

Reassessing delayed and forgone marriage in the United States

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Abstract

Demographic projections from standard nuptiality models suggest that four-year college graduates are becoming more likely to marry than other women, and that the proportion of all U.S. women ever marrying may be stabilizing after decades of decline. To test these findings, I develop a new projection technique that predicts the proportion of women marrying by age 45 under flexible assumptions about trends in age-specific marriage rates and effects of unmeasured heterogeneity. Results from the 1996 and 2001 Surveys of Income and Program Participation suggest that the “crossover” in marriage by educational attainment is weaker and taking longer than previously predicted. Instead, the strongest educational divergence with respect to delayed marriage involves childbearing; among all women who delay marriage, college-educated women are the only group becoming more likely to have a child after (and not before) marriage. Also, while these results suggest some stabilization from previous declines in the proportion of all women who ever marry, recent trends are still broadly consistent with an ongoing slow decline in marriage.

Introduction

Marriage rates in the United States have continued a slow decline through recent decades. Just under 2.2 million couples married in 2003, the lowest number since the mid-1970s and the lowest overall rate of all time – at 7.5 per thousand, just lower than 7.8 per thousand in 2002 and 7.9 per thousand at the dismal heart of the Great Depression in 1932 (NCHS 2004, U.S. Statistical Abstracts 2001 and 1970.) To a large extent, this decline in marriage rates represents a change in marriage timing rather than a change in the proportion of women and men who ever marry. However, marriage rates cannot continue to decline indefinitely without producing dramatic changes in the proportions never-marrying and the characteristics of the marriages that do occur.

Trends in marriage in the United States have three intersecting social dimensions of special interest to many observers. One dimension involves cultural and ideological changes that promote individual over collective values, thereby leading to marked changes (or declines) in family patterns (Popenoe 1993, Bumpass 1990). A second, related dimension involves the decades-long rise in women's labor force participation and the potential conflicts that arise between work and family, particularly in women's young adult years.

The third dimension, and the one of primary interest in this paper, involves diverging family patterns in a time of rising social and economic inequality. Differences in the levels or circumstances of marriage have the potential to “lock-in” inequality. If socio-economic advantage coincides with a higher probability of marriage or with more favorable circumstances in the marriages that occur, then disadvantageous family patterns could become concentrated among couples and children that already face economic hardships (c.f. Elwood and Jencks 2004). The analysis of marriage in the context of social inequality is particularly difficult because it

requires comparisons across social categories (such as race and educational level) as well as across ages and time periods.

Previous analyses of group differences in the proportions of women ever marrying have focused on race or education, and trends by race are fairly clear. From the 1960s to the 1980s proportions ever marrying declined for all women from the historically high levels of the baby boom (Espenshade 1985, Rodgers and Thornton 1985), but have always been lower for black women than for white women (Bennett, Bloom and Craig 1989). Since 1980, proportions ever marrying have continued to decline rapidly among black women, but proportions ever marrying among white women and hence the overall population may have stabilized or even increased slightly since the late 1980s (Goldstein and Kenney 2001, Schoen and Standish 2001).

Trends by education are more uncertain, and have varied across time periods and even statistical models. Goldstein and Kenney (op. cit.) find evidence for an educational crossover in marriage, with proportions of white women who ever marry increasing to very high levels among women with a four-year college degree (over 97% for white college grads born in 1960 to 1964), surpassing the high proportions marrying among women of lower educational attainment. These findings of nearly universal marriage among college graduates contrast strongly with earlier work by Bennett and Bloom (1986) which projected that 20% of white, college-educated women would never marry.

Much of the uncertainty in these studies stems from a central methodological problem – researchers want to make pronouncements about birth cohorts of women *well before* they have finished their marrying years. This was a fairly minor problem when most women married before their mid-twenties. However, women in the United States now marry at later ages than ever before (Fitch and Ruggles 2000). Furthermore, new cultural factors contributing to delayed

marriage, such as women's career involvement and reliable birth control, may shape the age patterns of marriage in historically novel ways, potentially confounding both formal and informal attempts to use past marriage patterns to predict the future.

This paper assesses trends in the proportion of United States women who marry by age 45, compared across race and educational attainment, and with an emphasis on how trends in delayed marriage might affect the characteristics of those marriages. I base my marriage projections on the newest available surveys with large samples and marriage histories (the 1996 and 2001 Surveys of Income and Program Participation, or SIPP) and on a modified form of a fertility projection approach used by Rindfuss, Morgan and Swicegood (1988). In addition, I measure trends and group differences not only in the numbers of delayed marriages, but also in two important characteristics of those marriages – whether a delayed marriage was preceded by a nonmarital birth, and whether a delayed marriage is followed by a birth within ten years.

Conceptual and Modeling Issues

Given a birth cohort for whom marriage rates for the mid-adult years are as yet unobserved, there are two ways to predict the proportion that will ever marry. One can predict missing marriages by extrapolating *within cohorts* from marriage patterns in the young adult years of the most recent birth cohorts, or by extrapolating *across cohorts* from age-specific marriage rates observed in the mid-adult years from earlier birth cohorts. As I will explain, each extrapolation approach has important advantages; extrapolating from mid-adult years in previous cohorts allows one to control for *trends in age-specific marriage rates*, while extrapolating from

young adult years within the same cohort allows one to control for *unmeasured heterogeneity* in the population. An ideal projection exercise will combine elements of both approaches.

Age-Specific Marriage Rates

An age-specific marriage rate is the proportion of individuals who marry in a small age interval divided by the proportion unmarried at the start of that interval. The age pattern of marriage rates has traditionally been a hump with a peak in the early twenties, rising steeply at early adult ages and falling more slowly at later ages. For cohorts born since the 1940s, peak marriage rates in young adulthood have been uniformly declining. However, for women in their late twenties and older, trends in marriage rates have been more varied, with period increases for some educational and racial groups and period declines for others. For recent birth cohorts, then, trends in young adult marriage rates do not suffice to predict marriage rates at older ages. To demonstrate how such variation might come about, I will briefly discuss possible cultural or economic shifts that could cause marriage rates at mid-adult ages decline, stay the same, or increase, but that are all consistent with declining young adult marriage rates.

In one possible scenario, marriage rates decline across successive cohorts of young adults and continue to decline across cohorts of mid-adults. Such a pattern of eroding marriage rates at all ages of the life course could occur if social or cultural shifts underlying declines in marriage were not specific to any age. Examples of such shifts include relative decreases in earning power at lower socioeconomic strata, particularly for working-class or minority men (Wilson 1987), the ascendance of individualistic over collective values (Popenoe 1993), or widespread increases in women's economic independence (Becker 1981, Parsons 1949). Declining marriage rates across birth cohorts would result in declines in proportions of women ever marrying across

birth cohorts, although the scale and age patterns of those declines would be subject to buffering effects of exposure and unmeasured heterogeneity (to be discussed in the next section).

Another possibility is that substantial declines in marriage rates across cohorts of young adults would be followed by fairly constant age-specific marriage rates across the same cohorts at older ages. Such a pattern could result from a lengthening of the early adult part of the life course, as more women develop their careers in young adulthood (Oppenheimer 1988) or else simply take time for themselves before entering marriage and childbearing (see Presser 2001), and while young men's careers take longer to develop (Oppenheimer and Lew 1995). In such a scenario, the proportion of individuals ever marrying would decline slowly at first, then stabilize. The proportion ever marrying could still be fairly high, because even relatively low marriage rates for unmarried women and men in their thirties could result in a majority marrying by age 45. Of course, persistent levels of marriage could belie significant changes in the character of marriage as marriages occur at older ages; for example, marital fertility could decline even if the proportion of marriages remains stable, and women who marry at older ages would be exposed to the possibility of a premarital birth for a longer time span.

In a third scenario, marriage rates which *decline* across cohorts of young adults actually *increase* across the same cohorts at older ages, with the result that total proportions ever marrying remain stable or even increase over time. This pattern would distinguish marriage *delayed* from marriage *forgone*. Such a pattern could occur if widespread delays in young adult marriage make later marriages easier or more desirable, for example, by bringing about increases in networks of potential marriage partners at older ages or changes in age preferences for potential marriage partners (NiBhrolchain 1993). In an extreme case, improvements in marriage opportunities at *older* ages could cause marriage rates at *younger* ages to decline even if overall

social conditions become more favorable for young adult marriage; young adults would choose not to marry because it would cost them the opportunity to enter an even better marriage at an older age. Increased women's incomes could have such an effect if they extend opportunities for lengthy marriage searches or increase the importance of income over youth as a signal of high desirability in a potential wife (Sweeney 2002).

In summary, even if young adult marriage rates are declining uniformly, mid-adult marriage rates could plausibly be moving in any direction over time. Hence, for a given birth cohort, an analysis of marriage patterns in young adulthood cannot effectively predict marriage patterns in older adult years. An ideal marriage model should therefore look *across* birth cohorts to capture trends in mid-adult marriage rates, although it is never certain that such trends will persist. Changes in childbearing patterns before and after delayed marriage could also provide supporting evidence for a deliberate shift in the timing of marriage.

Unmeasured Heterogeneity

In a given society there will always be a few individuals less able or willing to enter marriage than others, or else completely unable or unwilling to marry, and this unmeasured heterogeneity has a strong effect on age-specific marriage rates. When a cohort's early adult marriage rates are high, very few of the individuals who are able and motivated to marry will postpone marriage, so the population still unmarried at a later age will largely consist of cohort members who are unable or unmotivated to marry, thereby producing very low observed marriage rates at older adult ages. If a subsequent birth cohort's declining marriage rates at early adult ages increase the proportion of individuals still unmarried at later ages, the *composition* of

the exposed population also changes as more individuals who are intrinsically able or motivated to marry remain unmarried, and observed age-specific marriage rates will rise at later ages.

A modeling approach that uses young adult marriage rates to project mid-adult marriage rates within the same birth cohort allows one to control for effects of unmeasured heterogeneity in the marrying population. If the proportion ever marrying is quite high for a given birth cohort, then even if marriage rates decline across subsequent cohorts, unmeasured heterogeneity will increase the rates of delayed marriages and buffer the decline in proportions ever marrying.

To demonstrate such a buffering effect of unmeasured heterogeneity, I use a simulation of age-specific marriage rates based on the “highest marriage” group in the study – nonhispanic white women born 1945-49 who did not receive a four-year college degree (see Figure 3 for the actual data that inspired these simulations). 95% of these women married by age 45, and most of them married young; marriage rates rose to a peak at age 20 and declined thereafter. In this simulation, marriage rates increase linearly from age 15 to age 20, then decrease linearly to age 45, and the baseline marriage rate is set to result in 95% of the population marrying by age 45. For a set of comparison cohorts, I then lower the relative marriage rates to 75%, 50%, and 25% of the baseline rate across all durations.

Figures 1 and 2 show age specific marriage rates for the simulation exercises under different assumptions about unmeasured heterogeneity. Figure 1 assumes no unmeasured heterogeneity in the population. Figure 2 assumes a finite mixture or “mover-stayer” heterogeneity in which 4 percent of the population, the “stayers”, is unwilling or unable to marry at any age and 96 percent of the population, the “movers”, experiences the simulated marriage rates. (The simulated marriage rates move almost all the “movers” into marriage by age 45.) To

offset the presence of “stayers”, the baseline rates must be higher than in Figure 1 if 95% of the whole population is to marry by age 45.

< Figure 1 about here >

< Figure 2 about here >

Figure 2 demonstrates that observed marriage rates at age 30 and older can rise across successive cohorts, even as the underlying marriage rate falls dramatically. This counterintuitive result occurs because the proportion of “movers” at those ages is rising more rapidly than the marriage rate of the “movers” is declining. Note also that this effect is most pronounced in the early stages of marriage decline, as the baseline rate falls from 100% to 75%. As marriage rates continue to fall, unmeasured heterogeneity becomes less effective at slowing the decline.

Table 1 shows the proportions ever marrying in the simulated marriage regimes shown in Figures 1 and 2. Under the assumption of no population heterogeneity, a twenty-five percentage point decline in marriage rates from 100% to 75% of baseline reduces the total proportion marrying by age 45 by six percentage points, from .95 to .89, while the proportion marrying at ages 25 to 44 increases from .20 to .25 despite declines in age-specific marriage rates, due to the increased proportion of women exposed to the possibility of marriage at older ages. This pattern illustrates the buffering effect of population exposure on proportions ever marrying. Significant declines in marriage rates produce small declines in proportions marrying, at least in the early stages of decline.

<Table 1 about here >

Under the assumption of constant heterogeneity a decline in marriage rates from 100 to 75 percent of baseline reduces the population marrying by age 45 by a mere 2 percentage points, from .95 to .93. Hence, unmeasured heterogeneity in a marrying population has an additional

buffering effect on the proportions ever marrying. In a third simulation in Table 1, I relax the assumption of constant heterogeneity across cohorts and allow the proportion of “stayers” to increase as the baseline marriage rate decreases. This simulation produces proportions ever marrying between those of the two previous simulation exercises, with proportions ever marrying dropping from .95 to .92 as baseline marriage rates fall from 100 to 75 percent and the proportion of stayers increases from .04 to .0533.

In all of these simulations, declining marriage rates across cohorts cause some decline in proportions marrying by age 45. Effects of unmeasured heterogeneity and exposure buffer much of the decline in proportions ever-marrying, but do not completely offset decreases in the total proportions of women marrying. Furthermore, declines in proportions ever-marrying become steadily more pronounced as marriage rates continue to decline.

The point of this discussion is that when marriage rates have been high, it can be very difficult to distinguish two nearly opposite trends in marriage. On one hand, women may be effectively delaying marriages and then marrying at later ages, while on the other hand, conditions leading to marriage may be slowly deteriorating, but the marriage proportions and even the marriage rates at mid-adult ages may be temporarily rising due to the effects of exposure and unmeasured population heterogeneity.

Under such circumstances, the *characteristics* of delayed marriages might provide insights into the social and individual forces leading to delayed marriage. Two important and easily measured characteristics of a delayed marriage are whether a delayed marriage is preceded by a premarital birth, and whether a first birth follows the delayed marriage. All else equal, women who delay marriage have a longer period at risk of a premarital birth and a greater risk of age-related subfecundability than women who marry in young adulthood. Hence, one would

expect women who value childbearing within marriage to prefer earlier rather than later marriages. If high levels of premarital childbearing and low levels of childbearing following marriage persistently characterize delayed marriages even as delayed marriages become more common, such a pattern may indicate that delayed marriage is occurring as a *residual* option simply because earlier marriages are no longer available.

On the other hand, women with strong preferences for marital childbearing might be willing to postpone marriage if delayed marriage involved a low probability of premarital childbearing and a high probability of childbearing following marriage. Access to reliable fertility control (both to postpone and then to have children) could then initiate a feedback loop; childbearing within delayed marriage increases, thereby increasing the willingness of women who desire marital childbearing to risk a delayed marriage, thereby further increasing childbearing within delayed marriage. Hence, one might expect childbearing before delayed marriage to decline, and childbearing within delayed marriage to increase, for groups of women deliberately “trading” early adult marriages for better, later marriages

Choice of projection model

Currently available techniques for projecting the proportion of women who ever marry include two nuptiality models based on the age distribution of first marriages, and two approaches based on the conditional marriage rates for each year of age. To justify my own choice, I will briefly describe the alternatives.

Classic demographic nuptiality models fit the age distribution of marriages to a set of parameters. The Coale-McNeil model (Coale and McNeil 1972, Rodriguez and Trussell 1980) describes the age distribution of first marriages as a function of E , the proportion of women who

never marry, and μ and σ , the mean and standard deviation of the age for women who do marry, using a complex functional form based on analyses of historical populations. The Hernes model (Hernes 1972) consists basically of a level parameter and a decay parameter for the intensity of marriage, plus a parameter for the proportion married at T_0 , the start of observation. Coale and Trussell (1996) provide a general discussion of nuptiality models.

Nuptiality modeling has been used to predict the proportions ever marrying for cohorts of women that have not completed their marrying years (c.f. Bloom and Bennett 1990; Goldstein and Kenney 2001). While these models generally have a good track record, they sometimes produce extreme and inconsistent predictions for a group of particular importance to this study – recent cohorts of college-educated white women. An infamous example is the incorrect and publicly acclaimed prediction that college-educated women who have not married by age 25 have only a 50% chance of ever marrying (Greer 1986, Bennett and Bloom 1986). In the appendix I compare my results to results based on a Hernes model and discuss possible reasons for any differences.

In part as a response to uncertainty about parametric models of demographic behavior, Rindfuss, Morgan and Swicegood (1988) modeled first births using a common-sense approach that might be called the “latest available data” approach. This approach can be applied to first marriage formation as well. To estimate the proportion of a cohort of women that will ever marry, one first records their observed age-specific marriage rates. Then, for age categories that these women have not yet reached, one substitutes the age-specific first marriage rates for the most recent with observed data at those age categories. The resulting series of age-specific marriage rates can be used to calculate the “survivor” function of persons who would pass through all ages without ever marrying. A potential weakness of this approach is that it does not

account for the possibility of unmeasured heterogeneity or age-specific trends that can affect marriage rates at ages 30 or older. In the next section I describe adjustments that can correct this potential weakness.

A final technique worth mentioning is the use of synthetic period life tables (c.f. Schoen and Standish 2001) which, like the “latest available data approach”, are derived from age-specific marriage rates. A synthetic life table measure calculates the proportion of women who would marry if they followed the age-specific first marriage rates of women of different ages at one point in time, producing an estimate of the total proportion marrying that is comparable to a Total Fertility Rate as an estimate of completed fertility.

Synthetic period life tables are unsuited for educational comparisons because they require researchers to correctly identify some college graduates at ages before they finish college. In addition, period life tables are particularly vulnerable to distortion from changes in the tempo of marriage. Bongaarts and Feeney (1998) provide a general discussion of concerns about synthetic life-table measures.

Data and Methods

Models for Proportion Marrying

Table 2 portrays the age-specific survivor probabilities to first marriage for a series of birth cohorts. In this table, $S_{c,t}$ represents the proportion of individuals in a five-year birth cohort C who remain unmarried to the end of age interval T , adjusted for any censoring during age interval T using a Kaplan-Meier life table procedure. The objective of the estimation procedure

is to project the missing cell values for birth cohorts 3, 4, and 5 (with increasing uncertainty as the number of missing cells increases for more recent cohorts).

< Table 2 about here >

I begin by demonstrating the estimation procedure for a cohort with no missing data. Cohorts 1 and 2 in Table 2 already have more or less complete information on marriage from age 15 to 44. For a cohort C with complete data across all age groups to age 45, the proportion P_C never-married at age 45 is calculated by equation 1. In equation 1, $-\Delta S_{C,t}$ is the proportion of persons in cohort C experiencing a first marriage in interval t , adjusted for any censoring within the cohort using Kaplan-Meier life table estimation.

$$P_C = \prod_{t=15}^{44} \left(\frac{S_{C,t} - \Delta S_{C,t}}{S_{C,t}} \right) = S_{C,45} \quad (1)$$

Next I demonstrate a procedure for cohorts with missing data. Cohorts 3 through 5 in Table 3 do not have complete data to age 45. The proportion never-married cannot be estimated directly for these cohorts, so one uses the latest available data from cells on the left to fill missing cells. Given a 5-year birth cohort C with valid observations of age-specific survivorship up to age T_1 , the previous 5-year cohort $C-1$ with valid observations of age-specific survivorship up to age T_2 , and all preceding 5-year cohorts $C-n$ with valid observations of age-specific survivorship up to age T_n , up to the point where $T_n \geq 44$, the projected proportion of individuals in cohort C not marrying by age 45 is as follows:

$$S_{C,45} = \prod_{t=15}^{T_1} \left(\frac{S_{C,t} - \Delta S_{C,t}}{S_{C,t}} \right) \prod_{t=T_1+1}^{T_2} \left(\frac{S_{C-1,t} - \Delta S_{C-1,t}}{S_{C-1,t}} \right) \dots \prod_{t=T_{n-1}+1}^{44} \left(\frac{S_{C-n,t} - \Delta S_{C-n,t}}{S_{C-n,t}} \right) \quad (2)$$

One can modify this procedure to allow for unmeasured heterogeneity in the marrying population. For each successive cohort, assume some unknown proportion of the population $S_{(s)}$ is unable or unwilling to marry at any age. The predicted proportion of individuals in cohort C not marrying by age 45 is then:

$$S_{(s)} + S_{C,45} = S_{(s)} + \prod_{t=15}^{T_1} \left(\frac{S_{C,t} - S_{(s)} - \Delta S_{C,t}}{S_{C,t} - S_{(s)}} \right) \prod_{t=T_1+1}^{T_2} \left(\frac{S_{C-1,t} - S_{(s)} - \Delta S_{C-1,t}}{S_{C-1,t} - S_{(s)}} \right) \dots \prod_{t=T_{n-1}+1}^{44} \left(\frac{S_{C-n,t} - S_{(s)} - \Delta S_{C-n,t}}{S_{C-n,t} - S_{(s)}} \right) \quad (3)$$

When one uses a spreadsheet program to solve equations such as this, one encounters two difficulties. Firstly, one can only adjust for unmeasured heterogeneity of the finite mixture or “mover-stayer” form. To evaluate whether alternate forms of unmeasured heterogeneity affect the estimates, I used the aML statistical program (Lillard and Panis 2000) to replicate the main models with an assumed normally distributed unmeasured heterogeneity factor. The results were substantively the same. Secondly, while unmeasured heterogeneity is present in every population, it is difficult to identify. Social scientists have developed various techniques to statistically control for it (see Heckman and Singer 1984; Palloni and Sorensen 1990; Blossfeld and Hamerle 1992), but it is usually impossible to identify the form and level of unmeasured heterogeneity without explicit and often unsupportable assumptions. Instead of trying to identify the level of unmeasured heterogeneity in a given population, I solve equation 3 for a range of possible values of $S_{(s)}$.

As a next, step, I adjust the procedure to allow for changes in age-specific marriage rates. Instead of using observed age-specific cohort survivorship from previous cohorts, I identify the linear trend in age*cohort survivorship using ordinary least squares regression. The predicted

proportion of individuals in cohort C not marrying by age 45 is described by equations 4 through 6.

$$S_{C,45} = \prod_{t=15}^{T_1} \left(\frac{S_{C,t} - \Delta S_{C,t}}{S_{C,t}} \right) * f(T_1 + 1, T_2) \dots * f(T_{(N-1)} + 1, T_N) \quad (4)$$

where the proportion remaining unmarried through an age interval is a function of the cohort C

$$f(T_{(n-1)} + 1, T_n) = b_0 + b_1 C \quad (5)$$

and where b_0 and b_1 are estimated by ordinary least squares regression using the equation

$$\prod_{t=T_{n-1}}^{T_n} \left(\frac{S_{c,t} - \Delta S_{c,t}}{S_{c,t}} \right) = b_0 + b_1 c + e \quad (6)$$

for values of c from $c = 1$ to $c = C-1$

Finally, I combine the adjustments for linear trends from equations 4 through 6 with the controls for mover-stayer heterogeneity from equation 3. The resulting algorithm has the following form:

$$S_{C,45} = \prod_{t=15}^{T_1} \left(\frac{S_{C,t} - \Delta S_{C,t} - S_s}{S_{C,t} - S_s} \right) * f(T_1 + 1, T_2) \dots * f(T_{(N-1)} + 1, T_N) \quad (7)$$

with the following adjustment to the ordinary least squares regression equation for b_0 and b_1 :

$$\prod_{t=T_{n-1}}^{T_n} \left(\frac{S_{c,t} - \Delta S_{c,t} - S_s}{S_{c,t} - S_s} \right) = b_0 + b_1 c + e \quad (8)$$

I provide confidence intervals for these estimation procedures in two ways. First, I estimate models across a range of assumptions about the levels of heterogeneity in the population and the presence or absence of linear trends in age-specific marriage rates. Then, for each model based on its own set of assumptions, I use bootstrap procedures to draw 120 random samples with replacement and assess the 95% confidence interval for the 120 samples. Full details of the bootstrap procedure are available on request.

Data

In these analyses I use the combined 1996 and 2001 Survey of Income and Program Participation (SIPP) (U.S. Census Bureau 2001). The Wave 2 Topical Modules of the SIPP contain nearly complete marital histories for women and for men, with large samples to allow tests for interactions between cohort trends and educational attainment. I limit this analysis to women, for whom fertility histories are also available. I further restrict the sample to women born in the United States from 1945 to 1974. With these cohort and nativity restrictions, the final sample contains 31,798 women. From the SIPP marriage histories, I record women's age at first marriage, to the nearest month, or age at interview if there is no reported marriage. I show separate results for nonhispanic white women and nonhispanic black women, plus combined results for all U.S. women, including Hispanic women and women of other racial and ethnic backgrounds. I restricted the sample to women born in the United States to exclude women who marry outside the US.

To include childbearing outcomes in the analysis of proportions of women marrying by age 45, I combine the marriage history with a fertility history. This combined marriage and fertility history allows me to count first marriages preceded by a nonmarital birth, and to count

childless first marriages followed by a first birth within 10 years. I employ a Kaplan-Meier life table procedure to control for censored observations in recent birth and marriage cohorts.

In addition to distinctions by race, I use the educational attainment of the mother at interview as a key explanatory variable. I thus make the necessary assumption that the woman had the same educational attainment at interview as at the time of the first marriage, or at least that the personal characteristics associated with educational attainment are in some sense permanent across the life course. This assumption may be incorrect for cases where a marriage precipitates or hinders a return to schooling.

Cohort trends in educational attainment also pose a potential problem for interpreting trends in marriage by educational attainment. The proportion of women reporting a four-year college degree at interview has changed from the 1945-1949 to the 1970-1974 birth cohorts under study. If the propensity to marry is not linearly related to education, but instead peaks somewhere in the middle of the educational distribution, then proportions ever marrying will increase for the growing “higher” educational category, and decline for the other, shrinking educational category. The shift in proportion of college graduates has been relatively small across birth cohorts, from 26 percent of the sample of women born 1945-54 to 30 percent of the sample of women born 1965-74. However, if this added (and subtracted) four percent has a particularly high propensity for marriage, simple shift in educational attainment could produce small effects that mimic an educational “crossover” in propensity to marry.

In all the models shown, I do not use statistical controls for the few cases involving imputation of race, education, or the date of a first marriage. In sensitivity analyses (not shown), I estimated models that excluded the few cases with imputation flags, then estimated separate

parametric event history models with coefficients for imputation flags. The results of these sensitivity analyses were substantively identical to the results shown here.

In a preliminary analysis I used the combined June 1985, June 1990, and June 1995 Current Population Surveys' (CPS) fertility and marriage histories for women age 15 to 65 at interview, with a larger sample of 72,128. Results from the CPS were fully comparable to results from corresponding birth cohorts in the SIPP, except for black college graduates, who had *lower* marriage rates in the SIPP, and except for all women age 40 and older, who had slightly *higher* marriage rates in the SIPP. The U.S. Department of Labor (2001) has published a full description of the procedures used in collecting the CPS data.

Results

Age-specific marriage patterns.

Table 3 shows the weighted distribution of ages at first marriage for women in the sample, adjusted for censoring where necessary using Kaplan-Meier life table procedures. For all groups of women in the sample, the proportion marrying before age 25 has decreased across birth cohorts, and the proportion marrying after age 25 has increased.

< Table 3 about here. >

Figures 3 to 6 show the age specific first marriage rates corresponding to the distribution of ages in Table 3. Figure 3, for white nonhispanic women with no four-year college degree, bears some similarity to Figure 2, and thus appears to be partly consistent with marriage rates declining at young adult ages but buffered at later ages by effects of unmeasured heterogeneity. Peak marriage rates for women in their early twenties have clearly declined across all birth cohorts, from about .25 per year in the 1945-54 birth cohort to below .13 per year in the 1965-74

birth cohort. By comparison, marriage rates for women in their thirties appear to be stable or increasing across cohorts, although marriage rates continue to decline with age. At age forty and older, marriage rates remain low, and it is difficult to judge trends because of a lack of observations from the most recent birth cohorts.

< Figures 3 to 6 about here. >

Figure 4 shows that marriage rates for white nonhispanic women with four-year college degrees have also declined at young adult ages, but have increased substantially across cohorts for college graduates in their late twenties and early thirties. In fact, for the most recent cohorts of college graduates, first marriage rates at age thirty are higher than at any previous age. At ages 35 and older, it is not clear whether marriage rates are increasing over time. Hence, if an educational crossover in marriage is occurring, it is likely to be due to marriage trends among women in their early to mid-thirties, a pattern which may reflect women's interest in marrying at an age that still allows them to bear children.

Age specific marriage rates for nonhispanic black women, by education, are shown in Figures 5 and 6. Small sample sizes preclude detailed analysis, but marriage rates appear to be low and declining, particularly at young adult ages, across successive cohorts of nonhispanic black women with no four year college degree. For nonhispanic black women with a four year college degree, marriage rates are declining at young adult ages, but may be rising across cohorts at ages around 30.

Marriage trends for all U.S. women.

Table 4 presents results of the simulation exercises for proportions of women marrying by age 45. For example, in the sample from the 1945-49 birth cohort, 7.9 percent of U.S.-born

women remained unmarried to age 45. Marriage rates are observed for all age groups, so this estimate requires no assumptions about unmeasured heterogeneity or trends in age-specific marriage rates, and the 95% confidence interval (7.2 percent to 8.6 percent) reflects simply a bootstrap estimate of the sampling error. The 1960-64 and subsequent birth cohorts have unobserved age categories, so their corresponding columns include estimates for combinations of possible levels of unobserved heterogeneity and two possible levels (absence or presence) of linear trends in age-specific marriage rates for unobserved ages. Table 4 shows results only for the lowest and highest conjectured levels of unmeasured heterogeneity; that is, 0% and 6% “stayers” (0% and 4% for white women with no four-year college degree). Estimates that assume 2% and 4% “stayers” fall predictably between the extremes.

< Table 4 about here >

In the top row of estimates, which assume no heterogeneity and no age-specific trends in marriage rates, the predicted percent of women remaining unmarried increases from 7.9 to 11.7 percent between the 1945-49 and 1970-74 birth cohorts. The most recent cohorts have the most uncertainty, but the pattern for the 1970-1974 cohort could indicate a leveling off of the proportion of women who never marry, perhaps due to the favorable economic conditions of the late 1990s and/or the small size of the 1970-1974 birth cohort compared to preceding *and* succeeding birth cohorts, which produce an effect *opposite* that of a traditional demographic “marriage squeeze” (c.f. Akers 1967).

An important pattern in these models is that the projected proportion never marrying is lower when one assumes *either* unmeasured heterogeneity *or* trends in age-specific marriage rates, but not *both*. In fact, the model that assumes *both* linear trends *and* high levels of unmeasured heterogeneity predicts the *highest* percent never marrying (14.1 percent for the

1970-74 cohort). Assumptions of unmeasured heterogeneity and age-specific trends counteract each other because both processes are “competing” to explain the same phenomenon of slightly increasing marriage rates at ages 30 and older.

Figure 7 summarizes in graphic form the projected percent of all U.S. women never-married at age 45. The solid line shows the simplest model that assumes no linear trends in age-specific marriage rates and no unmeasured heterogeneity. The dotted lines show the best estimates for the highest and lowest models, respectively, and the vertical bars show the 95% confidence intervals across all 960 models (120 samples for each of 8 models, including levels of heterogeneity at 0%, 2%, 4%, and 6%, with and without linear trends in age-specific marriage rates). Hence, the uncertainty in the predictions comes from both sampling error and from uncertainty about modeling assumptions. Within this range of uncertainty, one could interpret the results as a stabilization in proportions ever marrying or as a slow, monotonic increase in proportions of women never-marrying consistent with continuing declines in marriage rates.

< Figure 7 about here >

Marriage trends by education

The next section of Table 4 shows the projected percent of U.S. white nonhispanic women with no four-year college degree who remain unmarried by age 45. These projections indicate a rising fraction of women never marrying, from 5.3 percent in the 1945-49 birth cohort to 8.3 percent in the 1970-74 birth cohort. However, the 95% confidence intervals for recent birth cohorts are consistent with the possibility that the proportion remaining unmarried is stabilizing. The following section shows estimates for the percent of U.S. white nonhispanic women with a four-year college degree who will marry by age 45. After a peak of 12.6 percent

remaining unmarried for the 1955-59 cohort, the various models are all consistent with a decline in the proportion of white nonhispanic college graduates who remain unmarried at age 45.

Figure 8 summarizes results from Table 4 into a chart of the percent of white nonhispanic women never-married at age 45, by education level. The models shown make no additional adjustments for age-specific trends in marriage rates or mover-stayer heterogeneity. College graduates and other women show converging probabilities of marriage, with some evidence suggesting a crossover for birth cohorts after 1965. However, the levels of uncertainty remain wide, and as I discussed in the data section, some part of the convergence may simply reflect an increase in the proportion of women who obtain a four-year college degree.

< Figure 8 about here >

Table 4 also contains results from models for nonhispanic black women. For black nonhispanic women with no four-year college degree, the percent never married at age 45 is very high and increasing across birth cohorts, although the high levels of uncertainty do not rule out the possibility that percent marrying might be stabilizing. For black nonhispanic women with a four year college degree, patterns appear to be similar to those for less educated black women, but the uncertainty of the estimates is considerable. Due to small sample size, the projections for black nonhispanic women do not include the full range of modeling assumptions.

Childbearing before and after delayed marriage.

Tables 5 and 6 conclude the analysis of trends in delayed marriage by showing patterns of childbearing before marriage and after marriage, respectively. Table 5 shows a general pattern in which an increasing proportion of marriages are preceded by a nonmarital birth, a result that is not surprising given the rise in nonmarital fertility in the United States in recent

decades. College graduates who marry at age 30 or older, however, show a trend in the opposite direction. This trend is statistically significant among nonhispanic white women, for whom marriages with a premarital birth declined from 18 percent to 8 percent, but not among nonhispanic black women.

< Table 5 about here. >

Table 6 shows patterns of childbearing after marriage for women childless at first marriage. The birth cohorts are strongly truncated by the interview dates because they measure birth events in the 10 years following a marriage, but the observable trends suggest that childbearing following delayed marriage has increased in recent decades, particularly for women with a four-year college degree. The sample sizes for blacks were too small to produce meaningful results (but the results are available on request).

< Table 6 about here. >

Discussion

The results of this analysis are not inconsistent with the crossover in marriage by educational attainment noted by Goldstein and Kenney (op. cit.), but such a crossover is taking longer and may be weaker than previously predicted. The lack of a clear difference between college graduate and other women in proportions ever marrying is not unexpected, given that the effects of unmeasured heterogeneity and exposure can cause the proportions ever marrying to persist at a high level long after marriage rates have begun to decline.

While educational differences in proportions of women ever marrying may be small, educational differences in childbearing before and after a delayed marriage appear to be increasing. Across cohorts, college graduates who postpone marriage past age 30 are becoming

less likely to have children before marriage and *more* likely to have children after marriage. In comparison, among less-educated women, the growing number who delayed marriages have persistently high rates of premarital first births and relatively low rates of first births after marriage. Such a divergence may indicate that college graduates are successfully transplanting “traditional” marriage with marital children to a new, later part of the life course, while the rising numbers of less educated women who delay marriage are responding to fewer opportunities for on-time marriages by “settling for” later marriages.

The projections in this analysis also suggest a revised interpretation of trends in marriage by race. Whereas previous projections suggested that marriage trends for blacks were declining while those for whites were stable or increasing, the projections in this paper suggest that marriage could still be in decline for lower educational groups of all races. Proportions ever marrying could be more sensitive to recent declines in marriage rates among blacks than among whites simply because marriage rates for blacks are declining from a lower starting point; hence, declines in marriage for blacks are buffered less by effects of exposure at later ages and unmeasured heterogeneity.

In summary, while the overall educational inequality in proportions ever marrying may be smaller than indicated by previous research, trends in marriage for less-educated families are clearly a cause for concern, and these trends might be expected to become more pronounced in the future. This assessment is preliminary, but it justifies our attention because by the time interactions between economic inequality and marriage become more apparent, they may be more intractable than they are now.

Appendix:

Alternately, an age-specific spike in marriage produced by historically novel circumstances might not fit the nuptiality series on which the Coale-McNeil models are based. I analyze these issues in greater detail in the appendix.

Levels and trends in marriage projected in this analysis differ in some respects from the best previously published estimates by Goldstein and Kinney (2001) using Hernes nuptiality models and data from the 1995 Current Population Survey. Results from the present study indicate much *higher* levels of nonmarriage among nonhispanic white college graduates in some birth cohorts (10.2 percent unmarried at age 45 for the 1960-1964 birth cohort in this study, compared to 2.7 percent unmarried at age ∞ in G&K.) Conversely, the present study finds generally *lower* levels of nonmarriage among cohorts of nonhispanic white and black women with no four-year college degree, although the results for any given cohort are not different at a statistically significant level. I applied the “latest available data” modeling technique from this study to the 1995 CPS data, and results were comparable to the “latest available data” results from the SIPP 1996/2001 data rather than the Hernes results for the 1995 data, so the discrepancy does not appear to be explained by the difference in data sets.

There may be several reasons for the discrepancy in projected marriage patterns is thus among white college graduates. While the parameters in Hernes models adjust for shifts in the timing of marriage, they may not be nuanced enough to account for a systematic repositioning of marriages to a slightly later part of the adult life course. For example, a widespread but limited shift in age at marriage could occur if women delay marriage due to education and career starts, yet still remain interested in marrying early enough to leave time for marital childbearing. A

Hernes model, with its single decay parameter, could take the spike in marriages around age thirty and inappropriately project elevated marriage rates into the forties or older.

As a concluding investigation, I estimated a Hernes model for the SIPP 1996/2001 data. Hernes (op. cit.) described several possible techniques for estimating his model, and I found variation in results depending on the technique used, the starting time t_0 , and whether I weighted each year equally (which Hernes and Goldstein and Kenney appeared to do) or weighted each year of age according to the number of marriages in that year. I found that I had the most stable results with an unweighted three- parameter nonlinear least squares model in STATA of the form

$$Y = b_0 + b_1 b_2^X \quad (\text{A1})$$

This equation can be matched to the Hernes model as follows. The basic Hernes model has the form

$$\frac{dP_t}{dt} = Ab^t (1 - P_t)P_t \quad (\text{A2})$$

This equation can be made into a solvable form by specifying a parameter for P_0 , the nonzero proportion married by an arbitrary time t_0 , set at age 16 for this study.

$$P_t = \frac{1}{1 + \frac{(1 - P_0)\exp(A / \log b)}{P_0 \exp(Ab^t / \log b)}} \quad (\text{A3})$$

where P_t , the cumulative proportion married at age t , is Y from equation A1,

where A , the overall marriage intensity parameter, is calculated as $b_1 * \log b_2$ from equation A1,

where b , the decay parameter, is b_2 from equation A1,

and where P_0 is calculated as $\exp(b_0 + b_1)/(1 + \exp(b_0 + b_1))$ from equation A1.

I estimated the Hernes model for white nonhispanic women with a four-year college degree in the 2001 SIPP, then used the resulting parameters to calculate not only the proportion ever marrying but also the projected age-specific marriage rates. In the unfinished cohort, the projected proportion ever marrying came out to 96 percent, higher in the Hernes model than in the “latest available data” method. Goldstein and Kenney had analogously high projected marriage levels for their “unfinished” cohorts of college graduates in the 1995 CPS.

When I graph the Hernes projections for marriage rates in the unfinished cohort, the results are as shown in Figure A1. For observed ages to age 35, these marriage rates are roughly comparable to the graph in Figure 4, but the projected marriage rates in the Hernes model are rather high in the unobserved ages after age 35, resulting in elevated marriage rates for college graduates in their late thirties and early forties and correspondingly high projections of college graduates who ever marry.

It could be that the relatively high marriage rates for college graduates in their late thirties and forties will come to pass as predicted by the Hernes model, but I suspect that the Hernes model was overly sensitive to two age-specific marriage patterns in partially observed cohorts of college graduates. These are the high marriage rates at the last observed ages (the late twenties and early thirties), and the low marriage rates in the teen years compared to previous cohorts, which I take to be a survey artifact of midlife college graduation among a few older women who married as teens, who are then asked their educational attainment at interview. Together, these age-specific effects push down the estimates of A and P_0 in unfinished cohorts and inflate the decay parameter b , thereby projecting a high proportion of very late marriages.

From this analysis I tentatively conclude that while a Hernes model works well in describing the marriage patterns of completed cohorts as well as the marriage patterns of some

incomplete cohorts, it may not be appropriate for projecting completed marriage patterns for incomplete cohorts of college graduates who may be delaying marriages by repositioning them to a specific part of the life course – namely, the late twenties and early thirties.

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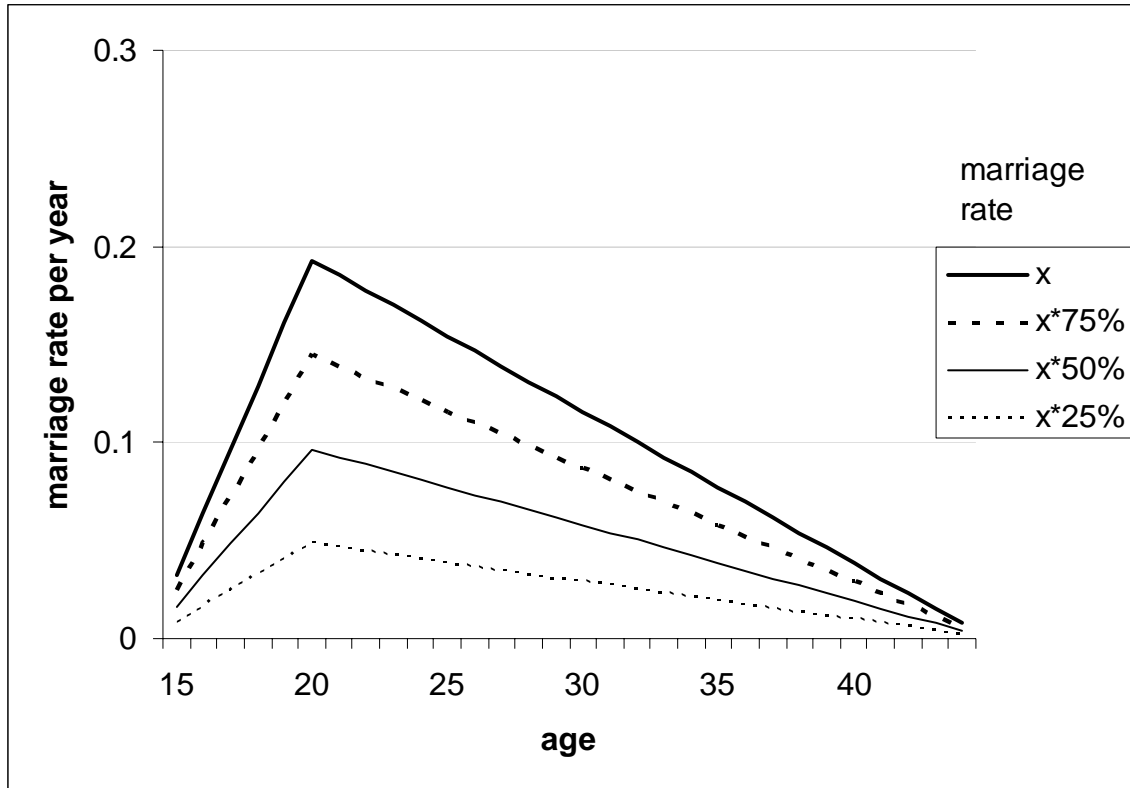
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Figure 1: Simulation Exercise Depicting Declining Age-Specific Marriage Rates.

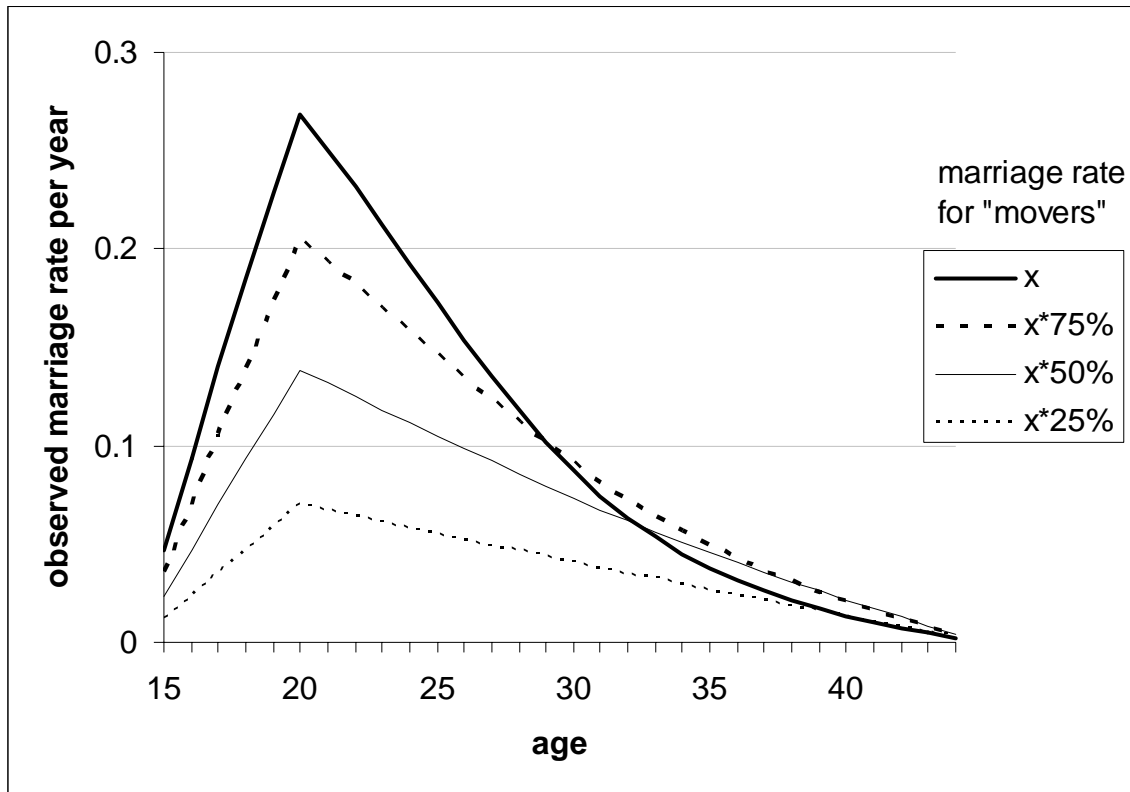


Description of model: Marriage rate increases linearly from age 15 to age 20, then decreases linearly from age 20 to 44.

The baseline rate produces a cumulative .95 proportion marrying by age 45.

See text for details.

Figure 2: Simulation Exercise Depicting Declining Age-Specific Marriage Rates with Unobserved Population Heterogeneity.



Parameters of model: For 96% of the population (“movers”), the marriage rate increases linearly from age 15 to age 20, then decreases linearly from age 20 to 44. 4% of the population are “stayers” who never marry.

The baseline rate produces a cumulative 0.95 proportion marrying by age 45.

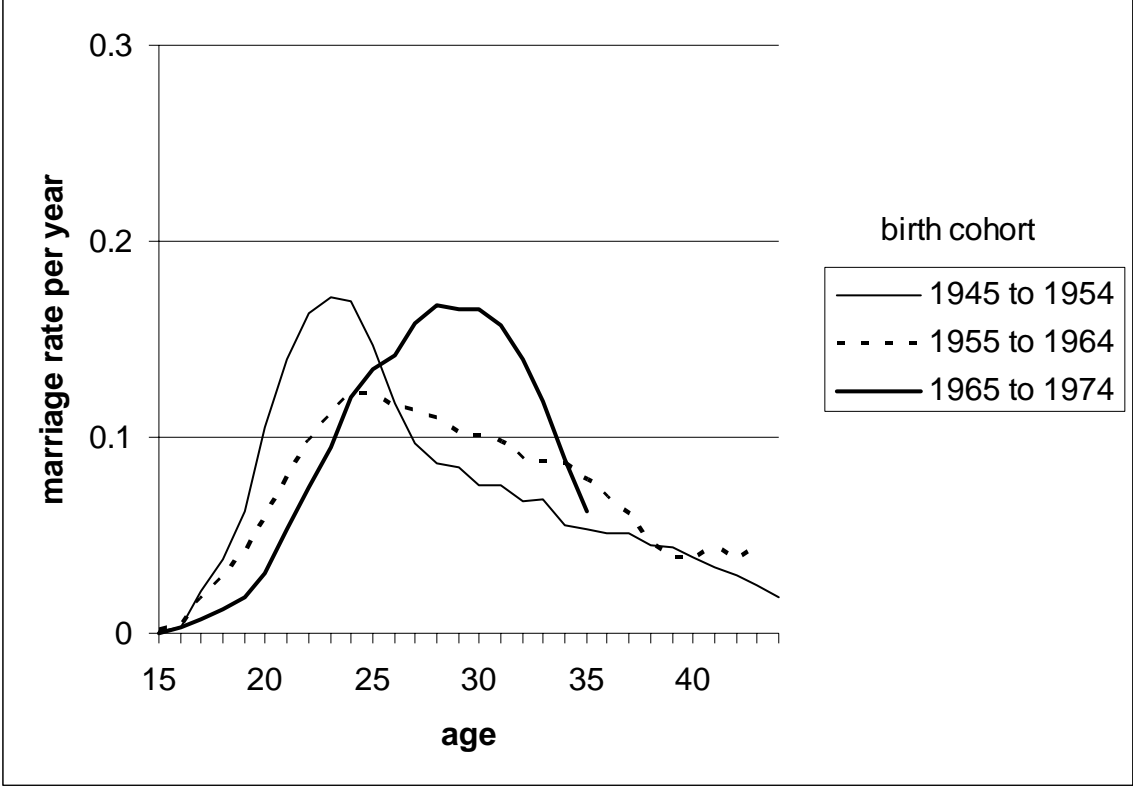
See text for details.

Figure 3: First Marriage Rates by Age and Birth Cohort for U.S. White Nonhispanic Women with No Four-Year College Degree.



Source: 1996 and 2001 Survey of Income and Program Participation. N = 17,741
Marriage rates are smoothed averages across five years of age.

Figure 4: First Marriage Rates by Age and Birth Cohort for U.S. White Nonhispanic Women with a Four-Year College Degree.



Source: 1996 and 2001 Survey of Income and Program Participation. N = 6,953
Marriage rates are smoothed averages across five years of age.

Figure 5: First Marriage Rates by Age and Birth Cohort for U.S. Black Nonhispanic Women with no Four-Year College Degree.



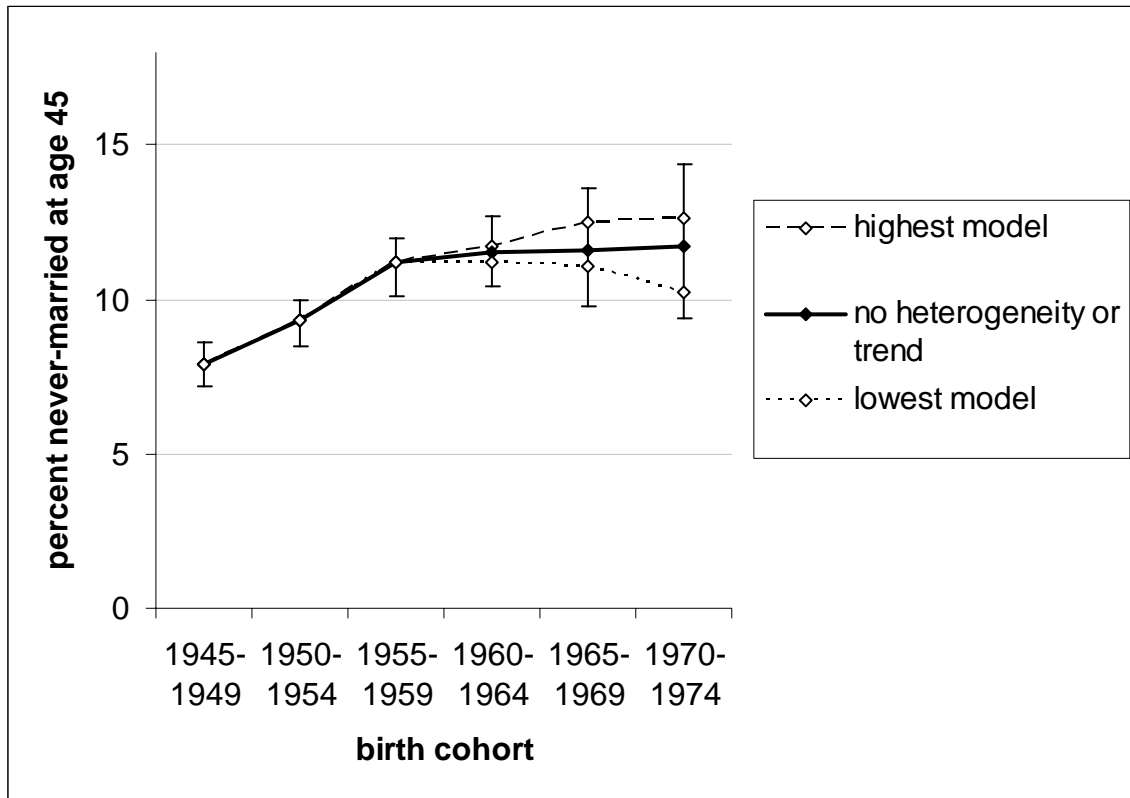
Source: 1996 and 2001 Survey of Income and Program Participation. N = 3,903
Marriage rates are smoothed averages across five years of age.

Figure 6: First Marriage Rates by Age and Birth Cohort for U.S. Black Nonhispanic Women with a Four-Year College Degree.



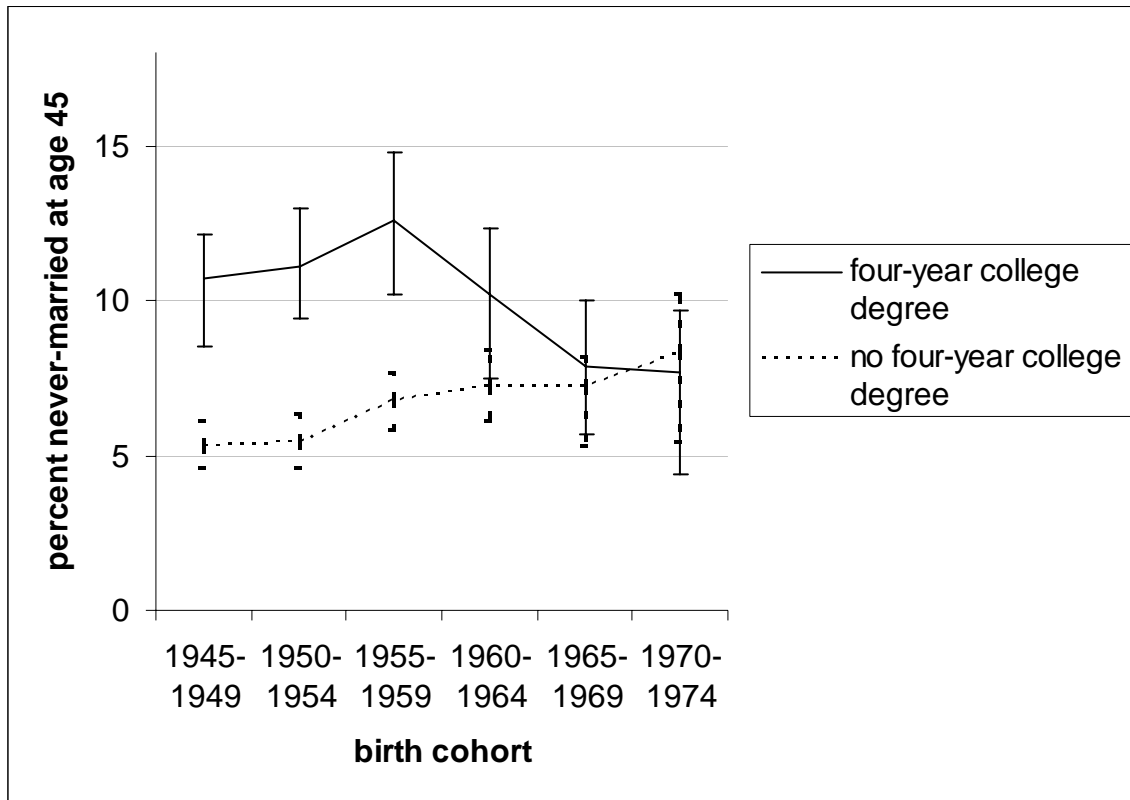
Source: 1996 and 2001 Survey of Income and Program Participation. N = 727
 Marriage rates are smoothed averages across five years of age.

Figure 7. Proportion of All U.S. Women Never-Married at Age 45, According to Selected Projection Models.



Source: 1996 and 2001 Survey of Income and Program Participation. N=31,798
 Vertical lines represent the middle 95% of all outcomes for 960 bootstrap simulations across eight projection models.

Figure 8. Proportion of U.S. White Nonhispanic Women Never-Married at Age 45, by Education Level, Averaged Across Projection Models.



Source: 1996 and 2001 Survey of Income and Program Participation. N = 24,694
 Vertical lines represent the middle 95% of all outcomes for all bootstrap simulations across all projection models.

Table 1: Proportion of Women Marrying By Age 45, Based on Simulation Exercises with Declining Marriage Rates.

	<i>Marriage rate for "movers" (=x)</i>			
	<i>x*100%</i>	<i>x*75%</i>	<i>x*50%</i>	<i>x*25%</i>
<u><i>Assume no population heterogeneity^a</i></u>				
% "stayers"	0%	0%	0%	0%
<i>Proportion of women married at age:</i>				
15-24	.75	.64	.50	.24
25-44	<u>.20</u>	<u>.25</u>	<u>.28</u>	<u>.20</u>
Cumulative proportion married by age 45	.95	.89	.78	.44
<u><i>Assume constant heterogeneity^b</i></u>				
% "stayers"	4%	4%	4%	4%
<i>Proportion of women married at age:</i>				
15-24	.84	.76	.62	.39
25-44	<u>.11</u>	<u>.17</u>	<u>.24</u>	<u>.26</u>
Cumulative proportion married by age 45	.95	.93	.86	.65
<u><i>Assume increasing heterogeneity^b</i></u>				
% "stayers"	4%	5.33%	8%	16%
<i>Proportion of women married at age:</i>				
15-24	.84	.75	.60	.34
25-44	<u>.11</u>	<u>.17</u>	<u>.23</u>	<u>.23</u>
Cumulative proportion married by age 45	.95	.92	.83	.57

a. Peak marriage rate at age 20 = .193/year

b. Peak marriage rate for "movers" at age 20 = .2945/year

See text for details.

Table 2. Graphical representation of survivor probabilities used to estimate proportions of women never marrying.

Age	birth cohort				
	1: 1950-1954	2: 1955-1959	3: 1960-1964	4: 1965-1969	5: 1970-1974
15	$S_{1,15}$	$S_{2,15}$	$S_{3,15}$	$S_{4,15}$	$S_{5,15}$
...	$S_{1,...}$	$S_{2,...}$	$S_{3,...}$	$S_{4,...}$	$S_{5,...}$
29	$S_{1,29}$	$S_{2,29}$	$S_{3,29}$	$S_{4,29}$	$S_{5,29}$
30	$S_{1,30}$	$S_{2,30}$	$S_{3,30}$	$S_{4,30}$	
...	$S_{1,...}$	$S_{2,...}$	$S_{3,...}$	$S_{4,...}$	
35	$S_{1,35}$	$S_{2,35}$	$S_{3,35}$		
...	$S_{1,...}$	$S_{2,...}$	$S_{3,...}$		
40	$S_{1,40}$	$S_{2,40}$			
...	$S_{1,...}$	$S_{2,...}$			
44	$S_{1,44}$	$S_{2,44}$			

$S_{c,t}$ represents the proportion of individuals in a five-year birth cohort C who remain unmarried to the end of age interval T , adjusted for any censoring during age interval T using the Kaplan-Meyer life table procedure.

Table 3: Distribution of ages at first marriage for US women.

	Birth cohort		
	1945 to 1954	1955 to 1964	1965 to 1974
<i>All US women</i>			
Marriage by age 24	.72	.58	.48
Marriage at age 25-29	.11	.17	.23
Marriage at age 30-34	.04	.08	.11
Marriage at age 35-44	<u>.04</u>	<u>.06</u>	---
Total married through age 44:	.91	.89	---
<i>Nonhispanic white, No 4-year college degree</i>			
Marriage by age 24	.81	.69	.60
Marriage at age 25-29	.08	.14	.19
Marriage at age 30-34	.04	.06	.09
Marriage at age 35-44	<u>.03</u>	<u>.04</u>	---
Total married through age 44:	.95	.93	---
<i>Nonhispanic white, 4-year college degree</i>			
Marriage by age 24	.60	.42	.34
Marriage at age 25-29	.16	.27	.37
Marriage at age 30-34	.07	.12	.15
Marriage at age 35-44	<u>.06</u>	<u>.08</u>	---
Total married through age 44:	.89	.89	---
<i>Nonhispanic black, No 4-year college degree</i>			
Marriage by age 24	.57	.42	.30
Marriage at age 25-29	.11	.12	.13
Marriage at age 30-34	.06	.08	.13
Marriage at age 35-44	<u>.06</u>	<u>.09</u>	---
Total married through age 44:	.80	.71	---
<i>Nonhispanic black, 4-year college degree</i>			
Marriage by age 24	.44	.34	.16
Marriage at age 25-29	.20	.23	.25
Marriage at age 30-34	.11	.10	.17
Marriage at age 35-44	<u>.07</u>	<u>.03</u>	---
Total married through age 44:	.78	.71	---

Source: 1996 and 2001 Survey of Income and Program Participation. N = 13,615
 Estimates are obtained from cohort life tables.

**Table 4. Women Never Marrying by Age 45 as a Percent of All US Women.
Predictions by Modeling Assumption and Birth Cohort.**

	Birth Cohort					
	1945 to 1949	1950 to 1954	1955 to 1959	1960 to 1964	1965 to 1969	1970 to 1974
<i>All US women</i>						
No age*cohort trend, 0% “stayers”	7.9 (7.2, 8.6)	9.3 (8.5, 10.0)	11.2 (10.1, 12.0)	11.5 (10.6, 12.6)	11.6 (10.4, 12.6)	11.7 (10.4, 13.1)
No age*cohort trend, 6% “stayers”				11.2 (10.7, 12.4)	11.5 (10.5, 12.4)	11.6 (10.6, 12.7)
Linear age*cohort trend, 0% “stayers”				11.2 (10.3, 12.5)	11.1 (9.3, 12.6)	10.2 (8.4, 12.1)
Linear age*cohort trend, 6% “stayers”				11.7 (10.6, 13.4)	12.5 (10.4, 14.8)	12.6 (10.3, 15.0)
<i>N</i>	4,727	5,464	5,983	5,915	4,943	4,766
<i>Nonhispanic white women, no 4-year college degree</i>						
No age*cohort trend, 0% “stayers”	5.3 (4.6, 6.1)	5.4 (4.6, 6.3)	6.8 (5.8, 7.7)	7.2 (6.2, 8.3)	7.2 (5.9, 8.3)	8.3 (7.0, 9.9)
No age*cohort trend, 4% “stayers”				7.1 (6.3, 8.0)	7.1 (6.1, 8.0)	7.7 (6.7, 8.9)
Linear age*cohort trend, 0% “stayers”				7.0 (6.0, 8.4)	6.7 (5.0, 8.5)	7.0 (4.8, 9.6)
Linear age*cohort trend, 4% “stayers”				7.2 (6.0, 8.9)	7.4 (5.7, 9.6)	8.2 (5.8, 11.0)
<i>N</i>	2,843	3,139	3,452	3,286	2,558	2,463

Source: 1996 and 2001 Surveys of Income and Program Participation. See text for details of modeling assumptions.

95% confidence intervals are in parentheses, and are based on a bootstrapping procedure of 120 samples drawn with replacement from the original sample.

**Table 4 (continued). Women Never Marrying by Age 45 as a Percent of All US Women.
Predictions by Modeling Assumption and Birth Cohort.**

	Birth Cohort					
	1945 to 1949	1950 to 1954	1955 to 1959	1960 to 1964	1965 to 1969	1970 to 1974
<i>Nonhispanic white women, 4-year college degree</i>						
No age*cohort trend, 0% “stayers”	10.7 (8.5, 12.1)	11.1 (9.4, 13.0)	12.6 (10.2, 14.8)	10.2 (7.5, 12.2)	7.9 (6.0, 9.5)	7.7 (5.5, 9.6)
No age*cohort trend, 6% “stayers”				10.5 (8.2, 12.3)	9.0 (7.8, 10.0)	8.9 (7.6, 10.2)
Linear age*cohort trend, 0% “stayers”				9.7 (7.0, 11.9)	7.0 (4.9, 9.2)	5.6 (3.1, 8.3)
Linear age*cohort trend, 6% “stayers”				10.2 (8.0, 12.0)	8.6 (7.2, 10.1)	7.8 (6.5, 9.5)
<i>N</i>	1,010	1,242	1,310	1,238	1,151	1,002
<i>Nonhispanic black women, no 4-year college degree</i>						
No age*cohort trend, 0% “stayers”	16.6 (13.3, 20.1)	23.3 (19.7, 26.9)	26.4 (22.5, 29.9)	28.9 (25.0, 33.5)	32.8 (27.5, 36.9)	33.8 (27.5, 39.2)
<i>N</i>	521	621	675	780	655	651
<i>Nonhispanic black women, 4-year college degree</i>						
No age*cohort trend, 0% “stayers”	13.4 (6.9, 22.2)	27.1 (20.8, 34.9)	30.9 (22.8, 38.2)	27.9 (27.8, 37.0)	38.3 (26.8, 49.7)	33.1 (23.0, 50.7)
<i>N</i>	103	143	143	113	116	109

Source: 2001 Survey of Income and Program Participation. See text for details of modeling assumptions.

95% confidence intervals are in parentheses, and are based on a bootstrapping procedure of 120 samples drawn with replacement from the original sample.

Table 5: Women with a Birth Prior to First Marriage, as a Percent of All Women at First Marriage. By Education, Age at Marriage, Race, and Birth Cohort.

	Birth cohort			Trend: 1965 to 1974 – 1945 to 1954
	1945 to 1954	1955 to 1964	1965 to 1974	
<i>Nonhispanic white, No 4-year college degree</i>				
Age at first marriage 29 or younger	7% (1%)	9% (1%)	15% (1%)	+ 8 % *
Age at first marriage 30 or older	42 (2)	40 (2)	45 (5)	+ 3
<i>Nonhispanic white, 4-year college degree</i>				
Age at first marriage 29 or younger	2 (1)	2 (1)	3 (1)	+ 1
Age at first marriage 30 or older	18 (2)	13 (2)	8 (3)	- 10 *
<i>Nonhispanic black, 4-year college degree</i>				
Age at first marriage 29 or younger	33 (2)	37 (2)	43 (3)	+ 10 *
Age at first marriage 30 or older	74 (4)	81 (3)	82 (6)	+ 8
<i>Nonhispanic black, 4-year college degree</i>				
Age at first marriage 29 or younger	12 (3)	16 (3)	19 (6)	+ 7
Age at first marriage 30 or older	43 (8)	35 (9)	29 (13)	- 14

Source: 1996 and 2001 Survey of Income and Program Participation. N = 29,324

Standard errors in parentheses.

* Trend statistically significant at $p < .05$

See text for details.

Table 6: Women having a child within 10 years of a first marriage, as a percent of all women childless at first marriage.

By education, age at marriage, and birth cohort for nonhispanic white women.

	1945 to 1954	1955 to 1964	Trend: 1955 to 1964 – 1945 to 1954
<i>Nonhispanic white, No 4-year college degree</i>			
Age at first marriage 29 or younger	86% (1%)	85% (1%)	- 1 %
Age at first marriage 30 to 39	51 (3)	59 (4)	+ 8 *
<i>Nonhispanic white, 4-year college degree</i>			
Age at first marriage 29 or younger	77 (1)	77 (1)	+ 1
Age at first marriage 30 to 39	56 (3)	74 (3)	+ 18 *

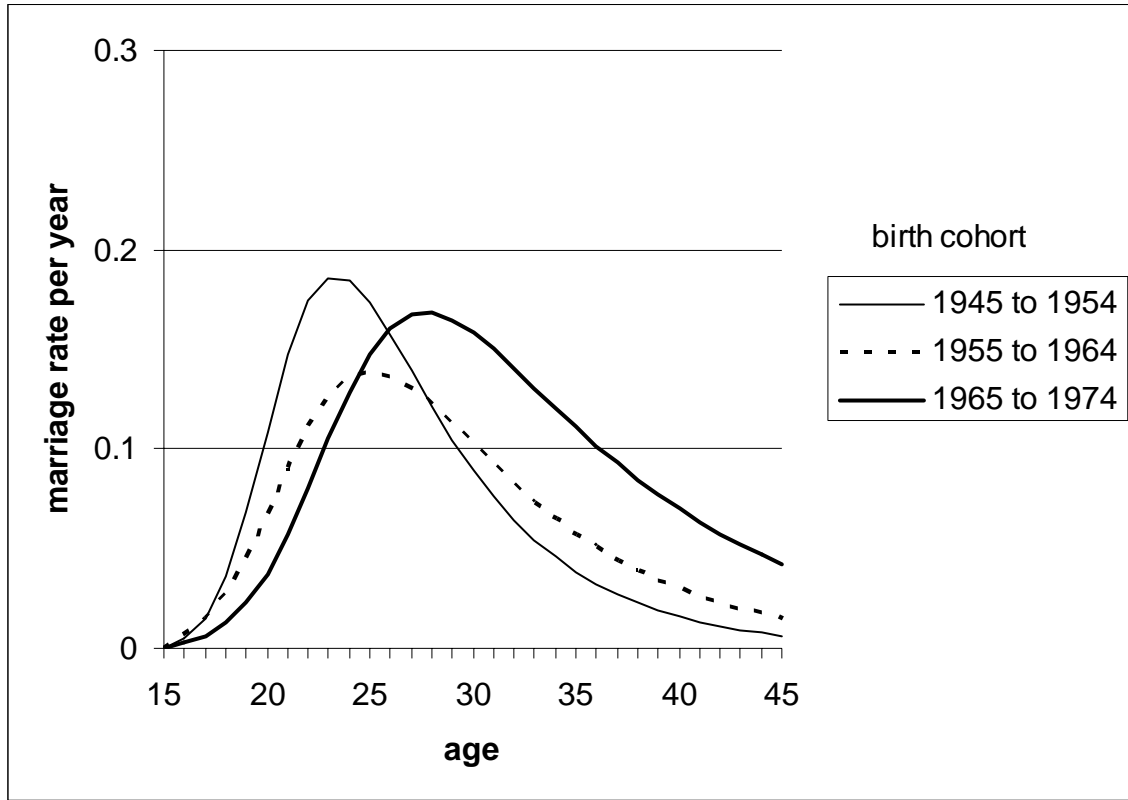
Source: 1996 and 2001 Survey of Income and Program Participation. N = 14,476

Standard errors are in parentheses.

* Trend statistically significant at $p < .05$

See text for details.

Figure A1: First Marriage Rates by Age and Birth Cohort for U.S. White Nonhispanic Women with a Four-Year College Degree, Based on Parameters from Hernes Models.



Source: 2001 Survey of Income and Program Participation. N = 3,165

Hernes parameters and estimates for each cohort are as follows:

For 1945 to 1954 cohort, $A = 1.377$, $b = .835$, $P_0 = .00381$, $t_0 = 16$, $P_\infty = 0.888$

For 1955 to 1964 cohort, $A = 0.948$, $b = .872$, $P_0 = .00746$, $t_0 = 16$, $P_\infty = 0.884$

For 1965 to 1974 cohort, $A = 0.911$, $b = .902$, $P_0 = .00334$, $t_0 = 16$, $P_\infty = 0.958$