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INCOME INEQUALITY AND EDUCATIONAL ASSORTATIVE MATING:

ACCOUNTING FOR TRENDS FROM 1940 TO 2003

Robert D. Mare and Christine R. Schwartz

University of California – Los Angeles

May 2005

*Robert D. Mare and Christine R. Schwartz, Department of Sociology, University of California– Los Angeles. Address correspondence to Robert D. Mare, Department of Sociology, UCLA, 264 Haines Hall, Box 951551, Los Angeles, CA 90095-1551; E-mail: mare@ucla.edu. We benefited from financial support from the Russell Sage Foundation, the Jacob K. Javits Fellowship Program, the UCLA Department of Sociology, and the John D. and Catherine T. MacArthur Foundation. This research was carried out using the facilities of the California Center for Population Research, which is supported by the National Institute of Child Health and Human Development. We also thank Henry Farber for providing the February 1990 Current Population Survey data.

INCOME INEQUALITY AND EDUCATIONAL ASSORTATIVE MATING IN THE UNITED STATES: ACCOUNTING FOR TRENDS FROM 1940 TO 2003

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NOTE TO READERS

This paper is a very preliminary draft. Before the final papers are due for the 2006 PAA meeting, we expect to make substantial revisions. The most important of these are:

1. Examine the effects of income inequality on assortative mating using a more plausible time lag for these effects than used in the present draft and explore the robustness of our conclusions to alternative lag assumptions.

2. Provide a more explicit model of the ways that the time gap between school leaving and marriage may affect educational assortative mating, using a variant of the specifications used by Mare (1991).

3. Examine assortative mating trends separately for immigrants and non-immigrants and investigate whether the changing nativity composition of the married population accounts for assortative mating trends.

4. Provide further discussion and, where possible, analysis of several additional issues including the changing selectivity of marriage, the changing proportion of marriages that are higher order, and possible interactions between the effects of the school to marriage time gap and of income inequality.

INCOME INEQUALITY AND EDUCATIONAL ASSORTATIVE MATING: ACCOUNTING FOR TRENDS FROM 1940 TO 2003

ABSTRACT

This paper investigates an unanticipated consequence of rising income inequality, namely changes in patterns of educational assortative mating. The association between spouses' educational attainments has important implications for economic and social inequalities among families and households. Over the past 40 years in the U.S., the resemblance of husbands' and wives' educational attainments has increased markedly. For example, the proportion of couples in which spouses share the same broad education category increased by approximately 20 percent and the odds of educational homogamy increased by about 25 percent during this period (Schwartz and Mare 2005). Although rising inequality among households may be a consequence of increasing spousal resemblance on educational attainment, income inequality among individuals may itself be a *cause* of trends in educational assortative mating. Rising earnings inequality has resulted in increasing returns to education and thus wider economic and social gaps between education groups. These widening gaps may account for couples' increasing tendency to marry along educational lines. In this paper, we evaluate this argument by analyzing Decennial Census and Current Population Survey data from 1940 to 2003 on the educational resemblance of spouses and the income distributions of men and women within education groups. We also consider several other factors that may affect assortative mating trends, including increases in the relative earnings of women in the immigrant population and changes in the timing of schooling and marriage. Trends in the earnings gaps between educational groups and reduced gender inequality in the workforce appear to account for most of the change in several key measures of spousal resemblance in educational attainment since the early 1970s. From 1940 to the early 1970s, changes in educational assortative mating are mainly the result of changes in the timing of school leaving and entry into marriage.

INCOME INEQUALITY AND EDUCATIONAL ASSORTATIVE MATING: ACCOUNTING FOR TRENDS FROM 1940 TO 2003

INTRODUCTION

Patterns of who marries whom have implications for the formation of families, the maintenance of boundaries between groups, the extent of inequality among families and individuals, and the persistence of social hierarchies from generation to generation. (e.g., Cavalli-Sforza and Feldman 1981; Eckland 1968; Fernández and Rogerson 2001; Johnson 1980; Kalmijn 1991b; Mare 1991, 2000). Because individuals mate nonrandomly on social and economic traits, the clustering of couples on these traits is an essential source of inequality. Further, because most children are raised by one or more of their biological parents, the resemblance between mothers and fathers on key dimensions of socioeconomic status may reinforce or offset the intergenerational impact of inequality in the socioeconomic positions of parents.

The resemblance between partners on formal educational attainment is an important dimension of assortative mating because of the role that education plays in economic inequality and its persistence from generation to generation (e.g., Kalmijn 1991a, 1991b; Mare 1991; Qian 1998; Qian and Preston 1993; Smits, Ultee, and Lammers 1998; Ultee and Luijkx 1990). For individuals, educational attainment is their first major socioeconomic status that is defined separately from the resources of their parents, it has a major impact on all subsequent life outcomes, and it potentially affects the well-being of their children. Educational assortative mating, moreover, appears to have grown in significance over the past century. In part, this reflects a decline in the relative influence on marriage of ascriptive factors such as religion, ethnicity, and family background (Kalmijn 1991a; Kalmijn 1991b). It also reflects the increased

importance of educational institutions as marriage markets as young people spend an increasing portion of their lives in school (Blossfeld and Timm 2004, Mare 1991).

Substantial research documents a growing positive association between the educational attainments of husbands and wives (e.g., Kalmijn 1991a; Mare 1991; Pencavel 1998; Qian 1998). In a recent paper, we updated prior studies of educational assortative mating in the United States by analyzing trends between 1940 and 2003, using Decennial Census and Current Population Survey data (Schwartz and Mare 2005). Some of our results are reproduced in Figure 1, which shows that, between 1960 and 2003, the percentage of husbands and wives who occupy the same broad educational stratum increased steadily, from approximately 45 to 55 percent, a trend that holds for both marriages that occur within a year or two of the observation date ("newlyweds") as well as for the stock of existing marriages ("prevailing marriages").[1]

Despite numerous trend studies of educational assortative mating and widespread recognition that assortative mating patterns are an important indicator of social inequality, relatively little research has focused explicitly on explaining these historical trends. In this paper we consider several possible explanations of trends in educational assortative mating, provide systematic data that bears upon one major class of explanations, and present supplementary data that bears upon other explanations. In developing our analysis, we draw upon recent theoretical work on the relationships between inequality and household formation, as well as our knowledge of major demographic and economic trends in the United States. In view of massive increase in inequality over the past several decades and the potential interdependence between patterns of assortative mating and inequality, our paper emphasizes the potential effects of several forms of social and economic disparity on assortative mating. At the same time, we recognize that trends

in marriage patterns are complex and thus are unlikely to be reducible to a single set of causal mechanisms.

ACCOUNTING FOR CHANGE IN EDUCATIONAL ASSORTATIVE MATING

Educational Assortative Mating and the "Distances" Between Education Categories

Educational assortative mating is a pattern of association between two discrete traits: the formal educational attainments of husbands and wives. Although educational attainment is often regarded as a quantitative measure, it results from the accumulation of a series of discrete education credentials, not all of which affect or are affected by the determinants and consequences of educational attainment in the same way (e.g., Mare 1980, 1981). Because of the institutional structuring of education, moreover, education distributions are typically skewed and "lumpy," thus defying summary by quantiles or scalar measures of dispersion or covariation.[2] A better approach is to regard persons with varying amounts of formal schooling as members of distinct social groups, analogous to occupations or religious affiliations, and to conceptualize patterns of intermarriage between groups as the result of relationships among their underlying attributes, which may include patterns of behavior, cultural beliefs and practices, demographic composition, or economic statuses. The attributes are, in a wide variety of cases, quantitative variables that govern the affinities and distances between groups. For example, Klatzky and Hodge (1971) and Hout (1984) modeled intergenerational occupational mobility patterns as correlations between the socioeconomic statuses, training, and other attributes of occupations. Johnson (1980) viewed religious assortative mating as arising in part from underlying social distances between religious groups.

Changes in educational assortative mating between fixed education categories may result from changes in the meanings of those categories, that is, changes in the values of underlying attributes of persons who have that amount of education. It is a commonplace observation, for example, that a high degree "means" something different today from what it did 50 years ago. To take this into account in the analysis of historical patterns, we measure the underlying attributes of a given education credential and allow these attributes to change as a result of macroeconomic, demographic, and institutional factors. If these characteristics of education groups govern partner selection in the marriage market, their secular changes may account for trends in educational assortative mating.

The Economic Returns to Schooling and Educational Assortative Mating

A key source of difference among education groups is the economic status typically experienced by persons with varying levels of educational attainment (e.g., Blau 1977; Fernández, Guner, and Knowles 2005; Rytina, et al. 1988; Smits, Ultee, and Lammers 1998:268). Variation in expected earnings levels across education groups may have a major effect on the marriage market for individuals with varying amounts of schooling. Persons with higher expected lifetime earnings may run in different social circles, which determine the types of partners they are likely to encounter. Such persons may also be able to attract members of the opposite sex who themselves have relatively higher expected earnings. Expected economic rewards may also affect differentials in marital stability inasmuch as the incentives to remain with a spouse who has poor economic prospects may be diminished, especially for partners who themselves are attractive to others by virtue of their own potential success. Given the competitive nature of the marriage market, these effects are likely to structure educational assortative marriage and marriage dissolution, inasmuch as opposite sex pairs with disparate

educational attainments have unequal chances market of marrying persons with good economic potential.

Whereas education differences in expected economic rewards contribute to a positive correlation between the educational attainments of husbands and wives, *changes* in the economic returns to schooling may be a source of change in intermarriage between persons with varying amounts of educational attainments. During the past 30 years, accompanying the general increase in income inequality, the returns to educational attainment have grown markedly (e.g., Gottschalk 1997; Katz and Murphy 1992; Mare 1995), implying that the economic and possibly social distances between education groups have grown as well. This suggests that growing disparities in the expected earnings of different educational attainment groups may partly account for increases in educational homogamy over this period.

Inequality between Men's and Women's Earnings and Returns to Schooling

The discussion thus far has assumed a common set of earnings differentials across educational attainment groups for both men and women. This is, of course, highly unrealistic in view of the historically lower rates of return to schooling for women relative to men and the gradual reduction in gender disparities in wages and labor force participation over the past several decades. A more comprehensive account of the ways in which earnings inequalities have affected assortative mating, therefore, must take account of the separate effects of widening economic disparities between education groups as well as reductions in earnings disparities between men and women. Differences in economic resources and the returns to educational attainment for men and women may have several possible effects on educational homogamy. One view is that lower gender inequality may lead to lower spousal resemblance on educational attainment because, when gender disparities are low, women are less compelled to evaluate

potential marriage partners on earnings potential. Instead, they are relatively free to rely on their own labor market potential and to seek men who have other desirable attributes. That is, when women's earnings are more equal to those of men, they are freer to marry for "love" rather than for "money" (Fernández, Guner, and Knowles 2005). This argument focuses on the marriage preferences of women and the ways in which changes in gender disparities in the labor market affect their marriage opportunities.[3]

An alternative perspective emphasizes changes in how *men's* preferences in the marriage market are realized and how their partner choices change as women's status in the labor market improves. That is, as gender roles become more egalitarian, men may be more likely to compete for high-earning women just as women have traditionally competed for high-earning men (England and Farkas 1986:182; Oppenheimer 1994:332-334; Mason and Jensen 1995:3; Mare 1991). To the extent that earnings are correlated with education, increased sex symmetry in the competition for mates implies increased sorting on education and an increased tendency for highly educated, high-earning men to marry high-earning women (Sweeney and Cancian 2004). Whether these changes result from changes in the availability of partners (e.g., high-earning men and women may now be in closer physical proximity because of decreases in the sex-segregation of work and leisure) or from changes in preferences, they imply greater symmetry in partner choice, which may result in greater educational homogamy.

Some evidence supports both of these views of the effects of gender inequality on marriage sorting. On the one hand, Fernández, Guner, and Knowles (2005) find a positive effect of gender inequality in the labor market on spousal educational resemblance across 34 developed societies. On the other, Sweeney and Cancian (2004) document an increase in the correlation between the expected future earnings and occupational statuses of men and women in recent

decades in the U.S., which they attribute to the growing importance of women's economic contributions to marriage and men's preferences for higher earning women. A comprehensive behavioral model that allows for the competing and potentially different preferences of men and women in the marriage market can, in principle, allow for both kinds of effects. Analyses of the association between gender disparities in earnings and educational assortative mating, such as those presented in this paper, can reveal which set of influences predominates in a given empirical context but not identify their separate effects.

Changes in the Timing of Marriage and School Leaving

In addition to changes in the economic returns to schooling and the changing relative labor market position of men and women, other factors may contribute to trends in educational assortative mating. From 1940 until the 1970s, changes in the timing of schooling and marriage on spousal resemblance in new marriages accounted for some of the decrease in intermarriage across educational barriers (Mare 1991). During eras when people typically marry shortly after leaving school, schools may structure marriage markets more closely than during eras when people delay marriage for a number of years after leaving school. Similarly, within a cohort of young persons, at educational attainment levels where marriage follows relatively quickly after leaving school, the chances of intermarriage between education groups may be lower than at lower education levels where individuals may wait a number of years to marry. During the period from 1940 to the 1960s, when trends in average educational attainment increased average age of leaving school and average age at marriage fell, a larger proportion of couples married shortly after leaving school, resulting in decreased intermarriage between education groups (Mare 1991). From the 1970s onward, when age at marriage steadily increased, the effects of educational institutions on marriage markets may have weakened, a trend that, in the absence of

other changes, might have reduced educational homogamy. Alternatively, the influence of marriage and educational timing may have given way to the effects of other factors that changed more rapidly over the more recent period.

Intergenerational Dynamics of Economic Inequality and Assortative Mating

In this paper we emphasize the potential effect of economic inequality on marriage markets, resulting from the changing economic return to schooling, the economic basis of differential association, and competition for mates with varying potential in the labor market. Educational assortative mating, however, may be a cause as well as a consequence of socioeconomic inequality (e.g., Kremer 1997; Mare 2000; Fernández, Guner, and Knowles 2005). Spouses may contribute to each other's economic successes and failures, depending on their own resources which depend, in part, on their respective educational attainments. Perhaps more important, spousal resemblance on educational attainment contributes to inequality of home environments experienced by their children. Higher joint inequality in the parental generation begets more inequality among offspring, which may, in turn, lead to further inequality and marital homogamy in the offspring generation. This raises the possibility of a dynamic interdependence of assortative mating and inequality, which may lead to a number of alternative equilibria (Fernández, Guner, and Knowles 2005; Fernández and Rogerson 2001; Kremer 1997). It is beyond the scope of the present paper to investigate the full set of these relationships. Our analyses bear on a single step in a complex causal chain, albeit in an attempt to account for an important social trend.

Issues in the Study of Educational Assortative Mating

Prevailing and New Marriages. The stock of prevailing marriages at any point in time is the result of past flows of persons into new marriages ("weddings") and marital dissolutions due

to divorce, separation, and death. Similarly, patterns of educational assortative mating in prevailing marriages are the result of differential rates of marriage and dissolution by the combined educational attainments of partners, as well as educational upgrading within marriage (Schwartz and Mare 2003). Well specified behavioral models of sorting behavior should, in principle, take into account the timing of specific events, such as marriage and divorce and focus on the time-varying populations at risk to these events. This may be especially important when one links covariates of assortative mating, such as expected earnings returns to schooling, earnings inequality, etc., to marriage patterns. Although this suggests that we should focus on new marriages and divorces in our analysis of inequality effects, we focus instead on prevailing marriages for several reasons. Most important, trend data on educational assortative mating is sparse for new marriages. Data on marriage timing are available from the Decennial Censuses only up until 1980 and from the June Current Population Surveys between 1971 and 1995. In contrast, prevailing marriages are observable in a much richer time series of Censuses and Current Population Surveys (see below and Appendix Table 1). Additionally, as we show elsewhere, for periods in which both new and prevailing marriages are observable, differences in educational assortative mating trends are small (Schwartz and Mare 2005). Whereas assortative mating patterns in new marriages may be regarded as "leading indicators" for trends in the stock of prevailing marriages, the time series of new and prevailing marriages track each other closely for a sufficiently narrow age band of persons in prevailing marriages. Moreover, although marital disruption and educational upgrading also affect assortative mating in prevailing marriages, patterns of new marriages have by far the largest impact on assortative mating (Schwartz and Mare 2003).

Conditional and Unconditional Distributions of Marriages. A complete model of marriage sorting trends and their dependence on inequality patterns should take account of the population at risk to marriage, the possibility that marriage itself depends on the expected characteristics of potential partners, and the changing nonrandom selectivity into marriage. In the analyses reported here, however, we follow most of the past literature on assortative mating and focus instead on the relative odds of intermarriage between education groups conditional upon marriage. This strategy enables us to make effective use of high quality data and make comparable historical comparisons, but it does not enable us to distinguish empirically the effects of changing preferences for marriage partners and changing opportunities for marriage (e.g., Logan, Hoff, and Newton 2002). This must await future research.

Marriage and cohabitating unions. We restrict our analyses to partner resemblance in marriage, rather than in heterosexual unions more generally. Despite secular increases in rates of nonmarital cohabitation and in the proportions of marriages that are preceded by a period of cohabitation, legal marriages remain far more prevalent than unmarried unions, and the latter remain typically relationships of much shorter duration (Bumpass and Lu 2000). Moreover, studies of historical trends in the educational resemblance of pooled samples of cohabiting and marital unions differ little from trends in marital unions alone (Qian and Preston 1993:492).

Conceptualizing Inequality Effects. In examining the effects of the expected economic returns to schooling on intermarriage between education groups, it is necessary to specify the ways in which individuals perceive the expected "quality" of marriage partners who vary in their educational attainment. Although these expectations may vary across all individuals and all potential partners, it is difficult to incorporate this information into an empirical analysis. In practice, we characterize the economic potential of men and women with varying amounts of

schooling by time-varying summary measures of the economic status of each sex-specific education category with which we "scale" education. Even ignoring individual heterogeneity in how alternative marriage partners are viewed, however, leaves open a number of questions about how inequality effects should be specified. These issues include which income sources should be considered, whether to use indexes of economic potential that standardize for labor supply differences (such as wage rates) or indexes that vary with both wage rates and labor supply (such as annual earnings), how to summarize within-education category education distributions, what populations over which to compute summary measures, and for what time period these measures apply. With regard to the last of these issues, it is unclear how to link the expected economic status of education groups to the stock of prevailing marriages in any given year inasmuch as those marriages began at a variety of years prior to the point when they are observed.

Our approach is to make arbitrary but plausible judgments about each of these issues, although in our ongoing research we will explore the robustness of our results to alternative measurement decision and develop a more precisely specified behavioral model at the individual level to guide our future analyses. For our present purposes, we focus on median (log) annual wage and salary income for prime working age (25-64 year olds) in the year prior to our measurement of prevailing marriages. Thus, we ignore the dispersion of earnings within schooling categories, combine the effects of variation in labor supply and wage rates, exclude self-employment income, and ignore the possibility that inequality affects marriages primarily in the years that the marriages were formed – rather than in the years that they are observed.

DATA AND METHODS

Educational Assortative Mating

We use Decennial Census data from the Integrated Public Use Microdata Series (IPUMS) and Current Population Survey (CPS) data to examine educational assortative marriage patterns from 1940 to 2003. Most of our analyses rely on a sample of prevailing marriages in which the wife is 18 to 40 years old, regardless of the marriage parity of either partner (N=1,998,933). We also report a limited set of results from a sample of "newlywed" couples in which the wife is 18 to 40 and in which her first marriage occurred within two years of the interview date (N=78,294) (see Appendix Table 1).[4] We limit our analysis to wives age 18 to 40 because this age range covers most married couples with co-resident children.[5]

Our sample of prevailing marriages is drawn from the 1940, 1960, 1970, 1980, 1990, and 2000 Censuses, the March, June, and October supplements of the CPS from 1962 to 1978, and all 12 months of the CPS from 1979 through 2003.[6] Our sample of newlyweds is drawn from data for which wife's date of first marriage or age at first marriage information is available. Only data from the June CPS for 1971, 1973-1977, 1979-1983, 1985-1988, 1990, 1992, 1994, and 1995 and from the 1940, 1960, 1970, and 1980 Censuses contain this information.

Measurement of Educational Attainment

Our analysis of historical trends in educational assortative marriage is complicated by a change in the wording of the educational attainment question, which was implemented by the CPS in January 1992 and by the Census in 1990. The major difference between the new and the old version of the question is that the old version elicits a numeric response to the question "What is the highest grade or year of regular school…has ever attended?" whereas the new version identifies specific degree completion levels beginning with "high school graduate – high

school diploma or the equivalent" and ending with "doctorate degree."[7] To establish a single classification of educational attainment for all years, we follow the procedure for maximizing comparability between the old and new questions outlined by Jaeger (1997) and Park (1996). We classify each spouse into one of five categories of highest year of schooling (<10, 10-11, 12, 13-15, 16+). For the old question in 1940, persons were classified by highest grade completed. For the old question in the 1960-1980 Censuses and the 1962-1991 CPS's, persons are classified by highest grade completed except for those who attended 13 years but completed only 12 whom we nonetheless allocate to the 13-15 category (attended some college). For the new question in the 1990-2000 Censuss and the 1992-2003 CPS's, persons are classified by their highest grade of schooling up through "high school diploma or the equivalent" into the <10, 10-11, and 12 year categories. Persons who completed 12 years but did not graduate are classified as completing 12 grades. Persons with "some college, no degree" or an associate degree are classified as 13-15. Persons with a bachelors or any higher degree are classified as 16+.

Earnings Distributions

Our measures of earnings for each educational attainment category are taken from Public Use Microdata from the 1940 and 1960 Decennial Censuses and from the March Current Population Surveys for 1962 through 2003. Our measures are median log wage and salary incomes specific to sex and major education category for persons aged 25 to 64 who worked more than 39 weeks in the year and who were neither self-employed nor living in group quarters (following a similar approach to the one used by Katz and Murphy [1992]). Earnings measures were adjusted to constant 2002 dollars using the CPI-U-RS for 1977 to 2002 and the CPI-U prior to 1977.

As described further below, we measure the economic returns to educational attainment through comparisons of median log earnings for *men* across education categories, irrespective of whether we are scaling the educational attainment of *husbands* or *wives* in the educational assortative mating table. We measure gender inequality in earnings levels and returns to educational attainment through comparisons of median log earnings for *men* specific to a given education category for *husbands* to the median log earnings for *women* specific to a given education category for *wives*.

Log-Linear Models

We analyze changes in educational assortative marriage using log-linear models for contingency tables, which provide estimates of the changing association between spouses' educational attainments while controlling for shifts in their marginal distributions. Our contingency table cross-classifies husband's highest year of schooling completed (<10, 10-11, 12, 13-15, 16+), wife's highest year of schooling completed (<10, 10-11, 12, 13-15, 16+), year (1940, 1960, 1962, 1964,…,2003 for prevailing marriages; and 1940, 1960, 1971, 1973,…,1977, 1979,…,1983, 1985,…,1988, 1990, 1992, 1994, 1995 for newlyweds) and data source (Census, CPS).[8] For prevailing marriages, there are 47 unique combinations of year and data source and therefore we have a 5 X 5 X 47 = 1,175 cell table. For newlyweds, there are 23 unique combinations of year and data source yielding a 5 X 5 X 23 = 575 cell table. Because our sample of newlyweds from the CPS is small within years, we present trends in the association between husband's and wife's education for newlyweds in roughly 5-year intervals (1940, 1960, 1970-1974, 1975-1979, 1980-1984, 1985-1989, 1990-1995), but control for single-year changes in the marginal distributions of spouse's education by data source and by education question version.

Our goal is to represent changes in the association between husband's and wife's education in a parsimonious yet accurate way. Some previous studies have used relatively complex models of changes in the association between husband's and wife's education (e.g., Blackwell 1998; Mare 1991; Kalmijn 1991a, 1991b; Qian 1998). These studies use models that fit the data well, but do not provide a straightforward measure of changes in educational homogamy. Our approach is to use both simple and more complex models to summarize and capture key features of changes in assortative marriage. We use *homogamy* models to summarize trends and *crossings models* to show which parts of the education distribution generate overall trends homogamy. Homogamy models represent the association between husband's and wife's education in terms of a single parameter for the odds that husbands and wives share the same rather than different education levels. Crossings models represent the association between spouses' education as a series of barriers to marriage between adjacent education levels (Blackwell 1998; Johnson 1980; Kalmijn 1991b; Mare 1991).

We start with a baseline model in which the association between husband's and wife's education is assumed to be time-invariant. Because our primary concern is with describing *trends* in the educational resemblance of spouses, we do not parameterize educational assortative marriage parsimoniously in the cross-section. Instead, we saturate the cross-sectional interaction between husband's and wife's education and focus on more parsimonious representations of changes in the association from 1940 to 2003. Our baseline model for prevailing marriages is:

$$\log(\mu_{ijkl} / t_{ijkl}) = \lambda + \lambda_i^H + \lambda_j^W + \lambda_k^S + \lambda_l^Y + \lambda_{ij}^{HW} + \lambda_{ik}^{HS} + \lambda_{il}^{HY} + \lambda_{jk}^{WS} + \lambda_{jl}^{WY} + \lambda_{kl}^{SY} + \lambda_{ikl}^{HSY} + \lambda_{jkl}^{WSY} + \lambda_{ijk}^{HWS} \quad (1)$$

where H denotes husband's education (i = 1,…,5), W is wife's education (j = 1,…,5), Y is year (l = 1,…,43), and S is data source (k = 0,1). Thus, μ_{ijkl} is the expected number of marriages

between husbands in education category *i* and wives in education category *j* in year *l* from data source *k*. This model captures variation in the distribution of husband's and wife's education by year and data source (λ_{ikl}^{HSY} and λ_{jkl}^{WSY}), allows the interaction between husband's and wife's education to vary by data source (λ_{ijk}^{HWS}), and contains all lower order terms.

The Census and the CPS contain household weights in most years to ensure that the sample is representative of the population.[9] We incorporate these weights in our models using an offset t_{ijkl}, which is the inverse of the total weighted frequency of the cell divided by the unweighted cell count (Agresti 2002:391; Clogg and Eliason 1987).[10] The model for newlyweds replaces year *l* in equation (1) with year l' ($l' = 1,\ldots,22$ where $Y' = 1940, 1960, 1970, 1971, 1973,\ldots,1977, 1979,\ldots,1983, 1985,\ldots,1988, 1990, 1992, 1994, 1995$).

We add homogamy and crossings parameters to our baseline model shown above to estimate trends in assortative marriage. A homogamy model is:

$$\log(\mu_{ijkl} / t_{ijkl}) = \text{Baseline model} + \gamma_{ol}^{OY} \qquad (2)$$

where $O = 1$ if husband's education category equals wife's education category and 0 otherwise, and γ_{ol}^{OY} denotes the change in the odds of homogamy in year *l* relative to the baseline year (1940). For newlyweds, year is expressed in roughly 5-year intervals in its interaction with homogamy ($l'' = 1,\ldots,7$) but is not constrained in the baseline portion of the model ($l' = 1,\ldots,22$).

A crossings model is:

$$\log(\mu_{ijkl} / t_{ijkl}) = \text{Baseline model} + \gamma_{ijl}^{HWY} \qquad (3)$$

where

$$\gamma_{ijl}^{HWY} = \begin{cases} \sum_{q=j}^{i-1} \gamma_{ql} & for\ i > j, \\ \sum_{q=i}^{j-1} \gamma_{ql} & for\ i < j, \\ 0 & for\ i = j, \end{cases}$$

and γ_{ql} represents the change in the difficulty of crossing educational barrier q in year l relative to the baseline year (1940). The crossings parameters are the log odds of marriage for couples in *adjacent* education categories relative to the log odds of homogamy. The log odds of marriage for more educationally dissimilar couples are calculated by adding the crossings parameters that correspond to each barrier crossed (Johnson 1980:108-113; Powers and Xie 2000:117-119).[11]

In examining the degree to which changing earnings gaps between education categories may account for changes in the odds of marrying homogamously or in the odds of crossing education barriers, we replace the year-specific homogamy and crossings parameter in (2) and (3) respectively with time-invariant parameters for the effects of year-specific measures of earnings differences between education groups. These are variants of scaled association models that have been used by other investigators to replace qualitative measures of association with quantitative variables that account for these associations (e.g., Agresti 2002: 369-373, Goodman 1979, Hout 1983). For homogamy, we estimate models of the form

$$\log(\mu_{ijkl} / t_{ijkl}) = \text{Baseline model} + \gamma_o^{Omm} G_{ijl}^{mm} + \gamma_o^{Omf} G_{ijl}^{mf}, \qquad (2')$$

where

$$G_{ijl}^{mm} = \left| Y_{il}^{m} - Y_{jl}^{m} \right| ,$$

$$G_{ijl}^{mf} = \left| Y_{il}^{m} - Y_{jl}^{f} \right| ,$$

Y_i^m denotes the log median annual earnings of men in education category *i* in year *l*, Y_j^f denotes the log median annual earning of women in education category *j* in year *l*, and γ_o^{Omm} is the time-invariant effect of the interaction between homogamy and the absolute earnings gaps between husband's and wife's education categories based on male earnings, and γ_o^{Omf} is the time-invariant effect of the interaction between homogamy and the absolute earnings gaps between husband's and wife's education categories based on sex-specific earnings. For crossings, we estimate models of the form

$$\log(\mu_{ijkl} / t_{ijkl}) = \text{Baseline model} + \gamma_{ij}^{HWmm} G_{ijl}^{mm} + \gamma_{ij}^{HWmf} G_{ijl}^{mf} \qquad (3')$$

where

$$\gamma_{ij}^{HWmm} = \begin{cases} \sum_{q=j}^{i-1} \gamma_q^{mm} & for\ i > j, \\ \sum_{q=i}^{j-1} \gamma_q^{mm} & for\ i < j, \\ 0 & for\ i = j, \end{cases}$$

γ_q^{mm} denotes the time-invariant effect of the interaction between the difficulty of crossing educational barrier *q* and the absolute earnings gaps between husband's and wife's education categories based on male earnings, γ_{ij}^{HWmf} denotes the corresponding crossing interaction effects for the earnings gaps based on sex-specific earnings, and all other notation is as defined above.

In practice, we estimate models with varying combinations of homogamy and crossings and the effects of earnings gaps based on male and sex-specific earnings. In all of the models of the forms given by (2') and (3'), we condition on the (saturated) cross section associations between husband's and wife's educational attainment and allow for changes in these associations only through interactions between association parameters and changes in earnings gaps between

education groups. As shown below, we assess the adequacy of these models in accounting for trends in educational assortative mating both with standard statistics for goodness of fit and graphical comparisons of observed trends in marriage patterns with those predicted under these models.

EMPIRICAL RESULTS

Trends in Educational Attainment and Educational Assortative Mating

Table 1 shows the weighted distribution of husband's and wife's education using Census data from 1940 to 2000.[12] It shows massive increases in educational attainments for both husbands and wives. Whereas the majority of husbands and wives had less than 10 years of education in 1940, they represent only about 6% of married persons in 2000. As the proportion of husbands and wives with low levels of education has dropped, the proportion of married persons with 16 or more years of education has increased from the single digits in 1940 to almost 30% in 2000.[13] Although educational attainment has grown for both sexes, it has grown more so for wives than for husbands. In 1940, 12% of husbands had completed at least some college compared to only 10% of wives, but by 2000 over 60% of wives had completed at least this much schooling compared to only 57% of husbands.

The trends in educational homogamy shown in Figure 1 reflect both changes in the associations between husbands' and wives' educational attainments and also the changes in the marginal education distributions shown in Table 1. The trend in educational assortative mating net of trends in the marginal distributions can be seen from estimated odds ratios based on loglinear models as discussed above. Figure 2 shows the trend in the odds that a marriage is homogamous (relative to heterogamy), net of the trends in the marginal distribution for both

prevailing and new marriages. These trends are based on the model described by equation (2). Statistics for the fit of this and other models discussed in this paper are presented in Table 2. The odds of homogamy increased from somewhat more than 3 to somewhat more than 4 between 1960 and 2003, roughly a 33% change. In contrast to the trend in percentages homogamous for prevailing marriages shown in Figure 1, the levels of spousal resemblance after 2000 exceed even the high level observed in 1940. This difference in trends is attributable to the heavily skewed education distributions in 1940, which affect the trends in percent homogamous.

As shown in Table 2, the model for homogamy trends (2) clearly fits better than the model for no change (1) by either the likelihood ratio (G^2) or the BIC criterion. Although descriptively useful, however, this model oversimplifies the change in educational assortative mating. A better model represents the trends as changes in the odds of crossing selected educational "barriers" to intermarriage (equation (3) and Model 3 in Table 2). Figure 3 shows the trends in expected odds of crossing adjacent education barrier for this model. At the two lower barriers (<10 vs. 10-11 and 10-11 vs. 12), shown in the upper panel of Figure 3, the crossings trends roughly parallel the trends for homogamy as a whole. After 1960, the "ease" of marrying across education groups declines monotonically. For the 10-11 vs. 12 barrier, this is a steady decline over the 40 year period. For the lowest barrier, the odds of crossing are approximately stable between 1960 and 1980 and then decline sharply. At both of the two higher barriers (12 vs. 13-15 and 13-15 vs. ≥ 16) the odds of crossing fall monotonically from 1940 to approximately 1970 but diverge thereafter. For the 13-15 vs. ≥ 16 barrier, the odds are approximately stable during the 1970s and 1980s, but resume a downward course from 1990 on. For the 12 vs. 13-15 barrier, the odds of intermarriage increase at a gradual but steady pace from 1970 to the present. Taken as a whole these trends are consistent with increasing resemblance

on educational attainment between husbands and wives over most the period considered here. Our results suggest, however, that these increases resulted mainly from increased rigidity at the top of the educational distribution from 1940 to 1970 and at the bottom during the past three decades.

Trends in Earnings of Education Groups

To investigate the degree to which trends in these trends in educational assortative mating may result from changes in economic inequality among education groups, we first examine trends in earnings specific to educational attainment for men and women and then use these trends in our statistical models for marriage. Figure 4 reports the trends in median annual earnings for full-year wage and salary workers adjusted to constant 2002 dollars. The figure shows the divergence of earnings across education groups, especially for men. The gap between college graduates and other workers begins to increase in the 1960s and accelerates in the mid-1980s, when gaps between other education groups begin to widen as well. This is also a period of increases in the relative earnings of women, which occurred primarily because non-college women did not suffer the erosion of real earnings experienced by their male counterparts (e.g., Bernhardt, Morris, and Handcock 1995). These patterns show that the economic distances between education groups grew substantially over the past 30 years, whether defined in terms of men's or women's returns to schooling. They also suggest a more complex set of trends in the distances between the economic rewards to men's and women's levels of educational attainment, including male-female disparities within a given level of educational attainment and disparities between men and women who differ in their educational attainment.

Figure 5 summarizes the trends in the earnings disparities across education groups and gender disparities in earnings within education groups. Each of these trends is a weighted

average of median log earnings differences over the education groups in our analysis. Trends in the gaps for specific education levels and adjacent education categories are shown in Appendix Figure 1. The average log earnings differences between adjacent education categories for male earnings ("M-M, Hed ne Wed") again shows the substantial increase in the economic returns to educational attainment since the 1970s. The average differences in median log earnings between men and women within each educational attainment category ("M-F, Hed = Wed") fluctuated between 1940 and the late 1960s, when they began to shrink, first gradually and then more precipitously during the 1980s and 1990s. The combined influences of changing educational and gender stratification in earnings are shown in the trend for differences between adjacent education categories using gender-specific log earnings ("M-F, Hed > Wed" and "M-F, Hed < Wed"), which also indicate that the earnings disparity between men and women declines from the late 1960s onward. The downward trend between 1980 and 2003 in this disparity is greatest for male-female comparisons in which women have more education, because in this instance growing earnings disparities by educational attainment reinforce the impact of reductions in gender disparities. For male-female comparisons in which men have more education, the downward trend is somewhat more gradual because growing earnings gaps between education groups offset to some degree the impact of reductions in gender disparities. Because of overall increases in the economic returns to educational attainment, highly educated women are catching up to their less well-educated male counterparts faster than less well educated women are catching up to more highly educated men. Nonetheless, gaps between men and women decline for all within and between education category comparisons. This implies that, in general, decreasing gender stratification trumps increasing educational stratification in earnings. As shown in the Appendix Figure 1, one notable exception is for the gap between men with a

college degree and women with only some college, where the atypical recent good fortune of the former group results in a widening disparity.[14]

Effects of Earnings Inequality on Educational Assortative Mating

To investigate the effects of earnings inequality on educational assortative mating, we use a variety of scaled association models that represent the trends in the odds of educational homogamy and the odds of marrying across educational barriers as functions of a cross-section pattern of association combined (interacted) with trends in the earnings gaps between educational attainment groups. Table 2 presents fit statistics for these models, which are based on equations (2') and (3'). Models 2 and 3 in Table 2 are the homogamy and crossings trend models already discussed, and Model 4 combines their effects. By the BIC criterion, Model 3 fits the best among these three models and the year-specific homogamy levels are unnecessary to provide an adequate summary of the data. Because of the descriptive value of an overall homogamy measure, however, we report parallel and combined analyses of both homogamy and crossings trends.

Earnings Differences and the Odds of Homogamy. Model 5 parameterizes time variation in the odds of marital homogamy as the interaction of educational homogamy and the absolute differences between median log male earnings for husband's and wife's education categories. Model 6 is a corresponding model based on the median log earnings differences between male and female earnings for husband's and wife's education groups respectively. Model 7 includes both the male-male and male-female differences in median log earnings. The first three panels of Table 3 show the coefficients for the log earnings gaps for these models. The estimated parameters for Model 5 show that the male-male log earnings difference between education categories has a strong positive effect on the log odds of homogamy; that is, a one percent

increase in the male-male earnings gap raises the odds of homogamy by 0.45 percent. In contrast, a one percent increase in the male-female earnings gaps reduces the odds of homogamy by 0.345 percent. These relationships are preserved qualitatively when the effects of both earnings differences are considered simultaneously, although the effect of the male-male log earnings difference is reduced by approximately two thirds (to 0.148) while the male-female effect is only reduces by about one third (to -0.253). These estimates imply that both increases in the economic returns to schooling and reductions in the earnings gaps between men and women may have increased the resemblance between spouses on educational attainment. Conversely, they also imply that the improved labor market position of women has not reduced marital sorting on educational attainment as some have suggested. Evidently, the increased economic attractiveness of women to men outweighs women's improved ability to select marriage partners on other than economic criteria.

Figure 6 displays the trend in the expected odds of homogamy for each of these models, as well as the model for the year-specific homogamy parameters (Model 2). All three models track the observed increase in marital homogamy reasonably well from the early 1970s onward, although models that include the male-female earnings gaps (Model 6 and 7) follow the observed trend more closely and fit the data better than Model 5, which includes only the male-male earnings difference (see Table 2).[15] None of the three homogamy models that incorporate earnings differences, however, can adequately account for trends prior to the early 1970s, especially the steep decline and resurgence of homogamy from 1940 to 1970. Not surprisingly, when we compare these three models to a model that also includes year specific homogamy parameters (Model 13), the BIC criterion indicates that the earnings differences models cannot

inadequately account for the trends over the entire 1940-2003 period. We return to this issue below.

Earnings Differences and the Odds of Crossing Education Barriers. Models 8, 9, and 10 parameterize the trend in the odds of crossing education barriers in terms of male-male and male-female earnings differences. By the BIC criterion Model 10, which includes both the male-male and the male-female gaps, is the best fitting of these three models and, in addition, is more adequate than the model with year-specific crossings parameters (Model 3) and the model that includes both the earnings gaps and the year-specific parameters (Model 11). The fourth through sixth panels of Table 3 present the coefficients of the earnings differences for these models. In Models 8 and 9, the coefficients highlight the substantial negative impact of male-male earnings differences between education groups on the odds of intermarriage between education groups and the positive impact of male-female differences on intermarriage. The one anomaly is for the barrier between the groups with 12 and with 13-15 years of schooling, for which the coefficients are of opposite sign. This results because for this barrier alone, the odds of intermarriage have *increased* since 1970, the opposite trend from the other three barriers as well as educational homogamy overall (see Figure 3). When the effects of both male-male and male-female earnings differences are considered together, the results are more mixed, a result of high collinearity of the crossings interactions with the male-male and male-female gaps for specific education barriers.

As shown in Figure 7, the combined trends in the returns to education and the gender gap in education-specific earnings account well for the observed trends in the odds of intermarriage between education levels. For the two lower education barriers the trend in the male-female earnings difference by itself and jointly with the male-male earnings difference track the odds of

crossing extremely closely, both during the period from 1940 to 1970 when the odds of intermarriage increased and also after 1970 when homogamy decreased (Figures 7a and 7b). Further evidence of the quality of fit of these predictions is provided in Figure 8, which shows scatterplots of the observed crossings odds against the expected odds predicted from Model 10. For the two higher education barriers, the fit between the predicted and observed odds of crossing is somewhat poorer, but this appears be almost entirely due to the inability of the model to predict the full degree of decline in the odds of crossing between 1940 and 1970 (Figures 7c and 7d). From 1970 on, the correspondence between the trends implied by the earnings gaps and the observed odds of intermarriage between education groups is close. The trends for the top two education categories also highlight the very high correlation between the predictions from the male-male and the male-female earnings differences considered separately. As noted above, this may account for the some of the anomalous parameter estimates for the joint model (Model 10) as shown in Table 3.

Taken has a whole, these results strongly suggest the widening earnings inequality among education groups, in combination with shrinking earnings differences between male and female workers, are an important source of change in educational assortative mating. This is particularly the case since 1970, when the economic returns to educational attainment and the gender gap in earnings have changed dramatically.

Trends in the Time Gap Between School Leaving and Marriage

Although it is beyond the scope of the present paper to provide a comprehensive model of trends in assortative mating over the past 65 years, we can see how changes in the timing of schooling and marriage may have affected intermarriage between education groups and how this may supplement our models based on inequality trends alone. Secularly rising average ages of

leaving school, combined with fluctuations in age at marriage, affect the degree to which schools constrain the marriage market. During periods in which age at marriage is falling, this trend, combined with increases in educational attainment may reduce intermarriage between education groups (Mare 1991). Figure 9 shows the trends in the time gap between of school leaving and marriage for couples in prevailing marriages, based on the limited number of Censuses and CPS's that include information on age at marriage.[16] The top panel of Figure 9 shows these 25th, 50th, and 75th percentiles of these time gaps, all of which indicate a large decline between 1940 and 1970, followed by a plateau until the early 1980s and a large increase thereafter. Although trends in educational attainment affect these time gaps, for the most part they are driven by trends in age at marriage, which fell steadily during the baby boom years and remained relatively low until the early 1980s. The lower panel of Figure 9 shows median time gaps by levels of educational attainment, which each follow a similar trend to the full population of marriages, albeit at a different level. Within each year these gaps vary inversely with educational attainment, reflecting that persons with higher levels of education may marry later than their less educated counterparts, but experience a shorter time between school departure and marriage. This variation is consistent with the varying levels of intermarriage across education barriers at different levels of schooling, to wit, odds of crossing are generally lower at higher education barriers than at lower ones (see Figure 3) (Mare 1991).

In addition, the trends in the time gaps between school leaving and marriage are consistent with the trends in the odds of crossing education barriers between 1940 and the 1970s. This is particularly the case for the higher two barriers, where the predictions from education and gender inequality in earnings are poor (Figures 7c and 7d). These results suggest that variation in the time gap between school departure and marriage may be particularly consequential for

educational assortative mating precisely when marriages typically occur within the first one to two years out of school. This admittedly informal inspection of graphical evidence holds promise that marriage timing and inequality trends together may provide a simple yet remarkably well fitting statistical account of changes in educational assortative mating.

DISCUSSION

This paper reports an analysis of the links between inequality in the labor market among persons with varying amounts of schooling and trends in the association between husband's and wife's schooling in the United States over the past seven decades. Our analysis is preliminary in that it requires (1) further checking for robustness in the inequality effects to alternative definitions of the returns to schooling (including alternative age definitions, time lags, and types of income); (2) an effort to take account of changes in the variability of earnings *within* as well as between education groups; (3) an attempt to blend the inequality analysis with more rigorous assessment of the effects of the timing of schooling and marriage; (4) use of spatially disaggregated models and time series models on detrended earnings and assortative mating data to remove the joint dependence of our measures on a linear trend; (5) a consideration of additional demographic trends, especially the growing foreign born population; (6) and investigation of possible endogeneity of education-sex-specific earnings patterns to changes in marriage patterns. Beyond this work just to establish that the soundness of our basic empirical results, further work is also needed on the broader issue of the long run interdependence of inequality and marriage, including the ways in which inequality is an effect as well as a cause of assortative mating. Fernández, Guner, and Knowles (2005) take a major step in this direction, but further investigations are needed. At the theoretical level, efforts to distinguish the separate

effects of men's and women's preferences in a changing labor market should be specified. At the empirical level, all models should be calibrated to known time series of marriage patterns in the United States and elsewhere.

This recipe for further work notwithstanding, our paper strongly suggests that trends in earnings inequality among education groups and the gradual reduction of large gender disparities in the labor market have had a major impact on patterns of intermarriage among education groups. Rising inequality and economic hardship not only affect not only the lives of individuals, but also have strong ramifications for the ways that families are formed and may set the stage for further inequalities in subsequent generations.

FOOTNOTES

[1] These trends are for couples in which the woman is aged 18 to 40. Further details about the data and methods are provided below. The percent of marriages that are educationally homogamous was extremely high in 1940, in part because of the heavy concentration of both sexes in the lowest education category in that year.

[2] Educational differentials may also be multidimensional as a result, for example, of systems that track children into vocational and university preparation programs at an early stage. Such systems make it problematic to rank individuals into a single set of ordered categories (e.g., Breen and Jonsson 2000). For the purposes of this discussion, we assume that formal attainment does follow a unidimensional hierarchy.

[3] This assumes that educational attainment is more strongly correlated with the earnings potential of a husband than with other male characteristics that economically independent women may value.

[4] The June CPS contains information on date at first marriage whereas the Census Integrated Public Use Microdata Series (IPUMS) contains information on age at first marriage. Because the CPS samples are small, we define newlyweds in the June CPS as couples in which the wife was married for the first time within 24 months of the interview. With the exception of the 1940 Census, we define newlyweds as couples in which marriage occurred within one year of the interview date. In 1940, we define newlyweds as couples in which the wife was at most one year older at the interview date than at her age at marriage. This method, which is required by the cruder age measurements in 1940, includes some marriages that occurred up to two years prior to the interview date.

[5] Including young wives in our analysis may affect our estimates of trends in educational assortative marriage because of shifts in the timing of marriage and the improbability of obtaining high levels of schooling at young ages. In analyses not shown here, we examined trends for wives in prevailing marriages between the ages of 21 and 40. The results are very similar those presented and are available upon request.

[6] The 1950 Census did not obtain education information from both spouses. Although the CPS has been administered since the 1940s, the earliest microdata are available for March 1962. Although the same households may appear in several months of the CPS because of the survey's rotation group scheme (U.S. Bureau of the Census 2002), we select our sample so that each marriage appears only once (see Appendix Table 1).

[7] The categories in the new education question are: less than 1st grade, 1st-4th grade, 5th or 6th grade, 7th or 8th grade, 9th grade, 10th grade, 11th grade, 12th grade – no diploma, high school graduate – high school diploma, or the equivalent, some college but no degree, Associate degree in college – occupational/vocational program, Associate degree in college – academic program, Bachelor's degree, Master's degree, professional school degree, and Doctorate degree.

[8] This education classification scheme corresponds to the completion of major degrees and is consistent with past research (Mare 1991).

[9] The 1960, 1970, and 1980 Census samples are self-weighting. We use the wife's person weight for the couple for both the Census and CPS.

[10] To preserve our original sample size, we normed the original weights so that the sum of the weights equals the sample size within data sources, CPS months, and years. In a very small number of cells in which the frequency equals zero, we set t_{ijkl} to 1.

[11] Our homogamy and crossings models assume that trends in the pattern of association between husband's and wife's education are (quasi-) symmetrical with respect to sex. The models used in this paper nonetheless do allow for changes in *hypergamy*, that is, the likelihood that husbands marry down with respect to education. Trends in hypergamy are largely functions of changes the marginal education distributions for husbands and wives and these trends are reflected in the marginal trends that are included in our baseline model.

[12] Whereas this table presents weighted frequencies, the actual frequencies that we analyze are unweighted and adjusted using an offset term for the sampling weight in our log-linear models. This method is discussed in the text.

[13] Table 2 also illustrates the relevance of our educational classification. Although the proportion of individuals with less than 10 years of schooling today is small, these individuals represent a large share of married persons historically. If we were examining assortative marriage exclusively in more recent decades we might safely collapse all those with less than 12 years of schooling into a single category and distinguish between those with college degrees and those with graduate or professional degrees. For the majority of the period studied, however, husbands and wives with graduate or professional degrees are a trivial proportion of our sample.

[14] Education-specific medians do not fully summarize the cross-section pattern and trend in education-specific earnings distributions. As is well known, earnings inequalities grew both within and between major education categories over the period studied here. It is possible that more complex functions of education-gender-specific earnings distributions may affect assortative mating patterns in ways not captured in the models discussed in this paper.

[15] Models such as (6) and (7) that include interactions with the male-female earnings gap (G^{mf}) are not nested within the unrestricted time series models such as Model (2). This is

because interactions with G^{mf} allow for time-varying asymmetric interactions between husband's and wife's schooling. It is nonetheless possible to gauge the relative adequacy of these models both informally by inspection of graphs and more formally through the BIC statistics (Raftery 1995).

[16] These calculations assume that persons leave school at the model age for their level of educational attainment and are based on the age at marriage and attainment level of the wife in each couple. Whereas public use data from the 1960, 1970, and 1980 Censuses report age at marriage and current age in calendar quarters, the 1940 Census reports these quantities in whole years, the June CPS's provide estimates from actual months of birth and marriage. The trends reported in Figure 9 are adjusted for Census-CPS difference. The sample for these calculations includes marriages in which the wife was aged 18-40, was in her first marriage, and was married for less than 16 years at the time of the interview.

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TABLE 1. DISTRIBUTION OF HUSBAND'S AND WIFE'S EDUCATION IN PREVAILING MARRIAGES BY YEAR (WIVES 18-40)

Wife's Years of Schooling	Husband's Years of Schooling					
	lt 10	10-11	12	13-15	ge 16	Total
1940:						
lt 10	43.99	4.45	3.12	0.78	0.40	52.74
10-11	7.33	3.88	2.61	0.69	0.36	14.87
12	6.55	3.60	8.13	2.29	1.91	22.48
13-15	1.32	0.67	1.47	1.58	1.62	6.66
ge 16	0.32	0.16	0.47	0.54	1.75	3.24
Total	59.51	12.76	15.80	5.88	6.04	99.99
						N=158,512
1960:						
lt 10	16.02	3.41	3.49	0.82	0.23	23.97
10-11	6.23	4.35	4.58	1.40	0.46	17.02
12	7.97	6.14	17.12	6.10	3.77	41.10
13-15	0.97	0.86	2.67	3.57	3.93	12.00
ge 16	0.18	0.18	0.61	0.97	3.95	5.89
Total	31.37	14.94	28.47	12.86	12.34	100.00
						N=203,117
1970:						
lt 10	7.94	2.41	3.09	0.69	0.21	14.34
10-11	4.13	3.63	4.88	1.37	0.38	14.39
12	5.77	5.47	21.86	8.27	4.44	45.81
13-15	0.71	0.85	3.38	5.27	5.48	15.69
ge 16	0.20	0.18	0.89	1.54	6.95	9.76
Total	18.75	12.54	34.10	17.14	17.46	99.99
						N=208,093
1980:						
lt 10	4.27	1.35	2.24	0.70	0.22	8.78
10-11	2.03	2.06	3.63	1.30	0.27	9.29
12	3.42	3.76	21.99	9.25	4.06	42.48
13-15	0.73	0.93	5.16	9.42	7.49	23.73
ge 16	0.15	0.15	1.27	2.80	11.35	15.72
Total	10.60	8.25	34.29	23.47	23.39	100.00
						N=239,954
1990:						
lt 10	2.68	0.68	1.31	0.53	0.14	5.34
10-11	0.84	1.25	2.33	0.82	0.15	5.39
12	1.89	2.57	18.09	9.57	3.24	35.36
13-15	0.68	0.98	8.45	14.40	7.83	32.34
ge 16	0.14	0.17	2.00	4.76	14.51	21.58
Total	6.23	5.65	32.18	30.08	25.87	100.00
						N=238,372
2000:						
lt 10	3.47	0.60	1.42	0.52	0.16	6.17
10-11	0.68	1.01	1.79	0.65	0.13	4.26
12	1.80	2.02	15.54	7.33	2.41	29.10
13-15	0.76	1.06	9.26	14.91	6.98	32.97
ge 16	0.17	0.18	2.80	6.33	18.02	27.50
Total	6.88	4.87	30.81	29.74	27.70	100.00
						N=220,209

Notes : Totals may not sum to 100.00 because of rounding error. Results are weighted to correct for oversampling and sampling variability in 1940 and 2000.
Source: U.S. Census (IPUMS).

TABLE 2. LOG-LINEAR MODELS OF THE ASSOCIATION BETWEEN HUSBAND'S AND WIFE'S EDUCATION IN PREVAILING MARRIAGES

Model	df	G^2	BIC
(1) HYS, WYS, HWS	720	8075.5	-2370
(2) Model 1 + OY	678	6626.9	-3210
(3) Model 1 + CY	552	2521.8	-5487
(4) Model 1 + OY + CY	510	2101.9	-5297
(5) Model 1 + OG^{mm}	719	7388.4	-3043
(6) Model 1 + OG^{mf}	718	7105.2	-3312
(7) Model 1 + OG^{mm} + OG^{mf}	717	7071.4	-3331
(8) Model 1 + CG^{mm}	715	5687.4	-4686
(9) Model 1 + CG^{mf}	715	4873.5	-5500
(10) Model 1 + CG^{mm} + CG^{mf}	710	3855.4	-6445
(11) Model 1 + CG^{mm} + CG^{mf} + CY	544	1727.7	-6165
(12) Model 1 + CG^{mm} + CG^{mf} + OG^{mm} + OG^{mf}	709	3669.4	-6617
(13) Model 1 + OG^{mm} + OG^{mf} + OY	675	6258.0	-3535
(14) Model 1 + CG^{mm} + CG^{mf} + OG^{mm} + OG^{mf} + OY + CY	500	1290.3	-5964

Notes: N = 1,998,956. Cells = 1,175. Model terms (number of parameters): Y = Year (42); H = Husband's education (4); W = Wife's education (4); S = Data source (1); O = Homogamy (1); C = Crossings Parameters (4); G^{mm} = Male-Male absolute log earnings gap (1); G^{mf} = Male-Female absolute log earnings gap (1).

Sources: Current Population Survey (CPS) and U.S. Decennial Census data (IPUMS).

TABLE 3. EFFECTS OF EARNINGS GAPS ON EDUCATIONAL ASSORTATIVE MATING

	Male - Male		Male - Female	
Model and Coefficient	γ	$\lvert\gamma/S.E.(\gamma)\rvert$	γ	$\lvert\gamma/S.E.(\gamma)\rvert$
Model 5: Homogamy	0.450	26.2	---	---
Model 6: Homogamy	---	---	-0.345	18.6
Model 7: Homogamy	0.148	5.8	-0.254	10.5
Model 8:				
lt 10 vs. 10-11	-0.509	10.9	---	---
10-11 vs. 12	-0.568	13.1	---	---
12 vs 13-15	0.815	28.1	---	---
13-15 vs ge 16	-0.441	12.3	---	---
Model 9:				
lt 10 vs. 10-11	---	---	1.142	36.8
10-11 vs. 12	---	---	0.246	9.7
12 vs 13-15	---	---	-0.596	26.3
13-15 vs ge 16	---	---	0.232	6.5
Model 10:				
lt 10 vs. 10-11	1.094	33.4	0.252	5.0
10-11 vs. 12	-0.139	4.9	-0.355	6.9
12 vs 13-15	-0.578	15.4	0.713	17.8
13-15 vs ge 16	-0.083	1.9	0.311	6.0

Notes: Earnings are calculated for those working more than 39 weeks in the previous year and are adjusted to 2002 dollars using the CPS-URS from 1977 to 2003 and the CPI-U from 1940 to 1976. For fit of models see Table 2.

Sources: 1962-2003 Current Population Survey (CPS) and U.S. Census data (IPUMS).

APPENDIX TABLE 1. DATA SOURCES AND SAMPLE SELECTION[a]

	Newlyweds	CPS m-i-s[b]	Prevailing Marriages	CPS m-i-s[b]
(1) Census[c]				
1940	1% General sample	N/a	1% General sample	N/a
1960	1% General sample	N/a	1% General sample	N/a
1970	1% Form 1 State sample	N/a	1% Form 1 State sample	N/a
1980	1% Metro (B Sample)	N/a	1% Metro (B Sample)	N/a
1990	N/a	N/a	1% Unweighted sample	N/a
2000	N/a	N/a	1% Census sample	N/a
Total N	49,552		1,268,283	
(2) Current Population Survey				
June supplement[d]	1971	1-8	1971	1-3, 5-7
	1973	1-8	1973	5-7
	1974-1977	1-4, 5-8[e]	1974-1977	5-7
	1979	1-8		
	1980-1983	1-4, 5-8[e]		
	1985	1-8		
	1986-1988	1-4, 5-8[e]		
	1990	1-8		
	1992	1-8		
	1994	1-8		
	1995	1-8		
March supplement[d]	N/a	N/a	1962	1-8
		N/a	1964-1978	5-8
October supplement[d]	N/a	N/a	1968-1978	5-8
Merged Outgoing Rotation Groups file[f]	N/a	N/a	1979-2003	8
Total N	24,352		730,673	

Notes : N/a = not applicable, no date-of-marriage information.

[a]The information in this table pertains to the data sources and sample selection of the marriage data in this paper. In addition, data from the March CPS from 1962-2003 (available from Unicon Research Corporation) and the 1940, 1950, and 1960 Censuses (IPUMS) were used to estimate median earnings scores by education, sex, and year. These scores were then merged onto the marriage data. The earnings sample is composed of persons 25-64 who worked more than 39 weeks in the previous year and were not self-employed or working without pay. Moreover, for comparability with the CPS, persons living in group quarters in the Census are dropped.

[b]For the CPS, specific month-in-samples (m-i-s) were selected to eliminate the possibility of duplicate marriages in the data.

[c]Integrated Public Use Microdata Series: Version 3.0 (Ruggles, et al. 2004) (www.ipums.org).

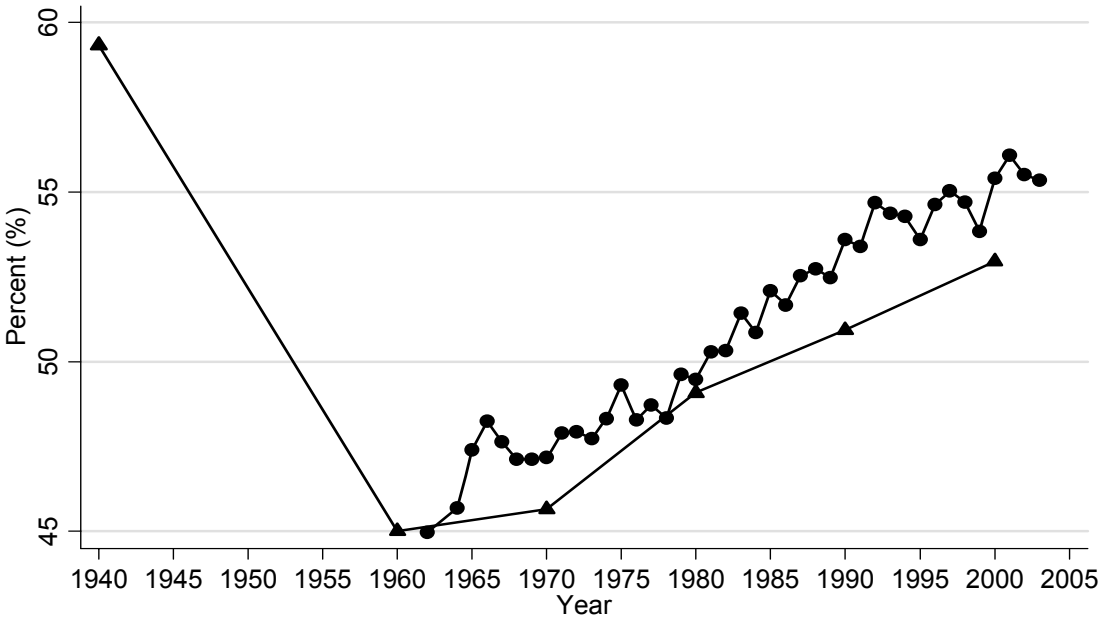
[d]Unicon Research Corporation.

[e]All couples in m-i-s 1-4 were selected. Couples in m-i-s 5-8 who were married in the previous June were dropped to avoid duplicate observations.

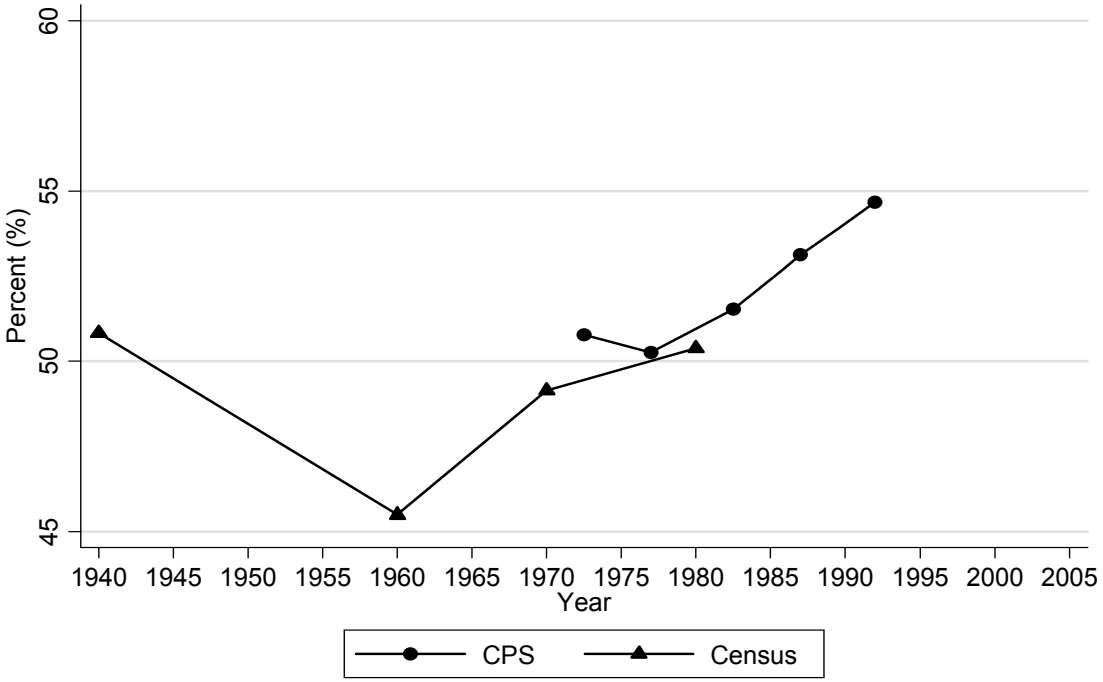
[f]National Bureau of Economic Research (www.nber.org).

FIGURE 1. PERCENT HOMOGAMOUS BY DATA SOURCE (WIVES 18-40), U.S. 1940-2003

Panel A. Prevailing Marriages:



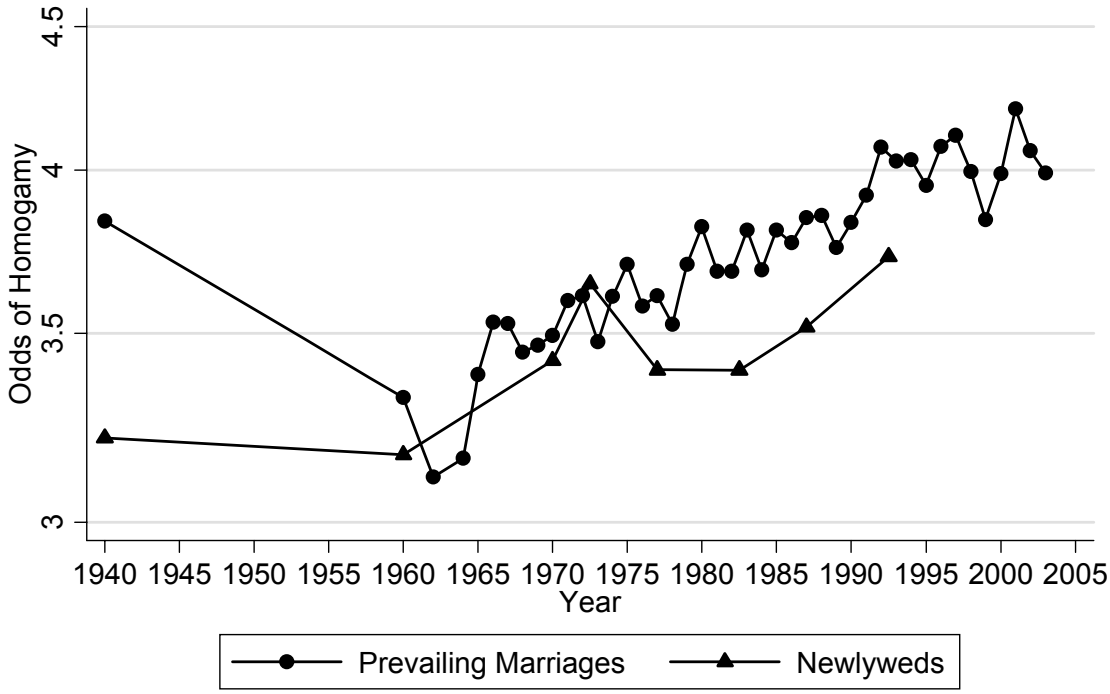
Panel B. Newlyweds:



Notes: Results are weighted. Education categories are lt 10, 10-11, 12, 13-15, and ge 16 years of schooling. For newlyweds, years are grouped into roughly 5-year intervals: 1970-74, 1975-79, 1980-84, 1985-89, 1990-95. They are graphed at their mid-point.

Sources: Current Population Survey (CPS) and U.S. Census data (IPUMS).

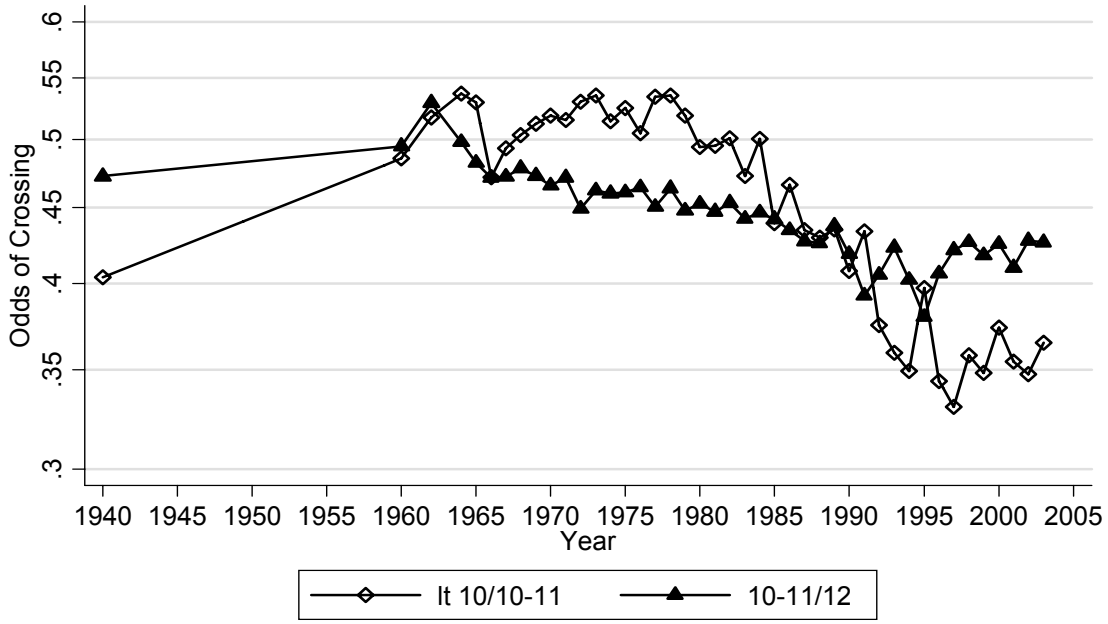
FIGURE 2. ODDS OF HOMOGAMY BY SAMPLE (WIVES 18-40), U.S. 1940-2003

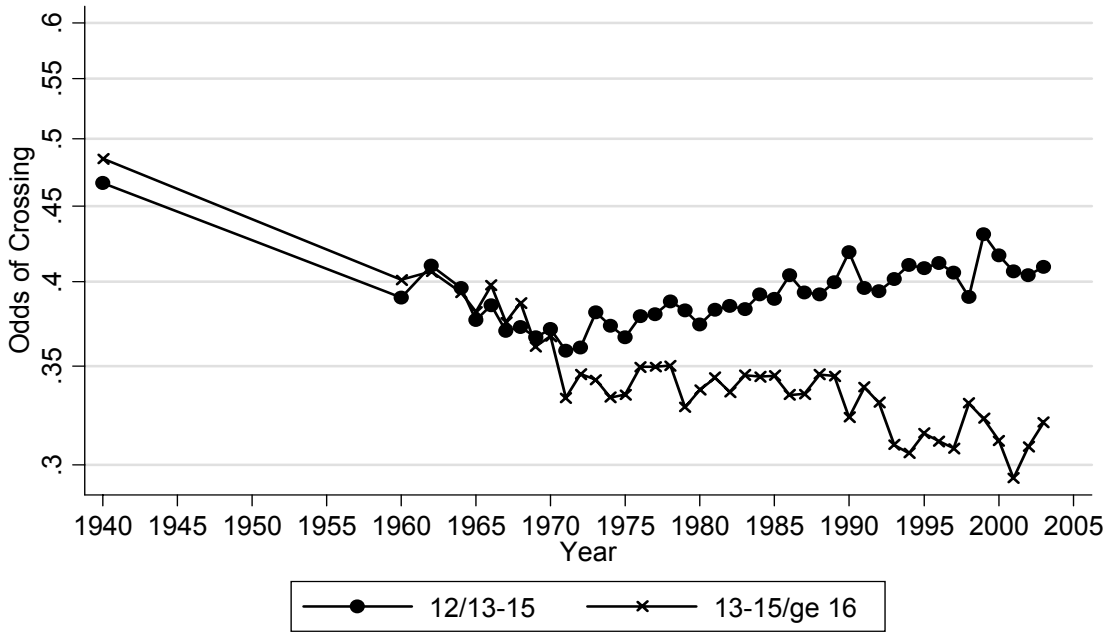


Notes: Education categories are lt 10, 10-11, 12, 13-15, and ge 16 years of schooling. For newlyweds, years are grouped into roughly 5-year intervals: 1970-74, 1975-79, 1980-84, 1985-89, 1990-95. They are graphed at their mid-point.

Sources: Current Population Survey (CPS) and U.S. Census data (IPUMS).

FIGURE 3. ODDS OF CROSSING AN EDUCATIONAL BARRIER AMONG PREVAILING MARRIAGES (WIVES 18-40), U.S. 1940-2003



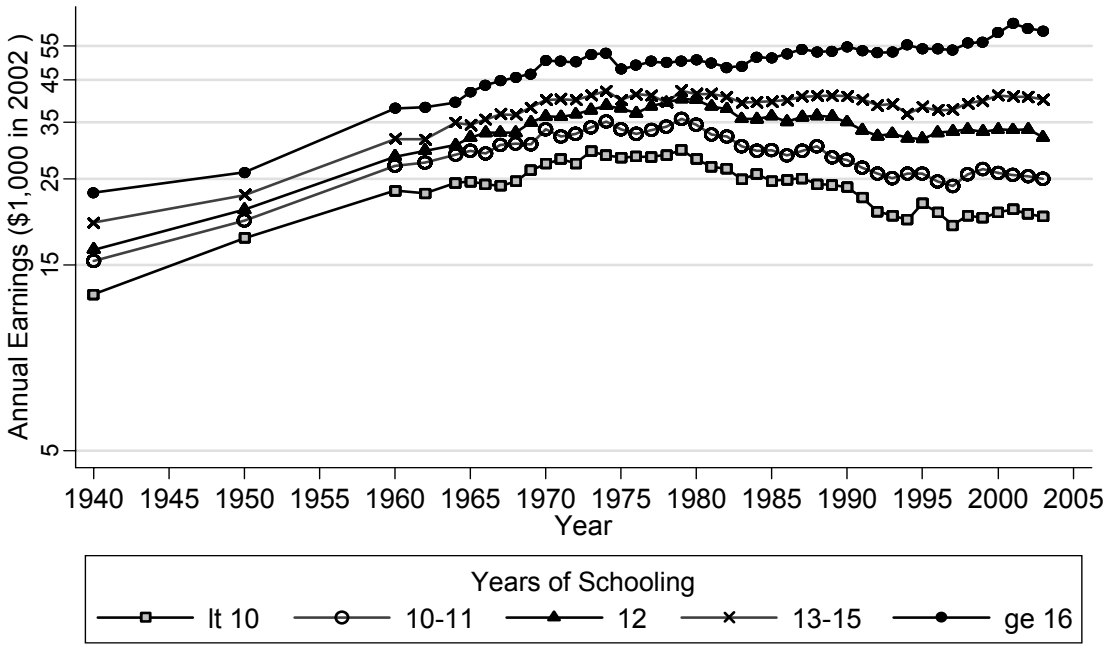


Notes: Education categories are lt 10, 10-11, 12, 13-15, and ge 16 years of schooling.

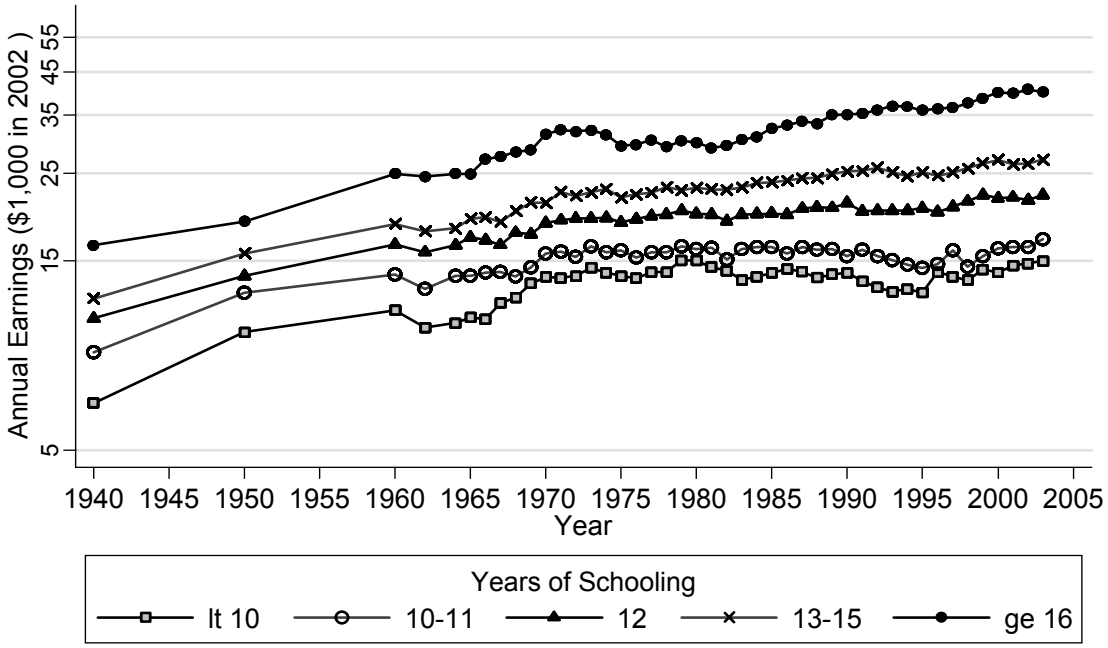
Sources: Current Population Survey (CPS) and U.S. Census data (IPUMS).

FIGURE 4. MEDIAN LOG ANNUAL EARNINGS BY EDUCATION AND YEAR, U.S. 1940-2003

Panel A. Men Age 24-65



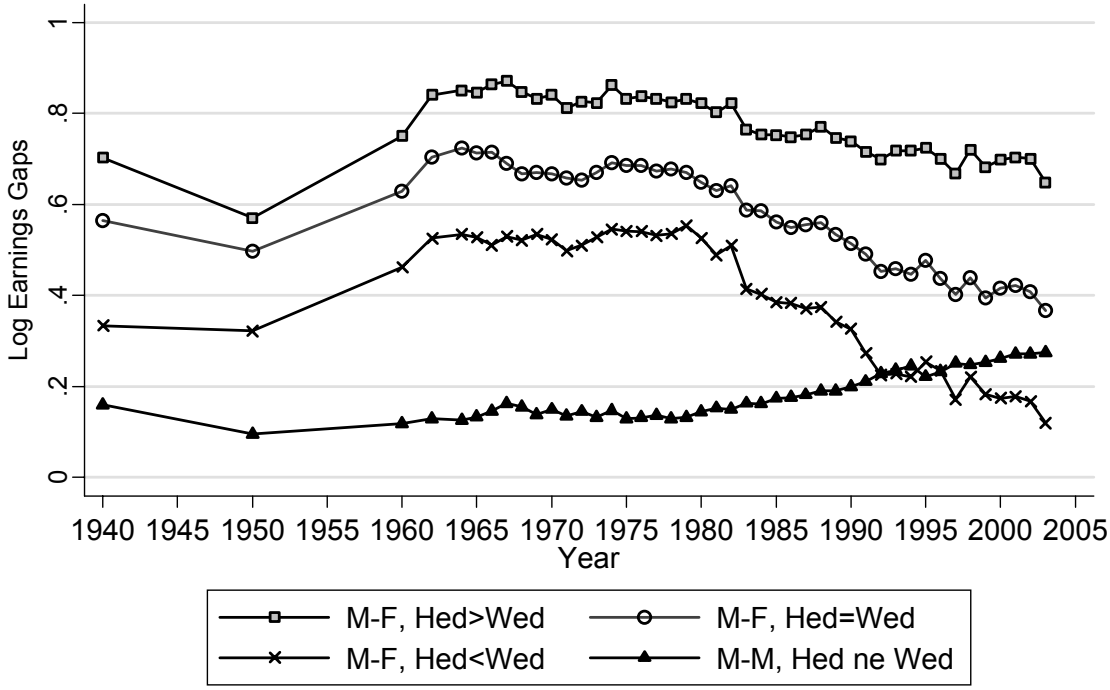
Panel B. Women Age 24-65



Notes:.Earings are calculated for those working more than 39 weeks in the previous year and are adjusted to 2002 dollars using the CPS-URS from 1977 to 2003 and the CPI-U from 1940 to 1976.

Sources: 1962-2003 March Current Population Survey (CPS) and 1940, 1950, and 1960 U.S. Census data (IPUMS).

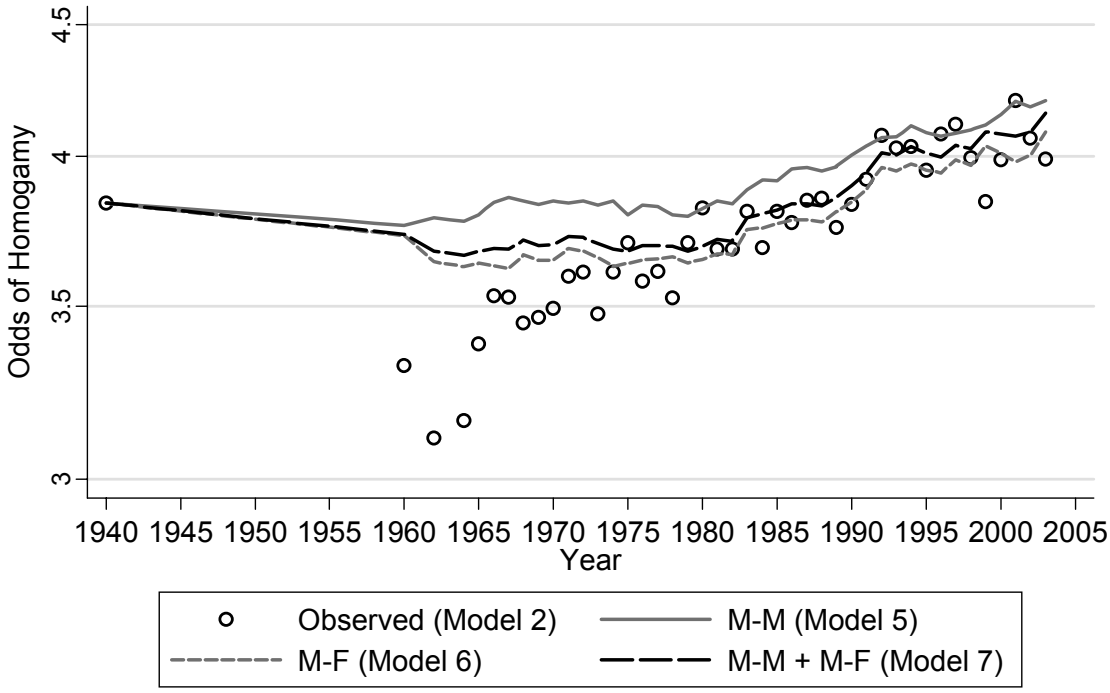
FIGURE 5. AVERAGE LOG EARNINGS GAPS BY EDUCATION AND YEAR, U.S. 1940-2003



Notes: Earnings are calculated for those working more than 39 weeks in the previous year and are adjusted to 2002 dollars using the CPS-URS from 1977 to 2003 and the CPI-U from 1940 to 1976. See text for calculation details.

Sources: 1962-2003 March Current Population Survey (CPS) and 1940, 1950, and 1960 U.S. Census data (IPUMS).

FIGURE 6. PREDICTED ODDS OF HOMOGAMY (WIVES 18-40), U.S. 1940-2003

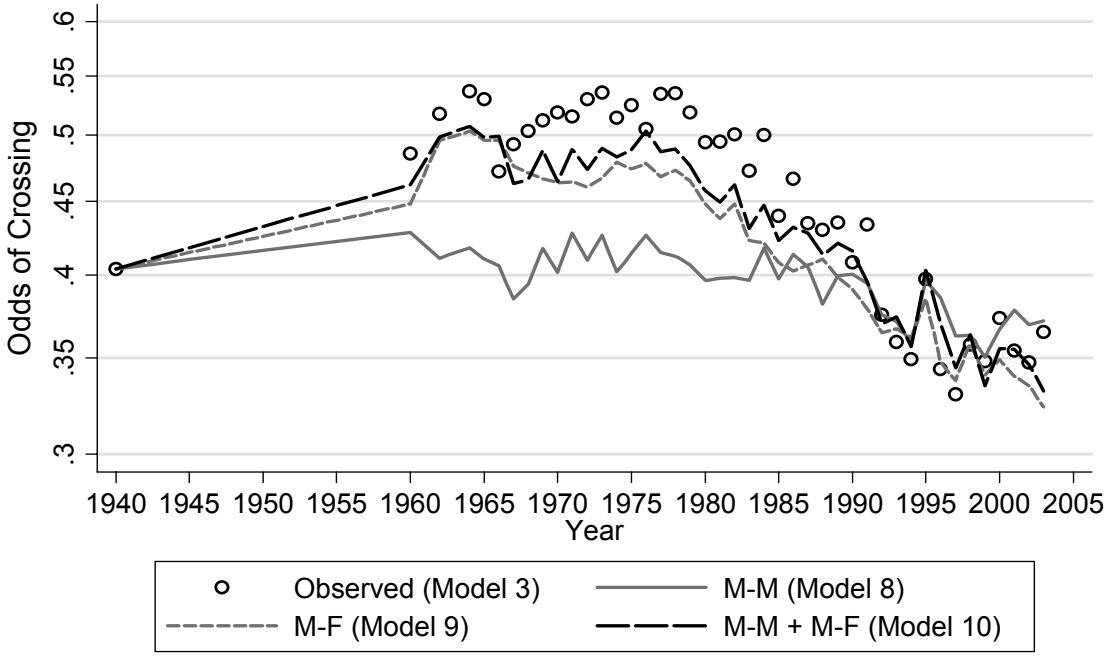


Notes: Education categories are lt 10, 10-11, 12, 13-15, and ge 16 years of schooling. For models fit statistics see Table 2. M-M = |log(median male earnings by husband's education level) – log(median male earnings by wife's education level)|; M-F = |log(median male earnings by husband's education level) – log(median female earnings by wife's education level)|.

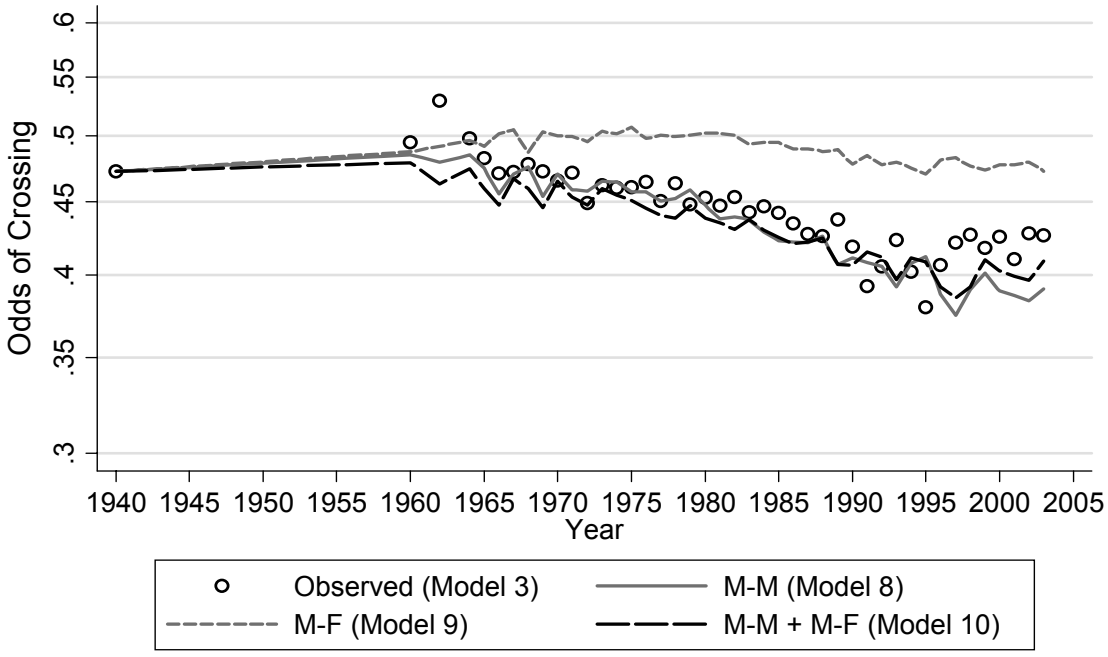
Sources: Current Population Survey (CPS) and U.S. Census data (IPUMS).

FIGURE 7. PREDICTED ODDS OF CROSSING AN EDUCATIONAL BARRIER (WIVES 18-40), U.S. 1940-2003

Panel A. Odds of Crossing lt 10/10-11 Years of Schooling Barrier vs. Odds of Homogamy



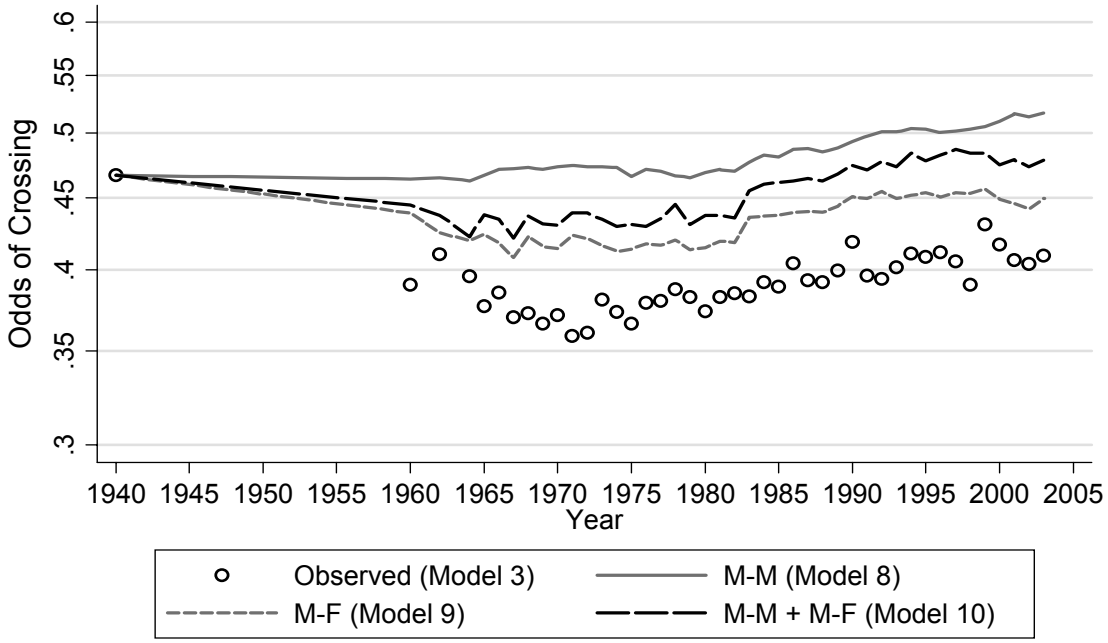
Panel B. Odds of Crossing 10-11/12 Years of Schooling Barrier vs. Odds of Homogamy



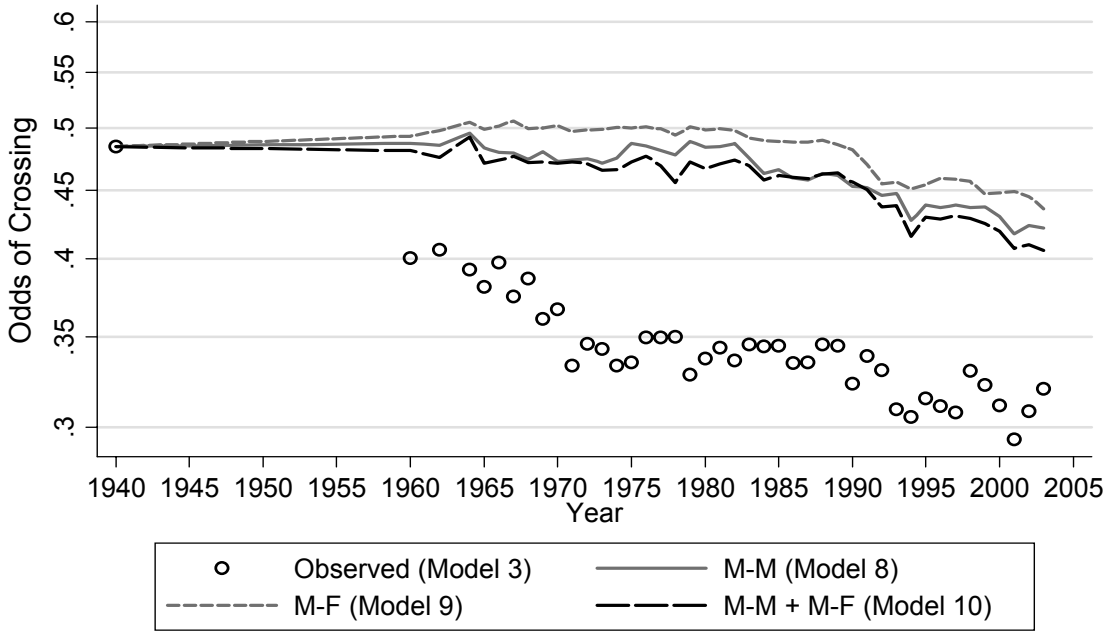
(continued…)

FIGURE 7 (continued)

Panel C. Odds of Crossing 12/13-15 Years of Schooling Barrier vs. Odds of Homogamy



Panel D. Odds of Crossing 13-15/ge 16 Years of Schooling Barrier vs. Odds of Homogamy

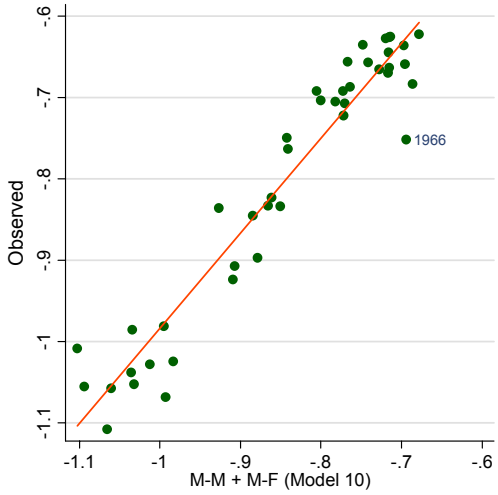


Notes: For models fit statistics see Table 2. M-M = |log(median male earnings by husband's education level) – log(median male earnings by wife's education level)|; M-F = |log(median male earnings by husband's education level) – log(median female earnings by wife's education level)|.

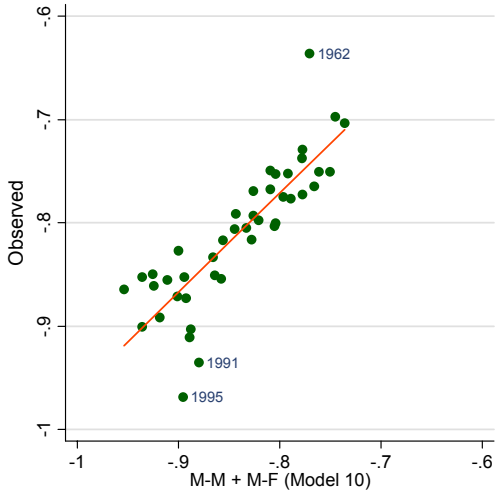
Sources: Current Population Survey (CPS) and U.S. Census data (IPUMS).

FIGURE 8. OBSERVED VS. PREDICTED ODDS OF CROSSING AN EDUCATIONAL BARRIER VS. ODDS OF HOMOGAMY

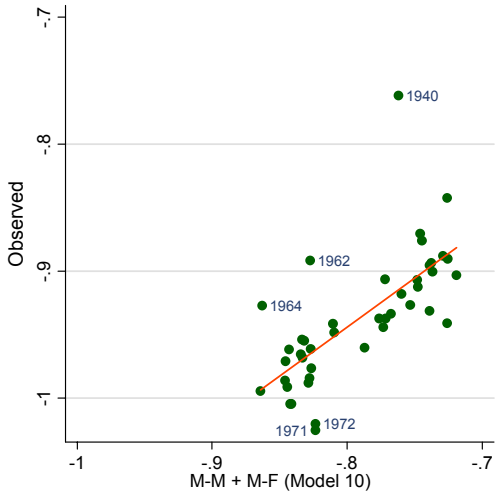
Panel A. lt10/10-11 Years of Schooling Barrier



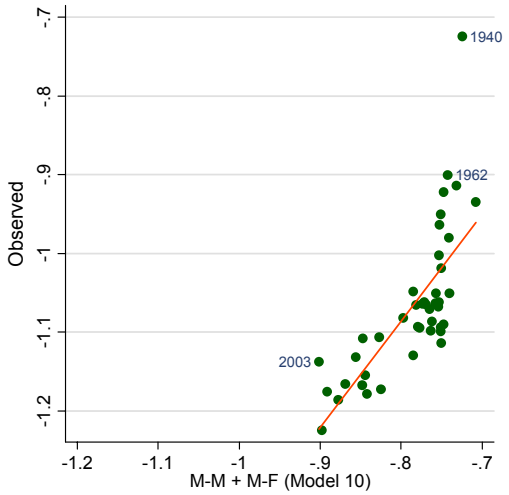
Panel B. 10-11/12 Years of Schooling Barrier



Panel C. 12/13-15 Years of Schooling Barrier



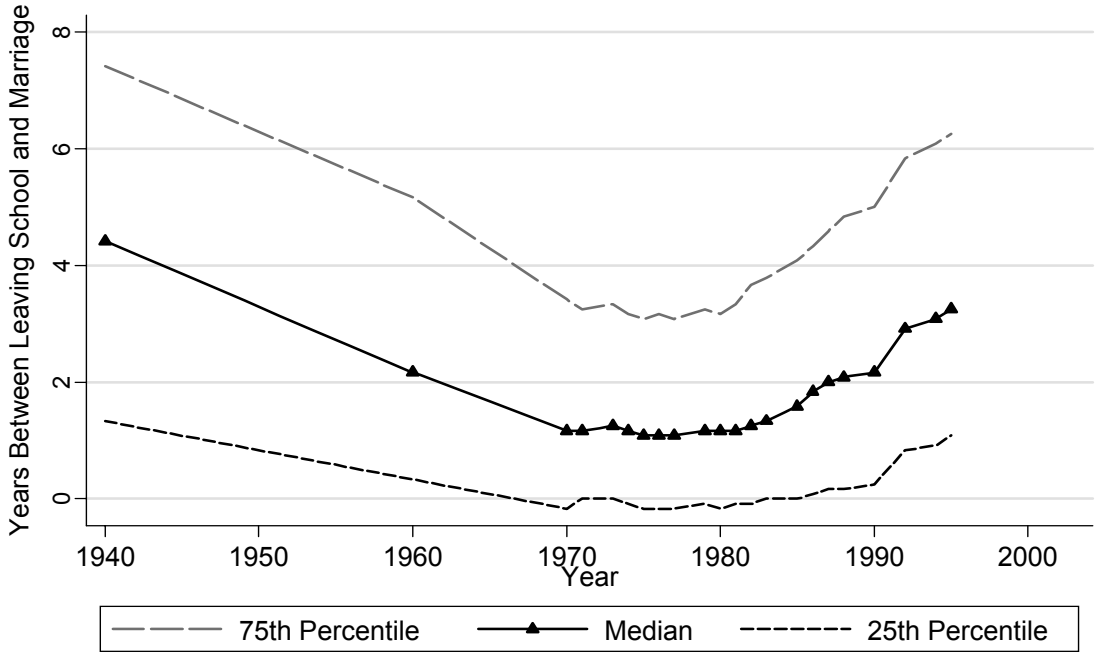
Panel D. 13-15/ge 16 Years of Schooling Barrier



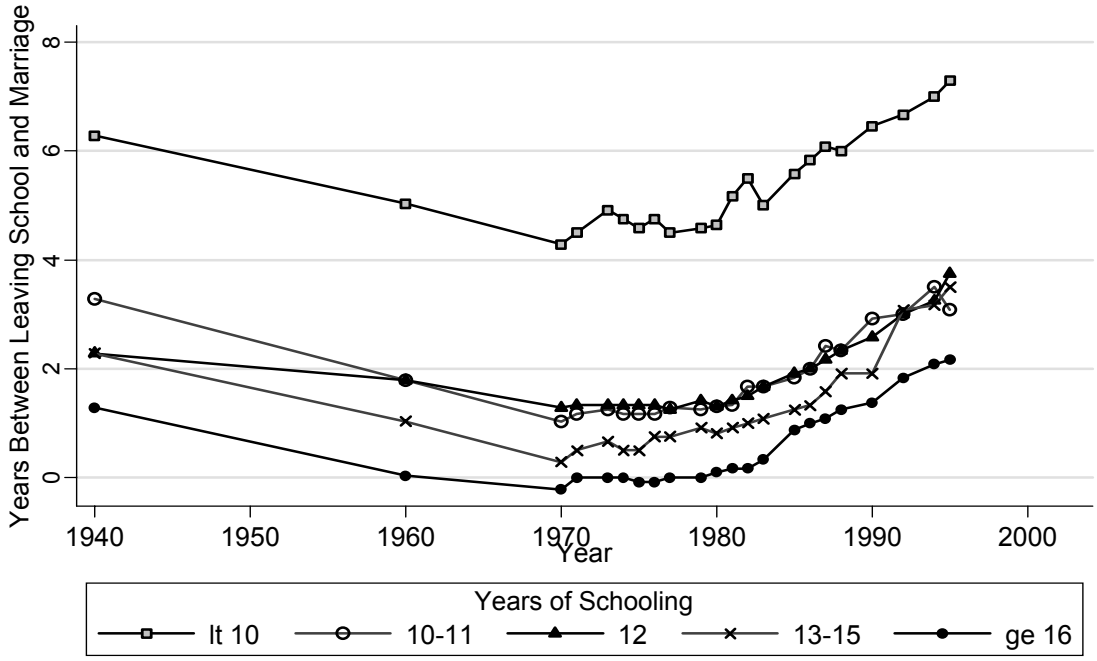
Notes: See Table 2 for model fit statistics.
Sources: Current Population Survey (CPS) and U.S. Census data (IPUMS).

FIGURE 9. YEARS OF SCHOOLING BETWEEN LEAVING SCHOOL AND MARRIAGE BY YEAR FOR WIVES (18-40), U.S. 1940-1995

Panel A. Years Between Leaving School and Marriage, Median and Quartiles



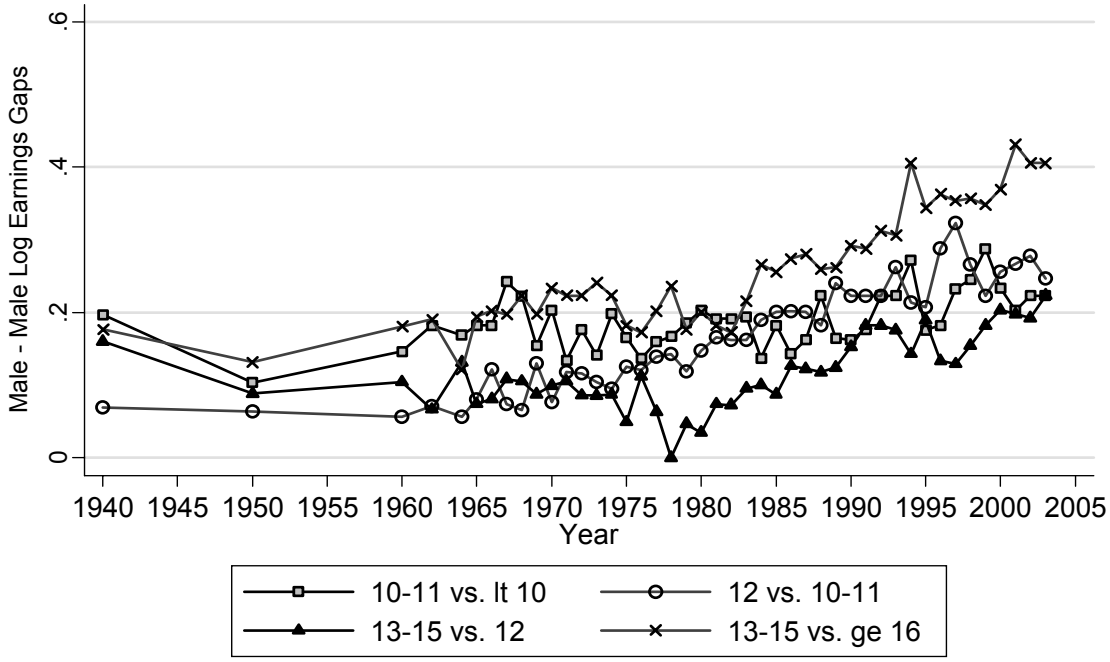
Panel B. Years Between Leaving School and Marriage, by Education Category of Wife



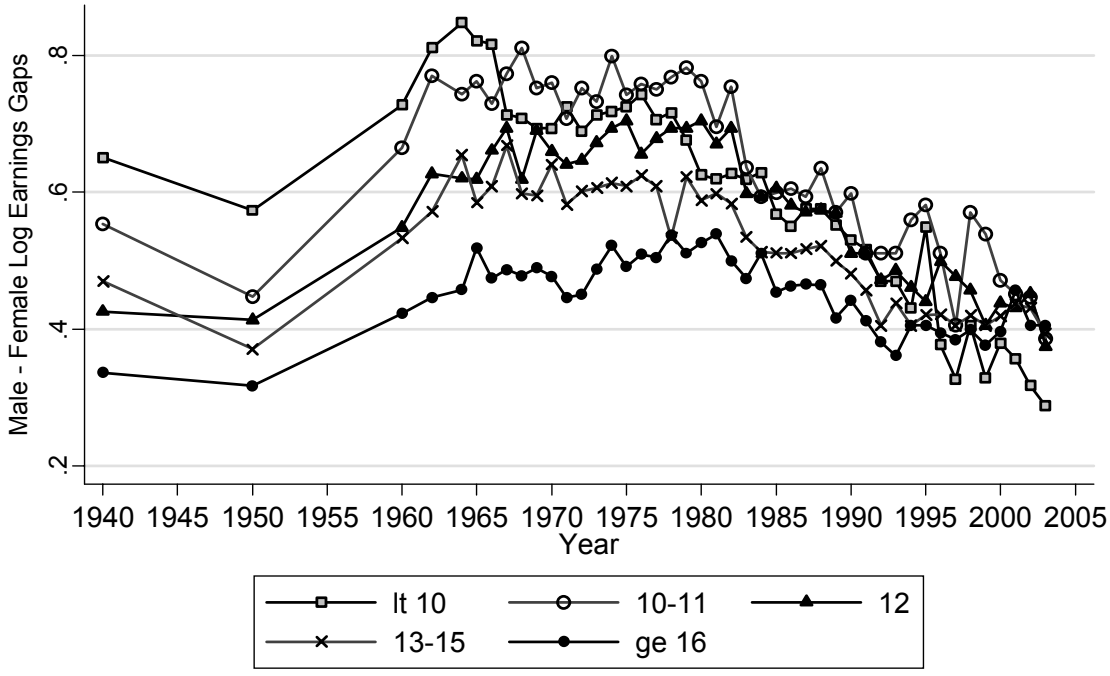
Notes: Estimates have been adjusted for differences by data source.
Sources: June Current Population Survey (CPS) and 1940, 1960, 1970, and 1980 U.S. Census data (IPUMS).

APPENDIX FIGURE 1. LOG EARNINGS GAPS BY EDUCATION AND YEAR, U.S. 1940-2003

Panel A. Male-Male Log Earnings Gaps, Husband's Education ≠ Wife's Education



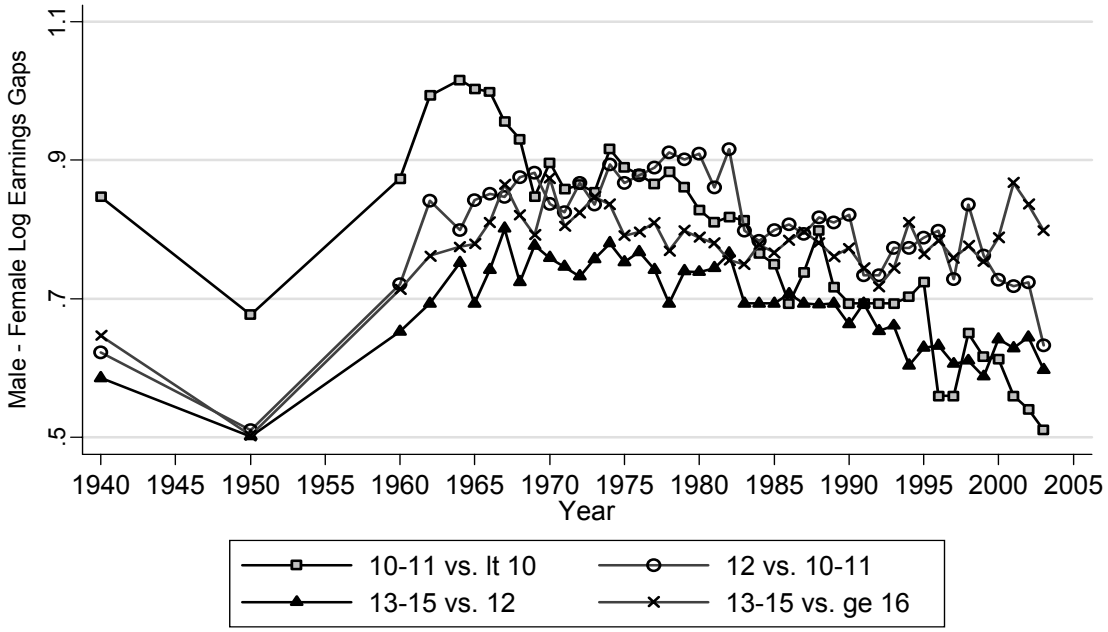
Panel B. Male-Female Log Earnings Gaps, Husband's Education = Wife's Education



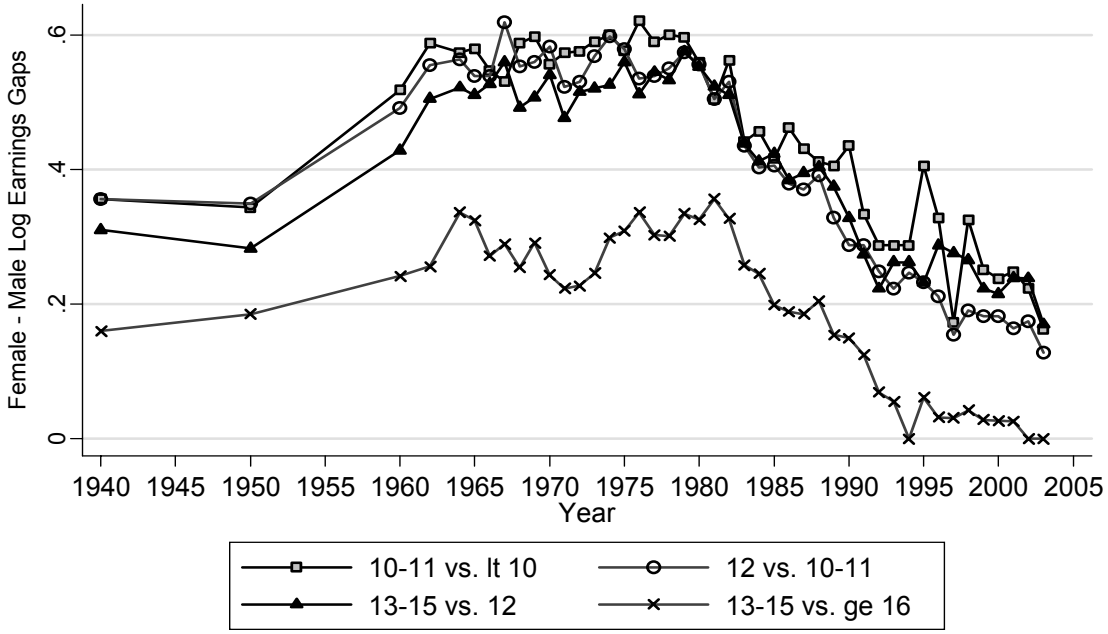
(continued…)

APENDIX FIGURE 1 (continued).

Panel C. Male-Female Log Earnings Gaps, Husband's Education > Wife's Education



Panel D. Male-Female Log Earnings Gaps, Husband's Education < Wife's Education



Notes: Earnings are calculated for those working more than 39 weeks in the previous year and are adjusted to 2002 dollars using the CPS-URS from 1977 to 2003 and the CPI-U from 1940 to 1976.

Sources: 1962-2003 March Current Population Survey (CPS) and 1940, 1950, and 1960 U.S. Census data (IPUMS).