Underlying diversity of the first marriage process in China

—an application of Hernes' Model

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Research Background

Marriage in the Chinese population has long been portrayed as distinctly early and universal. It is estimated that around the late 1920s, less than one per thousand women and about three per thousand men never married in rural China (Barclay et al. 1976). The singulate mean age at marriage (SMAM) was 17.5 years for females and 21.3 for males during that period. The impression derived from the traditional scenarios as this has in fact rendered Chinese marriage pattern as the "standard" in analyzing marriage patterns of other populations (Coale and Watkins, 1986). In addition, this commonly-held view of early and universal marriage in China has hampered, at least partly, the development of marriage research in China. The nationally representative marriage data have not been available until the 1980s in China.

The traditional view of Chinese marriage pattern has rarely been questioned; however, exceptions do exist. By analyzing the data collected among the Chinese farmers during 1929-1931, Barclay et al. (1976) conclude that those farmers under study presented a remarkably consistent picture of early and universal marriage. However, they further argue that, the traditional marriage pattern reflected in the data has been too outdated to represent the marriage pattern in modern China or among the Chinese living abroad in recent times.

Using the data from the 1982 One-Per-Thousand Fertility Sample Survey, Coale (1984) examines the female marriage pattern in China from 1950 to the first half of 1982. He illustrates that although almost all the Chinese females eventually got married, the period total female first-marriage rate (TFFMR)[1] had changed dramatically with the changing marriage pattern during that time period. Although the mean age at first marriage increased only slightly from 18.46 in the 1940s to 18.68 in the

[1] TFFMR: the number of women who will ever marry per thousand.

1950s, a sharp increase in the mean age at first marriage was observed since 1970. Along with enactment of the new marriage law in 1980, a marriage boom was observed and the mean age at first marriage fell from 23.1 in 1979 to 22.7 in the first half of 1982.

In a previous study (Niu 2003), I review the previous literature on marriage in China and investigate the pattern of spousal age differences in the Chinese population by employing the census data in 1990. Although there is no information about age at first marriage in the dataset, which impedes research efforts to examine the marriage process systematically, the diversity of the marriage pattern is still evident from the data. It is demonstrated clearly that the marriage pattern in the Chinese population varies from rural to urban areas, from one region to another, from one ethnicity to another, and from low-educated population to highly educated population. That study combines the information for both husband and wife, and the results confirm that there are marked socioeconomic, cultural and demographic differentials in contemporary Chinese marriage pattern.

In addition to the improved situation in the research data on marriage, the recent development in modeling techniques also facilitates studies in re-examining the marriage pattern in modern China. Coale (1984) examines the Chinese marriage pattern with the Coale-McNeil's model. He finds that for the cohorts aged 15 in 1950, 1960 and 1965, their nuptiality experiences fit very well after age 20. While for the cohort reaching 15 in 1970, the standard curve only fits well up to age 22 and it underestimates the proportion ever married above age 22. Coale concludes that the standard distribution seems to fit very well when age at marriage is governed by accepted social norms and gradually evolving conditions. In the young cohorts, the departure of the fitted curves from the observed ones may be largely attributable to the impact of the government action that artificially reduced rates of first marriage at early ages and led to artificially high rates at later ages.

Using Becker's economic marriage model, Xu et al. (2003) investigate the timing of marriage among the young Chinese with the data collected from "*The study of the status of contemporary Chinese women* (SSCCW)" in 1991. They examine the marriage differentials in timing by scrutinizing the factors such as the rural/urban residence, regional economic growth, personal wage, and schooling. It is found that almost all marriages occur from 16 to 30 years in the young cohorts, which holds true both in cities and in the countryside, although young people in the countryside get married significantly earlier. It is also pointed out that regional economic growth appears to slow down the process of entry into first marriage for both males and females, and in both cities and the countryside. Above all, it is suggested that better-educated young people tend to marry later because of their job complexity.

As reflected in the existing research results, significant variations characterize the marriage pattern in China nowadays. This is true both because of the rapid socioeconomic development and as a consequence of the great changes in cultural spheres observed in China in recent decades along with the implementation of the open-door policy. In addition, as most demographic events occur within family, the dramatic changes observed in other demographic aspects in recent decades also suggest the potential changes in nuptiality (e.g., Cheng 1993, Coale 1984). It is clear that the traditional picture of early and universal marriage is no longer adequate, sometimes even misleading, in understanding the marriage pattern in modern China. The diversity of marriage pattern together with inadequate knowledge on it invites further systematic research, especially in light of the newly developed techniques and models.

In this study, I apply Hernes' diffusion model (Hernes 1972) to examine the underlying variation in the process of entering first marriage in China. The major objective is to investigate the processes of entry into first marriage for different cohorts, among the population with different socioeconomic and demographic characteristics. It is expected to contribute to our knowledge about the changing tendency of the first marriage process across successive cohorts and its variation among different subpopulations.

Furthermore, I also attempt to investigate the applicability of the Hernes model in the Chinese population through this empirical study.

The Hernes Model

In his paper "The process of entry into first marriage" (1972), Hernes introduces his mathematical model for the marriage process based on sociological assumptions and the idea of diffusion. He models the process of first marriage for a cohort as a diffusion process, which is influenced by the initial marriageability of the cohort, the deterioration rate of the marriageability over ages, and changing social pressure and availability of potential mates as individuals age. The marriage rate is low during the first marriageable years and it increases in the late teens, which is followed by a decline in the mid-twenties.

Hernes assumes the same initial marriageability for each individual in a cohort, which takes on the highest value in the first marriageable ages. According to Hernes, marriageability declines with age for reasons of both individual and social perspectives. On the one hand, personal attractiveness declines with aging process in general. On the other, the pool of potential marriage partners and the related variability decline with age. Hernes models the process of declining marriageability as a declining function of time. He suggests that each person starts out with a certain marriage potential, initial marriageability, and this potential declines with a constant proportion over time, deterioration rate. Since the initial marriageability and the deterioration rate are assumed to be the same for each individual in a cohort, for the cohort as a whole, the initial marriageability and the deterioration rate are the average.

Hernes models the social pressure to entry into first marriage as a function of the cumulative proportion married in a cohort. According to him, as the proportion already married increases in a cohort, single persons in the cohort experience increasing social pressure to marry because of the psychological

undesirability of celibacy and the related popular culture. He suggests that the social pressure on those remaining single is proportionate to the percentage of already married in their cohort. Paralleling to the assumption for individual marriageabilities and deterioration rates, Hernes assumes equal rate of changes in individual probabilities of getting married in a cohort. And as a result, the rate of change in the proportion married is a function of the proportion already married, the proportion not yet married, and a parameter of conversion.

Combining the two forces, Hernes' model is expressed as:

$$\frac{dP_t}{dt} = Ab^t(1-P_t)P_t,$$

where P_t is the proportion of the cohort already married at time t; A is the average initial marriageability for the cohort and b is the constant of deterioration. Integrating this function and rearranging the formula, the model turns out to be:

$$P_t = \frac{1}{1+\frac{1}{ka^{b^t}}}$$

where $\log a = \frac{A}{\log b}$ and $k = \frac{P_0}{a(1-P_0)}$.

For parameters estimation, Hernes suggests using the estimation procedure used for Gompertz function (the three point procedure). By dividing the data into three equal sections, the constants can be estimated with:

$$b^T = \frac{\sum_3 \log g_t - \sum_2 \log g_t}{\sum_2 \log g_t - \sum_1 \log g_t}$$

$$\log a = (\sum_2 \log g_t - \sum_1 \log g_t)\frac{b-1}{(b^T-1)^2}$$

$$\log k = \frac{1}{T}\{\sum_1 \log g_t - \frac{(b^T-1)}{(b-1)}\log a\}$$

where $g_t = ka^{b^t} = \frac{P_t}{1-P_t}$, Σ_1 Σ_2 and Σ_3 represent the sums of logarithms of observed cumulative percentage of married for the first, the second and the third sections respectively, and T is the number of observations in each of the three sections.

Empirical Assessments of Hernes' Model

As displayed above, Hernes' model is based on the concept of diffusion which captures the individual (psychological) and cultural effects on the process of entry into marriage. Compared with some other nuptiality models, its merit of sociological and behavioral meaningfulness is most frequently appreciated (Coale and Trussell 1996, Burch 1992). Furthermore, inherent in its mathematical expression, the Hernes model is also evaluated with its "intuitively appealing" (Coale and Trussell 1996), parsimony and tractability (Burch 1992).

Previous empirical application of Hernes' model is only observed in the literature for a few societies, mainly studies in the US. Hastings et al (1973) examine the generalizability of Hernes' model across successive cohorts. They use average cumulative percentages of age-specific first marriages for aggregated cohorts from 1891 on, and conclude that Hernes' model depicts the overall process of entry into first marriage accurately in general. Using this model, they also project that the percentage of females ever married will decline because of the increased percentages of women completing a college education and the inverse relationship between the level of educational attainment and marriageability.

Goldstein et al (2001) use data from the 1995 Current Population Survey and compare estimates from the Hernes model with those from the Coale-McNeil model. They find that the two approaches produce consistent forecasts for the US marriage case. Using maximum-likelihood methods, Goldstein

et al predict the marriage behavior of females in those young cohorts which have not completed marriage experience by the date of the survey. They suggest that it makes more sense to estimate the Hernes model parameters for the subpopulations with various socioeconomic and demographic characteristics respectively, compared with the attempt to build multivariate model[2] for the pooled sample.

Although the empirical assessment of Hernes' model is far from sufficient, existing evidence confirms the value of this model, especially in modeling the cohorts with completed marriage information (Burch 1992, Martin 2004, Sorensen 1978, Todd et al. ?). Since the behavioral intuition implied in this model is not unique to such societies as the US, it is worthwhile to apply Hernes' model in other social contexts. In China, the traditional custom dictates that getting married is a must, as the saying goes "It is natural to get married when you grow up." Therefore, it is true that the social pressures to marry come from parents, relatives, neighbors and even colleagues when a male or female stays single after his or her 20s. On the other hand, since the motivation and eligibility to marry declines inevitably as one gets old, "marriageability" will decline consequently (Burch 1992). In a word, the conformity between the marriage process in Chinese society and the behavioral meaning of Hernes' model validates the empirical application of Hernes' model in studying the Chinese marriage pattern.

Data and Method

In this study, I employ the data from one-per-thousand sample of the Chinese population census in 2000. Hernes' model is applied to the data to examine the diversity of the process entry into first marriage for successive cohorts, of males and females, and for different subpopulations of various

[2] As implied with the concept of diffusion, log-logistic function is appropriate to capture the diffusion process (Billari 2001, et al.). However, according to Goldstein et al., it may be better to examine the Hernes' model parameters separately for different subpopulations.

socioeconomic characteristics. Concerning the diffusion process implied in Hernes' model, I estimate the model for the populations in cities, towns and the countryside separately. And minorities' population is modeled separately from Han population. Educational differential is considered independently in the modeling process as well. All these factors are found to be closely related with the marriage process in Chinese population as reflected in previous research (Niu 2003).

As illustrated in previous studies, most of the first marriages in China occur from late teens to earlier 30s (Xu et al. 2003). This is also evident by comparing the proportion married in different age groups (as shown in Figure 1). To employ the Hernes model in investigating the process of entry into first marriage, only those cohorts with completed experience, aged 40-44, 45-49, 50-54, 55-59, 60-64 and 65-69 in 2000, are focused on in this study. Cumulative proportions married in these cohorts are calculated for each single age. Based on the distribution of marriage by age in the successive cohorts, marriages earlier than 14 or later than 40 years are dropped to improve the model fit[3]. The total number of truncated cases is less than 2% for all the cohorts.

**** (Figure1 about here) ****

Major Results

The overall model

Employing Hernes' model, the parameters are first estimated for the male and female populations in general, and the results are displayed in Figures 2 through 4. Compared with the older cohorts, the

[3] Using the data for the national male population, I compare the fitted results from the original data, those from the data with only very early marriages truncated (as suggested by Hernes) and from the data with both very early and very late marriages truncated. The result confirms that the last procedure works out the best fit.

average initial marriageability (*A*) is consistently higher in younger cohorts and the corresponding constant of the deterioration of initial marriageability (*b*) is relatively lower in these younger cohorts. This overall picture holds true for both males and females (see Figure 2 and Figure 3).

While higher initial marriageability normally corresponds to lower average age at marriage, it is not always the case when both timing and tempo are concerned. As shown in table 1 and table 2, the singulate mean age at marriage (SMAM)[4] is relatively higher in the younger cohorts although the initial marriageability is also higher in these cohorts (see Figure 2). This seems opposite to the normally expected pattern between the initial marriageability and mean age at marriage. However, by looking at the tempo of the marriage process, it is clear that although younger cohorts under study do not marry earlier in general, their processes entering into first marriage are comparatively faster (see table 3 and table 4). Therefore, the higher initial marriageability in the younger cohorts denotes faster marriage process rather than lower average age at marriage.

The faster process entering into first marriage in the younger cohorts is also confirmed by the relatively lower constant of deterioration of initial marriageability in these cohorts. Compared with the older cohorts, the declining constant of deterioration in the younger cohorts denotes that the young cohorts get married more rapidly (Hastings et al 1973). From Figure 4, it is also clear that no matter how different are the initial marriageability and the corresponding constant of deterioration across cohorts, the majority in the Chinese population will eventually get married, and this is true for both males (more than 97%) and females (more than 99%). Nevertheless, the male population has obviously lower proportion ever married compared with the female population.

[4] Calculated by employing Hajnal's method (Hajnal 1953), SMAM demotes the mean age at first marriage of the women marrying before 50. As remarked by Hajnal, this measure is equivalent to the average age at marriage.

By comparing the parameters (*A* and *b*) for male and female populations, the gap between the two curves (as shown in figures 2 and 3) can be explained partly by the age difference between spouses. Dictated by the marriage custom, the age pattern between spouses has normally been older husband with younger wife. Although the dominant marriage custom varies across the geographic regions in China as well as over time, significant age differences between spouses—with the overall pattern of older husband with younger wife—are still prevalent (Niu 2003). Therefore, it is less insightful to make direct comparison of the parameters for males and females within the same cohorts.

Examining the changes in the parameters across successive cohorts, it is evident that the relatively monotonic changing tendency has been disturbed by the cohort aged 55-59 in 2000. This is reflected as a minor rise in the *A* parameter (the average initial marriageability) and a slight dip for the *b* parameter (the constant of deterioration). However, there is a substantial decline in the asymptotic value for the cohort aged 55-59 in 2000, especially for males. This may be related to the marriage squeeze experienced by this male cohort (Niu 2003). Although some compensatory marriages occurred later on in this cohort as a result of the diffusion effects on the marriage process, the proportion ever married is still lower than the contiguous cohorts. In addition, according to Coale (1984), the historical events in China during the late 1950s and early 1960s may also play a part in this fluctuation.

**** (Figures 2 through 4 about here) ****

Model estimates for the subpopulations with various educational attainments

Figures 5 through 10 illustrate the model estimates for the subpopulations with different educational attainments, and for males and females separately. Consistent with the overall pictures for the males and the females in general, the initial marriageability is higher in the younger cohorts and the corresponding

constant of deterioration is lower in those cohorts, which is true for both the male and the female subpopulations with various educational attainments. However, much more marked fluctuation is observed when the educational difference is taken into account, and it is especially true for the female population.

For the male subpopulations, the lower the educational attainment, the higher the average initial marriageability and the lower the constant of deterioration in general. This is true because the males with lower educational attainments normally seek to get married more rapidly, although their eventual marriage proportion is significantly lower than the highly educated counterparts (see Figure 9). From Table 1 and Table 3, it is clear that although males with lower education have significantly slower tempo (see Table 3) in entering into first marriage compared with those highly educated in the same cohort, the mean ages at marriage are still relatively younger for them.

From Figure 5 and Figure 7, it is also clear that educational differential in the parameters (*A* and *b*) is more significant for those with relatively lower educational attainments. For instance, males with no more than primary school education and those with junior or senior school education in the same cohort differ substantially in the initial marriageability and the related constant of deterioration. Comparatively, those with higher educational attainments, either vocational school education or college education, are more likely to have comparable initial marriageability and the related constant of deterioration. This is evident from the crossovers reflected in the corresponding curves in Figure 5 and Figure 7. Possible explanation can be the fact that males with vocational school education or some college education always have the similar working and living environment as well as comparable prestige, given the relative underdevelopment of education in China about two decades ago. Therefore it is less surprising that the diffusion process functions across these subpopulations.

Looking at the parameters estimated for female subpopulations as shown in Figure 6 and Figure 8, the educational differential is much less significant for these female subpopulations across successive cohorts. This is the case because a woman's education played relatively less important role in mate searching in the past. There was even a saying in the old days in China, "Innocence is a virtue for women (*nvzi wucai bian shi de*)." Although things have changed over time, for the cohorts under study, rather fewer females have achieved post secondary education, which also discounts the relative importance of education for these female cohorts in their marriage process. Nevertheless, it is still rather risky to deny the educational differential in the process entering into first marriage for the females under study. Comparatively, females with lower educational attainments have lower mean age at marriage (see Table 2), and the proportion ever married declines for females with some college education in the younger cohort (see Figure 10).

Comparing the male and female populations with different educational attainments, the model parameters seem to suggest that higher education benefits males substantially in their marriage selection process, which is evident from the higher proportion ever married (asymptotic values) and higher tempo (see Table 3). The same cannot be said for females, however, as is evident from the somewhat declined asymptotic values for the females with higher educational attainment (see Figure 10). In addition, it is found that highly educated females may be more susceptible to marriage squeeze than their low educated counterparts as was the case in 1980s in some big cities such as *Tianjin* (Niu 2003). Because relatively fewer females pursued post secondary education in the cohorts under study, those highly educated females may be less influenced by their cohort-peers in the diffusion process of entering into first marriage. The situation is expected to change in younger cohorts (aged below 40 in 2000) as more and more females in those cohorts are pursuing postgraduate education.

**** (Figures 5 through 10 about here) ****

Model estimates for the subpopulations in different places of residence

From Figures 11 through 16, the parameters of the marriage patterns for the subpopulations in different places of residence are presented for males and females separately. As towns in China act as a transitionary level between cities and the countryside in many aspects, I adopted this tripartite classification of residence in this study rather than the general binary classification as rural and urban.

Similar to the changing tendency described above, the average initial marriageability increases in the younger cohorts, the related constant of deterioration declines across successive cohorts, and the proportion staying single is relatively higher in the younger cohorts. These overall trends are observed among all the subpopulations regardless of their difference in their place of residence.

Nonetheless, the place of residence does make difference for the male and female subpopulations according to the data used in this study. As shown in Figures 11, 13 and 15, males in different places of residence have significantly different marriage patterns. Generally speaking, males in cities have the lowest initial marriageability (A) and the highest deterioration rate of marriageability (b), and the proportion ever married is highest for this male subpopulation. In contrast, the males in the countryside have the highest initial marriageability, the lowest deterioration rate, and the greatest proportion eventually remaining single. It is evident that the differences reflected in the process of first marriage parallel, and are largely determined by, the socio-economic differences among cities, towns and the countryside. Given the patrilocal custom in China and the substantial socio-economic difference in various places of residence, the place of residence has contaminated effects on the attractiveness of the male subpopulations, and it is crucial to examine the first marriage process of these subpopulations separately.

As implied in the prevalent patrilocal custom in China, the place of residence makes much less difference in the first marriage process for females compared with its impacts for males. By examining the changes in the initial marriageability (*A*), the corresponding deterioration rate (*b*) and the asymptotic value across cohorts, it is clear that females in cities, towns and the countryside are more likely to have comparable first marriage processes, as is also evident in Table 2 and Table 4. This is true because given the patrilocal custom practiced in most areas in China, marriage-oriented female migration is more likely to blur the distinction among residences for them. In addition, it is more common and readily acceptable for a female from the countryside to marry a male in cities in China, while the reverse is far less normal.

The different implications of the place of residence for males and females are also evident from the historical tempo of their respective processes entering into first marriage. Partly because of the much narrower network in the countryside, the marriageability declines much faster for the males in the countryside. Given the socio-economic disparity related with various places of residence and the more common marriage-oriented female migration out of the countryside, males in the countryside may be more susceptible to potential marriage squeezes. This is confirmed by the distinctive changing tendencies in the asymptotic value for the male subpopulations as shown in Figure 15—while relatively smooth changing is observed for males in cities and towns, substantial decline in the cohort aged 55-59 in 2000 only presents for the males in the countryside.

**** (Figures 11 through 16 about here) ****

Model estimates for subpopulations of different ethnic groups

The model estimates for the subpopulations of Han and minorities in China are displayed in Figures 17 through 19. The overall trends of the changing parameters across successive cohorts are the same as those demonstrated for the male and female populations as a whole. Again, male subpopulations for both Han and minorities have largely parallel changing tendencies in their marriage processes across cohorts. In contrast, the curves fluctuate substantially for the parameters of female subpopulations, especially the Han females. And the curves for the two female subpopulations overlap in some cohorts.

As shown in Figure 17, a slight dip is observed in the initial marriageability of the cohort aged 50-54 in the female Han subpopulation. Correspondingly, the declining trend of the deterioration rate across successive cohorts is reversed by this female cohort, and for the cohort aged 45-49 in 2000 the *b* value is still higher than that for the cohort aged 55-59. This may be related with the prevalent late marriage in the 1970s, which is manifest in the changes in SMAM of Han females and that of non-Han females from Table 2. In the 1970s, females were encouraged to postpone marriage (until 23 in rural areas and until 25 in urban areas) by the official policy. According to the research results of Coale (1984), the proportion of women who had ever married before reaching age 24 was reduced from 89% to 76% in rural population and from 68% to 20% in urban population during the 8 years from 1971 to 1979.

From Figure 19, it is evident that the minorities' female population has slightly lower proportion ever married compared with Han females. On the contrary, the minorities' male population has higher proportion ever married than the Han male counterpart. In addition, the marriage squeeze observed in the male cohort aged 55-59 is only reflected in the Han subpopulation. This may be partly related with gender differential in intermarriage custom. For the sake of sustaining and enlarging their population size, the minorities prefer marrying Han females rather than marrying Han males.

**** (Figures 17 through 19 about here) ****

Conclusion and Discussion

In this study, I use Hernes' diffusion model to investigate the diversity in the marriage process in modern Chinese population. Although it is commonly believed that the marriage pattern in China is characterized exceptionally with early and virtually universal marriage, this view is over simplified and insufficient to understand the modern marriage process in the Chinese population. The results in this article demonstrate the underlying variations in the process of entry into first marriage as reflected in the changing tendencies of the parameters in Hernes' model across successive cohorts.

The overall picture shows that the initial marriageability increases across successive cohorts, and the constant of the deterioration of marriageability decreases correspondingly. These changing tendencies are related with the increasing mean age at first marriage and the generally increasing tempo of first marriage process in the younger cohorts (see Tables 1 through 4). As a result, the proportion ever married drops somewhat in the younger cohorts. As a whole, female population has lower initial marriageability and higher deterioration rate of marriageability. This can be partly explained by the age difference between spouses and the sex ratio for successive cohorts. Females marry at relatively younger age compared with males; therefore it is less intuitive to make direct comparison of the marriageability for males and females of the same age. Above all, the proportion ever married is higher for females than for males.

Consistent with the diffusion concept as depicted in Hernes' model, different subpopulations experience distinctive processes of entry into first marriage. In general, higher educational attainment favors males in their first marriage process more than it does females. The male subpopulation with higher education has lower initial marriageability and higher deterioration rate, and as a result, the

proportion ever married is higher than the male subpopulation with lower education. Comparatively, the distinction is not as sharp for female subpopulations as for males according to the results for the cohorts under study. This can be partly explained by the insignificant role of females' education in the traditional custom and the relatively smaller size of highly educated females in the past in China. However, the situation is expected to change in young cohorts as more and more females are pursuing post secondary education.

Besides educational attainment, the place of residence and the ethnicity also make substantial difference in isolating subpopulations in the marriage process. Thus the diffusion process has distinctive effects for various male and female subpopulations. Generally, the subpopulation in cities has lowest initial marriageability, highest constant of deterioration, and highest proportion ever married. The situation for the subpopulation in the countryside is exactly opposite. However, this is more evident for males than for females. The female subpopulations under study demonstrate no substantial contrast over cohorts, and this may be related with the gender differential in marriage-oriented migration.

Although the model proposed by Hernes is not confined to the female population, the existing empirical results of this model focus exclusively on the female population. In this study, I apply Hernes' model to examine the first marriage process for both female and male populations in China. The goodness of fit for the model is illustrated in the appendix Figures (Figures 20 through 85), from which the diversity of the marriage process in the different subpopulations is also evident.

As a whole, Hernes' model seems to fit much better for the male population in China than for the female population. Possibly this is because females are more "scarce" on the marriage market. Although most Chinese appreciate entering into marriage, the declining fertility rate and the well-accepted marriage norm of older husband with younger wife may result in the unfulfilled demand for females on

the marriage market. Therefore, the declining marriageability along with age is more of a problem for males than for females.

Based on my results for the cohorts with completed marriage experience (the cohorts aged 40 and above in 2000), the model fits much better in the older cohorts (aged 50-54, 55-59, 60-64 and 65-69 in 2000). For the youngest cohort in this study (aged 40-44 in 2000), the cumulative proportion ever married is somewhat overestimated for the ages from roughly 18 to 25. And the cumulative proportion ever married for the cohort aged 45-49 in 2000 is underestimated below age 20 and overestimated from 20 to 25. To a great extent, these distinctions reflect the historical shifts in the tempo of the first marriage process. More detailed pictures for the subpopulations with distinct socioeconomic characteristics are displayed in the appendix Figures as well.

Although this study aims at improving our understanding about the marriage process in modern Chinese population, most of the cohorts under study got married two decades ago. Therefore, the rapid changes in Chinese society during the past two decades are hardly seen in these cohorts. Furthermore, by using the retrospective data, the result in this study is not insulated from selectivity (e.g. mortality-related selectivity) especially in old cohorts. Further studies in this field can be carried out by projecting the marriage process for the young cohorts (as used by Goldstein et al). With the changing socioeconomic characteristics (e.g. education) and the new ideology prevalent in young cohort (not shown in this study), the marriage process is expected to display more diversity in the future.

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Appendix:

Table1: Cohort-specific singulate mean age at marriage for males

	Singulate mean age at marriage for males (SMAM)					
	40-44	45-49	50-54	55-59	60-64	65-69
National	24.0	24.1	23.6	23.4	23.2	22.6
Primary school	23.4	23.6	23.2	23.1	22.9	22.4
Junior middle school	23.9	24.3	23.7	23.2	23.3	22.7
Senior middle school	24.3	24.7	24.5	24.5	24.1	24.1
Vocational school	24.6	24.9	24.8	24.3	24.4	23.4
Junior college	25.4	25.9	25.7	25.2	25.1	24.3
College and above	25.9	26.7	27.0	27.0	26.9	26.1
City	25.2	25.6	25.3	24.8	24.5	23.4
Town	24.0	24.4	23.8	23.8	23.5	22.8
Countryside	23.4	23.5	23.0	22.9	22.7	22.3
Non-han (minorities)	23.3	23.5	23.1	23.1	23.3	22.8
Han	24.0	24.2	23.6	23.4	23.2	22.6

Table2: Cohort-specific singulate mean age at marriage for females

	Singulate mean age at marriage for females (SMAM)					
	40-44	45-49	50-54	55-59	60-64	65-69
National	22.3	22.0	21.0	20.4	20.1	19.8
Primary school	21.5	21.2	20.5	20.0	19.9	19.7
Junior middle school	22.7	23.1	22.2	21.1	21.0	21.0
Senior middle school	23.6	24.3	23.9	22.6	22.1	22.0
Vocational school	24.1	24.6	23.9	23.0	22.5	22.7
Junior college	24.7	25.3	25.1	23.9	23.3	22.6
College and above	25.5	26.2	25.7	25.3	25.4	23.9
City	23.7	23.7	22.4	21.4	20.5	20.0
Town	22.4	22.2	21.2	20.3	20.2	19.8
Countryside	21.7	21.3	20.5	20.1	20.0	19.8
Non-han (minorities)	21.5	21.3	20.7	20.5	20.5	20.4
Han	22.4	22.0	21.1	20.4	20.1	19.8

Table 3: Cohort-specific duration from the first 10% to the last 10% marriages—males

	Years elapsed from the first 10% to the last 10% marriages—males					
	40-44	45-49	50-54	55-59	60-64	65-69
National	8	10	11	12	12	12
Primary school	18	15	14	16	13	13
Junior middle school	7	9	9	10	10	11
Senior middle school	7	7	10	10	11	13
Vocational school	6	7	9	9	11	12
Junior college	6	6	9	10	10	14
College and above	6	6	8	7	9	12
City	8	8	10	10	11	12
Town	7	9	10	11	11	12
Countryside	10	11	12	13	13	13
Non-han (minorities)	9	11	11	11	12	12
Han	8	10	11	12	12	12

Table 4: Cohort-specific duration from the first 10% to the last 10% marriages—females

	Years elapsed from the first 10% to the last 10% marriages—females							
	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69
National	6	6	6	8	8	8	7	8
Primary school	6	6	7	8	7	7	8	8
Junior middle school	6	6	6	8	9	7	8	10
Senior middle school	7	6	5	6	9	9	8	9
Vocational school	6	5	5	7	8	7	8	10
Junior college	7	6	6	6	9	7	9	8
College and above	6	6	6	5	8	5	6	8
City	7	6	6	8	9	9	8	9
Town	7	6	6	8	9	7	7	8
Countryside	7	6	7	7	8	7	8	8
Non-han (minorities)	8	7	7	9	9	9	10	10
Han	6	6	7	8	8	8	7	8

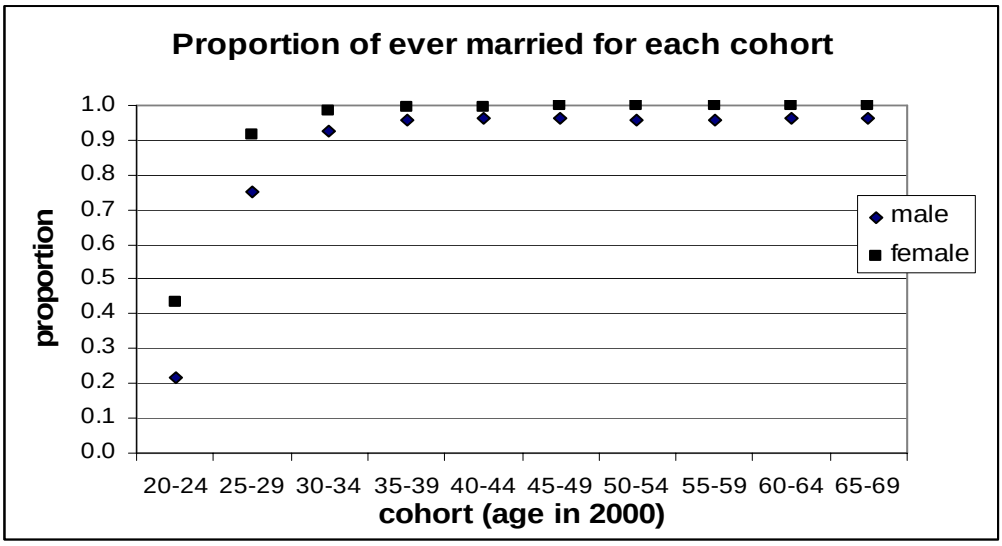


Figure 1

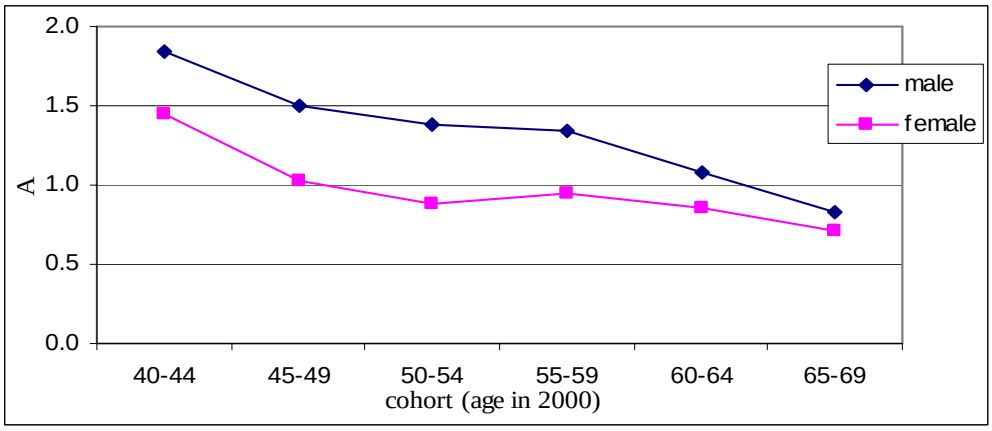


Figure 2: Change in the initial marriageability (A) over cohorts

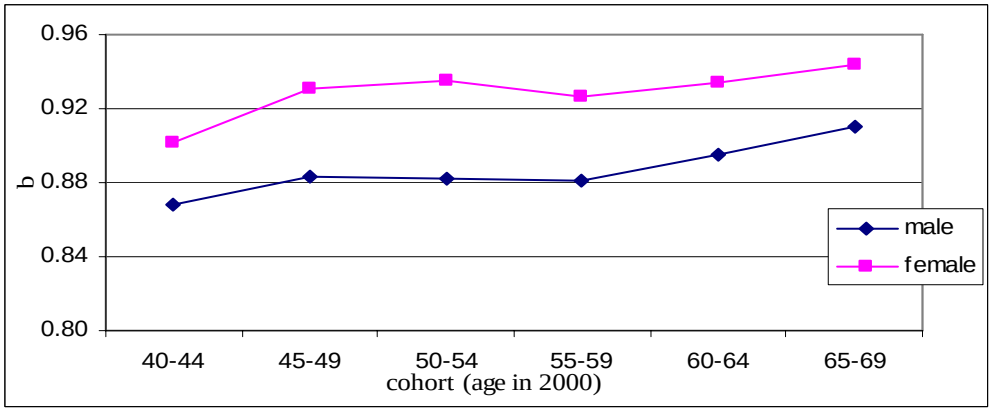


Figure 3: Change in the constant of deterioration (b) over cohorts

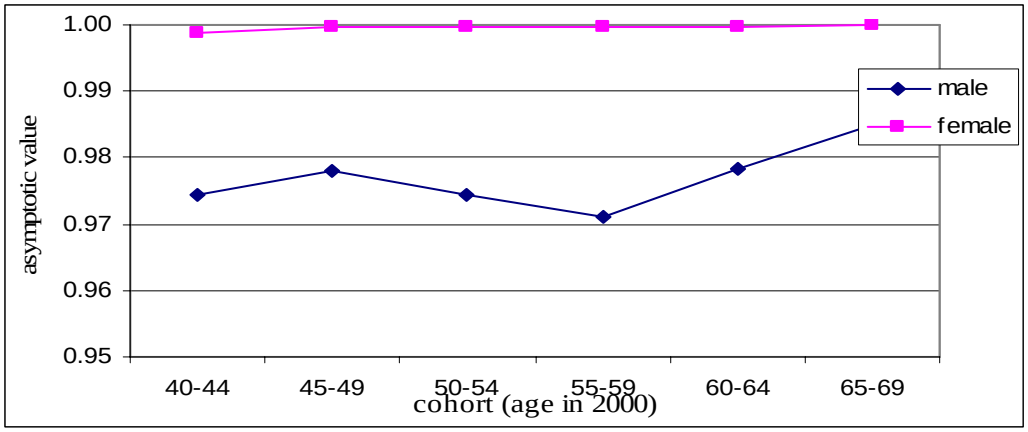


Figure 4: Change in the asymptotic value over cohorts

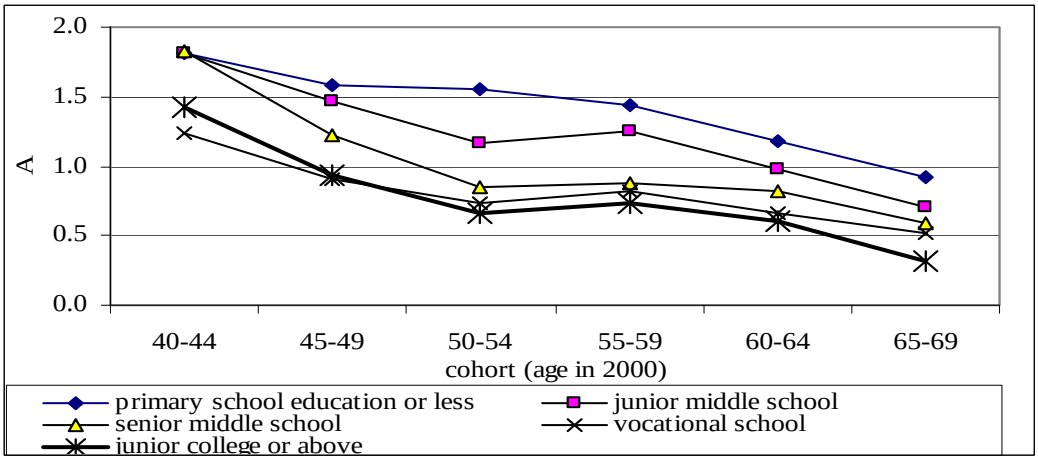


Figure 5: Change in the initial marriageability (A) over cohorts—male

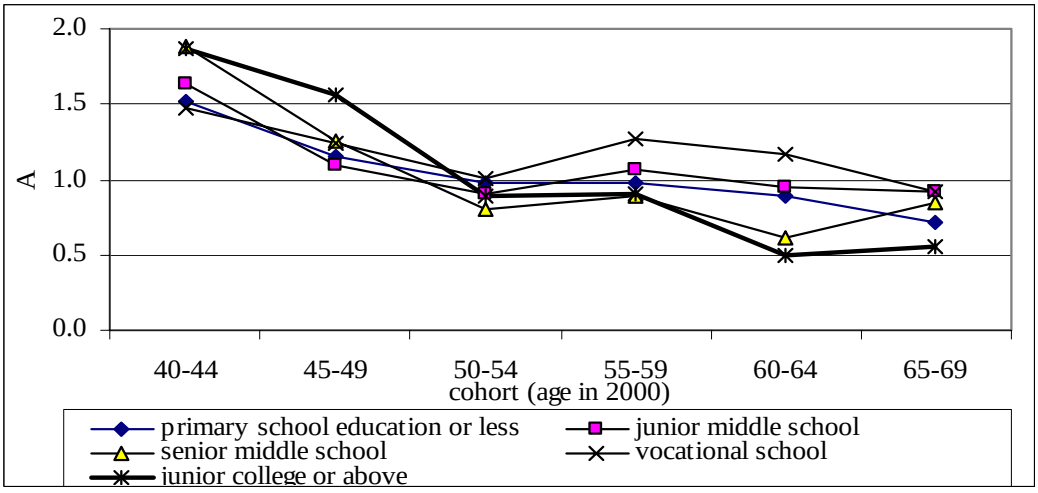


Figure 6: Change in the initial marriageability (A) over cohorts—female

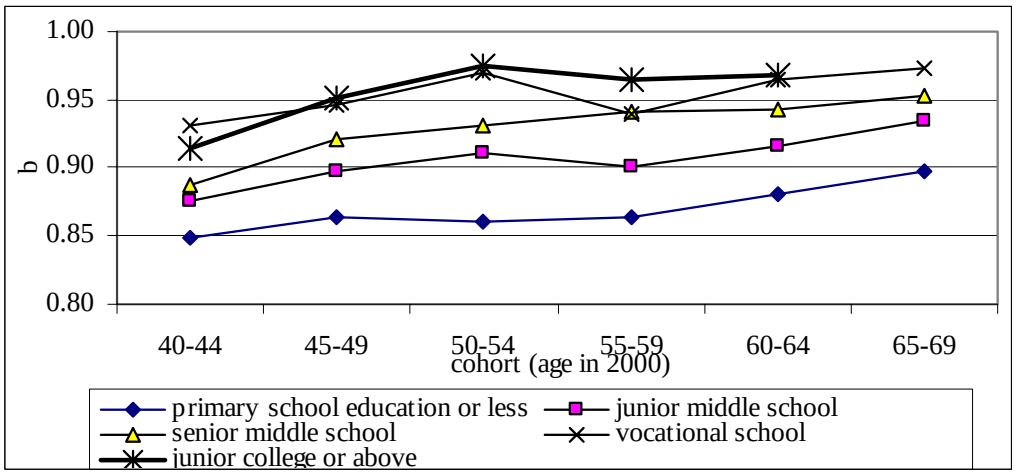


Figure 7: Change in the constant of deterioration (b) over cohorts—male

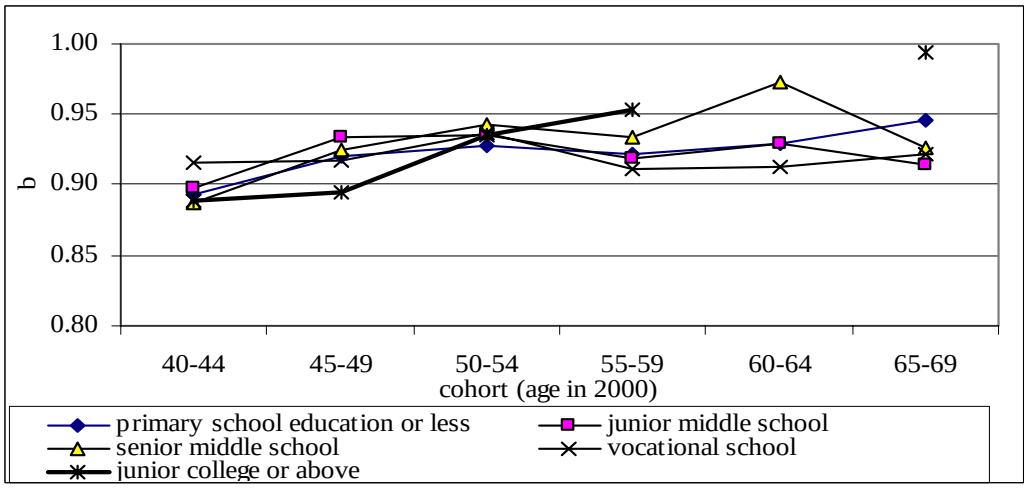


Figure 8: Change in the constant of deterioration (b) over cohorts—female

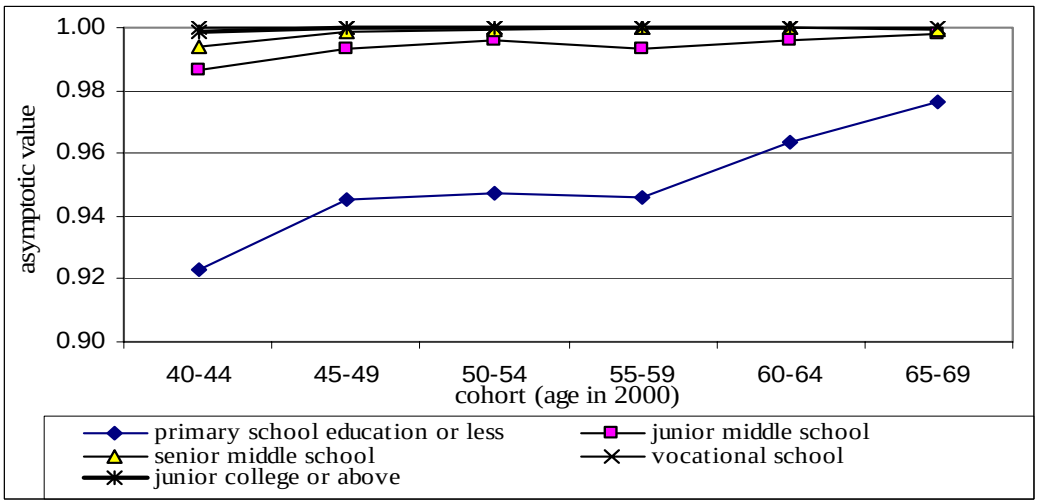


Figure 9: Change in the asymptotic value over cohorts—male

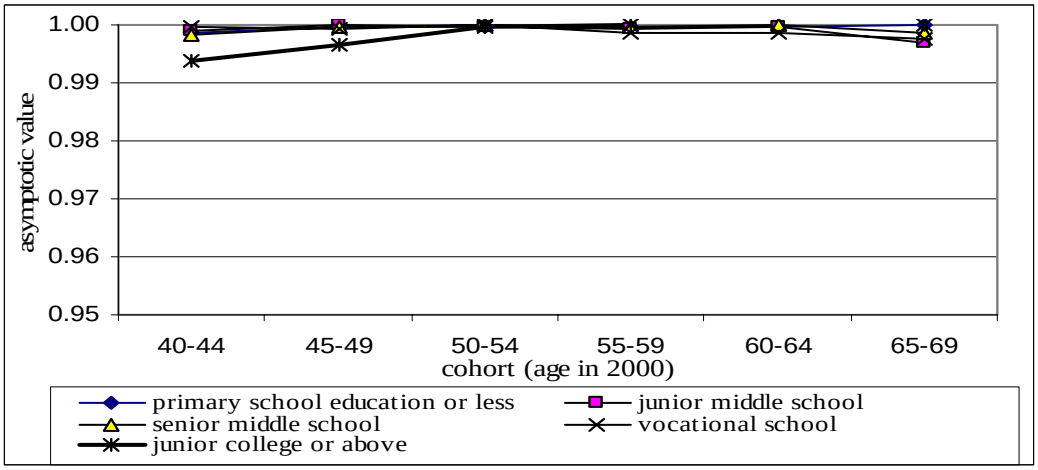


Figure 10: Change in the asymptotic value over cohorts--female

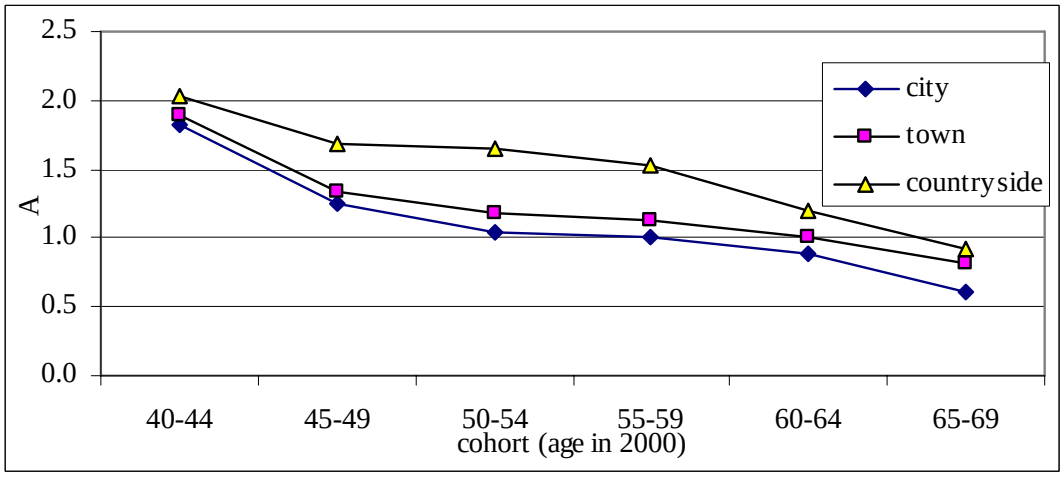


Figure 11: Change in the initial marriageability (A) over cohorts—male

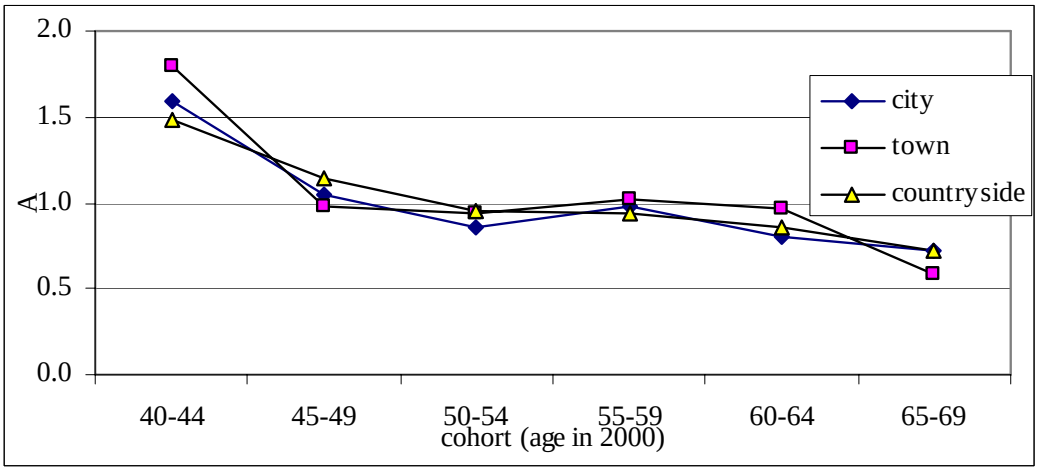


Figure 12: Change in the initial marriageability (A) over cohorts—female

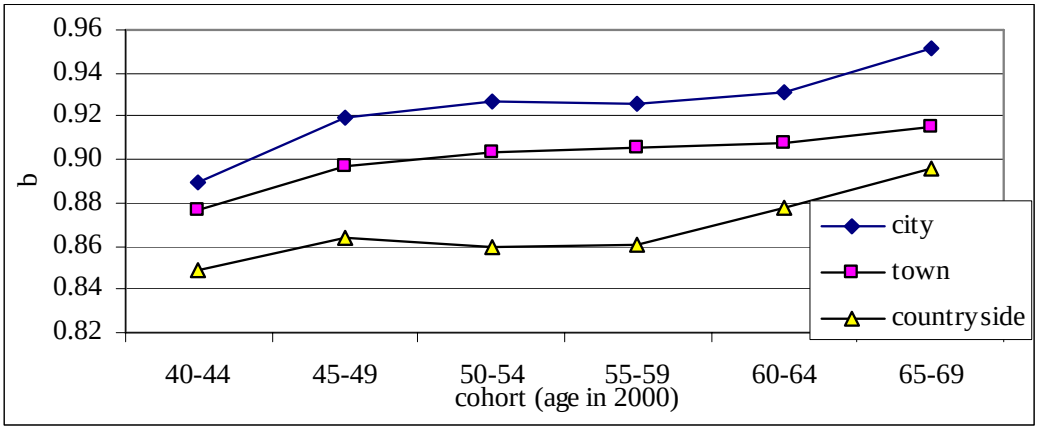


Figure 13: Change in the constant of deterioration (b) over cohorts—male

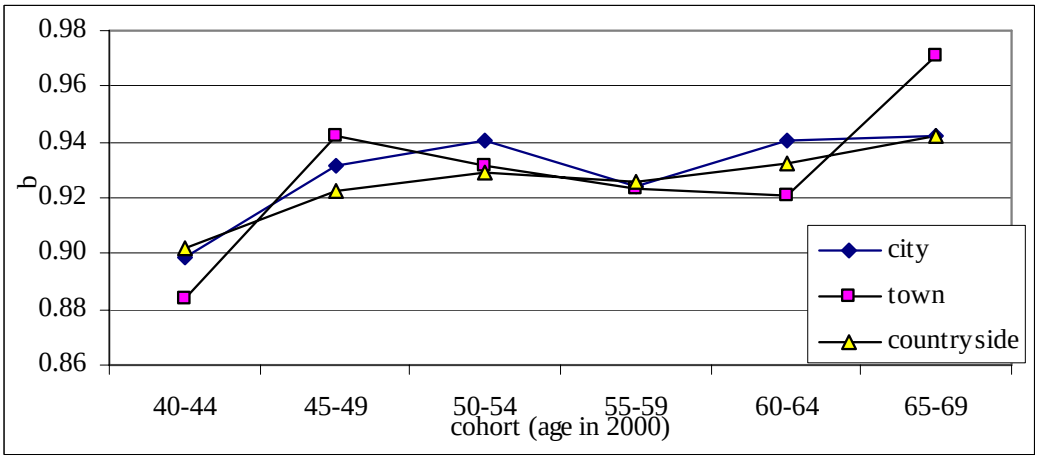


Figure 14: Change in the constant of deterioration (b) over cohorts—female

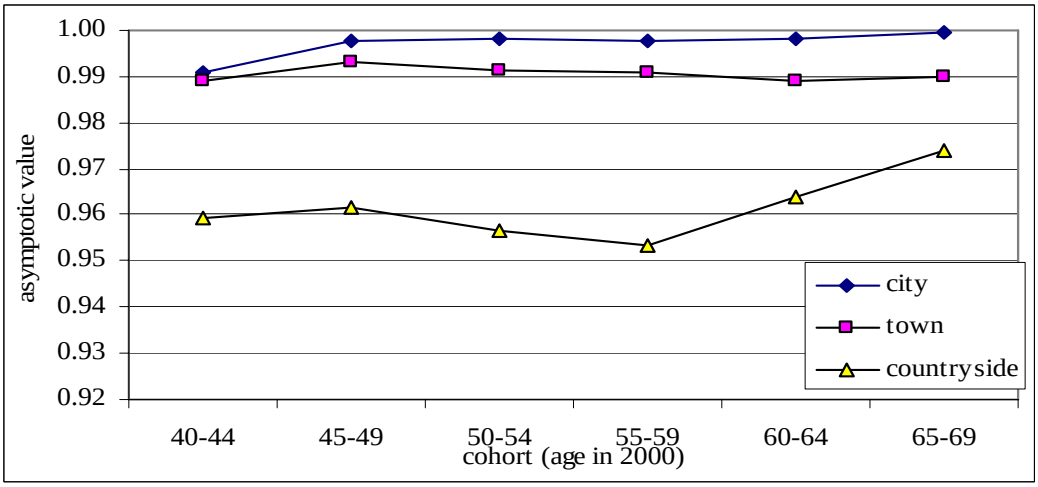


Figure 15: Change in the asymptotic value over cohorts—male

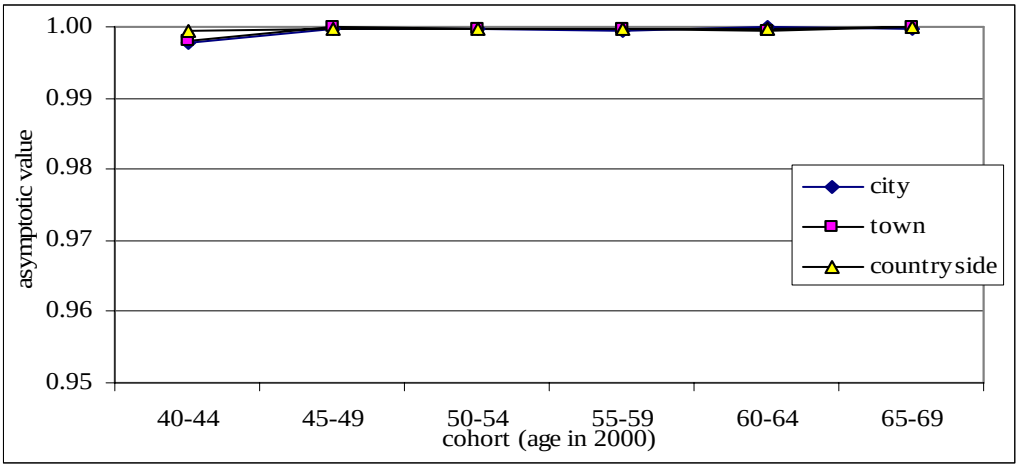


Figure 16: Change in the asymptotic value over cohorts—female

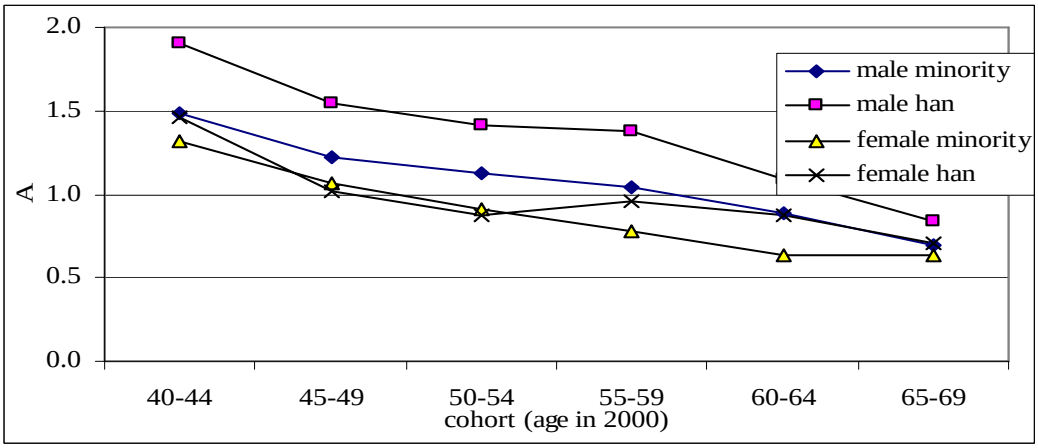


Figure 17: Change in the initial marriageability (A) over cohorts

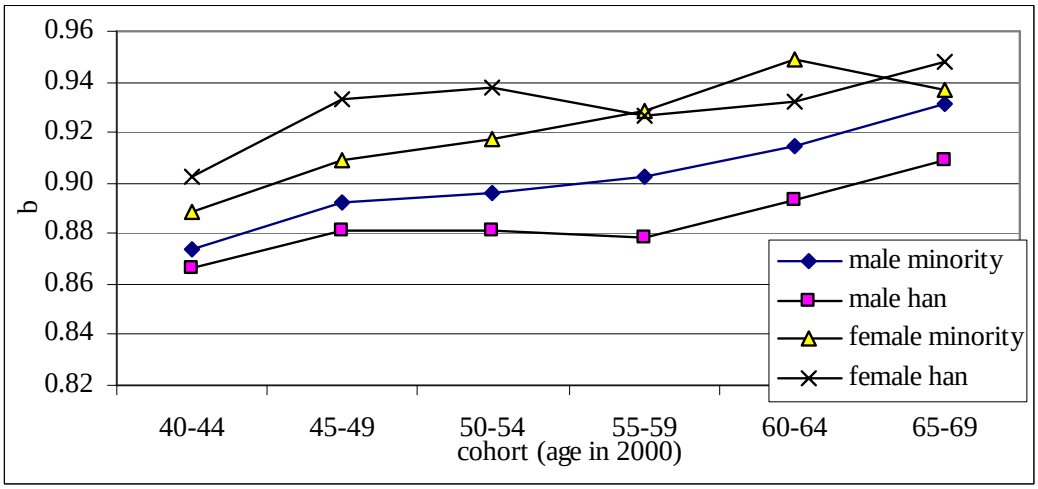


Figure 18: Change in the constant of deterioration (b) over cohorts

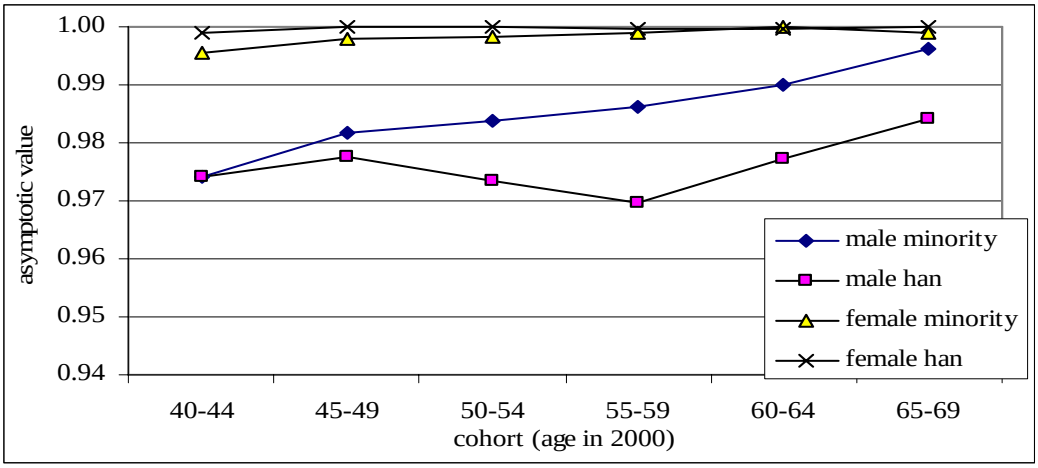
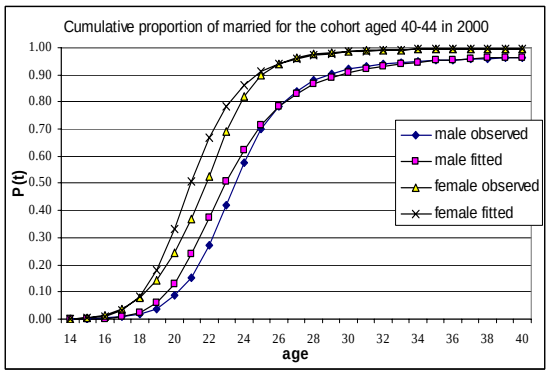


Figure 19: Change in the asymptotic value over cohorts



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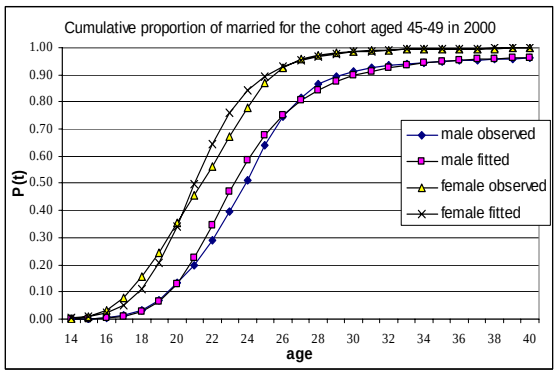

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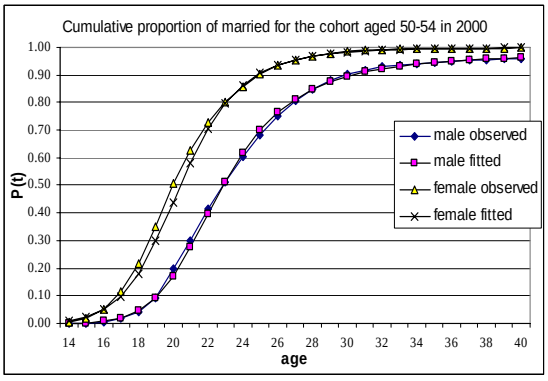

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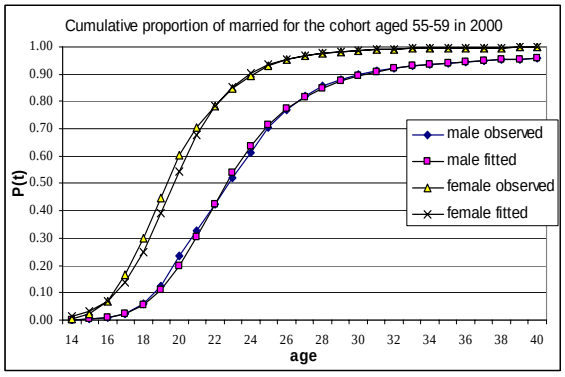

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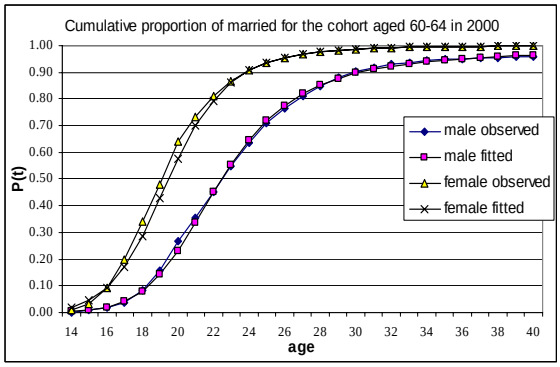

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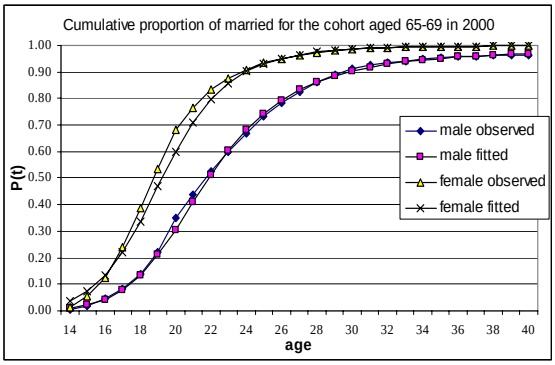

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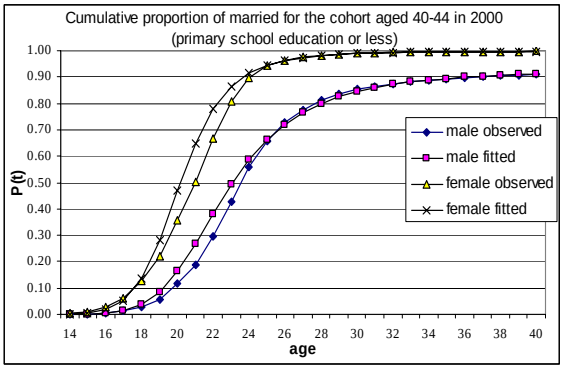

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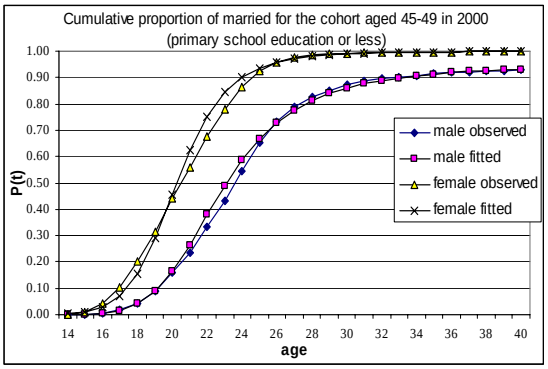

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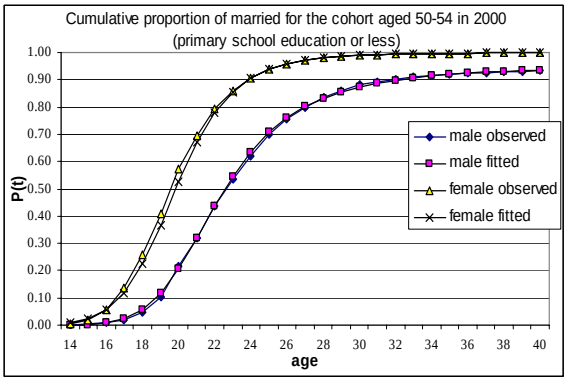


Figure 28

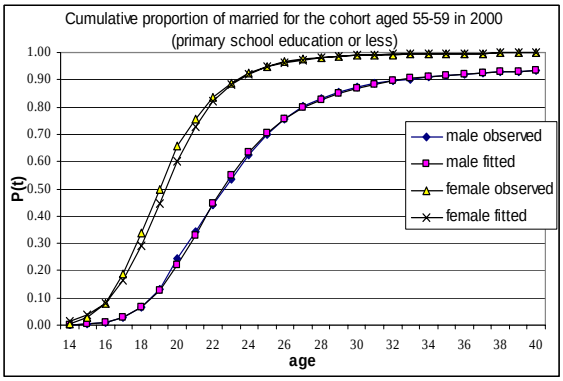
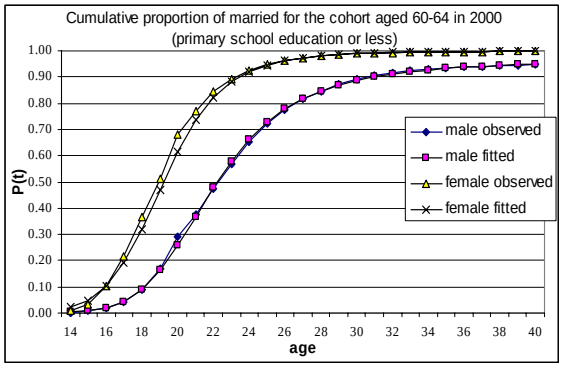


Figure 29



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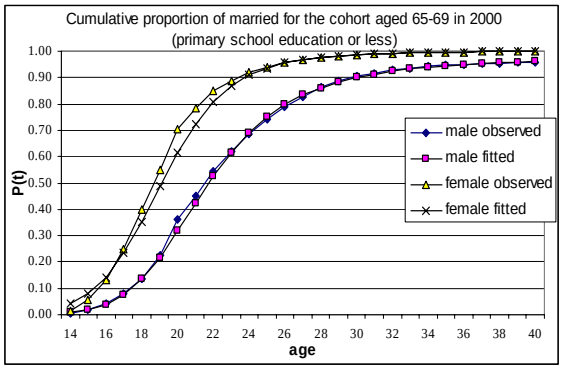

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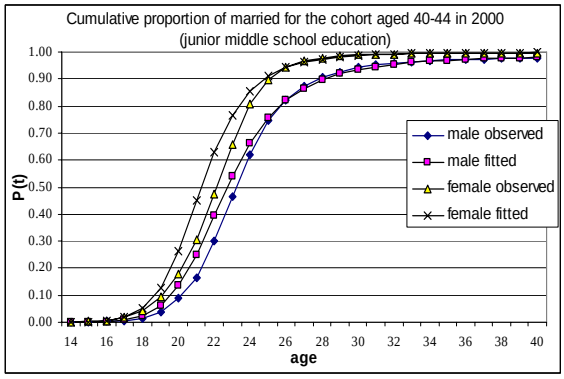
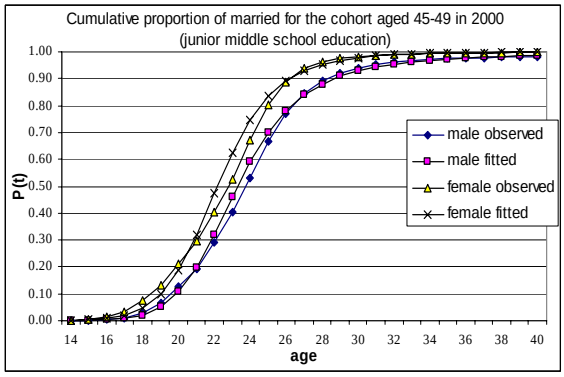


Figure 32



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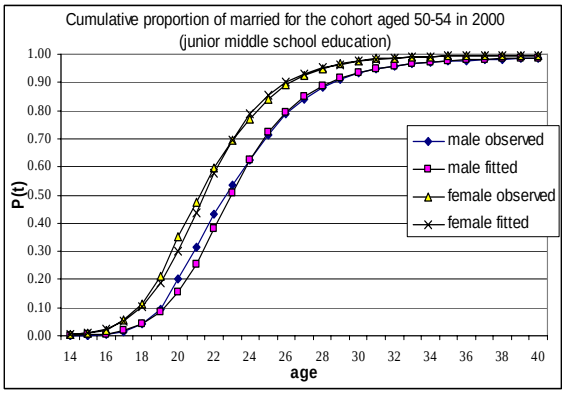

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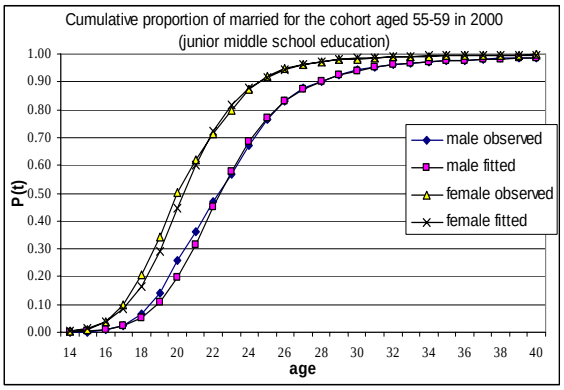

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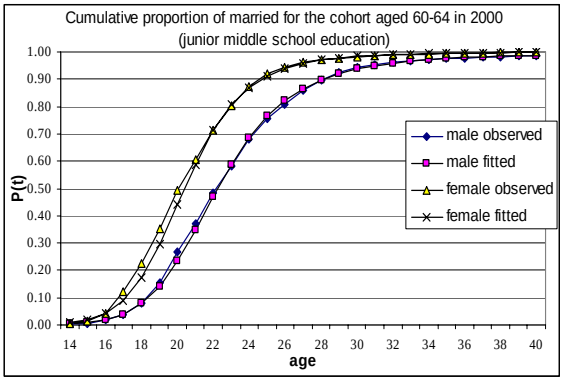

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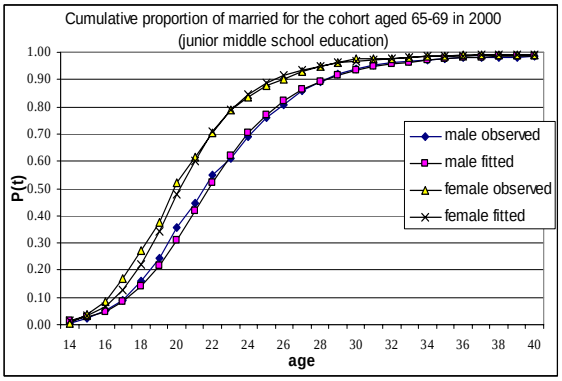

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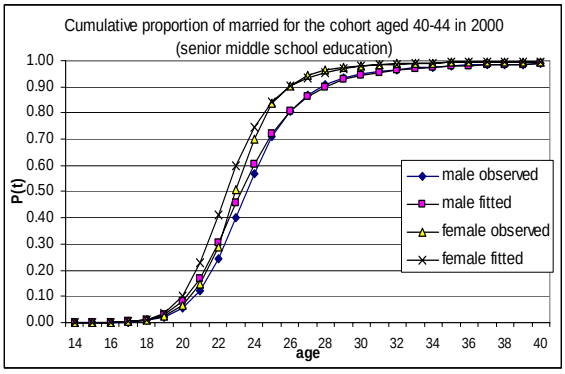

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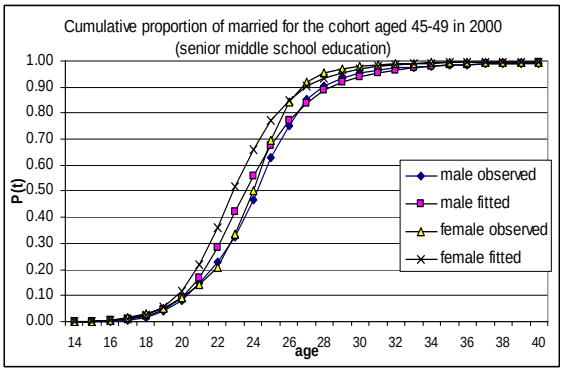

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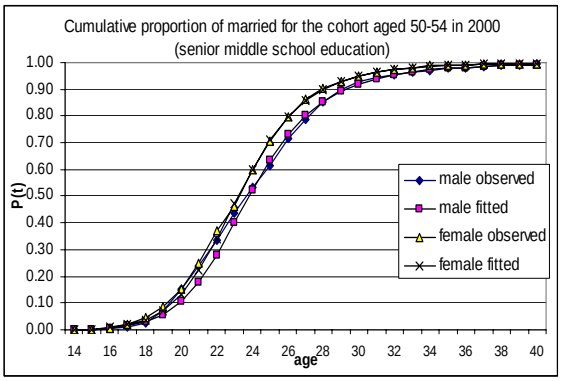

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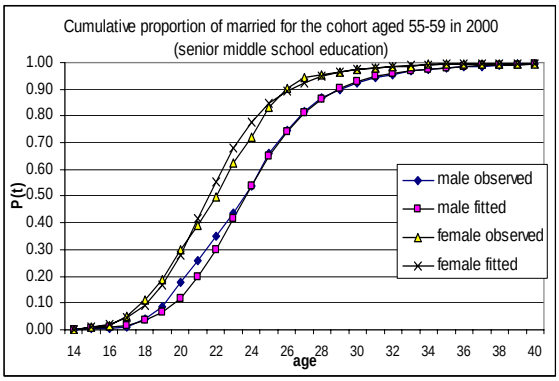

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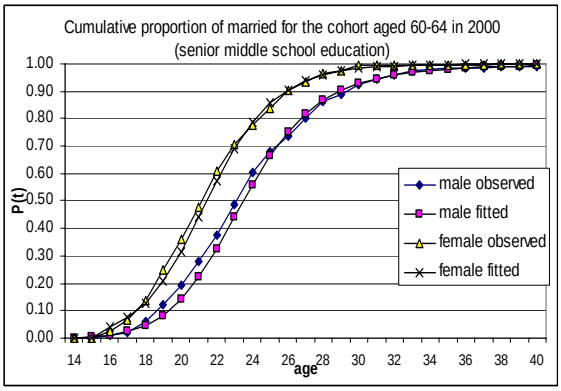

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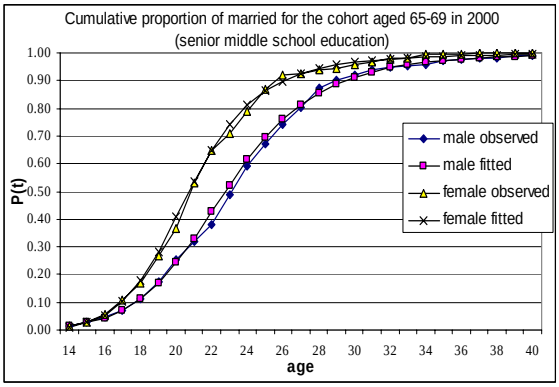

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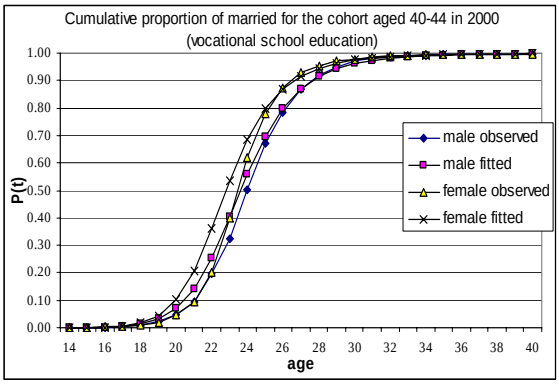

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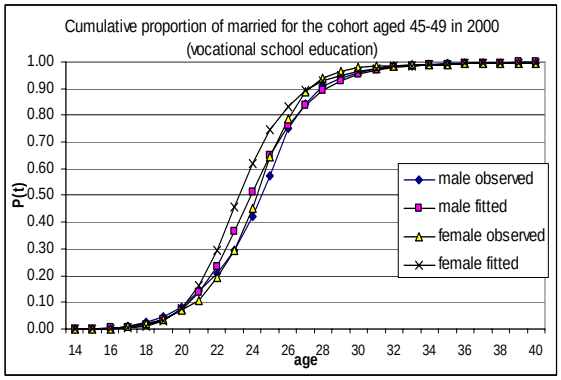

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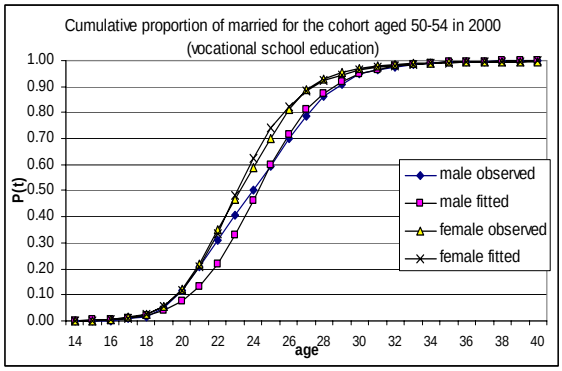

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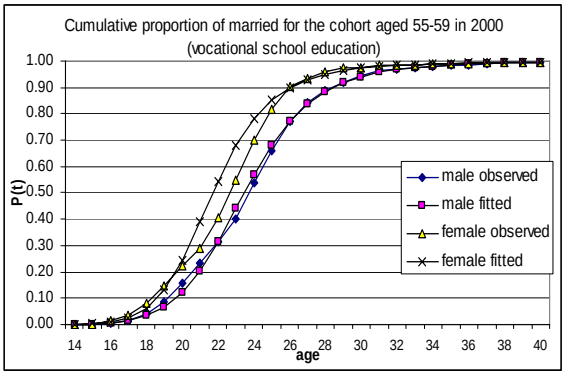

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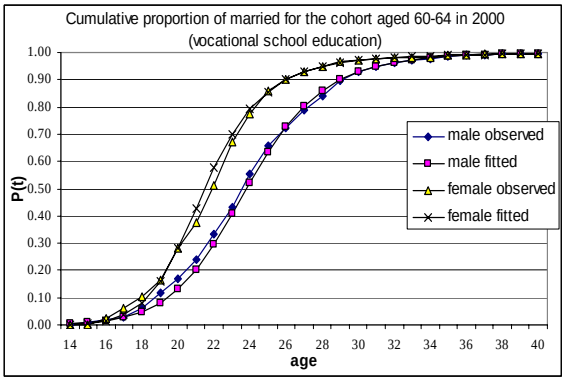

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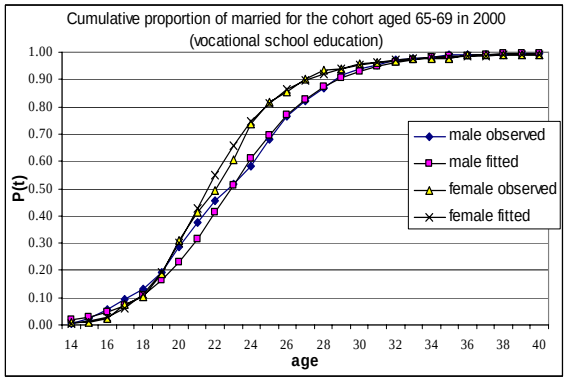

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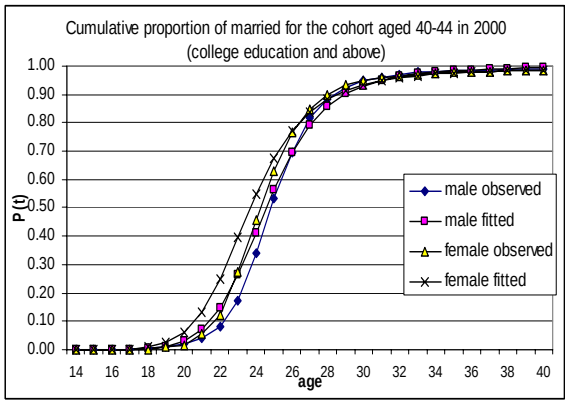
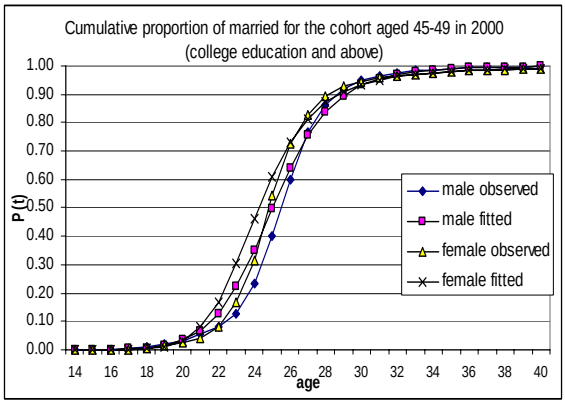


Figure 50



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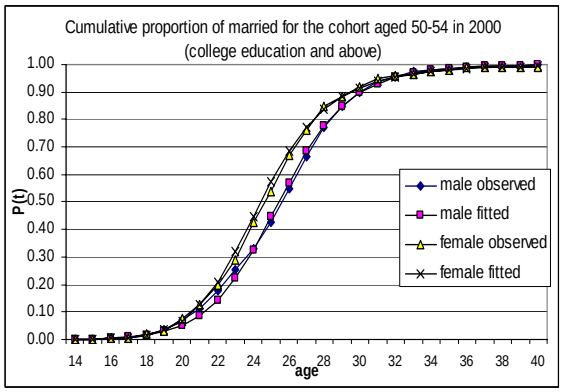
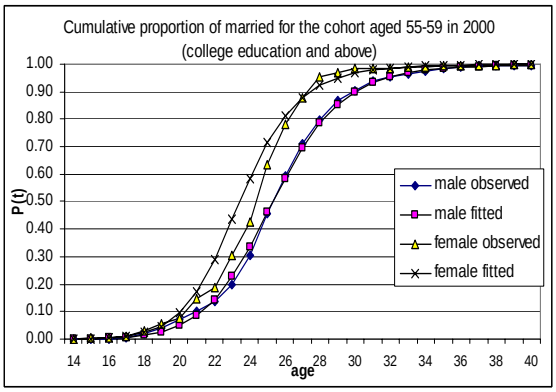


Figure 52



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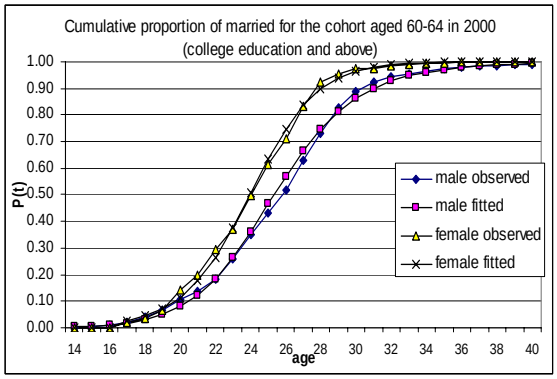

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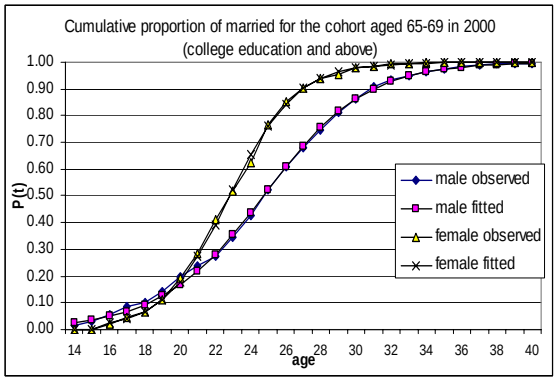

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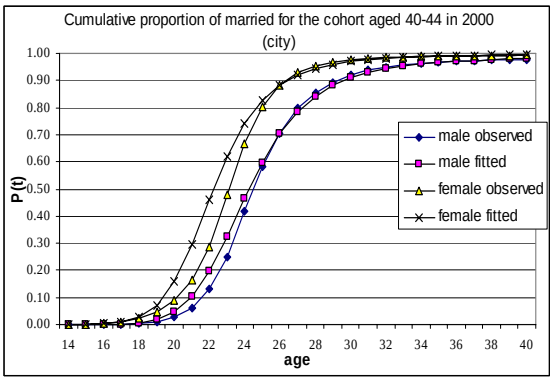

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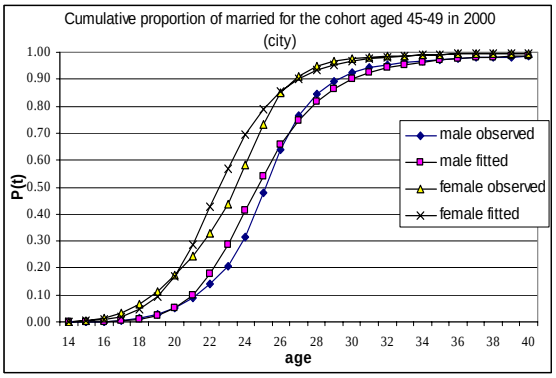

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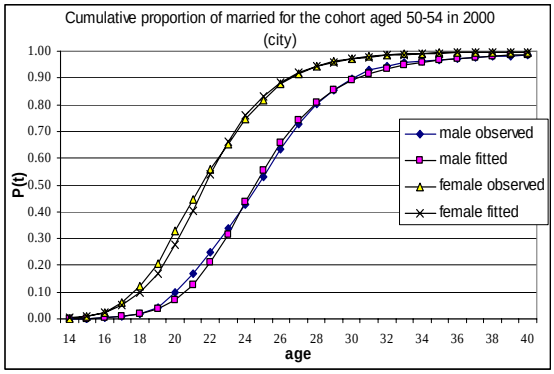

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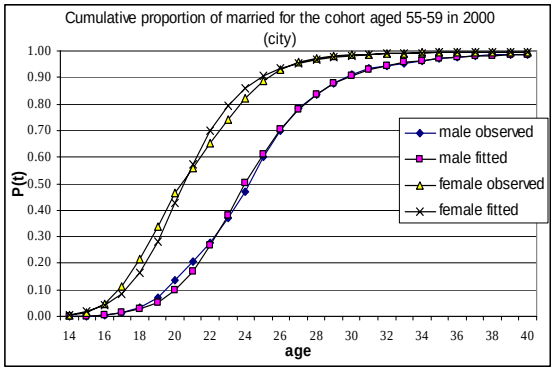

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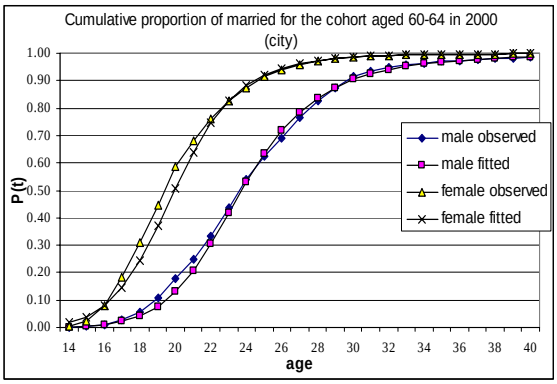

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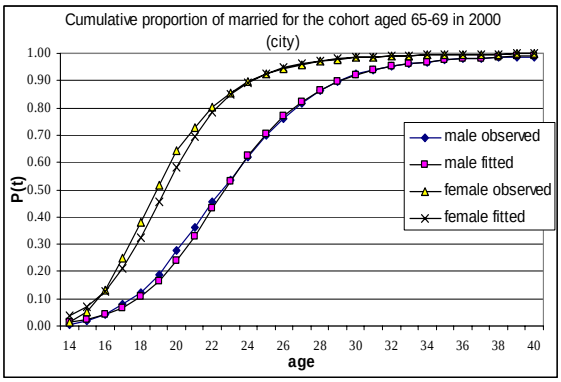

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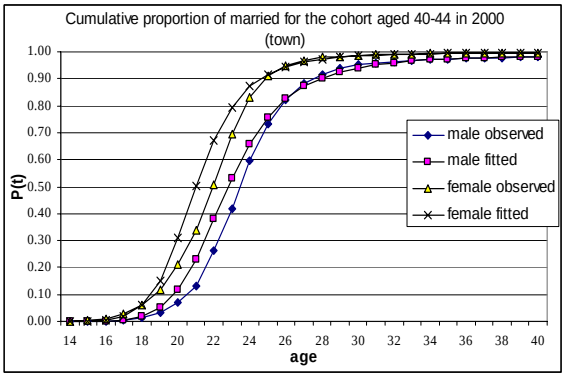

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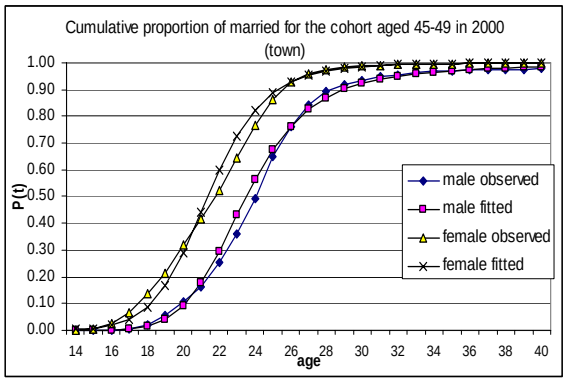

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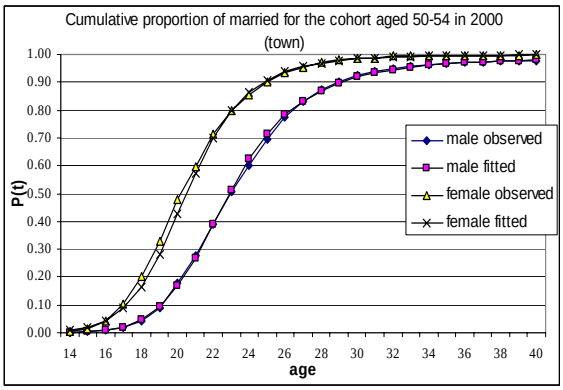

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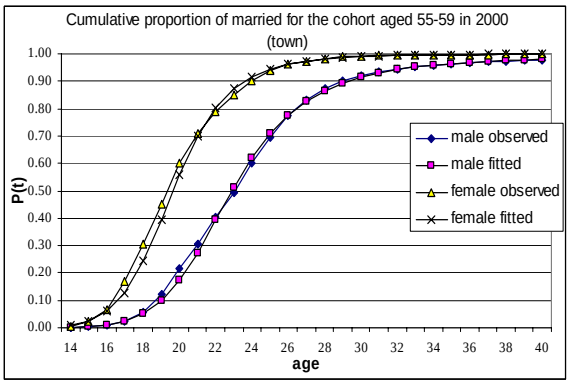

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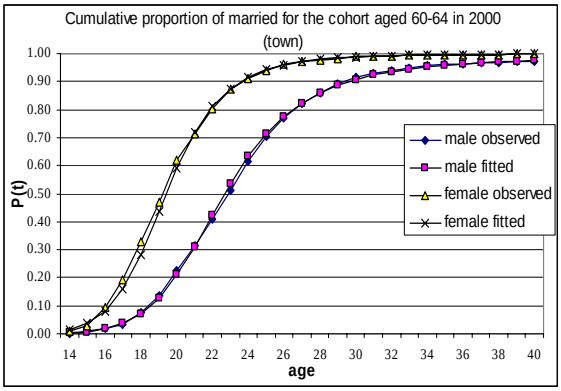

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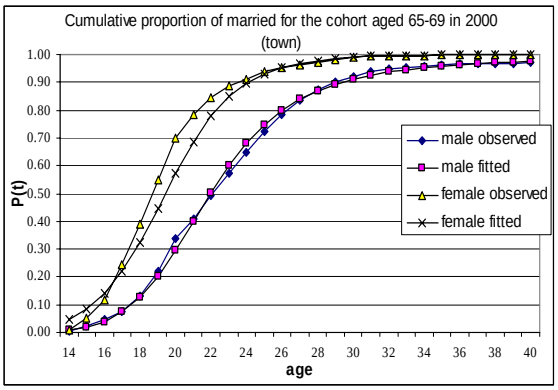

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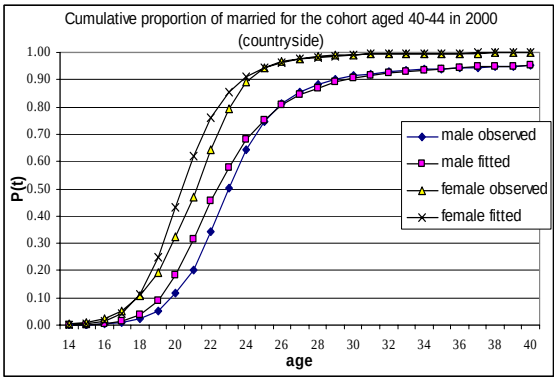

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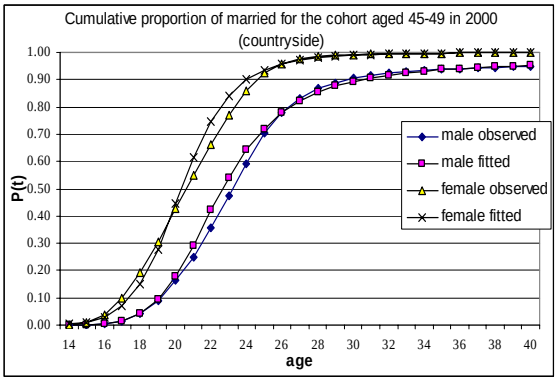
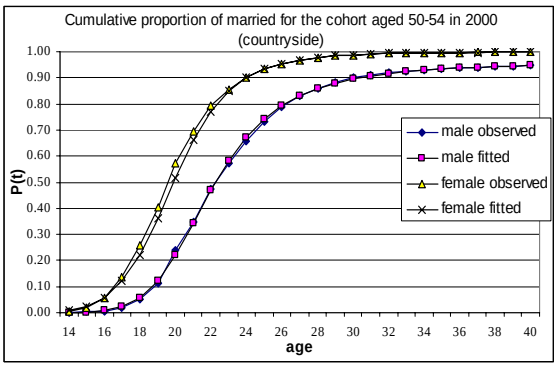


Figure 69



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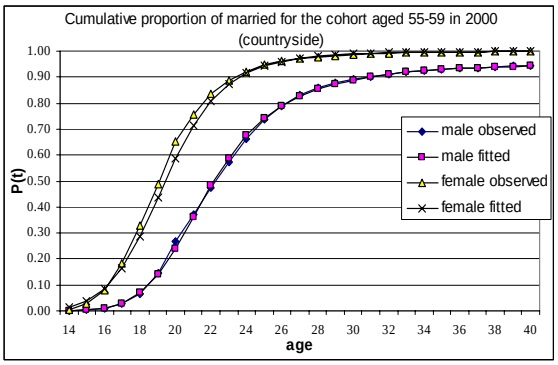

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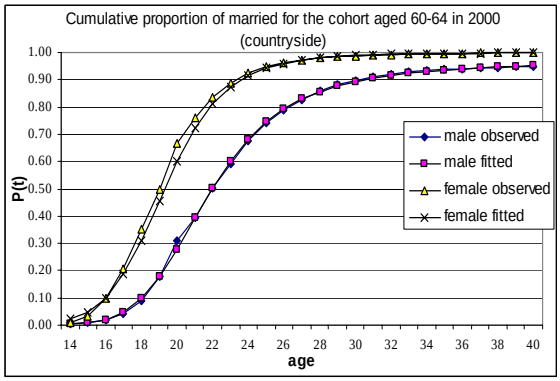

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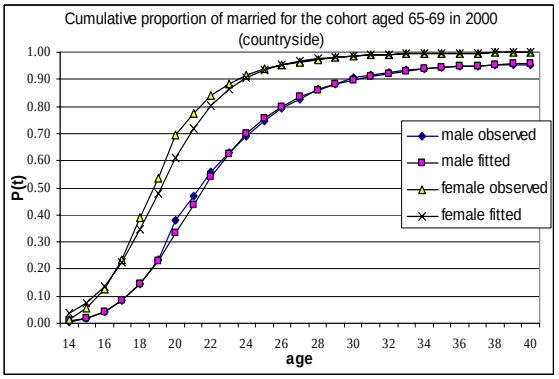

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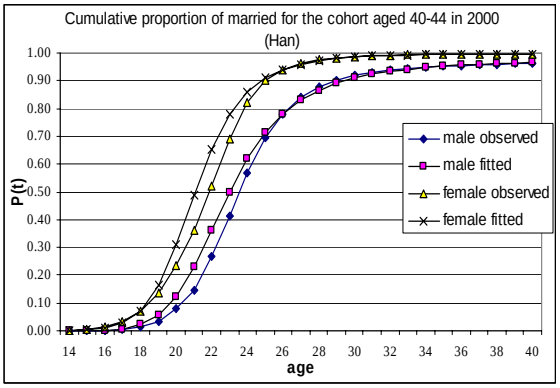

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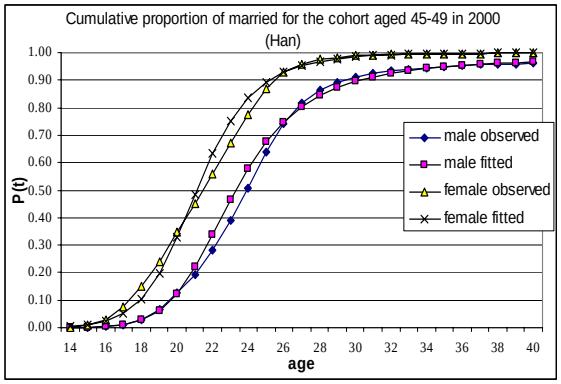

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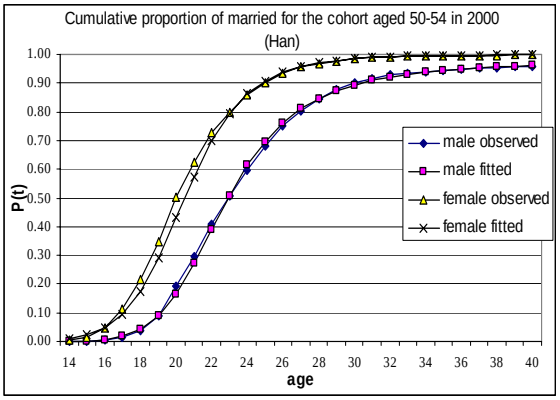

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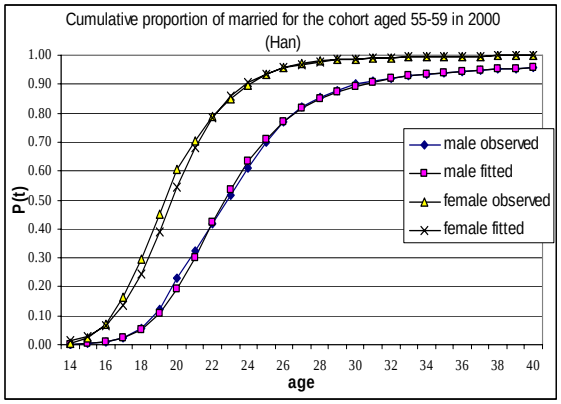

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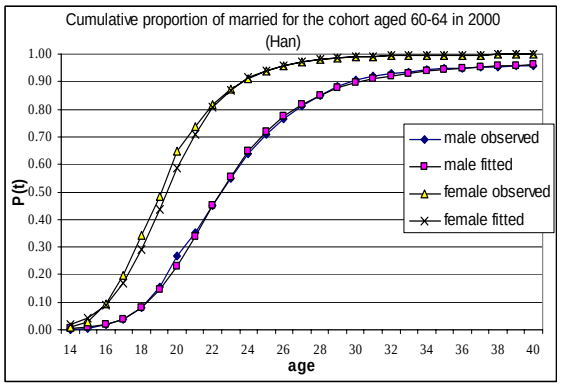

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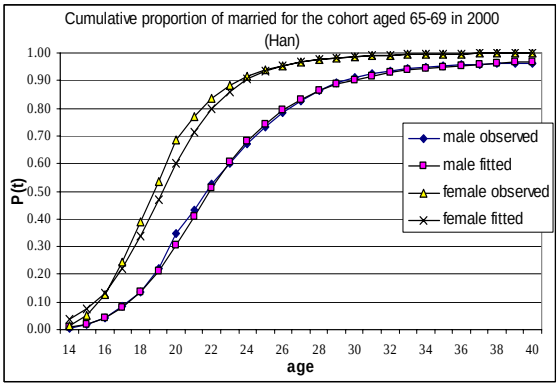

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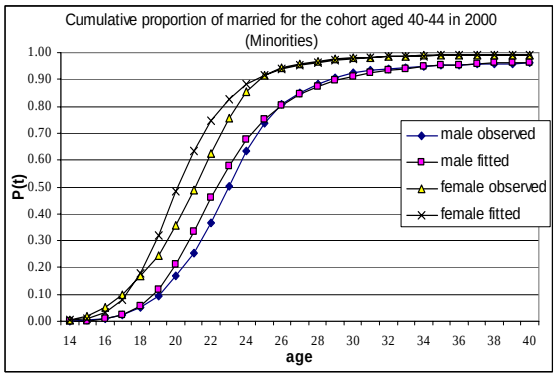

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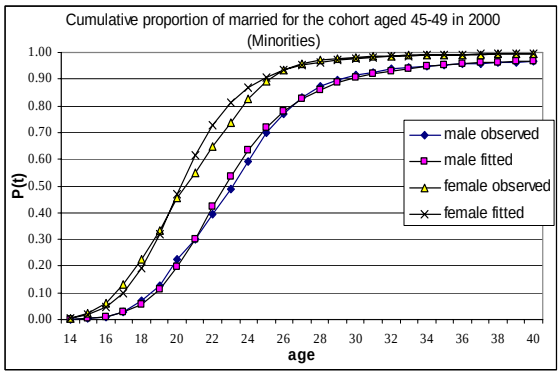

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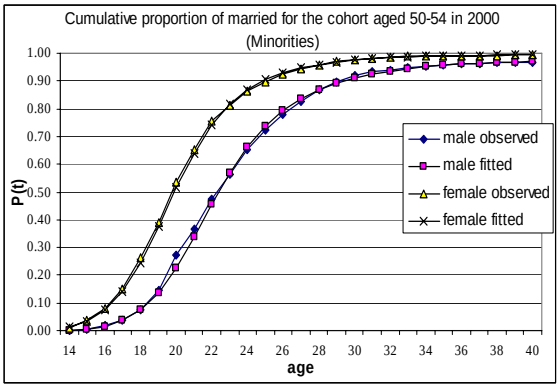

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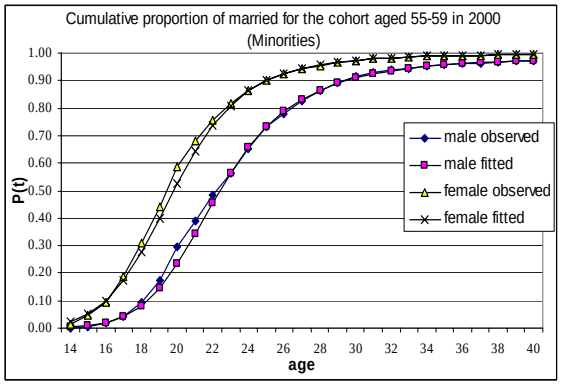

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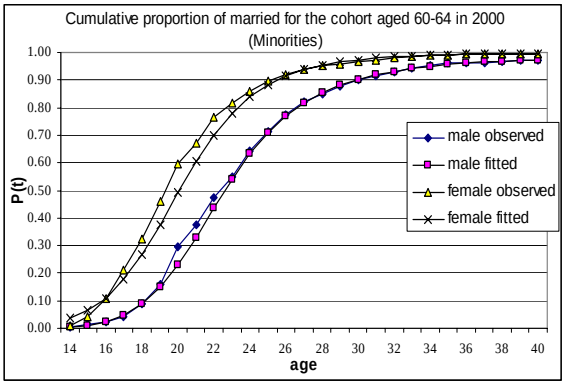

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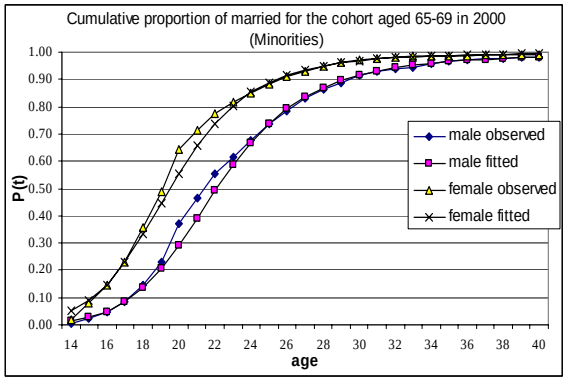

Figure 85