THE DECLINE IN MARRIAGE: AN AGE-PERIOD-COHORT ANALYSIS, ISRAEL 1961-1994

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The Decline in Marriage: An Age-Period-Cohort Analysis, Israel 1961-1994

Three explanations –two economic and one ideational– dominate the current debate over the decline in marriage. Using Israeli Census data this paper tests the three major hypotheses explaining the decline in marriage in an age-period-cohort model. Increased earnings account for most of the decline among women, probably by diminishing women's economic reliance on men. Cohort replacement accounts for much of the rest of the decline among women, attitudinal change being the more likely mechanism through which cohort replacement affected marriage. Among men cohort replacement is the major explanation for the decline. Period influences creating economic insecurity –unemployment and inflation– account for much of the rest of the decline among men.

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In the last four decades the developed countries have experienced great decline in the marriage rates of both men and women. Three explanations –two economic and one ideational– dominate the current debate over the decline in marriage (Billari, Liefbroer, and Philipov 2006; Kalmijn 2007). One economic explanation stresses the role of women and is based on the theory of gains to marriage that is closely associated with Becker (1991). It asserts that the increased economic power of women has diminished their economic reliance on men and made marriage less desirable (Bachrach, Hindin, and Thomson 2000). A second economic explanation stressing the role of men asserts that the decline in young men's labor-market position caused marriage to decline (Oppenheimer 1988). Ideational shifts in the ethical, religious and political realm are a commonly invoked third explanation for changes in marriage (Lesthaeghe and Van de Kaa 1986; Lesthaeghe and Surkyn 1988). It has been difficult to test this hypothesis, because a sufficiently long time-series of data on attitudes is often difficult to obtain. Lesthaeghe and Surkyn (1988), however, argue that the major mechanism for attitudinal change is the demographic dynamic of cohort succession: when an older birth cohort dies out, it is replaced by a new cohort that holds different values reflecting its unique historical experience. Thus, if attitudinal change is a cohort effect, then the hypothesis that the decline is due to attitudinal change can be falsified by the absence of cohort influences in the decline.

Few studies provide an empirical answer to the question of ultimate interest: Why are people marrying later and less than in the past? A large body of research exists on the correlates of marriage, such as education, unemployment and attitudes.

An estimate of the relative contribution of each of these variables to the decline in marriage, however, is rarely provided. While theories of marriage decline provide explanations for variation over time, the testing of these theories is often limited to an explanation of the cross-sectional component of the variance. Correlations between two variables at a cross section, however, may differ from correlations between the same two variables in a time series. Using the twenty per cent sample of the 1995 Israeli Census this paper therefore tries to determine the extent to which the three hypotheses are able to explain the *temporal* component of the variance in an age-period-cohort model of marriage in 1961-1994.

Three major findings emerge from our analysis. First, the economic independence of women may have played a more important role in the decline in marriage than is usually acknowledged. Second, the role of the economic insecurity of young men may have been overstated. And third, cohort replacement –an omitted variable in previous analyses– makes a major contribution to the decline.

Theoretical Considerations

Using Dixon's (1971) framework, we review the explanations for the decline in marriage in terms of three mediating factors between social structure and marriage behavior: availability of mates, feasibility of marriage, and desirability of marriage. The availability of mates is determined primarily by the sex ratio of persons of marriageable age within endogamous groups. Feasibility is determined primarily by expectations regarding financial and residential independence of the newly married couple and by the availability of resources for meeting these obligations. The desirability of marriage, or the strength of the motivation to marry, is determined by

the availability of social and institutional alternatives to marriage and by the extent to which these alternatives are considered rewarding.

Availability of Mates

The availability of mates is unlikely to be the major explanation for a phenomenon that has affected both men and women. According to marriage squeeze theory, baby-boom women should have experienced a much less favorable market than those born earlier, because of their large numbers relative to non-baby-boom men a few years older. For men, the large cohorts of baby-boom women should give those born in the years right before the baby-boom a greater advantage in finding a mate, compared with men born earlier (Goldman, Westoff, and Hammerslough 1984; Goldscheider and Waite 1986). A marriage squeeze will create cohort effects in marriage. Due to the occurrence of sex differentials in cohort effects, a marriage squeeze is unlikely to be confused with other cohort influences.

Feasibility of Marriage

Dixon's second variable is the feasibility of marriage. One explanation for the decline in marriage stresses the role of men and is based on the idea that marriage requires economic security. It has long been recognized that marriage increases in times of prosperity and declines in times of recession (Bracher and Santow 1998, p. 275). Empirical studies generally support the view that unemployment and low earnings among men lead to delays in marriage (e.g. Ahn and Mira 2001; Bracher and Santow 1998; Kravdal 1999; Liefbroer and Corijn 1999; Lloyd and South 1996; Sassler and Schoen 1999; Sweeney 2002; Oppenheimer, Kalmijn, and Lim 1997; Oppenheimer 2003; Xie et al. 2003; Sassler and Goldscheider 2004; Kalmijn and Luijkx 2005).

Oppenheimer (1988) asserts that a decline in young men's labor-market position is the major explanation for the decline in marriage. A major impediment to making a long-term commitment is the uncertain nature of future characteristics and a major source of uncertainty lies in the timing of the transition to a stable work career. Easterlin (1978) argues that the sharp decline in the relative economic position of young males is because of the entry into the labor market of baby-boom cohorts that are large relative to older cohorts. Hence, the trend in marriage should reverse itself as the baby-bust cohorts reach young adulthood. Trovato (1988) reports that large cohorts of Canadian men experienced relatively low rates of marriage. Ending in 1985, however, his study does not include baby-bust cohorts. Assuming that Easterlin's relative cohort-size model explains the decline in the relative economic position of young males and that a decline in young men's labor-market position is the major explanation for the decline in marriage, the decline in marriage should be a cohort effect. On the other hand, Oppenheimer (1988) argues that, while relative cohort size is important, period influences are operating as well. Changes in the occupational structure over time may have caused a delay in the transition to a stable work career. Oppenheimer argues that greater investment in human capital also contributed to the delay.

While previous research shows that men's employment remains an important condition for the entry into marriage, it is not clear to what extent measures of young men's labor-market position explain long-term trends in marriage. Berrington and Murphy (1994) question whether there is a straightforward relationship between increased unemployment and the delay in marriage in Britain, highlighting the fact that first marriage rates began to fall in the early 1970s, predating the rise in youth unemployment. Wood (1995) found that the shrinking pool of high-earning, young

African-American men explains little of the decline in African-American marriage in the United States during the 1970s. Although Ahn and Mira (2001) show that male unemployment has a significant effect on the timing of marriage, their results seem to suggest that joblessness is not a major factor behind the decline in Spain.

While the labor-market position of young men has deteriorated there also has been an increase in wages. A rise in wage rates increases the likelihood of men to enter marriage (Oppenheimer 2003; Ahituv and Lerman 2007). Thus, the effects of youth unemployment and the rise in wage rates on marriage may partly cancel each other out.

A decline in young men's labor-market position is not the only possible source of economic insecurity. Adler (1997) argues that social and economic change due to unification caused economic insecurity in the case of Eastern Germany, while this paper argues that very high inflation caused economic insecurity in Israel in the late 1970s and early 1980s.

Desirability of Marriage

Dixon's third variable is the desirability of marriage. The economic independence model asserts that increases in educational attainment, a rise in rates of labor-force participation, and increased earnings have diminished women's economic reliance on men and have made marriage less desirable (Sassler and Schoen 1999). Although the independence hypothesis is primarily a hypothesis about non-marriage rather than delayed marriage, it might also be invoked to predict delayed marriage rather than non-marriage. By reducing the penalties of non-marriage, economic resources may encourage increased risk-taking in the form of higher minimum levels of acceptability of a prospective spouse (Oppenheimer and Lew 1995).

Under the independence argument, better educated women should be more economically independent of marriage. Using micro-level data Raymo (2003) reports that better educated women in Japan have a lower probability to marry, even when school enrollment is taken into account. Micro-level regression analyses in many other developed countries, however, show that once school enrollment is taken into account, better educated women do not have a lower probability to marry and often they have a higher probability to marry (Blossfeld and Jaenichen 1992; Goldscheider, Turcotte, and Kopp 2001; Oppenheimer and Lew 1995; Oppenheimer et al. 1997; Santow and Bracher 1994; Sweeney 2002; Thornton, Axinn, and Teachman 1995). Under the independence argument, employed women should be more economically independent of marriage. Micro-level regression analyses, however, show that employed women do not have a lower probability to marry and in some cases have a higher probability to marry (Bracher and Santow 1998; Goldscheider and Waite 1986; Lichter et al. 1992). Finally, under the independence argument, female earnings should have a negative effect on marriage. Ono (2003) reports a negative effect in a micro-level analysis of Japan. Lichter, Le Clere, and McLaughlin (1991) observed a negative effect in an aggregate-level analysis in the United States, but this was reversed in micro-level analyses (Lichter et al. 1992; Oppenheimer and Lew 1995; Sweeney 2002).

The desirability of marriage is determined by the availability of alternatives to marriage. In many countries cohabitation has become an alternative to formal marriage, at least a temporary one. Thus, part of the decline in marriage has been offset by increased living together without being married (Leridon and Villeneuve-Gokalp 1988; Bumpass and Sweet 1989; Haskey 2001). The (temporary) substitution of cohabitation for marriage is usually associated with a change in attitudes and

values (Thornton et al. 1995; Clarkberg, Stolzenberg, and Waite 1995). Lesthaeghe has made a powerful case that ideational change is strongly implicated in the decline in marriage (Lesthaeghe and Surkyn 1988; Lesthaeghe and Neidert 2006).

A central socio-psychological postulate is that cohorts tend to be marked for life by the ideas prevalent in their youth (Ryder 1965, p. 851). According to Lesthaeghe and Surkyn (1988), the mechanism for attitudinal change is the demographic dynamic of cohort succession: when an older generation dies out, it is replaced by a new cohort that holds different values reflecting its unique historical experience. Evidence that attitudinal change is a cohort effect is accumulating (Sears and Valentino 1997).

In the social sciences there is a continuing debate between those who describe people as making choices "rationally" on the basis of available information and those who emphasize a wide variety of distorting psychological influences. One area of continuing empirical clash between these perspectives focuses on the long-term stability of attitudes. At one extreme is the view that basic attitudes are always susceptible to change given compelling evidence. At the other extreme is the view that basic attitudes are acquired early and persist throughout life. Much of the evidence for value systems to have crystallized by early adulthood comes from the study of political socialization. Several studies of political socialization suggest that people are highly vulnerable to shifts in attitudes during early adulthood. Attitude stability increases with age. This increase appears to occur immediately following early adulthood, and attitude stability appears to remain at a constant, high level for the remainder of the life cycle (Alwin and Krosnick 1991; Firebaugh and Chen 1995; Inglehart 1985; Inglehart and Abramson 1994; Sears and Valentino 1997; Tilley 2002).

Lesthaeghe associates attitudinal change with the process of secularization (Lesthaeghe and Surkyn 1988). Empirical studies seem to indicate that religious commitment is largely determined in adolescence remaining more or less constant for the rest of the life cycle. Thus, the decline in religiosity appears to be mostly a cohort effect (Argue, Johnson and White 1999; Chaves 1989; Crockett and Voas 2006; Te Grotenhuis and Scheepers 2001; Tilley 2003; and Voas and Crockett 2005).

Explanations based on attitudinal change raise the question whether attitudinal change is endogenous or not. Some think that attitudinal change is primarily an effect, rather than a cause, of changed behavior (Easterlin 1978). The birth control pill which became available in the 1960s, for example, may have enabled a change in attitudes toward cohabitation and premarital sex insofar as its availability reduced the risks of sex outside marriage (Preston 1986, p. 183; Kiernan and Eldridge 1987, p. 61; Goldin and Katz 2000; and 2002).

Data and Variables

Due to multi-collinearity age-period-cohort analyses may require a large sample (see below). Samples drawn from the census are among the largest available. Unfortunately, questions on date of marriage have been dropped from many census questionnaires. Thus, for example, after 1980 the U.S. Census does not ask about the age at first marriage.[1] The unavailability of information on the timing of marriage in the latest census of many of the larger Western countries led us to investigate the decline in marriage in a more peripheral Western country: Israel. Although a small country, a twenty percent sample of the 1995 Census is available for restricted use. In the last section we will discuss the extent to which our results can be generalized to other Western countries.

The Arab minority group has been omitted from the analysis. Most of these are Muslims who were still in the first demographic transition when the Jewish majority started to enter the second demographic transition. The decline in marriage has barely started among this minority group. Further justification for a separate analysis of the two ethnic groups in Israel is the very low rate of intermarriage. Thus, the marriage markets of the two groups are almost completely independent of each other.

Like all other developed countries, Israel has undergone changes in reproductive behaviour in the last four decades, although not all of these are as dramatic as those that have occurred in other developed countries (Friedlander and Feldmann 1993; Schellekens 2009). Information on long-term trends in cohabitation is limited. Previous research, however, suggests that cohabitation in Israel is mainly a child-free prelude to marriage (Kaplan 2002; Baloush-Kleinman and Sharlin 2004).

We used the questions on year of only and first marriage in the latest census to reconstruct the marital history of cohorts born after 1924. The use of this census to reconstruct trends in nuptiality does not lead to a large bias, as shown, for example, by a comparison between the percentage of women aged 20-24 who had never married for each single year between 1966 and 1994 as estimated from the 1995 Census, with the same percentage based on current vital statistics (see Figure 1). The published series of the percentage of women who had never married at age 20-24 that is based on current statistics only starts in 1966. The sudden increase in 1972 in the published series is due to a correction in the denominator based on new population estimates that became available in the 1972 Census. This discontinuity is of course absent from our reconstructed series. The pre-1966 rise in the per cent never married is confirmed

by the 1961 Census. Based on the 1995 Census our estimate for 1961 (33.4) is only slightly below the actual percentage in the 1961 Census (34.2).

[Figure 1 about here]

The dependent variable indicates whether a never-married person married in a specific calendar year. We used a third-degree polynomial of age to model the relation between age and marriage (see next section for justification). We used a set of dummy variables to model the effects of cohorts. There are six five-year birth cohorts, while the reference category –1925-44– combines four smaller five-year cohorts.[2]

In order to estimate net cohort effects we need to control for period effects. In the first statistical model we use a set of dummy variables to control for period effects. There are seven five-year periods, except for a shorter reference period – 1961-64. In the other models, we replace the period effects with three proxies: average income, inflation, and unemployment. We used the gross domestic product (GDP) per capita in thousands of 1995 NIS as a proxy for average income (State of Israel 1998, Table 6.1). Real GDP per capita in Israel increased by more than 150 per cent, the interwar period of 1967-1973 witnessing the fastest growth (see Figure 2). We measured inflation by the natural logarithm of the percentage change in the consumer price index (State of Israel 1981, p. 250; and 1996, p. 248). A period of very high inflation started after the 1973 war and lasted until 1985 after reaching an all-time high in 1984 (see Figure 2). After controlling for GDP per capita and inflation, the effect of a series of unemployment rates of men aged 18-24 that is only available from 1972 is not significant. A longer series of unemployment rates that pools all ages and both sexes, however, does have a very significant effect on the marriage of men (State of Israel 1974-1996). This series is available from 1960 and correlates well with the unemployment rate of young men in the years that both series

are available (see Figure 3). All three macro-level variables are measured in year *t*-1 to model marriage in year *t*. Representing three aspects of living standards, it may be difficult to separately interpret the three economic variables –GDP per capita, inflation and unemployment– that are used as proxies for period effects. Hence, we will also look at their combined effect.

[Figures 2 and 3 about here]

We only have one proxy for the cohort effects. Following Trovato (1988) we measured relative cohort size as the number of men aged 20-34 as a percentage of men aged 20-64 (State of Israel 1961-1994). Figure 3 compares trends in relative cohort size with those in unemployment. Relative cohort size peaks in the 1970s. Thus, the rise in unemployment in the 1980s does not seem to be due to a decline in relative cohort size. A measure of attitudinal change that could serve as an additional proxy for the cohort effect is not available.

Earnings and unemployment are thought to be important determinants of marriage. Unfortunately retrospective individual-level information on earnings or unemployment is not available from the census. However, we are primarily interested in *trends*. The two macro-level proxies mentioned above – real GDP per capita and the unemployment rate – will pick up major trends in these omitted variables.

Two distinct education vectors were constructed for each person from information on the number of years of schooling. The first –educational status– charts yearly participation in education. The second vector –educational level– reflects actual attainment (Santow and Bracher 1994, p. 478). Our assumption that all respondents followed a model educational trajectory without interruptions, except for two (three) years of military or national service for women (men), is probably not unreasonable in the Israeli context (compare Raymo 2003). While education may

affect marriage, there may also be a reverse effect of marriage on education, because women who marry may drop out of school. To minimize this problem of endogeneity, we used educational status and level in year *t*-1 to model marriage in year *t*.

Jews who were born abroad in North Africa and the Near East, or to parents who were born there, entered the second demographic transition later and at a slower pace than other Israeli Jews, perhaps due to intergenerational influences on marriage (Barber 2000). Hence, we added a variable indicating Oriental origin.

Analytic Approach

The census only lists the calendar year of marriage. Hence, a discrete-time hazard model is used to assess the effects of the independent variables on the probability of marrying. We have assumed that the hazard for a marriage is constant within annual intervals. We estimate discrete-time event-history models using logistic regression. This kind of analysis can accommodate two common features of event histories: censored data and time-varying variables, such as age and educational status and attainment (Allison 1982).

The dependent variable in the statistical model is the annual log odds of marrying. The unit of analysis is the "person-year"; that is, each person contributes as many units to the analysis as the number for which he/she is observed. Person-years below age 20 were omitted from the analysis, thus excluding most of the years spent in military and national service. Records were right-censored at age 35 or at the end of 1994, whichever came first. After left-truncation at arrival in Israel and January 1, 1961, whichever came last, men and women contributed 887,791 and 597,550 person-years to the analysis, respectively.

Our review of the literature identified two hypotheses –Easterlin's relative cohort-size model and Lesthaeghe's second demographic transition– that predict cohort influences. Age-period-cohort models are particularly useful to detect the distinct impacts of age, period, and cohort on some outcome of interest. Disentangling the distinct effects of age, period and cohort, however, involves a methodological problem, because the three are perfectly correlated. There are at least three conventional strategies for identification and estimation: (1) constraining two or more of the age, period, or cohort coefficients to be equal; (2) transforming at least one of the age, period or cohort variables so that its relationship is nonlinear; and (3) assuming that the cohort or period effects are proportional to certain measured variables (Yang and Land 2006).

Mason et al. (1973) point out that the identification problem can be solved by imposing equality constraints on categories of age, period and/or cohort. One criticism of this method is that estimates of model effect coefficients are sensitive to the arbitrary choice of the identifying constraint. A second strategy is to parameterize the effect of age as a polynomial (Mason et al. 1973; Raftery, Lewis, and Aghajanian 1995; Yang 2008). While the use of a polynomial may solve the problem of identification or extreme multi-collinearity, high levels of multi-collinearity may remain a problem in models of change. Simulation studies have shown, however, that the deleterious effects of multi-collinearity may be largely offset when the sample size is large and the independent variables explain a high proportion of the variance in the dependent variable (Mason and Perreault 1991; and Grewal et al. 2004).[3] The analysis presented below is based on a very large sample, while period and cohort dummies explain a high proportion of the temporal component of the variance.

We chose to parameterize the effect of age as a cubic function, because higher-order polynomials change the exponents of the raw logistic coefficients of cohort and period effects by less then one percent. While the use of a polynomial solves the problem of the arbitrary choice of the identifying constraint, this approach still is not very informative about the mechanisms by which period-related changes and cohort-related processes act on the dependent variable of interest.

"Period" is a poor proxy for some set of contemporaneous influences, and "cohort" is an equally poor proxy for influences in the past. When these influences can themselves be directly measured, there is no reason to probe for period or cohort effects (Hobcraft, Menken, and Preston 1982). Hence, a third strategy is to constrain the effects of period and/or cohort to be proportional to some other substantive variable. Heckman and Robb (1985) term this the “proxy” variable approach because period and cohort are represented by some other variable. We use three proxies for the period effect: real GDP per capita, the unemployment rate and the percentage change in the consumer price index. The "proxy" variable approach, however, also has its drawbacks. Replacing the period dummies by proxies may lessen the rigorousness of the control for the period effects on cohort differences (O'Brien 2000, p. 125). Although replacing an accounting dimension with measured variables solves an identification problem, it makes room for specification errors (Smith, Mason and Fienberg 1982). If the use of proxies does not lessen the rigorousness of the control for period effects, however, then cohort differences in the "proxy" variable approach should resemble cohort differences in the approach that uses period dummies. In order to determine the extent to which the use of proxies lessens the rigorousness of the control for period effects, we compare cohort differences in both strategies. After replacing period dummies with proxy variables, there is no need to replace age

dummies by a polynomial in order to identify the model. We retained the polynomial, however, to enhance comparability of the cohort dummies in the first and third model.

If the cohorts and time periods are unique entities, then conventional statistical methodology guidelines suggest that it might be more appropriate to model them with a fixed-effects specification. Hence, we model periods and cohorts as fixed effects. Yang and Land (2006 and 2008), however, argue that when sample sizes within each cohort and/or period are unbalanced mixed (fixed and random effects) models use the available information in the data more efficiently than fixed-effects models. They warn that the standard errors of estimated coefficients of conventional fixed-effects regression models may be underestimated, leading to inflated t-ratios and actual alpha levels that are larger than nominal levels of significance. To minimize this problem we use a nominal level of significance of one tenth of one percent.

Since we are only interested in explaining the temporal component of the variance, the current analysis does not present goodness of fit statistics, such as likelihood ratio tests. Instead we present a graphical comparison over time of observed and predicted values.

Results

Non-marriage in Israel is still limited. In 2005, only 5.5 percent of Jewish women and seven percent of Jewish men aged 50-54 had never married (State of Israel 2007, p. 146). Hence as far as the first three cohorts are concerned, the analysis presented below is mostly one of delayed marriage.

Figure 4 presents first marriage rates per 1000 person-years for women and men at ages 20-24, 25-29, and 30-34 for every single year between 1961 and 1994. Most of the decline occurred before age 25. There seems to be little change among

women above age 25 and men above age 30. In the analysis, we pool age groups and model the odds of marriage at ages 20-34. Table 1 presents descriptive statistics of the variables used in the analyses.

[Table 1 and Figure 4 about here]

Logistic Regression Model: Women

Table 2 presents three logistic regression models of the odds of marriage among women. Coefficients are presented as odds ratios or exponents of the raw logistic coefficients. The odds ratios are multiplicative effects on the odds of marrying in any one-year interval. A coefficient of 1.00 represents no effect, a coefficient greater than 1.00 represents a positive effect, and a coefficient less than 1.00 represents a negative effect on the odds.

[Table 2 about here]

The first model includes period dummies to estimate the net effect of cohorts. Compared with women born before 1945 the odds of marriage among younger cohorts initially increase reaching a high among those born in 1955-59. The odds of marriage start to decline among women born in 1960-64. The second and third models replace the period dummies with two proxies. The second model omits the cohort dummies to show the extent to which the omission of cohort dummies leads to bias in the coefficients of the other variables in the model. The estimates of the net cohort effects in the third model resemble those in the first model. Thus, the use of proxies does not seem to lessen the rigorousness of the control for the period effects on cohort differences to a large extent.

In the third model, the measure of average income has a negative effect on the odds of marriage. The hypothesis that a higher income diminished women's economic

reliance on men is consistent with this finding. Inflation also has a negative effect on the odds of marriage. The hypothesis that economic insecurity is a disincentive of marriage is consistent with this finding. The unemployment rate does not have a significant effect on the odds of marriage among women and has been omitted from the analysis.

The age-period-cohort models also include three individual-level explanatory variables. The coefficients of these variables are nearly identical in the first and third models. Our results show that enrollment lowers the odds of marriage, while educational attainment increases the odds of marriage, suggesting that an increase in educational attainment does not diminish women's economic reliance on men. Women of oriental origin have higher odds of marriage.

Figure 5 presents observed and predicted probabilities of marriage and shows the extent to which the second and third models are able to predict the decline in marriage. Notice how the omission of cohort dummies in the second model affects the goodness of fit.

[Figure 5 about here]

Figure 6 presents a hierarchical set of four counterfactual-predicted series of probabilities of marrying based on the third model. The first counterfactual-predicted series factors out the cohort effects from the observed series. Holding cohort effects constant at the level of the pre-1945 birth cohorts, marriage would not have declined after 1986 (thick dashed line). Thus, the decline after this date seems to be a cohort effect. In the absence of cohort replacement the decline before 1986 would have been even greater. When in addition to constant cohort effects inflation is held constant at the level of 1960, then marriage among women would have declined much less before the mid 1980s (thin dotted line). Thus, high inflation may have accelerated the decline

before 1986. Higher incomes seem to account for much of the rest of the decline. When in addition to constant cohort effects and constant inflation real GDP per capita is held constant at the level of 1960, then marriage among women would not have declined at all (thick dotted line). Actually, it would have increased slightly, due to an increase in education, as becomes evident when in addition the educational level of all women is held constant. When education is held constant at eight years of schooling, then the trend of the counterfactual-predicted probabilities (thin solid line) seems to indicate that marriage would neither have declined nor increased. Thus, the net effect of education – enrollment and attainment – is *positive*.

[Figure 6 about here]

Figure 6 suggests that increased earnings made the largest contribution to the decline (69 per cent; see Table 3). Thus the hypothesis that increased earnings have diminished women's economic reliance on men and made marriage less desirable fits the data and may be the major explanation for the decline among women. Cohort replacement is the second most important explanation for the decline (52 per cent). Inflation makes the smallest contribution to the decline. It may be difficult, however, to separately interpret the two macro economic variables justifying a look at their combined effect. Combined, inflation and real GDP per capita, explain almost 90 percent of the decline. Together, cohort replacement and improved living standards explain more than 100 percent of the decline, because otherwise a fourth variable – education– would have caused marriage to increase. The third model slightly overestimates the probability of marriage in 1961 and underestimates it in 1994. Thus it predicts a larger decline than actually occurred producing a negative residual in the explanation of the decline.

[Table 3 about here]

Logistic Regression Model: Men

Table 4 presents three logistic regression models of the odds of marriage among men. The first model controls for period dummies to estimate the net effect of cohorts. The odds of marriage do not start to decline before the cohort of 1960-64. The second and third models replace the period dummies with three proxies. The second model omits cohort dummies showing the extent to which the omission of cohort dummies leads to bias in the coefficients of the other variables in the model. In the third model the odds of marriage already start to decline among those born in 1955-59. Thus, a comparison of the cohort effects in the first and third model shows that the use of three proxies partially lessens the rigorousness of the control for the period effects on cohort differences. Hence, the third model probably overestimates the cohort effect, while underestimating the period effect.

[Table 4 about here]

Unemployment and inflation have negative effects on the odds of marriage, suggesting that economic insecurity made marriage less feasible. As opposed to a negative effect among women, however, the measure of average income in the second model, real GDP per capita, has a *positive* effect on the odds of marriage among men, suggesting that increased earnings made marriage more feasible among men. We also experimented with a proxy for the cohort effects. Our measure of relative cohort size, however, does not attenuate the cohort effects (result not shown). Hence, this variable was omitted from the final model.

As among women, our results show that enrollment lowers the odds of marriage, while educational attainment increases the odds. Unlike women, however, men of oriental origin have *lower* odds of marriage. Figure 7 shows the extent to

which the third model is able to predict the decline in marriage. It also shows the poor fit of the second model that omits cohort effects.

[Figure 7 about here]

Figure 8 presents a hierarchical set of four counterfactual-predicted series of probabilities of marrying based on the first and third models. Since, the cohort effects in the first model are not biased, we used it to factor out cohort effects from the observed series. If cohort effects were constant, marriage would not have declined after 1986 (thick dashed line). We used the third model to compute the other counterfactual-predicted series. When in addition to constant cohort effects inflation and unemployment are held constant at the level of 1960, then marriage among men would not have declined (thin dotted line). Thus the third model suggests that economic insecurity due to high inflation and unemployment was a major cause of the decline. When inflation and unemployment are held constant the third model predicts an increase in marriage, presumably due to increased earnings, the only proxy for period effects that is still allowed to vary. Indeed, when in addition real GDP per capita is held constant at the level of 1960 the third model predicts no increase in marriage (thick dotted line). Finally, in addition to the previous variables that are held constant, the educational level of all men is held constant at eight years of schooling. The trend of the counterfactual-predicted probabilities (thin solid line) suggests that greater investment in human capital does not explain the decline in male marriage. Predicted probabilities would have been slightly lower if not for the increase in educational attainment. Thus, the net effect of education – enrollment and attainment – among men is also positive.

[Figure 8 about here]

Figure 8 would seem to indicate that cohort replacement made the largest contribution to the decline (83 per cent; see Table 3). The third model suggests that economic insecurity as measured by inflation and unemployment makes the second most important contribution (58 per cent). The hypothesis that economic insecurity caused by high inflation and unemployment is a disincentive to marriage is consistent with this finding. It may be difficult, however, to separately interpret the three macro economic variables justifying a look at their combined effect. Real GDP per capita almost cancels out the effect of the two other economic variables. Thus, the economic factors combined do not seem to explain the decline. All five variables combined explain only about two thirds of the decline, the residual being due to unidentified period effects.

Conclusion and Discussion

Few studies provide an empirical answer to a question of prime interest: Why are people marrying later and less than in the past? There is plenty of research on the correlates of marriage, such as education, unemployment and attitudes. An estimate of the contribution of each of these variables to the decline in marriage, however, is rarely provided.

While theories of marriage decline provide explanations for variation over time, the testing of these theories is often limited to an explanation of the cross-sectional component of the variance. Correlations between two variables at a cross section, however, may differ from correlations between the same two variables in a time series. Using age-period-cohort models this paper focuses on the longitudinal component of the variance. Although there are age-period-cohort analyses of fertility (based on aggregate birth rates) for at least three developed countries –Western

Germany, the United States and Japan– this is the first attempt at an age-period-cohort analysis of marriage, to the best of our knowledge (Huinink 1988; Fukuda 2008; Pullum 1980). Pooling time-series data on marital status that span 34 years, and using statistical models that disentangle the confounding effects of age, period, and birth cohorts, this study provides new evidence of the extent to which the three major hypotheses are able to account for the decline. Three major findings emerge from our analysis. First, the economic independence of women may have played a more important role in the decline in marriage than is usually acknowledged. Second, the role of the economic insecurity of young men may have been overstated. And third, cohort replacement –an omitted variable in previous analyses– makes a major contribution to the decline.

Our results clearly call into question the appropriateness of mono-causal explanations of declining marriage. Three explanations dominate the current debate over the decline in marriage. One explanation – the economic independence hypothesis – stresses the role of women and asserts that increased economic power of women has diminished women's economic reliance on men and made marriage less desirable. Most of the individual-level evidence has not been kind to this hypothesis. We also found no individual-level evidence of the decline in marriage among women being associated with increases in educational attainment. As in several other countries, we actually report a positive correlation between female educational attainment and marriage. Perhaps, higher education provides greater access to more attractive marriage markets (Oppenheimer and Lew 1995, p. 118). Increased earnings as measured at the macro level, however, seem to account for most of the decline in marriage among women. In the absence of another theory that predicts an association between increased earnings and the decline in marriage, we cannot reject the

independence hypothesis. Earnings and educational levels working in opposite direction may raise doubts concerning the interpretation of the evidence, however, because at the individual level the two variables are likely to be correlated. Of course it is possible that the macro-level measure of income used in the analysis is not a proxy for individual-level earnings but for an unknown omitted variable. Another explanation is that higher educational attainment has two kinds of effect. First, higher educational attainment may provide greater access to more attractive marriage markets explaining most of the cross-sectional component of the variation due to educational attainment. Second, by enhancing economic independence an increase in educational attainment may explain most of the temporal component of the variation due to educational attainment. If the first kind of effect is the stronger of the two, then the second kind of effect may only become visible when a separate measure of trends over time in educational attainment or a correlated socio-economic measure is added to the analysis.

We rely on rather poor measures of the key explanatory factors, namely economic power of women, young men's labor-market position, and attitudes towards marriage and related behaviors. Instead of economic power of women we only have a measure of average income. Increased earnings as measured at the macro level seem to account for most of the decline in marriage among women. Our analysis does not show whether increased earnings influenced marriage by empowering women, through a deterioration of young men's labor-market position, or by changing attitudes towards marriage. Provided that no major explanations for the decline in marriage have been omitted from the literature, then surely the economic power of women is a more parsimonious explanation.

A second hypothesis for the decline in marriage –the economic insecurity hypothesis– stresses the role of men and is based on the idea that marriage requires economic resources and security. Virtually all micro-level studies find that low earnings and unemployment decrease marriage among men (Kalmijn 2007). High inflation may be another source of economic insecurity. Schellekens (2009) provides evidence for the depressing effect of high inflation on marital fertility. There are no previous studies, however, of the possible impact of high inflation on marriage. High inflation in Israel lasted until 1985. Thus, inflation is mostly a temporary explanation for the decline in marriage. Combined, unemployment and inflation seem to be the second most important explanation for the decline in marriage among men in Israel. Notice, however, that increased earnings almost cancel out the effect of economic insecurity as measured by unemployment and inflation. Thus, the three macro-economic variables combined do not explain the decline among men.

A third hypothesis attributes a major role to attitudinal change. The evidence for the role of attitudinal change is mostly indirect. An analysis of the decline in marriage in the United States between 1940 and 1987 by Mare and Winship (1991) suggests that socioeconomic factors cannot account for the drastic decreases in marriage rates in the United States. In an analysis of the retreat from marriage in 1986-1997, Lichter, McLauglin, and Ribar (2002) found only modest evidence for the economic model of marriage and call into question the appropriateness of strictly economic explanations of declining marriage.

Lesthaeghe and Surkyn (1988) argue that the major mechanism for attitudinal change is cohort replacement. Provided that attitudinal change contains a substantial cohort component, it should be possible to falsify the hypothesis that attitudinal change plays a major role. We use age-period-cohort modeling to estimate the

contribution of cohort replacement net of period effects. Our results seem to indicate that cohort replacement was a major factor in the decline in marriage among men, while it occupies second place among explanatory variables in the decline in marriage among women. Thus, we cannot reject the hypothesis that attitudinal change is a major explanation of the decline in marriage.

In our analysis there is a lack of cohort level measures of concern to various theories. This of course has to do with the availability of such measures in our data set. Thus, attitudinal change is not the only possible explanation for cohort effects. In particular, Easterlin's relative cohort-size model predicts that the decline in the relative economic position of young males is a cohort effect. A measure of relative cohort size, however, does not attenuate cohort effects. Moreover, the trend in marriage should reverse itself after relative cohort size peaked in the 1970s. Unemployment among young males is thought to mediate the effect of relative cohort size on marriage. Cohort effects, however, remain significant after controlling for the general unemployment level. Of course, this is not definite proof of the cohort influences being due to attitudinal change. Provided that there are no cohort theories of marriage decline that have been omitted from the literature, however, attitudinal change is a likely explanation for the cohort effects.

To what extent can our results be extrapolated to other Western countries? Israel differs from other Western countries in many ways, but most strikingly in its total fertility rate of more than 2.5 births per woman. Thus, it is perhaps not possible to extrapolate all of our findings to other Western countries. On the other hand, the dominant ethnic group in Israel is European and most Israelis would consider their country to be a Western society. Age at first marriage is not much lower than in the Western countries, while cohabitation is quite common now. Moreover, minority

groups that tend to resist cohabitation have either been excluded from our analysis, such as Arabs, or are under-represented due to their opposition to the census, such as Ultra-Orthodox Jews. Inflation in other Western countries during the second transition did not reach the levels it reached in Israel. High inflation, however, only provides a secondary explanation for the decline in Israel and has been controlled for. Earnings have also increased in other Western countries, while attitudinal change there may even have been greater. Thus, given the similar changes experienced by Israel and most other Western countries, our major results may also be relevant for other Western countries.

Notes

1. The Current Population Surveys (CPS) records marital status at a particular point in time and contains no longitudinal data (Lichter et al. 2002).

2. Most of those born before 1945 are immigrants. Since they spent much of their formative years on three different continents it makes little sense to divide them into smaller cohorts.

3. We experimented with smaller samples to investigate how sample size affects regression coefficients. When sample size is less than 50,000 person-years coefficients for the period and cohort effects were biased. Above 50,000 person-years coefficients are very similar to those in the full sample (results not shown).

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Table 1 – Descriptive Statistics for Variables Used in the Analysis

	Women		**Men**	
Variable	**Mean***	**Stand. Dev.**	**Mean***	**Stand. Dev.**
Marriage in year *t*	0.175	-	0.128	-
Age (years)	23.690	3.624	23.950	3.446
Oriental origin	0.500	-	0.530	-
Enrollment	0.376	-	0.217	-
Years of education (years)	12.286	2.902	12.026	2.772
Birth cohort:				
1926-44	0.101	-	0.122	-
1945-49	0.125	-	0.127	-
1950-54	0.160	-	0.161	-
1955-59	0.161	-	0.170	-
1960-64	0.167	-	0.173	-
1965-69	0.172	-	0.157	-
1970-74	0.114	-	0.090	-
Period:				
1961-64	0.045	-	0.059	-
1965-69	0.090	-	0.099	-
1970-74	0.130	-	0.131	-
1975-79	0.148	-	0.147	-
1980-84	0.162	-	0.161	-
1985-89	0.185	-	0.179	-
1990-94	0.240	-	0.224	-
GDP per capita (1000 NIS)	34.897	6.956	34.406	7.231
Inflation (per cent)	3.223	1.294	3.188	1.311
Unemployment rate	-	-	5.945	2.709
Person years	597,550		887,791	

Note: * means of person-years.

Table 2 – Logistic Regression of the Odds of Marriage: Women 1961-1994

	Model 1		**Model 2**		**Model 3**	
Variables	**e^b**	**p-value**	**e^b**	**p-value**	**e^b**	**p-value**
Age	73.997	0.000	58.847	0.000	74.127	0.000
Age squared	0.853	0.000	0.862	0.000	0.853	0.000
Age cubic	1.002	0.000	1.002	0.000	1.002	0.000
Oriental origin	1.028	0.001	1.042	0.001	1.027	0.001
Enrollment	0.626	0.000	0.611	0.000	0.624	0.000
Years of education	1.057	0.000	1.063	0.000	1.057	0.000
Birth cohort:						
1926-44	-	-			-	-
1945-49	1.138	0.000			1.068	0.001
1950-54	1.250	0.000			1.227	0.000
1955-59	1.343	0.000			1.265	0.000
1960-64	1.249	0.000			1.192	0.000
1965-69	0.956	0.359			0.917	0.056
1970-74	0.561	0.000			0.562	0.000
Period:						
1961-64	-	-				
1965-69	0.855	0.000				
1970-74	0.777	0.000				
1975-79	0.633	0.000				
1980-84	0.553	0.000				
1985-89	0.562	0.000				
1990-94	0.643	0.000				
GDP per capita			0.968	0.000	0.987	0.000
Inflation			1.026	0.000	0.928	0.000
Constant	0.000	0.000	0.000	0.000	0.000	0.000
-2Log likelihood	490,082.22		492,173.15		490,146.73	

Table 3 – Percent of the Decline in Marriage Explained 1961-1994

Variable	**Women**	**Men***
Cohort effects	51.6	83.4
Inflation & unemployment	19.6	58.3
GDP per capita	69.1	-57.6
Education	-22.0	-19.4
Residual	-18.3	35.3
Total	100.0	100.0

Note: *Among men the cohort effects were estimated using the first model; and the residual includes unidentified period effects.

Table 4 – Logistic Regression of the Odds of Marriage: Men 1961-1994

	Model 1		**Model 2**		**Model 3**	
Variables	**e^b**	**p-value**	**e^b**	**p-value**	**e^b**	**p-value**
Age	3397.814	0.000	3092.252	0.000	3486.825	0.000
Age squared	0.758	0.000	0.761	0.000	0.757	0.000
Age cubic	1.003	0.000	1.003	0.000	1.003	0.000
Oriental origin	0.954	0.000	0.960	0.000	0.955	0.000
Enrollment	0.665	0.000	0.666	0.000	0.666	0.000
Years of education	1.022	0.000	1.024	0.000	1.022	0.000
Birth cohort:						
1926-44	-	-			-	-
1945-49	1.073	0.000			1.065	0.001
1950-54	1.098	0.000			1.012	0.655
1955-59	1.068	0.027			0.880	0.000
1960-64	0.944	0.109			0.713	0.000
1965-69	0.725	0.000			0.511	0.000
1970-74	0.499	0.000			0.341	0.000
Period:						
1961-64	-	-				
1965-69	1.156	0.000				
1970-74	1.184	0.000				
1975-79	0.947	0.045				
1980-84	0.774	0.000				
1985-89	0.733	0.000				
1990-94	0.801	0.000				
GDP per capita			0.988	0.000	1.007	0.000
Inflation			0.932	0.000	0.919	0.000
Unemployment rate			0.934	0.000	0.989	0.000
Constant	0.000	0.000	0.000	0.000	0.000	0.000
-2Log likelihood	584,874.56		586,759.22		585,096.92	

Figure 1 – Per Cent Women Aged 20-24 Who Never Married, 1961-1994: Comparison of Estimates Based on 1995 Census with Estimates Based on Current Statistics

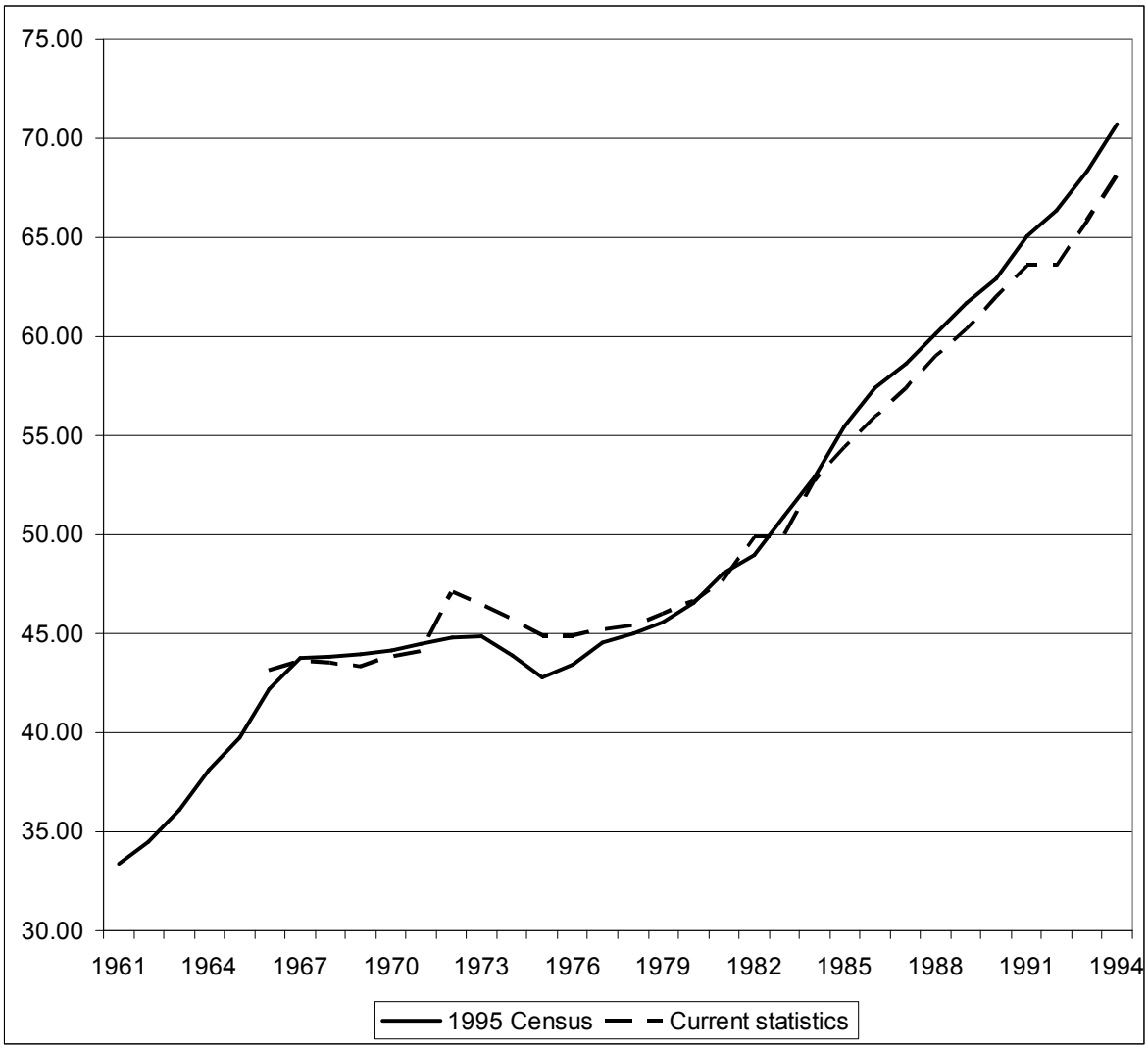

Figure 2 – Gross Domestic Product per Capita and Inflation, 1960-1994

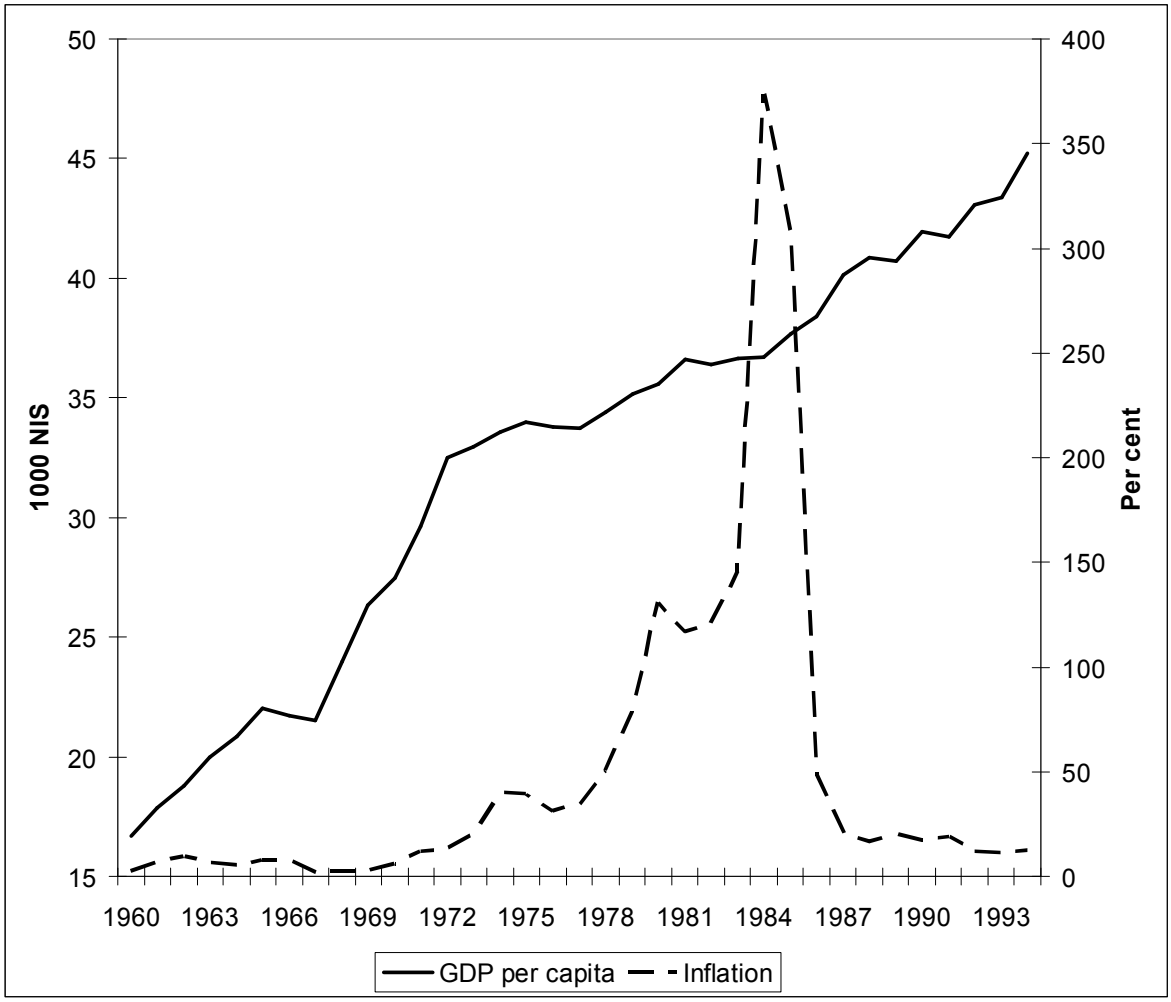

Figure 3 – Unemployment Rates among the Total Population and Men Aged 18-24 and the Percent of Men Aged 20-34, 1960-1994

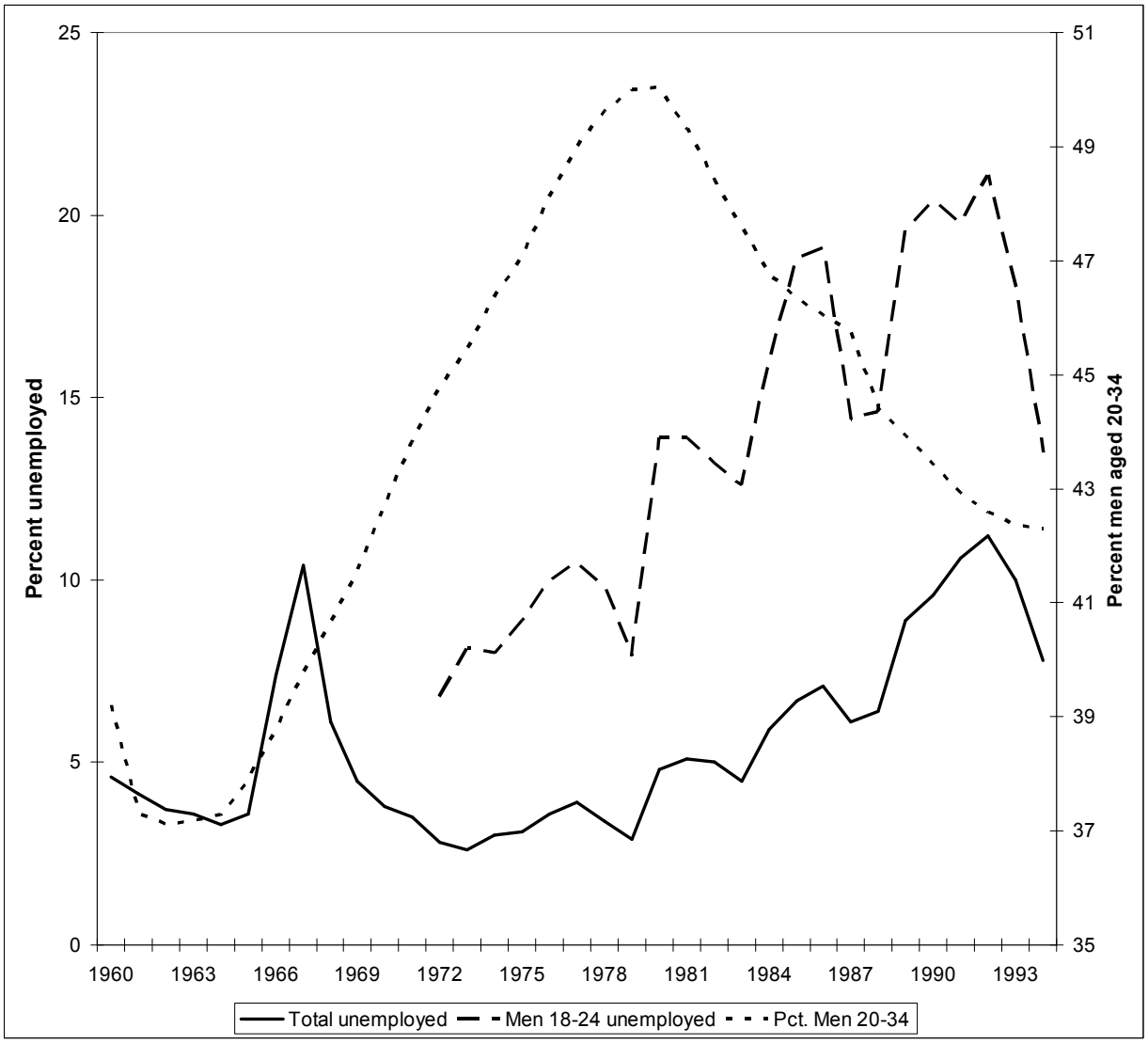

Figure 4a – First Marriage Rates per 1000 Person-Years for Women by Age Group, 1961-1994

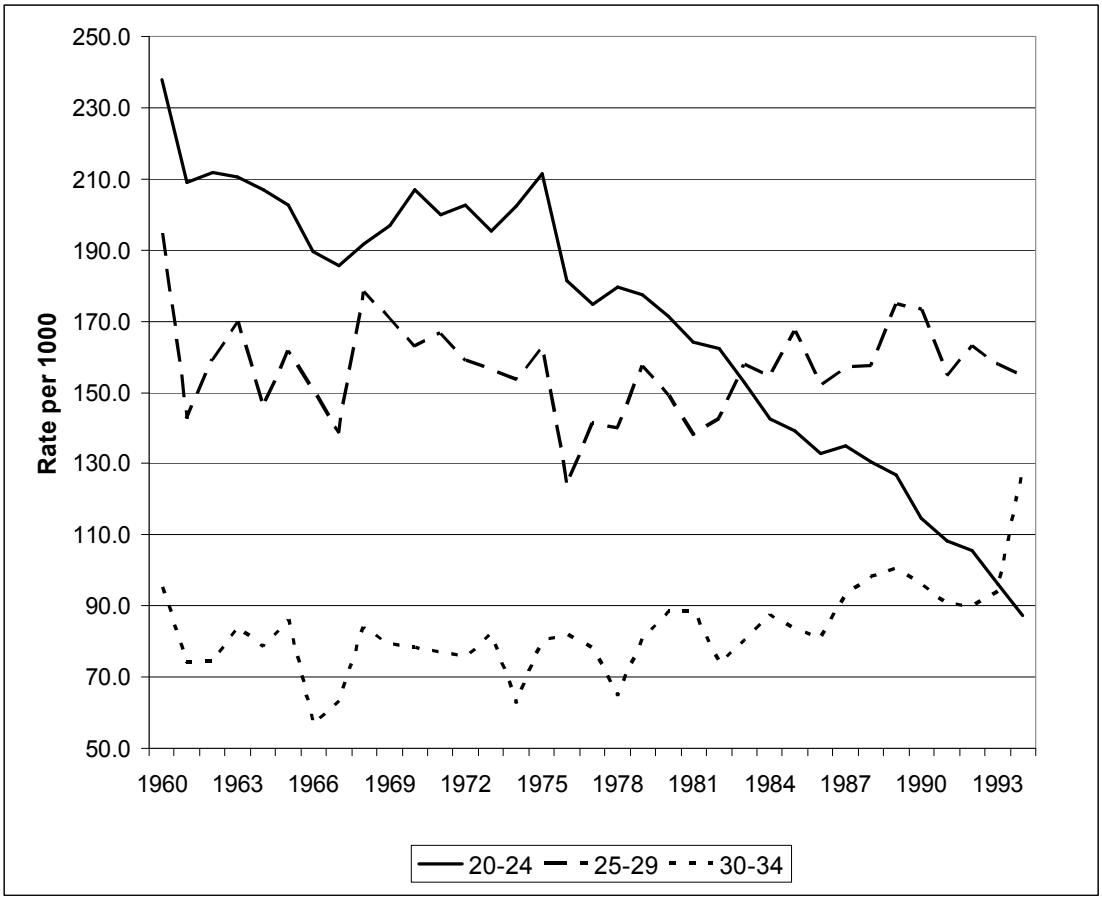

Figure 4b – First Marriage Rates per 1000 Person-Years for Men by Age Group, 1961-1994

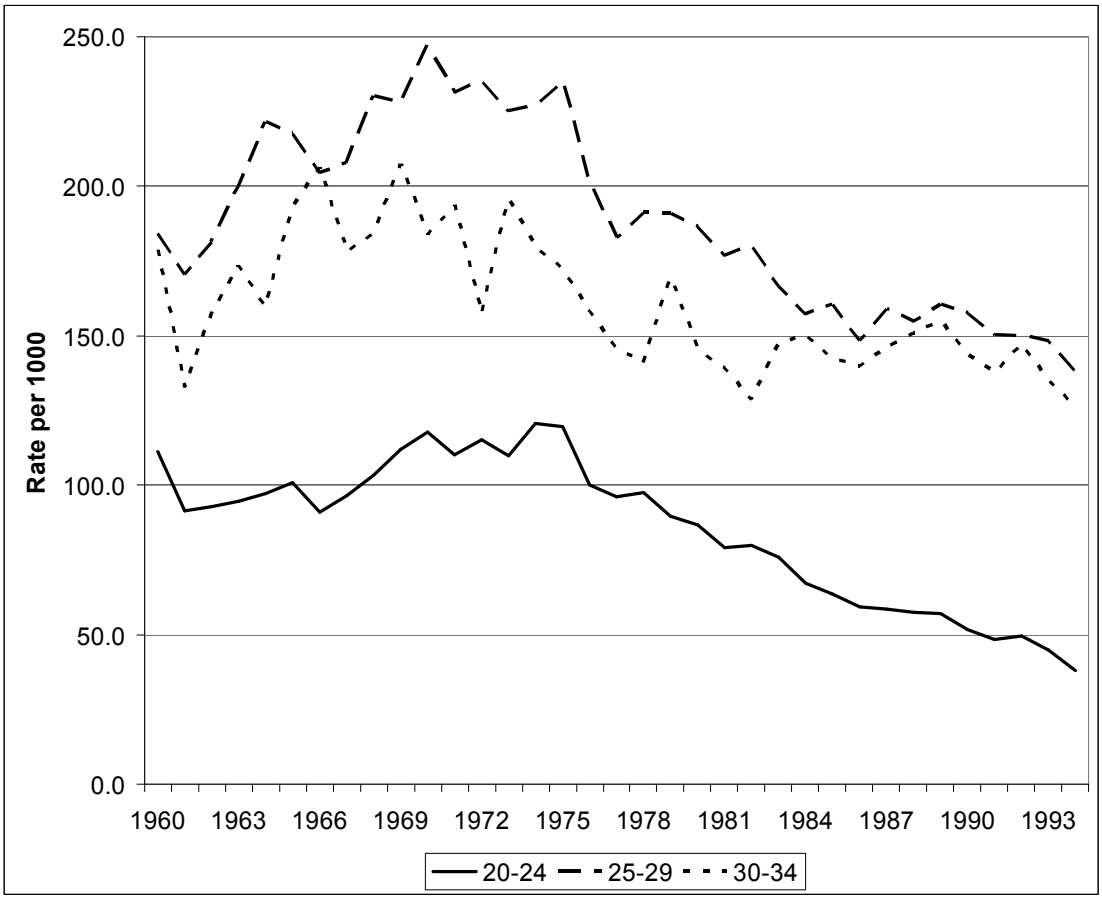

Figure 5 – Observed and Predicted Probabilities of Marriage at Age 20-34: Women

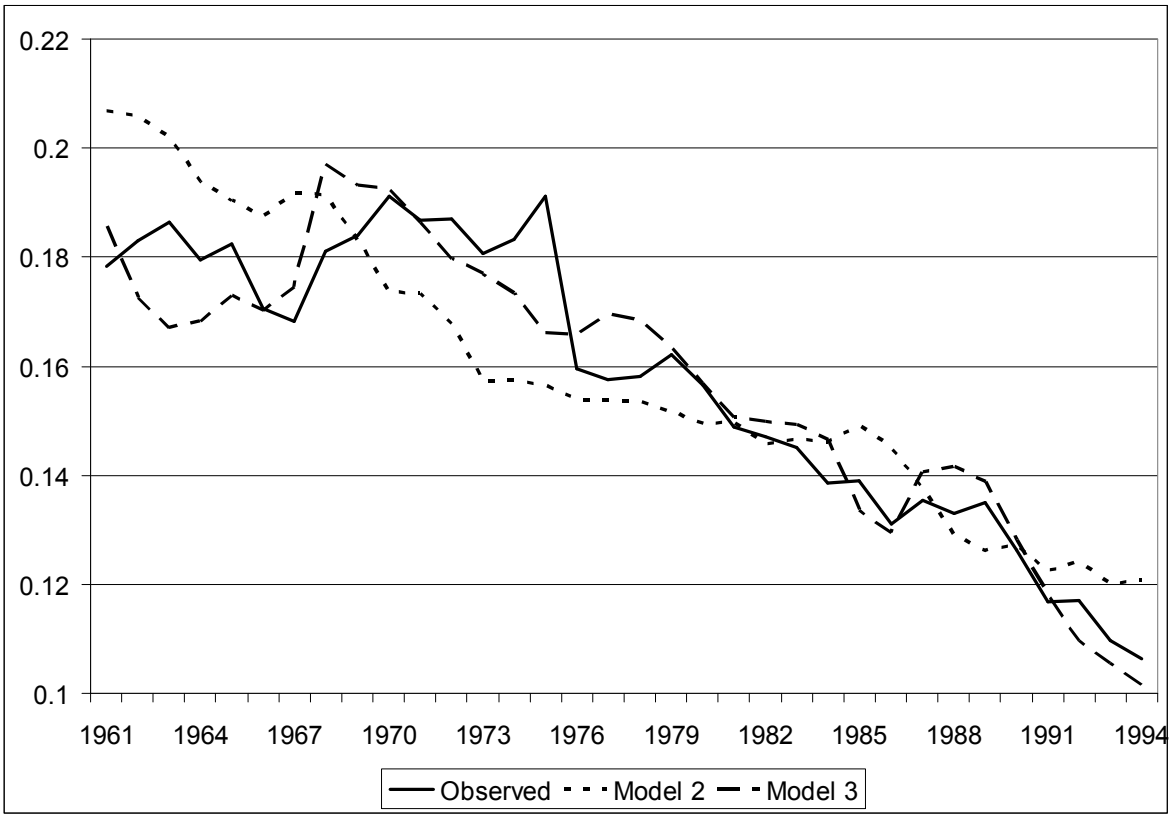

Figure 6 – Observed and Counterfactual-Predicted Probabilities of Marriage Assuming Constant (1) Cohort Effect; (2) Consumer Price Index (CPI); (3) GDP per Capita; and (4) Education: Women 1961-1994

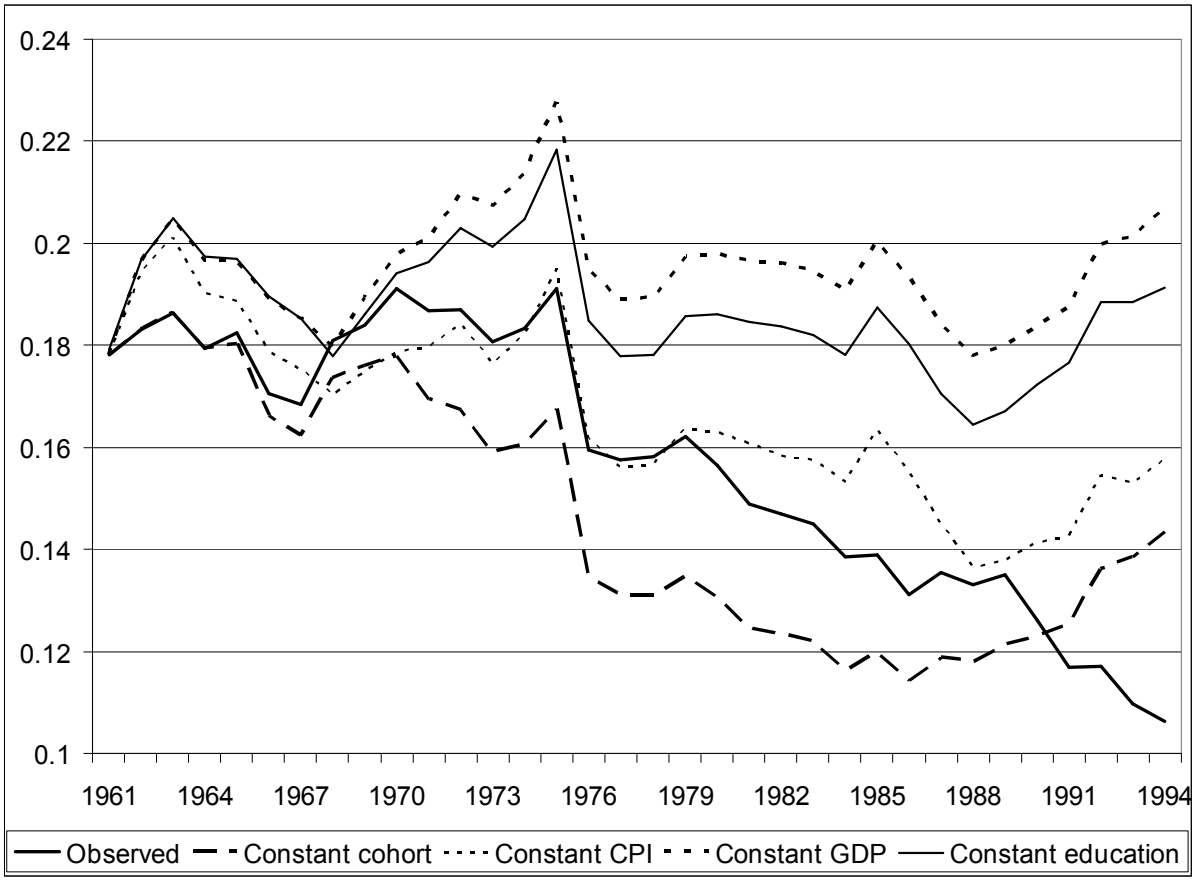

Figure 7 – Observed and Predicted Probabilities of Marriage at Age 20-34: Men

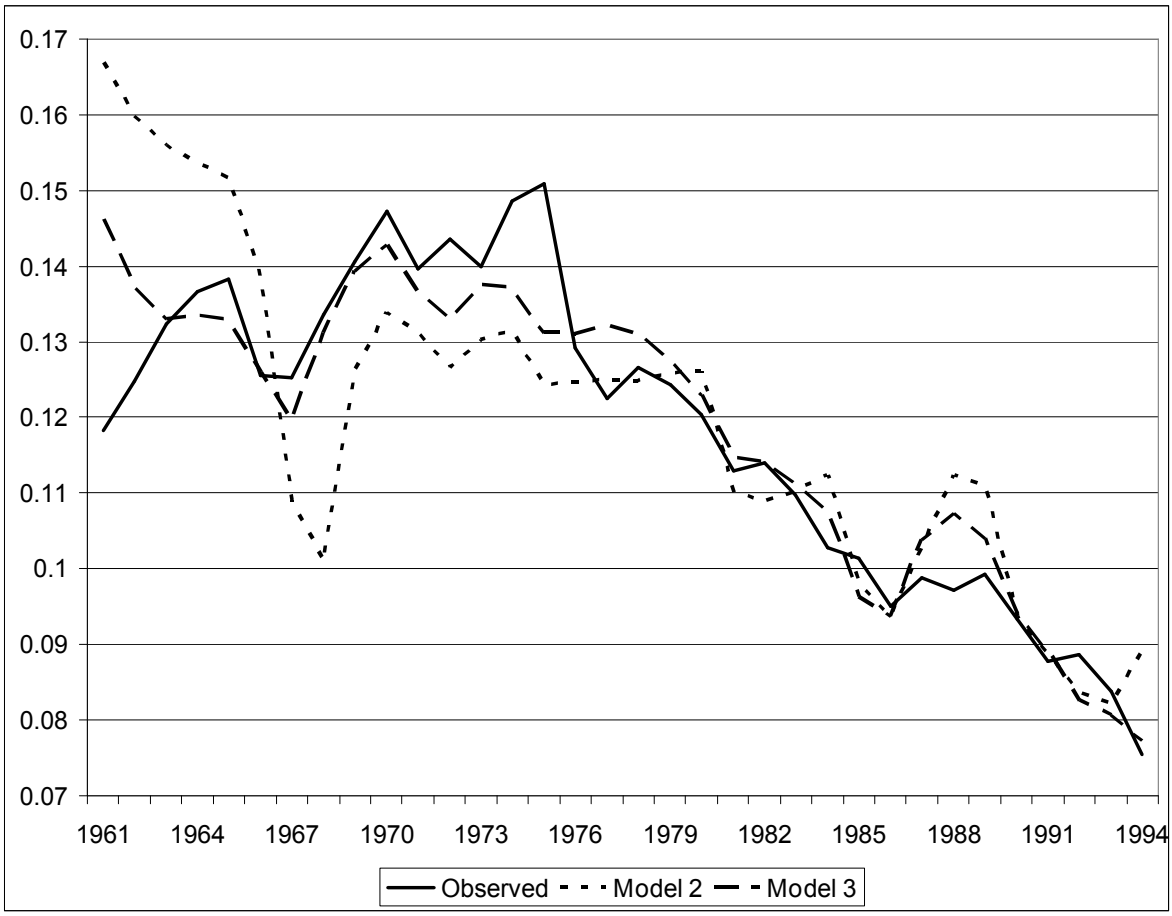

Figure 8 – Observed and Counterfactual-Predicted Probabilities of Marriage Assuming Constant (1) Cohort Effect; (2) Consumer Price Index (CPI) and Unemployment Rate; (3) GDP per Capita; and (4) Education: Men 1961-1994