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Are Educationally Hypogamous Marriages More Likely to End in Divorce in the United States?

New Estimates from 1996-2017 Data

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Abstract

Following strong trends towards higher female than male educational attainment, educationally hypogamous marriages are now more frequent than are hypergamous marriages in the United States and in other high-income countries. Traditional, "male-breadwinner" gender roles, meanwhile, are more consistent with hypergamous than hypogamous marriage, making the stability of hypogamous marriage a potential indicator of societal progression towards more gender-equal couple roles. The challenges of estimating relative divorce likelihoods between these two union types, and of these union types relative to educationally homogamous unions, however, are substantial. In the present study, we adduce 109,000 couple-years of divorce risk among hypogamous, hypergamous, and homogamous married couples in which the woman is aged between 20 and 59, as observed between 1996 and 2017 in five Survey of Income and Program Participation panels. Compared with educationally homogamous and hypergamous couples, we estimate an annual odds of divorce that is 31 percent higher for hypogamous couples. We further estimate that almost half of all hypogamous marriages will end in divorce. We interpret these findings as being consistent with the "stalled" or "unfinished" characterizations of the gender-role revolution in the United States.

Keywords: divorce, hypergamy, hypogamy, homogamy, education

Introduction

Beginning around 1990, educationally hypogamous marriages became more common than hypergamous marriages in the United States (Schwartz and Mare 2005: 630). The driver of this trend has been female educational attainment's exceeding male educational attainment, a phenomenon that also emerged around 1990 (Esteve et al. 2012). That is, the growth of educationally hypogamous marriages was not driven by changes in social preferences, but instead occurred against the prevailing "male-breadwinner" gender ideology (Tichenor 1999). Because hypogamous marriage deviated from this gender-role norm, it was hypothesized and found that hypogamous marriages would be at greater risk of divorce (Heaton 2002; Tzeng 1992). There has, however, also been a large shift away from the "male-breadwinner" gender ideology (Sayer and Bianchi 2000; Sweeney 2002), large enough to be labeled by many as a "gender revolution" (Goldin 2006; Goldscheider et al. 2015). In countries in which shifts in gender ideology have been larger, family behavior has adjusted (Arpino, Esping-Andersen, and Pessin 2015; Brinton and Lee 2016). Specifically with respect to divorce, Cooke (2006) found the United States' relative progressiveness to be associated with a weakening of the linkage of divorce risks to indicators of non-traditional marriages. More recently, however, Killewald (2016) found an enduring association of higher divorce risks with events that disrupt traditional gender roles within marriage, such as male unemployment.

Specifically, with respect to the relative educational attainments of the spouses, Schwartz and Han (2014) found a diminishing of differences in divorce risks in the U.S. between hypogamous and hypergamous marriage, such that there is no longer any discernible difference in risks in the most recent marriage cohorts. Grow et al. (2017) similarly found diminishing

ratios of divorce risk in educationally hypogamous relative to hypergamous marriages across marriage cohorts in 10 out of 12 European countries. Studies comparing divorce risks over time, however, encounter major empirical challenges. With respect to the U.S., Kennedy and Ruggles (2014) highlight major problems of comparability of data sources over time, and additionally problems in the handling of divorce trends that have differed by age, notably that younger couples' divorce rates have moved towards stability or decline at the same time that older couples' divorce rates have increased substantially. Lack of statistical power to compare earlier and recent cohorts' divorce risks with respect to specific conditions of gendered statuses in a couple is a further major empirical problem noted by both Killewald (2016) and Schwartz and Han (2014).

In the present study, we apply a data source not previously used for the two-sex study of divorce, that of the panel years of the Survey of Income and Program Participation (SIPP). Pooling data over the 1996, 2001, 2004, 2008, and 2014 Panels, we obtain 109,000 couple-years of divorce risk among married couples observed between 1996 and 2017, with hypogamous couples constituting a quarter of these couple-years. Nevertheless, in recognition of the still-limited numbers of couples experiencing divorce in each Panel, our goal is not to investigate trends over time. Instead, our goal is to estimate divorce risks in this approximately 20-year period of greater prevalence of hypogamous than hypergamous married couples, and to do so over a broad range of ages, those in which the wife is aged 20 to 59. Using these data in regression models that otherwise have much in common with Schwartz and Han's, we find an enduring higher risk of divorce for hypogamous couples. Specifically, we estimate annual odds of divorce that are 31 percent higher for hypogamous couples than for homogamous and hypergamous couples. We further estimate that this difference translates to a seven percentage-

point greater likelihood that a hypogamous marriage will end in divorce. We interpret these results, both alone and in comparison and contrast to those of Schwartz and Han (2014) and European studies (Grow et al. 2017), for their insights into progress in, or stalling of, the United States' gender revolution (Sayer and Bianchi 2000; England 2010; Cotter et al. 2011; Goldscheider et al. 2015).

Literature Review

The last several decades have been notable for a general increase in women's educational attainment over that of men, in the U.S. and in other high-income countries (Van Bavel, Schwartz and Esteve 2018). Esteve and colleagues (Esteve et al. 2012) describe it as leading to "the end of hypergamy" in marriage. Although the consequences of "the end of hypergamy" apply to many aspects of family life (e.g., Nitsche et al. 2018), the extent of its impact on marital stability has been unclear (Lyngstad and Jalovaara 2010). The change in the effect of relative education of the spouses on divorce is important because it follows other changes in gender dynamics. When women in the United States first entered the workforce in large numbers, it was still believed that the most successful marriage would be between a low-wage woman and a high-wage man due to their specializations in market versus house work (Becker 1974, 1985). The adjustment period in the later decades of the 1900s show this to have been the case, with couples in which the wife had more education and earnings than their husbands being more likely to divorce (Heaton 2002; Teachman 2010; Tzeng 1992). Feminist scholars believe this adjustment period was due to the non-normative nature of relationships where a woman out-earns the man or has a higher education than the man. Sayer and Bianchi (2000) found that much of this relationship could be explained away by measures of gender ideology. Therefore, it is not

necessarily the educational or wage difference that causes marital issues, but rather the gender dynamics of the relationship going against the established societal norms (Tichenor 1999). Following this reasoning, Schwartz and Han (2014), using data from the National Survey of Family Growth and the Panel Study of Income Dynamics applied to marriage cohorts from 1950 to 2004, found that educationally hypogamous couples became no more likely to divorce than hypergamous couples in the late-1980s through early-2000s marriage cohorts,

The causal trail of predictors of divorce, however, is a quantitatively and theoretically difficult topic to disentangle. Killewald (2016) addresses three separate theories and includes them in one analysis: on the economic independence of the woman, financial strain of the couple, and gender dynamics within the couple. Using data from the Panel Survey of Income Dynamics between 1968 and 2013, Killewald found evidence to support the risk of divorce being higher when the man does not have a full-time job, implying that deviations from the traditional male breadwinner model remain predictive of marital instability. Studies from the early 21st Century show that in general, when the status between a man and a woman in a marriage was not that of a male bread-winner model, the roles and relationships have to be redefined and renegotiated (Evertsson and Nermo 2004; Tichenor 2005). It has been argued (Goldscheider et al. 2015) that the links between the breaking of traditional gender roles (women entering the labor force or women out-earning their partners) and family-demographic processes are weakening due to high prevalence of family diversity (Raley and Sweeney 2020), expectations of female employment (Goldin 2006), and changing gender-role norms (Sayer and Bianchi 2000). While divorce is almost certainly changing in response to these broader gender-role transformations in the U.S. and other high-income countries, the character and extent of these changes is a topic about which much is still unknown.

Data and Methods

Our data are of U.S.-born women between the ages of 20 and 59 at risk of divorce from 1996 to 2017. The data come from the panel waves of the 1996, 2001, 2004, 2008, and 2014 Panels of the SIPP (U.S. Census Bureau 2021). The SIPP is a household-based nationally-representative sample panel survey conducted by the United State Census Bureau. The sample is a multistage stratified sample of the United States civilian non-institutionalized population. Each panel covers approximately four years. In the SIPP 1996-2008 Panels, respondents are interviewed every four months and therefore three waves of a panel are equal to 12 months. In the 2014 Panel, respondents were interviewed every 12 months (see Appendix Table A1 for details on the correspondence of SIPP waves and calendar-year time).

The SIPP collects information primarily on income and program participation, but also collects detailed demographic information sufficient to code the current characteristics of individuals and married couples, and of women's marital histories. SIPP's frequent newly-sampled panels provide for ongoing representation of the contemporary U.S. population. We use the panel observations to code occurrence of divorce between panel waves, always over a one year period. This use of the SIPP panel waves to identify divorces follows Manning, Brown, and Stykes (2016), who used SIPP panel data to code both cohabitation dissolutions and marital dissolutions in same-gender couples, and compared them to mixed-gender couples. We additionally compared the patterns of divorce by woman's education and other characteristics to estimates from the American Community Survey (ACS, Ruggles et al. 2020). The ACS has included a question on divorce in the 12 months before survey from the 2008 survey onwards. In results not shown, we found similar patterns of divorce by covariates between the ACS and our

SIPP panel-coded divorces, but with an overall higher level of divorce in the ACS. We return to this below, where we describe our adjustment of SIPP-predicted divorce probabilities to ACS levels.

The SIPP also asks marital histories (see Martin 2006). In the 1996-2008 SIPP Panels, respondents are asked a topical module at Wave 2, four months after Wave 1, that includes questions about their marital history. In the 2014 Panel, the same information is instead collected in a Social Security Administration (SSA) Supplement associated with the 2014 Wave 1 data collection. Because the SIPP's marital histories do not allow for the identification of the education and other characteristics of both spouses before a divorce, we do not use them to code divorces. However, we are able to use them to link the marriage observed at each panel's Wave 1 to the woman's answers provided in her marital history. Specifically, we create an indicator for whether the couple's marriage observed at Wave 1 is the woman's first marriage or a remarriage and, using the date of the start of the current marriage, we code the marriage cohort and the women's age when the marriage began. This also allows us also to code the duration of marriage relative to the year of each of panel wave interview that begins a panel year of exposure to divorce.

We restrict the sample followed annually in the SIPP panel waves to those couples who were married, spouse present at Wave 1, and in which the wife was aged 20-59 and U.S. born. We do not use exposure to divorce of couples who married only after Wave 1. To do so involves challenges both in accurately representing the probability of selection of the new spouse into the sample, and in identifying divorces for marriages formed between panel waves given the different following rules applied to original panel members versus to those who subsequently joined a panel household. We exclude foreign-born women from our analyses because their

patterns of divorce differ substantially from those of U.S.-born women and warrant a separate analysis that is beyond the scope of this project.[1] An additional complication for analyzing foreign-born women comes from our use of marital duration as a predictor of divorce, noting that some foreign-born couples will have marital years that preceded their arrival in the U.S.

Identification of Divorce Events and Years of Exposure to Divorce

Our goal is to identify exposure to divorce and divorce events over each panel year in the SIPP. We start with the all married, spouse-present sample of Wave 1 and follow the couple each year until either a divorce occurs or both members of the couple are lost to follow-up. Because panel waves are conducted at four-month intervals for the 1996-2008 panels, we collect information on whether the couple divorces across three waves to code a divorce in the annual interval. In the 1996-2008 panels, we observe up to four years of exposure to divorce, between waves 1 and 4, 4 and 7, 7 and 10, and 10 and 13. Only in the 2008 Panel, however is there a sufficient number of waves to code all four years of exposure to divorce (using waves 1-13). In 1996 and 2004, there is a sufficient number of waves to code three years of exposure to divorce (using waves 1-10), and in the 2001 Panel there is a sufficient number of waves to code two years of exposure to divorce (using waves 1-7). The divorce exposure years covered by our combined sample of the 1996-2008 Panels correspond approximately to the years 1996-1999,

[1] We found a large difference in education gradients of divorce between U.S.-born and foreign-born in both the ACS and the SIPP (results not shown). In the ACS, foreign-born women who have less than high school education have the lowest percentages of women divorcing annually, followed by bachelor's degree or more, high school, and those with some college have the highest percentage divorcing annually.

2001-2003, 2004-2007 and 2008-2012 (see again Appendix Table A1). In the 2014 panel, we observe three years of exposure to divorce, between annual waves 1 and 2, 2 and 3, and 3 and 4, corresponding to the period 2014-2017.

For the 1996 to 2008 Panels, the coding of divorce between Wave 1 and Wave 4 is used here as an example to explain how we code annual divorces between the first and second year of the couple year-pair. If a respondent A is married at Wave 1 to their spouse, person B, and married at Wave 4 to the same person B, we code them as having been at risk of divorce over the 12-month interval between those waves but remained married. A couple is identified as getting divorced between Waves 1 and 4 if in Wave 4 their status is identified as "divorced" from either the woman's or the man's record. Thus this "divorced" identification can be established when both partners are still in the survey (in different households), both with "divorced" as their marital status indicator, or when only one of the partners remains in the survey with their marital status indicator of "divorced" while the partner from the previous year has left the survey. A significant reason for survey attrition is family dissolution, so it is not surprising to find a higher percentage of divorced partners leaving the survey between waves. For this reason, it is especially important that we require only one member of the couple to be still in the interviewed sample for a divorce to be coded. In the 2014 Panel, although participants are interviewed only once every 12 months, the process of identifying divorce is otherwise the same as for the 1996-2008 Panels. Attrition of both individuals in the couple nevertheless leads to a substantial fraction of missing data in the SIPP.[2] It is partly for this reason that we use ACS data on divorce

[2] In analyses of the coding of divorce in the first year of exposure to divorce for the subset of women aged 20-39, we found Wave 1 to Wave 4 couple attrition rates of between 8% and 16%

in the 12 months before survey to adjust upwards the level of predicted annual divorce probabilities estimated from the SIPP in our estimation of the fraction of marriages ending in divorce (described below).

Education

The SIPP asks respondents to identify the highest degree received or grade completed. Respondents may choose between a grade level between 1st and 12th grade, high school, some college, vocational degree, associate degree, bachelor's degree, and other professional or graduate degrees. We code these into the four categories of less than high school graduate, high school graduate, some college, and college graduate (bachelor's degree or above). We apply the education coded for the participant at Wave 1 to each of their observations in our sample. This has two advantages. First, we avoid as much as possible the problem of individuals obtaining more education in anticipation of divorcing, as may occur when more education is accumulated after Wave 1. Second, we avoid errors due to inconsistent reporting of education across waves or of imputation of education (done at the U.S. Census Bureau) across waves.[3] Using our Wave 1 four-category education variables for the wife and husband, we code whether a marriage is educationally hypogamous (woman married to a man of lower education), hypergamous (woman

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of couples in the 1996-2008 Panels and in the 2014 Panel we found a Wave 1 to Wave 2 attrition rate of 24% of couples.

[3] Of participants who were observed to change education across the panel waves, we found in 40% of cases there was a decrease in their education level, which may logically only occur through respondent misreporting or imputation error (results not shown).

married to a man of higher education), or homogamous (woman married to a man of equal education).

Analyses: Descriptive Statistics and Multivariate Logistic Regression

First, we use weighted univariate and bivariate statistics to explore the differences in characteristics of the couple-years of exposure to divorce, overall and by whether the marriage is hypogamous, hypergamous, or homogamous. In these descriptive statistics we adjust for the survey sampling weight, which we first normalized to have a mean of 1 for each SIPP Panel separately before combining the five Panels (following Rendall et al. 2008). We conduct chi-square tests of difference in distributions between hypogamous, hypergamous, and homogamous couples that adjust for repeat observation of couples in multiple years of exposure to divorce risk. For continuous predictor variables, we conduct pairwise t-tests of differences in means.

We then proceed to run two multivariate binary logistic regressions. Again we adjust our standard errors and statistical tests for repeat observation of couples in multiple years of exposure to divorce risk. We do not use sample weights in these multivariate regressions, however, instead relying on a full specification of the determinants of divorce. In addition to our main explanatory variables (details immediately below), each regression includes main-effect education levels of both spouses, and additional control variables for race/ethnicity of the wife, race/ethnic heterogamy (different race/ethnicity of the husband than of the wife), wife's remarriage versus first marriage, her age at marriage, the duration of the marriage, and marriage cohort (year the marriage began). We do not include employment or earnings among the regressors for two reasons. First, women in particular have been found to increase their employment and earnings in anticipation of divorce (Özcan and Breen 2012). Second, in Schwartz and Han's (2014) analyses in which they alternately included their employment and

earnings predictors, they found negligible changes to the coefficients for their educational hypogamy, hypergamy, and homogamy explanatory variables.

The main explanatory variable in the regressions is that of whether the marriage is educationally hypogamous, hypergamous, or homogamous. In the first specification, we use 'homogamy' as the reference category, to predict differences in divorce risk for both hypogamous and hypergamous couples. In the second specification, we use 'homogamy or hypergamy' as the reference category, and predict differences in divorce risk for hypogamous couples relative to this combined category. The Model 2 specification of reference group was chosen after Model 1 revealed no substantive or statistically-significant difference between the divorce propensities of hypergamous and homogamous couples (shown in our Results section below), and that when either hypergamous or hypogamous couples alone were the reference category, the contrast with hypogamous couples did not attain statistical significance at the conventional .05 level (also as shown in Model 1 of the Results for the 'homogamous' reference category).

Estimates of the Fraction of Marriages Ending in Divorce

The odds ratio from a logistic regression of the annual risk of divorce provides a metric of comparison that is more easily interpretable than a logistic regression coefficient, and has the major advantage of additionally controlling for other well-known divorce risk factors such as having previously been married, getting married when younger, and having not graduated from college (see Lyngstad and Jalovaara 2010 for a summary review of the literature on divorce-risk factors). An even more informative metric, however, is the fraction of marriages ending in divorce. This metric has had an especially useful role in documenting differentials by education and other characteristics of the woman in the risk that a marriage will dissolve after a given

number of years (e.g., Raley and Bumpass 2003). We are not aware of its having previously been used to estimate such statistics by the education levels of both spouses, as we do here. We use a single-decrement marriage-survival life table to derive estimates of the fraction of marriages that will end in divorce by 10, 20, 30, and 40 years from the start of the marriage. The choice of 40 years duration matches the 40 years of our range of ages from 20 to 59 over which we estimate annual divorce probabilities. It also ensures that we have observations of couples at each single-year of marriage duration to use in our model predicting divorce risk by marital duration. Going beyond 40 years marital duration also introduces ages of higher mortality risk, which should then be modeled as a second decrement process (competing risk). For example, for marriages beginning with the woman aged 26, which is our estimated mean age of marriage in the population covered by our sample years 1996 to 2017, the couple would be exposed to divorce up to the wife's age 66.

Our single-decrement marriage-survival life table requires an annual discrete hazard of divorce to be estimated for each single-year marital duration. We achieve this in a smooth function of the annual divorce hazard by marital duration and union type (hypogamy versus homogamy/hypergamy) by using predicted values from a logistic regression with indicator variables for marriage durations 1, 2, and 3 and linear and squared terms for marital duration from 3 years onwards. The fit of these predicted probabilities to observed proportions divorcing by single-year marital duration is shown in our Results section. Because no covariates other than marital duration and union type (hypogamous versus hypergamous/homogamous) are used in this logistic regression to predict the annual divorce hazards, we use the same normalized SIPP weights in this regression as we use in the descriptive statistics. Before including the predicted divorce probabilities in the marriage-survival life table, we additionally apply an overall upward

adjustment factor by using ACS divorce probabilities estimated for the two panels with complete period overlap between the SIPP and the ACS, being the years 2008-2012 of the SIPP 2008 Panel and the years 2014-2017 of the SIPP 2014 Panel. An upward adjustment of the SIPP predicted probabilities is needed for two reasons. First, a marriage may dissolve initially by separation, with legal divorce not yet occurring within the year in which the dissolution is observed. Second, panel attrition is likely to be correlated with marital dissolution (as noted earlier). This selective attrition on the dependent variable will not necessarily be a problem for the estimation of the ratio of divorce risk between different union types, as seen in the estimation of an odds ratio, but it will bias downwards the annual probability of divorce for a given marital duration across union types. The ACS provides a very large, cross-sectional sample of all U.S. women in the household population, and asks if the woman divorced in the 12 months preceding the survey. Therefore, neither attrition nor time between dissolution and legal divorce factor in, making it a good source of unbiased estimates of divorce (Kennedy and Ruggles 2014). We calculated the ratio of divorce probabilities from the 2008-2011 and 2015-2017 ACS to SIPP to be 1.905. We apply this ratio to each of the predicted probabilities by marital duration and union type from the SIPP.

Results

Table 1 describes the population of couples at risk for divorce annually, overall and for educationally hypogamous, hypergamous, and homogamous couple-years of exposure to divorce. Recall that these statistics are for couples in which the wife is U.S.-born and aged between 20 and 59, observed between 1996 and 2017. In total, the five SIPP Panels capture 108,952 married couple-years from 44,927 couples, and 1,026

divorces occurring to those couples between panel waves. The sample of married couple-years of exposure to divorce, when weighted to represent the U.S. population of married couples, show that only just over half (54.5%) of married couples have the same level of educational attainment ("homogamous") when measured in four broad categories. Hypogamous marriages are more common (24.2%) than are hypergamous marriages (21.3%). Almost equal proportions of married women (33.5%) and married men (33.4%) were college graduates. However, more married men did not graduate from high school (8.1%) or were high school graduates (27.1%), whereas more married women had some college education, less than a bachelor's degree (33.8%). Because homogamous unions account for slightly over half of all unions, relatively small overall differences between the educational composition of married women and men generate substantial differences in men's and women's education in the 45.5% of unions in which one spouse has more education than the other. Looking first at men and women who are "marrying up" in education, meaning men in hypogamous unions and women in hypergamous unions, men are one third (six percentage points) more likely than are women to be less than high school graduates (20.6% versus 14.4%), whereas seven percentage-points more women in hypogamous unions than men in hypergamous unions have 'some college' education (36.6% versus 29.6%). Turning to men and women who are "marrying down" in education, men in hypergamous unions are six percentage-points more likely than are women in hypogamous unions to be college graduates (50.5% versus 44.9%), whereas women in hypogamous unions are more likely to have a 'some college' educational attainment (42.9%) or a high school graduate attainment (12.2%) than are men in hypergamous unions versus (40.2% and 9.3% respectively).

[TABLE 1 ABOUT HERE]

By race/ethnicity, Black women, and to a lesser extent Hispanic women, are overrepresented in hypogamous unions, whereas White women are overrepresented in hypergamous unions: 9.5% of hypogamous marriages, but only 5.5% of hypergamous marriages include a Black wife, whereas 86.3% of marriages versus 81.5% of hypogamous marriages include a White wife. Unions in which the wife and husband have different race/ethnic identities represent only 6.3% of all married-couple years, and we cannot conclude statistically that they are differently distributed between educationally hypergamous, hypogamous, and homogamous union types compared to race/ethnically homogamous unions. Educationally homogamous unions are much less likely to be remarriages (17.9%) than are either hypogamous (22.9%) or hypergamous (26.2%) unions. Women in both homogamous and hypergamous unions have lower mean ages at marriage (25.8 and 25.9 years old) than do women in hypogamous unions (26.5 years old). Finally, duration of marriage, itself an outcome of divorce propensities (unions less likely to divorce will, all else constant, be observed at longer durations) is shortest for hypogamous unions (mean duration of 15.4 years) and longest for hypergamous unions (mean duration of 18.1 years). The longer mean duration of hypergamous than hypogamous unions, however, will also be in part due to changes in educational imbalances by gender that favored men's educational attainments more in earlier than in later marriage cohorts. This is seen in a 3.5 year earlier mean marriage cohort of hypergamous (1986.0) than hypogamous (1989.5) unions. The mean marriage-cohort year for homogamous unions falls between the two (1988.2).

Multivariate logistic regression results are presented in two models, respectively for a three-way comparison of hypogamous, hypergamous, and homogamous (reference category) unions, in Model 1, and for a two-way comparison between hypogamous versus hypergamous or homogamous unions (joint reference category) in Model 2. Looking first at Model 1, compared to homogamous unions, hypogamous unions have 29% greater annual odds of divorce (Odds Ratio 1.29; 95% Confidence interval 0.96, 1.74), a difference that is statistically significant at the 0.10 level (p=0.090). The estimated odds of divorce for hypergamous unions relative to homogamous unions is 1.03 (95% CI: 0.76, 1.38). The almost identical estimated divorce risks between hypergamous and homogamous unions allows us to combine the two categories in Model 2 and thereby gain statistical power in estimating a contrast with hypogamous unions. The result is an annual divorce odds for hypogamous unions that is 31% greater than for hypergamous or homogamous unions (OR 1.31), but with a substantially tighter confidence interval (95% CI: 1.05, 1.65). This difference is statistically significant at the 0.05 level (p=0.017).

[TABLE 2 ABOUT HERE]

We use Model 2 in describing the other covariate associations with divorce, noting that the estimated magnitudes are similar between Models 1 and 2. Comparing first the main effects for the wife's education and the husband's education, using college graduate as the reference category, only the wife's educational attainment shows associations with divorce for lower educational attainments that are statistically significant. The gradient of the wife's educational attainment with divorce is in the expected negative direction, the highest odds being for wives with less than high school graduate (OR 1.64; 95% CI: 1.09, 2.47) or high school graduate (OR 1.62; 95% CI: 1.24, 2.13) educational attainment,

followed by some college educational attainment (OR 1.36; 95% CI: 1.12, 1.65). We do not find any race/ethnicity associations with divorce at the .05 level of statistical significance, but estimate a higher divorce propensity when the wife and husband's race/ethnicities differ (OR 1.27; 95% CI: 1.01, 1.59). As expected, the divorce propensity is substantially greater for remarriages relative to that for first marriages (OR 1.74; 95% CI: 1.47, 2.07). The estimated directions of association for the continuous variables with divorce propensity are also as expected, with older age at marriage and longer duration of the marriage both associated with lower annual odds of divorce, and later marriage cohort (over the range of marriages begun between 1952 and 2013) associated with a higher divorce propensity.

[FIGURE 1 ABOUT HERE]

The relationship of the annual divorce hazard to marital duration and educational hypogamy is shown in Figure 1. We use Model 2's two-category union type (hypogamous and hypergamous/homogamous unions) when estimating the single-decrement divorce life table, and therefore there are two sets of observed proportions divorcing and two sets of predicted probabilities divorcing by single-year marital duration. The predicted probabilities are from a logistic regression with indicator variables for durations 1, 2, and 3 years since the year of marriage (omitted variable for duration 3) and linear and squared duration from 3 years onwards. Our use of the combined hypergamous or homogamous union reference category allows for a predicted baseline hazard that provides a tighter fit to the observed proportions divorcing than for the hypogamous-union predicted probabilities. However, a similar pattern of higher observed proportions divorcing among hypogamous unions is seen across the marital durations graphed. The divorce hazard rises

steeply from duration to a peak at duration 3, and declines steadily thereafter. A similar pattern also of declining annual proportions divorcing with increasing marital duration is seen for both hypogamous unions and hypergamous/homogamous union groups, consistent with our specifying the regression as a proportional hazard.

[TABLE 3 ABOUT HERE]

Predicted proportions divorcing by 10, 20, 30, and 40 year marital durations are shown in Table 3, after applying the constant 1.905 adjustment ratio from the ACS compared to SIPP annual divorce probabilities to each of the predicted marital-duration and union-specific annual predicted divorce probabilities that are shown in Figure 1. The proportions divorcing by 10, 20, 30, and 40 year marital durations for hypogamous unions are 24%, 38%, 44%, and 48% respectively, versus 20%, 32%, 38%, and 41% respectively after 10, 20, 30, and 40 years of marriage durations for homogamous/hypergamous unions. As a reference point to these levels of divorce at 30 and 40 years of marriage duration, Kennedy and Ruggles (2014) estimate that between 40 and 45 percent of 55 to 64 year old ever-married persons in 2010 were ever divorced or separated.

Discussion

The present study investigated the divorce risks to educationally hypogamous marriages in a time period, 1996 to 2017, in which hypogamous marriages were more common than hypergamous marriages in the United States. The driver of higher prevalence of hypogamous than hypergamous marriage has been female educational attainment's exceeding male educational attainment (Esteve et al. 2012; Schwartz and Mare 2005) rather than any change in social preferences, causing a challenge the prevailing "male-breadwinner" gender ideology

(Tichenor 1999). Given this background, it had been unsurprising that earlier studies had found hypogamous marriages to be less stable than either hypergamous or educationally homogamous marriages (Heaton 2002; Tzeng 1992). Nevertheless, gender ideology has changed, whether through a "quiet revolution" (Goldin 2006) that emphasized women's sustained presence in the labor market through their working ages, or through a more thoroughgoing revolution encompassing changing expectations and behavior of both women and men for much greater gender equality in both the labor market and the family and household (Goldscheider et al. 2015). An alternative perspective, however, is that the revolution has "stalled", is "unfinished", or is mixed in its societal reach (Cotter et al. 2011; England 2010; Gerson 2011).

Addressing this debate, Schwartz and Han (2014:623) concluded that their findings of a disappearance of the earlier pattern of a higher divorce risk in educationally hypogamous than hypergamous marriages constitute "…an important counterpoint to claims that progress toward gender equality has stalled." Because our main findings are less sanguine with respect to progress towards gender equality than are Schwartz and Han's, notwithstanding the considerable overlap in population coverage and methodological treatments between our respective studies, it is useful to attempt some reconciliation between our findings and theirs. Schwartz and Han used data through 2010 to investigate whether educationally hypogamous marriages are still more unstable, and concluded that they no longer are. Using data that extend only 7 years further (to 2017), we conclude instead that educationally hypogamous marriages remain more unstable. There are important commonalities between our investigation and Schwartz and Han that we first note here. Both theirs and ours use nationally representative data sources extending into the first or (in our case) second decade of the 2000s, in which both the wife's and husband's educational attainments are available. Both they and we classify education into the same four categories (less

than high school graduate, high school graduate, some college, and bachelor's degree and above), specify regression equations with control variables for the wife's educational attainment and husband's educational attainment, and specify main effect variables into the three categories of hypogamous, hypergamous, or homogamous couple educational attainments.

The most important difference between our approaches is their use of a marriage cohort perspective, whereas we use a period perspective. Because our estimates are therefore of synthetic cohorts in a period perspective rather than for real marriage cohorts, they are not directly comparable to those of Schwartz and Han (2014). The data we used are unfortunately less compatible with a real-cohort perspective, as we begin observation of marriage-cohort divorce risks only in 1997. However, as Lyngstad and Jalovaara (2010) note in reviewing cohort versus period perspectives on divorce, there is no consensus on which is the more appropriate, with Teachman (2002) finding that period influences dominate whereas Ono (1999) finds that marriage cohort has an independent influence. A strength of our period perspective is that it allows better for consideration of divorce risks across a range of ages, including in part capturing what Kennedy and Ruggles (2014) refer to as the "gray divorce" phenomenon. Those authors find increases in divorce rates at ages 35 and above to be driving rising overall divorce risks in recent decades in the U.S. Schwartz and Han's real-cohort approach emphasizes the most recent social changes, among women and men who have recently married, and whose ages are on average around 30 for their 2000-2004 marriage cohort. The data that form the basis for Schwartz and Han's main analyses of cross-cohort change consist of only the first 5-10 years of marriage in their later (2000-2004) marriage cohort, whereas our study that cover a similar period (1996-2017) pools data across all marriage cohorts attaining ages 20 to 59 during the period, and over durations of marriage of between 1 and 40 years. The relative importance of

period-, cohort-, and age-specific influences on divorce risk may also be changing over time, but we leave this as an area for future research to address.

Another important difference between our results and those of Schwartz and Han is that we were not able to find statistically reliable differences in divorce risk specifically between hypogamous and hypergamous unions, whereas they do, although only for their earlier cohorts, and only for one of their two model specifications. This itself calls into question the statistical robustness of the conclusions of Schwartz and Han's study, subsequently summarized by Van Bavel et al. (2018:351) as indicating that "[U.S.] marriages in which wives have the educational advantage are no longer less stable than other union types." It appears not to rest on strong statistical foundations. Because we similarly lacked the statistical power to find statistically-significant differences in divorce risk specifically between hypogamous and hypergamous unions, we therefore chose instead to compare divorce risks of hypogamous marriages with those of a comparison group that combined homogamous and hypergamous marriages. We combined these two marriage types after first estimating a negligible magnitude of difference between them, and after finding that only by combining them could be draw conclusions about the relatively higher risks of divorce to hypogamous unions at the conventional .05 level of statistical significance.

Our findings when viewed alone are more compatible with a "stalled" characterization of the longer-term revolution in gender roles in the U.S. (Cotter et al. 2011; England 2010). Although we do not compare the divorce risk for hypogamous couples over time, we note that our estimate of a 31 percent greater odds of divorce falls within the 27 to 38 percent range of the seven studies of earlier data cited by Schwartz and Han (2014:606). In combination with the findings of Schwartz and Han (2014), however, our findings may be interpreted as compatible

with the longer-term revolution in gender roles in the U.S. being characterized as "incomplete" or "unfinished" (Gerson 2011; Goldscheider et al. 2015). Both Cooke's (2006) comparative study of divorce in Germany and the U.S., and the 12-country study of educational heterogamy and divorce risk across Europe of Grow et al. (2017), allow us to put our U.S. results into country-context perspective. Applying Esping-Andersen's (1999) groupings to the Grow et al. study places the U.S. closer to the other 'Liberal' regimes of their study, the United Kingdom and Ireland, and so too are those results showing no cross-cohort shifts away from higher divorce risks among educationally-hypogamous couples. Such a finding may be interpreted as evidence consistent with a "stalled" gender revolution (England 2010). Grow et al. find that the 'Conservative' regimes of Germany, Greece, the Netherlands, and Spain have each seen a trend towards less difference in divorce risk for hypergamous couples, but nevertheless at a level that still places their risk higher than that of hypergamous couples. This may be interpreted as evidence consistent with an "unfinished" gender revolution (Gerson 2011). If the U.S. is to be considered also as being at an "unfinished" stage of its gender revolution, Grow et al.'s (2017) finding that all three of the 'Social-Democratic' regimes they studied (Denmark, Finland, and Sweden) showed trends towards lower levels of divorce risk among hypogamous couples than hypergamous couples, points to a place where the U.S. has yet to find itself, but may eventually move towards. Our best conclusion from our estimates from two decades of recent data over a broad age range, therefore, is that the present level of marital instability of hypogamous couples in the U.S. is most consistent with either a "stalled" or "unfinished" characterization of its gender revolution.

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Appendix

Appendix Table A1: Distribution of Waves and Years Observed in the Survey of Income and Program Participation

1996 SIPP Panel Wave	1	2	3	4	5	6	7	8	9	10						
	1996-1997				1997-1998			1998-1999								
2001 SIPP Panel Wave	1	2	3	4	5	6	7									
	2001-2002				2002-2003											
2004 SIPP Panel Wave	1	2	3	4	5	6	7	8	9	10						
	2004-2005				2005-2006			2006-2007								
2008 SIPP Panel Wave	1	2	3	4	5	6	7	8	9	10	11	12	13			
	2008-2009				2009-2010			2010-2011			2011-2012					
2014 SIPP Panel Wave	1				2			3			4					
	2014				2015			2016			2017					

Table 1: Married Couples' 1996 to 2017 Years of Exposure to Divorce by Couple Educational Heterogamy (%)

	All	Couple Educational Combination Type			Chi square test for difference by Couple Type[a]
		Hypogamous	Hypergamous	Homogamous	
Couple Educational Heterogamy or Homogamy	100.0	24.2	21.3	54.5	n.a.
Wife's Educational Attainment					n.a.
Less than High School Graduate	6.2	0	14.4	5.7	
High School Graduate	26.6	12.2	49.0	24.1	
Some College	33.8	42.9	36.6	28.6	
Bachelors Degree or more	33.5	44.9	0	41.6	
	100.0	100.0	100.0	100.0	
Husband's Educational Attainment					n.a.
Less than High School Graduate	8.1	20.6	0	5.7	
High School Graduate	27.1	49.8	9.3	24.1	
Some College	31.3	29.6	40.2	28.6	
Bachelors Degree or more	33.4	0	50.5	41.6	
	100.0	100.0	100.0	100.0	
Wife's Race/Ethnicity					114.7
White	84.4	81.5	86.3	85.0	(p < .001)
Black	7.2	9.5	5.5	6.8	
Hispanic	6.9	7.8	6.8	6.6	
Other	1.5	1.2	1.5	1.6	
	100.0	100.0	100.0	100.0	
Race/Ethnically heterogamous (versus same race/ethnicity)					0.5
Different race/ethnicities of wife and husband	6.3	6.4	6.3	6.2	(p=.770)
Remarried (versus first marriage)					248.1
Remarried	20.9	22.9	26.2	17.9	(p < .001)
Woman's age at marriage (mean) [b]	26.0	26.5	25.9	25.8	
Duration of marriage (mean) [c]	16.6	15.4	18.1	16.6	
Marriage cohort year (mean) [d]	1988.1	1989.5	1986.0	1988.2	
Sample Number of couple-years	108,952	26,681	23,362	58,909	
Sample Number of couples	44,927	11,066	9,759	24,102	
Sample Number of divorces	1,026	298	227	501	

Notes: Wife is U.S.-born, aged 20 to 59

a. Rao-Scott Chi square statistic incorporating within-couple clustering of couple-years of observation.

b. mean age at marriage statistically different between hypogamous and hypergamous and between hypogamous and homogamous unions (t tests of difference in means, $p < .05$).

c. mean marriage duration statistically different between hypogamous, hypergamous, and homogamous unions.

d. mean marriage cohort statistically different between hypogamous, hypergamous, and homogamous unions.

Data Source: Survey of Income and Program Participation 1996, 2001, 2004, 2008, and 2014 Panels.

Table 2: Logistic Regression of Divorce on Couple Educational Heterogamy, Wife Age 20 to 59 in 1996 to 2017, Odds Ratios

	Model 1	Model 2
Couple Educational Combination Type		
Hypogamous	1.29	1.31
	(0.96, 1.74)	(1.05, 1.65)
Hypergamous	1.03	-
	(0.76, 1.38)	
Wife's Educational Attainment (Ref: College Graduate)		
Less than High School Graduate	1.57	1.64
	(0.78, 3.16)	(1.09, 2.47)
High School Graduate	1.57	1.62
	(0.98, 2.52)	(1.24, 2.13)
Some College	1.34	1.36
	(1.01, 1.77)	(1.12, 1.65)
Husband's Educational Attainment (Ref: College Graduate)		
Less than High School Graduate	1.00	0.96
	(0.51, 1.97)	(0.64, 1.43)
High School Graduate	1.13	1.10
	(0.7, 1.82)	(0.83, 1.45)
Some College	1.19	1.17
	(0.90, 1.57)	(0.96, 1.44)
Wife's Race/Ethnicity (Ref: White)		
Black	0.95	0.95
	(0.75, 1.21)	(0.75, 1.21)
Hispanic	0.87	0.87
	(0.67, 1.13)	(0.67, 1.13)
Other	1.49	1.49
	(1.00, 2.22)	(1.00, 2.22)
Race/Ethnically heterogamous (Ref: same race/ethnicity)	1.27	1.27
	(1.01, 1.59)	(1.01, 1.59)
Remarried (Ref: first marriage)	1.74	1.74
	(1.47, 2.07)	(1.47, 2.07)
Woman's age at marriage		
age at marriage	0.95	0.95
	(0.94, 0.96)	(0.94, 0.96)
age at marriage squared	1.001	1.001
Duration of marriage	(1.000, 1.002)	(1.000, 1.002)
duration	0.97	0.97
	(0.96, 0.98)	(0.96, 0.98)
duration squared	0.999	0.999
	(0.998, 1.000)	(0.998, 1.000)
Marriage cohort year	1.03	1.03
	(1.02, 1.04)	(1.02, 1.04)
Sample Number of couple-years	108,952	108,952

Notes: 95% Confidence intervals in parentheses

Data Source: Survey of Income and Program Participation 1996, 2001, 2004, 2008, and 2014 Panels.

Table 3: Percentages of Marriages Ending in Divorce by Couple Educational Heterogamy or Homogamy and Marital Duration

	Marriage Duration			
Union Type	10 years	20 years	30 years	40 years
Hypergamous or Homogamous	20.1	32.0	38.2	41.5
Hypogamous	24.0	37.6	44.5	48.0

Source: Authors calculations from the Survey of Income and Program Participation 1996, 2001, 2004, 2008, and 2014 Panels and American Community Survey years 2008-2017 (see main text for details).

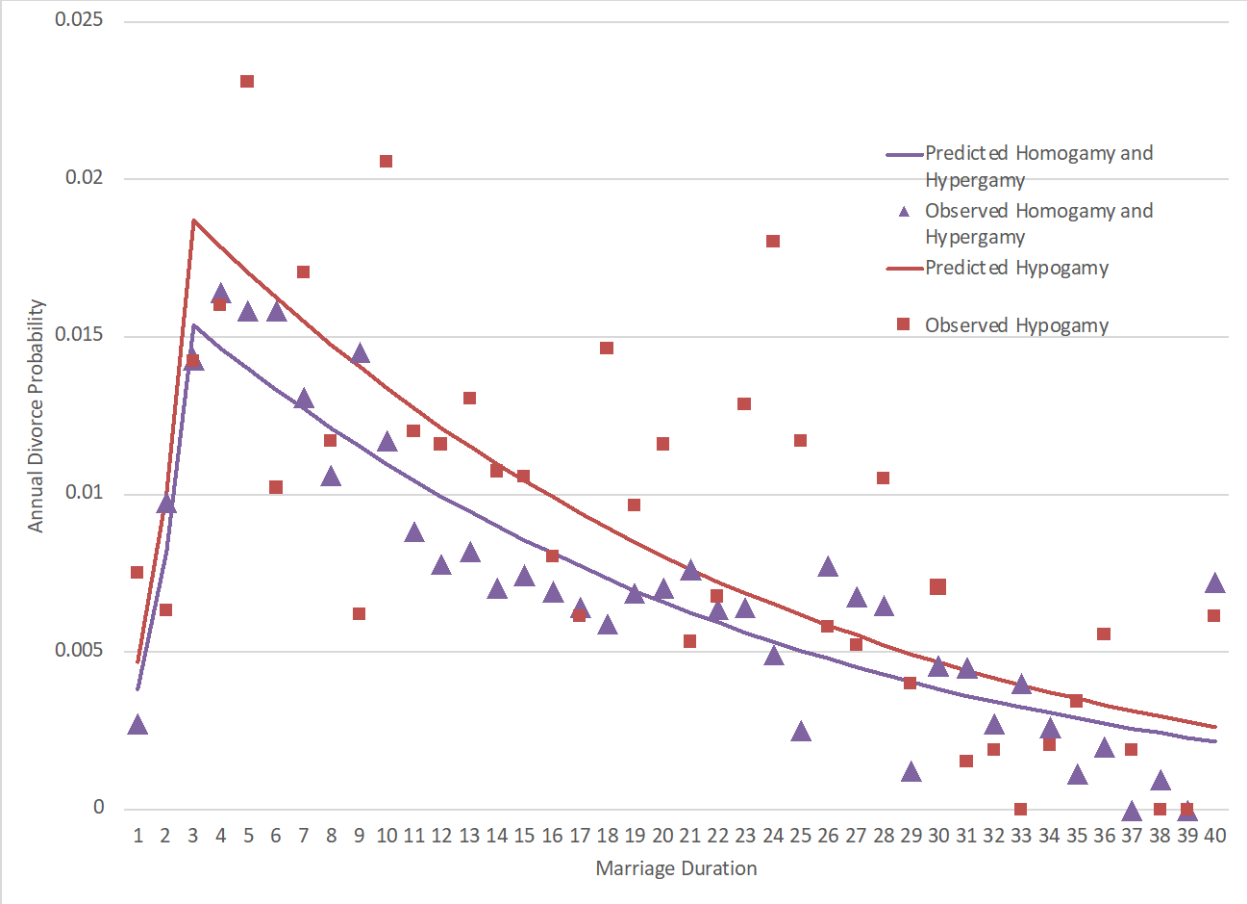

Figure 1: Predicted and observed probabilities: Hypogamous unions and Homogamous or Hypergamous unions