \sum_{x=15}^{\omega} \delta_{x}^{a-b}$$

The result of gradually replacing cohort a with b differs from that of gradually replacing cohort b with a. To eliminate this influence, we take:

$$\delta_x = \frac{1}{2} \times (\delta_x^{a-b} - \delta_x^{b-a})$$

2.2.4 Prediction of the proportion never married

Assuming x_0 as the initial age of marriage, M_x refers to the proportion ever married of the cohort at age x. The parameter A signifies the initial average first marriage capacity, $r < 1$ refers to the rate of decline in first marriage capacity with advancing age. Consequently, the proportion never married P_x is derived as follows:

$$\frac{dM_x}{dx} = A \times r^{x-x_0} \times M_x \times P_x$$

The solution is obtained as follows:

$$P_x = 1 - \frac{1}{1 + \frac{P_{x_0}}{M_{x_0}} \exp(\frac{A - A \times r^{x-x_0}}{\ln r})}$$

2.2.5 Impact of changes in the structure of education on changes in the proportion of women never married

Use i to denote the urban and rural area, j to denote different levels of education. UP_x^i denotes the population share of women aged x in urban or rural areas. $EP_x^{i,j}$ denotes the population share of women aged x with different levels of education in urban or rural areas. $NP_x^{i,j}$ denotes the proportion of women never married aged x with different levels of education in urban or rural areas. Thus, the expression for the proportion never married P_x is:

$$P_x = \sum_i \sum_j UP_x^i \times EP_x^{i,j} \times NP_x^{i,j}$$

The difference in the proportion never married between the observation cohort a and the benchmark cohort b at age specific of x years old is represented as:

$$\begin{aligned} P_x^a - P_x^b = & \sum_i \sum_j (UP_x^{a,i} - UP_x^{b,i}) \times \frac{EP_x^{a,i,j} \times NP_x^{a,i,j} + EP_x^{b,i,j} \times NP_x^{b,i,j}}{2} \\ & + \sum_i \sum_j (EP_x^{a,i,j} - EP_x^{b,i,j}) \times \frac{UP_x^{a,i} \times NP_x^{b,i,j} + UP_x^{b,i} \times NP_x^{a,i,j}}{2} \\ & + \sum_i \sum_j (NP_x^{a,i,j} - NP_x^{b,i,j}) \times \frac{UP_x^{a,i} \times EP_x^{a,i,j} + UP_x^{b,i} \times EP_x^{b,i,j}}{2} \end{aligned}$$

2.2.6 Tempo effect of the period never marriage rate

$TFMR_t$ denotes the total first marriage rate, $\overline{TP}_{x,t}$ denotes the average women population at age x in year t, $\overline{UM}_{x,t}$ denotes the average never married women population at age x in year t, $FM_{x,t}$ denotes the number of women in first marriages at age x in year t, and r_t denotes the rate of change in the mean age at first marriages for women in year t. The period never marriage rate is denoted by $PNMR_t$, then:

$$PNMR_t = 1 - TFMR_t = 1 - \sum_{x=15}^{49} \frac{FM_{x,t}}{\overline{TP}_{x,t}}$$

The tempo-adjusted period proportion never marriage is denoted by $PPNM_t$, then:

$$PPNM_t = \exp(-\sum_{x=15}^{49} \frac{FM_{x,t} / \overline{UM}_{x,t}}{1 - r_t})$$

The difference value between the two represents the tempo effect, then:

$$\text{Tempo effect} = PNMR_t - PPNM_t$$

3 Results and Conclusion

The results of the study show that: the later the cohort is born, the higher the proportion never married; women in the late-born cohort, with higher education, and living in urban areas are more likely to delay marriage and the recuperation of marriage is weakened at higher ages; the contribution of the decrease in the first marriage conditional probability for women in the late-born cohort to the proportion of lifelong never married women is increased at a lower age; the prediction results show that the proportion of lifelong never married women is elevated in the 1987 cohort up to the age of 49 years; and the contribution of changes in the educational structure of the late-born cohort to the overall change in the age-specific proportion never married increases; the tempo effect gradually increases in the degree of influence on the period never marriage rate. In the future, Chinese women will continue to delay their entry into marriage, and the likelihood of changing from late marriage to never marriage will further increase.

This paper also has some limitations. First, the marital history information on which the study is based is mainly based on respondents' recollections, and there is recollection bias, which may be more pronounced especially among the respondent women in the early birth cohort. Second, because women in the late birth cohort in this study had not yet fully passed marriage age at the time of data collection, their lifetime never married levels could only be analyzed by prediction. Finally, this study focused primarily on the never married status of women, and the never married status of males has not yet been explored in depth, and further research is needed in the future.