Mate Selection in America:

Gender Asymmetry in Educational and Income Assortative Marriage between 1980 and the Present

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Abstract

Mate selection in the United States has undergone significant changes in recent decades as women have outpaced men in education: while previously the norm was for the husband to have more education than the wife, today the wife is likely to be the better educated spouse. The full implications of this re-alignment of the relative education of spouses have not yet been examined rigorously. This includes a better understanding of how men and women value traits other than educational attainment in prospective spouses. The current paper focuses on education and income and examines three questions: 1) are the patterns of educational and income assortative marriage symmetrical with respect to sex? 2) how have patterns of educational and income assortative mating changed in recent decades? and 3) how does education interact with income to shape patterns of who marries whom over the decades? Drawing on data from the 1980 census and the American Community Survey (ACS) 2008 – 2012 5-year sample, I use log-linear statistical models to examine gender asymmetry in educational and income assortative marriage patterns among newlywed couples between 1980 and the present. I find that 1) although the percentage of newlyweds in which wives are more educated than husbands (i.e., educational hypogamy) almost doubled from 1980 to 2008-2012, much of the increase was due to shifts in marginal distributions of husband's and wife's education; 2) net of gender differences in income distributions, there is a tendency for women to marry a husband with higher income than themselves; and 3) educational hypogamy has remained traditional in the sense that it still primarily occurs when more-educated wives marry up in terms of income, a tendency that is higher than what we would expect given the composition of marriage markets. Thus, educational hypogamy does not necessarily imply women's income advantage in marriage. In fact, women who marry down in education tend to choose spouses more heavily on the basis of "money," suggesting the persistence of the traditional male-breadwinner norm in American marriages.

Women have made greater gains in educational attainment than men over the past few decades in the United States. Currently, women earn about 60% of bachelor's and master's degrees and reach parity with men in obtaining doctoral degrees (Diprete & Buchmann 2013). Women's gains in education have resulted in significant changes in marriage patterns. In 2012, 21% of married women had spouses who were less educated than they were – a twofold increase from 1980 (Wang 2014). The media and the public are asking what this trend means for American families.[1] As wives increasingly have similar or more education compared with their husbands (Schwartz & Mare 2005), will this result in more economically equitable marriages? When they marry less-educated men, do women also marry men with lower income and resultantly challenge the traditional breadwinning role of men in the family? In answering these questions, this paper will offer a more comprehensive investigation of changes in assortative mating in the United States and help understand the state of gender equality in American families.

This study focuses on education and income—two key indicators of socioeconomic status in marriage markets (Blossfeld 2009; Buss et al. 2001). It asks: 1) are the patterns of educational and income assortative marriage symmetrical with respect to sex? 2) how have patterns of educational and income assortative mating changed in recent decades? and 3) how does education interact with income to shape patterns of who marries whom over the decades? It breaks new ground by investigating how men's and women's education and income *interact* to shape mate selection patterns between 1980 and 2012. Prior research on educational assortative mating reveals that from 1960 to 2003 college graduates in the U.S. were increasingly likely to marry each other (Schwartz & Mare 2005). We know little, however, about how men and women value other socioeconomic traits of potential spouses in a marriage market where highly

[1] Time Magazine (Luscombe 2014) reported that wives are more educated than husbands in the U.S. and asked whether this pattern might help reduce income inequality and redefine the gender role expectations in the family.

educated women face a relative decline of similarly-educated men. According to the independence hypothesis (Oppenheimer 1988), as women's labor force participation increases, men increasingly emphasize earning power in evaluating potential spouses while women attach less importance to a mate's economic resources. Yet social exchange theory implies that women may value other traits more if they tend to marry men with less education; they may marry up in other aspects, for example, income. The exchange theory suggests that given a relative decline of similarly-educated men and persistent gender gaps in earnings, women may seek to maximize gains from marriage by evaluating potential spouses more on the basis of their income rather than education. In testing these two theories, this study sheds light on the extent to which the remarkable advances in women's educational attainment are able to transform women's socioeconomic position relative to their husbands and thus redefine gender roles in the family.

This study also advances our understanding of the impact of assortative mating patterns on economic inequality. Educational assortative marriage patterns are theoretically expected to have profound consequences for economic inequality, but recent studies find that increased similarity between husband's and wife's education contributed little to increases in family income inequality in the United States (for a review, see Schwartz 2013). Weak associations between education and income assortative mating serve as one potential explanation for the inconsistency between theoretical considerations and empirical evidence. This study explicitly assesses the association between education and income assortative mating and its trends over time, and allows us to gain insights into the implications of the continued changes in women's socioeconomic status and assortative marriage patterns for inequality in the United States.

DATA, MEASUREMENT, AND METHODS

Data

To answer the research questions, I analyze data from the 1980 census and the American Community Survey (ACS) 2008 – 2012 5-year sample. The 1980 census and the ACS from 2008 to 2012 are well-suited for this research because they contain information on respondents' age at first marriage (the census) or whether respondents married within the past 12 months (the ACS) as well as total personal income for the past 12 months. Thus, both datasets allow me to examine newly contracted first marriages and obtain information on both spouses' education and income at the time of marriage. As marriage patterns may differ between native-borns and immigrants, only U.S.-born couples are included in the analysis.[2] Additionally, given the focus on income, I limit my sample to working-age adults. In sum, I use a sample of U.S.-born newlyweds[3] in which both spouses were in their first marriages and between 18 and 55 years of age[4] at the time of the census or each survey. A few couples in which either spouse had negative income or both spouses had zero income are excluded from the analysis. The final sample size is 38,106 couples in 1980 and 37,686 couples in 2008-2012.

Measurement

Following Cancian and Reed (1999), I define husbands' (wives') income as their total pre-tax personal income or losses from all sources for the previous year. Income is inflation adjusted to 2012 dollars using the CPI-U-RS from 1980 to 2012. A top code on income was imposed in

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[2] Sensitivity analysis shows that results are substantively the same if immigrants are included.

[3] It is important to examine newlyweds. First, examining newlyweds are preferable if one is interested in how marriage markets influence who marries whom (Kalmijn 1998; Schwartz & Mare 2012). Second, incomes at the time of marriage are minimally influenced by postmarriage division of household and market labor (Cooke 2009). Third, assortative marriage patterns based on new first marriages are not influenced by marital dissolutions, remarriages, and educational upgrades after marriage (Schwartz & Mare 2012).

[4] In analyses not shown here, I replicated my analysis using alternative age ranges, e.g., 15 – 55 years of age and following Schwartz (2010), using prime working ages 21-55 years of age. Results are substantively the same.

1980, but not in 2008-2012. Following Schwartz (2010), I impose a consistent top code corresponding to the maximum percentage of the sample with top-coded income in 1980 (0.17% of men's total income). Thus, husbands' (wives') income above the 99.8th percentile is replaced with income of those at the 99.8th percentile in both time periods. I analyze the associations between spouses' education and income using log-linear models for contingency tables. To form the contingency table, I need to recode the continuous income measure into a categorical measure. To reduce zero cells while preserving adequate detail in spouses' income, I classify each individual's income by the decile (s)he occupies in the income distribution of the 1980 and 2008-2012 analytic samples, respectively. Because the intervals in higher income deciles tend to be wider than those in lower income deciles, following Schwartz (2010), I incorporate the real dollar value of income by assigning "scale scores" to each income decile. The scale scores are equal to the median value of the real income for each income decile. By assigning scale scores to income deciles, I incorporate both relative and absolute measures of each individual's income into the analysis.

I classify each spouse into one of the four categories of educational attainment—high school, some college, college graduates, and advanced degrees. The classification of educational attainment is somewhat different from that in past work (e.g., Mare 1991; Schwartz & Mare 2015; Qian 1997), which typically includes more detailed categories at the lower end of the educational distribution but lumps together college and graduate/professional degrees. In light of the striking reversal of the gender gap in higher education over the decades, I pay more attention to how highly-educated men and women look for spouses in the changing marriage markets. Thus, I distinguish between those with college degrees and those with advanced degrees. Taken together, I produce the contingency table by cross-classifying husband's and wife's income decile and educational attainment by time period, yielding a 3,200-cell table (10*10*4*4*2).

Methods

<u>Log-linear models</u>

I use log-linear models to analyze changes in educational and income assortative mating. Log-linear models control for gender differences in marginal distributions of education and income as well as shifts in the marginal distributions of husband's and wife's education and income (Kalmijn 2010; Schwartz & Mare 2005). Therefore, log-linear models allow me to examine assortative marriage patterns net of the effects of population structure (Hout 1983). The first series of models includes only educational combinations of spouses and time of observation. The second series of log-linear models investigates associations between spouses' income. Finally, I examine how education interacts with income to shape assortative mating patterns. To begin with, my basic model is

$$\log(\mu_{\mathrm{ijklt}} / t_{\mathrm{ijklt}}) = \lambda + \lambda_i^{HE} + \lambda_k^{WE} + \lambda_j^{HI} + \lambda_l^{WI} + \lambda_t^{Y} + \lambda_{it}^{HEY} + \lambda_{kt}^{WEY} + \lambda_{jt}^{HIY} + \lambda_{lt}^{WIY} + \lambda_{ij}^{HEHI} + \lambda_{kl}^{WEHI} + \lambda_{ijt}^{HEHIY} + \lambda_{klt}^{WEWIY}, \quad (1)$$

where *HE* is husband's education (i = 1, …, 4), *WE* is wife's education (k = 1, …, 4), *HI* is husband's income category (j = 1, …, 10), *WI* is wife's income category (l = 1, …, 10), and *Y* is period (t = 1, 2). Thus, μ_{ijklt} is the expected number of marriages between men with education i in income decile j and women with education k in income decile l in period t. This model captures variations in the distributions of husband's and wife's education and income by year (λ_{it}^{HEY}, λ_{kt}^{WEY}, λ_{jt}^{HIY}, λ_{lt}^{WIY}), controls for the associations between education and income for both husbands and wives and their variations by year (λ_{ik}^{HEHI}, λ_{jl}^{WEHI}, λ_{ikt}^{HEHIY}, λ_{jlt}^{WEWIY}), and contains all lower order terms. The ACS 2008-2012 5-year sample contains weights to ensure that the multi-year sample is representative of the population over the entire 5-year period, whereas the 1980 census is self-weighting. I incorporate the weights by an offset t_{ijklt}, which is the inverse of the total weighted frequency of the cell divided by the unweighted cell count (Agresti 2002: p. 391). To preserve the original sample size in 1980, I norm the original weights so that the sum of the weights equals the sample size (Schwartz & Mare 2005). In 8.6% of cases where the cell frequency equals zero (i.e., 276 out of 3200), I set t_{ijklt} to 1 (Schwartz & Mare 2005).[5]

I model associations between husband's and wife's education first. I allow the association between spouses' education to vary freely in the cross section and focus on more parsimonious representations of the change (Schwartz & Mare 2005). Then I add interaction terms between year and variable diagonal parameters (Qian 1997), crossings parameters (Schwartz & Mare 2005), and a hypogamy parameter to model changes in educational assortative marriage. The model becomes

$$\log(\mu_{\mathrm{ijklt}} / t_{\mathrm{ijklt}}) = \text{Model 1} + \lambda_{ik}^{HEWE} + \gamma_{ikt}^{OY} + \gamma_{ikt}^{HWY} + \gamma_{pt}^{PY}, \quad (2)$$

where λ_{ik}^{HEWE} is the time-invariant association between husband's and wife's education, $\gamma_{\mathrm{ikt}}^{\mathrm{OY}}$ is a set of interaction terms between year and each parameter estimate for homogamy of each educational group (*O* =1 when *i* = *k* =1, …, *O* = 4 when *i* = *k* = 4, and *O* = 0 otherwise), $\gamma_{\mathrm{ikt}}^{\mathrm{HWY}}$ is a set of interaction terms between educational crossings parameters and year, and $\gamma_{\mathrm{pt}}^{\mathrm{PY}}$ is the interaction term between the education hypogamy parameter and year (*P* = 1 when *i* < k and 0 otherwise). $\gamma_{\mathrm{ikt}}^{\mathrm{OY}}$ estimates the change in the odds of homogamy in 2008-2012 relative to the baseline year (1980), γ_{ikt}^{HWY} represents the change in the difficulty of crossing each education barrier in 2008-2012 relative to 1980. The education barriers estimated by the educational

[5] In sensitivity analysis not shown here, I added 0.5 to each cell to deal with empty cells (Agresti 2002: p. 397-398), and results did not change.

crossings parameters include the barrier between high school education or less and some college education, that between some college education and college degrees; and that between college degrees and advanced degrees. Variable diagonal parameters and crossings parameters assume that patterns of associations between husband's and wife's education are symmetrical with respect to gender. For example, crossings parameters assume that the difficulty of crossing each educational barrier is the same, no matter whether the husband or the wife has more education. Thus, to investigate the gender asymmetry in educational assortative mating, I constrain the cells in which the wife is more educated than the husband into one educational hypogamy parameter. γ_{pt}^{PY} estimates the change in the odds of hypogamy where the wife has more education than the husband in 2008-2012 relative to 1980. This parameter thus captures trends in the tendency for women to marry down in education net of the marginal distributions.

Building on the best-fitting model with educational assortative mating parameters, I further add parameters to model income assortative marriage. Because there are ten categories of husband's and wife's income, if I allow the association between spouses' income to vary freely in the cross section, similar to modelling educational assortative marriage, it will cost too many (9*9=81) degrees of freedom. Instead, I use parsimonious parameters and their interactions with year to model income assortative marriage and its change over time, which increases model fit (sensitivity tests not shown here but available upon request). Using a single correlation-type measure through liner-by-linear association models is found to inadequately capture the associations between husband's and wife's income (Schwartz 2010). Instead, patterns of income assortative marriage are better described by distance models incorporating both relative and absolute measures of income (Schwartz 2010). To model gender asymmetry in income assortative marriage, I constrain the cells in which the wife is in lower income deciles than the husband into one income hypergamy parameter. Then the model becomes

$$\log(\mu_{\text{ijklt}} / t_{\text{ijklt}}) = \text{Model 2} + \mathcal{E}\delta_{jl}^{D} + \mathcal{E}\delta_{jl}^{D}\lambda_{t}^{Y} + \delta_{jl}^{S} + \delta_{jl}^{S}\lambda_{t}^{Y} + \delta_{q}^{Q} + \delta_{q}^{Q}\lambda_{t}^{Y}\,, \qquad (3)$$

where δ_{jl}^{D} is a set of distance parameters indicating the absolute value of the difference between spouses' income *deciles* (the distance between husband's and wife's income deciles ranges from 0 to 9 and 9 dummy variables are created with *j* = *l* as the reference category), $\mathcal{E} = 1$ if $|j - l| \neq 0$ ($\mathcal{E} = 0$ otherwise), δ_{jl}^{S} represents one distance parameter indicating the absolute value of the difference between spouses' *log scale scores*, and δ_{q}^{Q} is an income hypergamy parameter.

Finally, I investigate how income and education interact to shape the patterns of who marries whom. In particular, I examine how the gender asymmetry in income assortative mating differs by educational pairing of spouses. I include interaction terms between income hypergamy parameters and educational homogamy and hypogamy parameters as well as changes in those interaction terms by year. The model is

$$\log(\mu_{\text{ijklt}} / t_{\text{ijklt}}) = \text{Model 3} + \gamma_{ik}^{O} * \delta_{q}^{Q} + \gamma_{p}^{P} * \delta_{q}^{Q} + \gamma_{ik}^{O} * \delta_{q}^{Q} * \lambda_{t}^{Y} + \gamma_{p}^{P} * \delta_{q}^{Q} * \lambda_{t}^{Y}, \quad (4)$$

<u>Hypergamy ratios</u>

Log-linear models are sometimes difficult to interpret (Rosenfeld 2005). Comparisons between observed and expected counts can be made to help understand patterns of assortative marriage (Kalmijn 2010). Following Kalmijn (1993) and Qian (1997), I compare observed income hypergamy ratios with expected income hypergamy ratios for different educational pairings of spouses by year. The observed hypergamy ratio is the number of couples in which wives are in lower income deciles than their husbands divided by the number of couples in which wives are in higher income deciles. The expected income hypergamy ratios are calculated based on the predicted counts under the model of quasi-symmetry (Hout 1983). The quasi-symmetry model includes marginal distributions of husband's and wife's education and income, variable diagonal parameters that capture educational homogamy, and the symmetric associations between spouses' income deciles. I allow the income association parameters to be different for four categories of educationally homogamous marriages and the associations in educational intermarriages are the average of the associations in corresponding educational homogamy (Kalmijn 1993). For example, the symmetric associations between spouses' income deciles among couples where one spouse has a college degree and the other spouse has an advanced degree are the average of the associations among couples where both spouses have college degrees and the associations among couples where both spouses have advanced degrees. Essentially, the model assumes that gender differences in the distributions of education and income lead to all the asymmetry in the contingency table. The difference between the observed and the expected asymmetry in the table must therefore arise from asymmetric mating tendencies between men and women (Kalmijn 2010).

RESULTS

Descriptive results

Descriptive results in Table 1 show substantial changes in the distributions of education and income among newlywed men and women. Educational attainment increased for both spouses from 1980 to 2008-2012, but increased more for wives than for husbands. In 1980, about 12% of husbands and wives were college graduates, whereas in 2008-2012, about 30% of wives but only 26% of husbands had college degrees. While the proportion of husbands with advanced degrees barely changed over the period, the proportion of wives with advanced degrees more than doubled. Similarly, income increased more rapidly for wives than for husbands. Percentages of wives in low income deciles declined but those in high income deciles increased. The opposite trend is true for husbands. Despite wives' greater gains in income over the decades, wives were still underrepresented in higher deciles but overrepresented in lower deciles at both time periods.

(TABLES 1 & 2 INSERTED HERE)

What are the implications of these changes for assortative mating? Table 2 shows that the percentage of wives marrying better-educated husbands declined from 21% in 1980 to 17% in 2008-2012, whereas the share of wives marrying less-educated husbands increased from 16% to 32% over the same period. In 1980 the husband was more likely to have more education, but in 2008-2012 the wife became more likely. From 1980 to 2008-2012, the share of couples in which husbands have higher income than wives declined, while the share of couples in which wives earn similar or more income relative to their husbands increased. Yet, from a couple perspective, wives remained more likely to marry husbands in higher income deciles. Indeed, nearly 60% of wives married husbands in higher income deciles in 2008-2012. Taken together, the descriptive results reveal a trend toward wives being more educated than their husbands and the persistent, dominant pattern of wives marrying higher-income husbands. In the next step, I will use log-linear models to examine whether these gender asymmetry in assortative mating patterns hold after I control for gender differences and shifts in marginal distributions of education and income.

Results of Log-linear Models

Table 3 reports the goodness-of-fit statistics—the deviance and the BIC statistics for each log-linear model examined in this study. Model selection is crucial in log-linear modeling. The goal of log-linear modeling is to reveal the association among the variables in consideration by finding a parsimonious model with acceptable goodness of fit using the Likelihood Ratio Test (L^2) and the Bayesian information criterion (BIC) (Hout 1983). The BIC statistic is equal to L^2 - (*df*) log(N) , which adjusts L^2 based on degrees of freedom and sample size. A smaller value of BIC indicates a better fitting model (Raftery 1986).

(TABLE 3 INSERTED HERE)

Model 1 is the baseline model, which includes variations in the distributions of husband's and wife's education and income by year, controls for variations in the associations between education and income for both husbands and wives by year, and contains all lower order terms. In other words, Model 1 assumes no association between husband's and wife's characteristics. Not surprisingly, the BIC for Model 1 is much larger than zero, indicating a poor model fit.

I examine educational assortative mating patterns by fitting Models 2 through 5. To capture the time-invariant associations between husband's and wife's education, I allow the association between spouses' education to vary freely in the cross section (Schwartz & Mare 2005). The significant reduction in deviance (L^2 = 49,072.61 – 14,655.97 = 34,416.64, $df = 9$, $p < 0.001$) indicates strong associations between husband's and wife's education. The BIC statistic for Model 2 is negative, indicating that Model 2 is preferred over the saturated model. In Models 3, 4, and 5, I examine different parameterizations of trends in educational assortative marriage. Model 3 captures changes in the tendency for couples to marry within the same educational category. By the BIC, adding these terms improves the fit of the model relative to Model 2, indicating that educational homogamy changed significantly between 1980 and 2008-2012. Model 4 adds crossings parameters. By the BIC, the crossings parameters further improve the model fit, suggesting that the strength of barriers to intermarriage across educational boundaries changed over the period I examine. To model the changes in tendency for women to marry down in education, I add a uniform educational hypogamy parameter in Model 5, which significantly decreases the deviance (L^2 = 14,322.25 – 14,308.03 = 14.22, *df* = 1, $p < 0.001$). The BIC also decreases a bit from Model 4 to Model 5. These results suggest that the tendency for women to marry less-educated men has changed from 1980 to 2008-2012 even net of the shifts in the marginal distributions of husband's and wife's education. It is, however, worth noting that the decreases in both the deviance and the BIC caused by adding the educational hypogamy parameter are rather small, suggesting that even though the percentage of educational hypogamy almost doubled from 1980 to 2008-2012 in the descriptive statistics (see Table 2), trends in the tendency for women to marry down in education did not actually change substantially after controlling for greater improvements in women's education relative to men's.

Next, in Models 6 through 11, I investigate patterns of income assortative marriage. To model the association between spouses' relative income (i.e., income decile), I add in Model 6 nine dummy variables indicating the absolute value of the differences between husband's and wife's income deciles. By the BIC, the distance parameters incorporating spouses' relative income improve the model fit. Moreover, Model 7 examines its variation by year and according to the BIC, the associations between spouses' relative income changed between 1980 and 2008-2012. To test whether men and women also value their spouses' real income, I include a term for the absolute value of the difference between husbands' and wives' log income scale scores in Model 8 and test variations in the association between spouses' real income by year in Model 9. By the BIC, there is indeed an association between husband's and wife's real income, but trends in the association did not change over the period I examine. To examine gender asymmetry in income paring of spouses, I add a uniform income hypergamy parameter to Model 8 which is the best-fitting model thus far. Compared with Model 8, there are significant reductions in the deviance (L^2 = 6,602.67 - 6,256.31 = 346.36, df = 1, p < 0.001) and the BIC (reduction in BIC = 335.13) in Model 10. Thus, these results suggest that associations between spouses' income remain gender asymmetrical even after controlling for gender differentials in marginal distributions of income. Model 11 further examines variations in income hypergamy by time period, and by the BIC, trends in income hypergamy changed from 1980 to 2008-2012.

Building on the best-fitting Model 11, I add interaction terms in Model 12 to investigate how income and education interact to shape the patterns of who marries whom. Model 12 adds interactions between the income hypergamy parameter and educational homogamy and hypogamy parameters. By the BIC, Model 12 fit more closely to the data than Model 11, suggesting that income assortative mating patterns differ by educational pairing of spouses. I further investigate trends in the interaction between income and educational assortative marriage patterns in Model 13. A comparison of BIC between Model 12 and Model 13 suggests that the associations between patterns of income and education assortative mating do not change from 1980 to 2008-2012.

Next, I examine the parameter estimates of the best-fitting Model 12 in detail. The model first presents parameter estimates for educational assortative mating patterns. Controlling for shifts in marginal distributions of spouses' education, homogamy among those with high school education or less did not significantly change, while homogamy between men and women with some college education significantly increased between 1980 and 2008-2012. At the higher end of the educational distribution, homogamy among college graduates decreased, whereas homogamy among those with advanced increased from 1980 to 2008-2012. The opposite trends here point to the importance of distinguishing between college degrees and advanced degrees in assortative mating research. Changes in crossings parameters indicate that the barrier to intermarriage between those with high school education or less and those with some college education became easier to cross in 2008-2012 than in 1980. Net of shifts in marginal distributions, the odds of educational hypogamy increased between 1980 and 2008-2012.

Model 12 also reveals patterns of income assortative marriage. The significant, negative coefficients for the absolute values of differences between husbands' and wives' income deciles indicate a tendency for men and women to marry a spouse with similar income. Moreover, the larger the distance between husbands' and wives' income deciles is, the lower the odds of marriage are. Although not all the coefficients are statistically significant, the overall trend in income assortative mating is that marriages between spouses from different income deciles were even less likely to occur in 2008-2012 than in 1980, indicating a tighter association between spouses' relative income. Controlling for marginal distributions and associations between spouses' income deciles, larger differences in spouses' income in real terms are associated with higher odds of marriage. Net of shifts in marginal distributions of husband's and wife's income deciles, the tendency for women to marry up in income significant decreased from 1980 to 2008-2012 (β = -0.24, exp(β) = 0.79, $p < 0.001$). Despite a significant decline, there was a tendency for women to marry up in income in both time periods (1980: β = 0.33, exp(β) = 1.39, $p < 0.001$; 2008-2012: β = 0.33 – 0.24 = 0.09, exp(β) = 1.10, $p < 0.05$).

How do income and education interact to shape the patterns of who marries whom? Compared with women who marry up in education, when women marry homogamously, especially for those at the lower end of the educational distribution, they are more likely to marry a husband in higher income deciles than themselves. The pattern does not hold among the highly-educated. Women with advanced degrees who marry a husband with advanced degrees are less likely to form traditional income hypergamy than women who marry up in education.

Moreover, compared with women who marry up in education, when women marry down in education, they are more likely to marry up in income ($\beta = 0.26$, $\exp(\beta) = 1.30$, $p < 0.001$). Note that such associations between income and educational assortative mating did not really change from 1980 to 2008-2012.

(TABLES 4 & 5 INSERTED HERE)

Hypergamy Ratios

Following Kalmijn (1993) and Qian (1997), I use hypergamy ratio to facilitate interpretations of the associations between income and educational assortative marriage patterns. In Table 5, for each type of educational pairing of spouses, I compare the ratio of the number of women marry up in income decile to the number of women marrying down as observed in the marriage table, to that ratio expected under the model of quasi-symmetry. In both time periods, in educationally hypergamous marriages, women marry up in income over 300% more often than they marry down, which is the evidence of income hypergamy. Expected ratios, however, show that this is more or less what we would expect given the composition of the marriage markets.

In educationally hypogamous marriages, we, however, see a different pattern. In 1980, when women married down in education, they married up in income about 286% more often than they married down. This ratio (3.86) is in fact higher than that would be predicted by the composition of the marriage market (3.12). In other words, in 1980, when women married down in education, they were actually 24% (3.86 / 3.12 – 1 = 24%) more likely to marry up, as opposed to marrying down, in income than what we would expect given gender differentials in income distribution. In 2008-2012, the results indicate that when women married down in education, they were still 63% more likely to marry up in income than they married down, although this observed hypergamy ratio is much lower than that in 1980. Given the gender inequality in income distributions, when women married down in education, they were predicted to be only 38% more likely to marry up in income than to marry down in 2008-2012. Thus, despite a decline in the observed and predicted hypergamy ratios in 2008-2012 relative to in 1980, the observed income hypergamy ratio was still higher than the expected ratio in 2008-2012 – a pattern similar to that in 1980.

In educationally homogamous couples, the income assortative mating patterns differ across the education distribution. When less-educated women marry similarly educated husbands, they are more likely to marry up in income than what we would expect given the composition of the marriage markets. The tendency for college-educated women in educational homogamy to marry up in income is more or less what we would expect given gender differences in income distributions. In contrast, for couples in which both spouses have advanced degrees, we observe the reverse pattern: the tendency for women to marry up in income is much lower than what would be expected given the composition of the marriage markets. Clearly, the results based on hypergamy ratios are in consistent with those from Model 12.

The implication is important: the tendency for women who marry more educated husbands than themselves to marry up in income is largely due to gender differences in income distributions (in fact, the observed tendency is slightly lower than the expected tendency), whereas the tendency for women to marry up in income is higher than what would be predicted by the composition of marriage market among women without college degrees who marry similarly-educated husbands and in particular among women who marry down in education. Thus, these results suggest that when women marry down in education, they tend to achieve economic gains by marrying a husband with higher income than themselves.

DISCUSSIONS

To sum up, the main findings of this paper are as follows. First, although the percentage of newlyweds in which wives are more educated than husbands almost doubled from 1980 to 2008-2012, much of the increase was due to shifts in marginal distributions of husband's and wife's education. Second, despite a significant decline in odds of income hypergamy between 1980 and 2008-2012, there was a tendency for women to marry up in income in both time periods even after controlling for gender differences in the marginal distribution of income. Third, marriages in which wives are more educated than husbands (i.e., educational hypogamy) have remained traditional in the sense that they still primarily occur when more-educated wives marry up in terms of income, a tendency that is higher than what we would expect given the composition of marriage markets. This result supports exchange theory but not the independence hypothesis (Oppenheimer 1988). In contrast, among couples in which husbands have more education than wives, the tendency for women to marry up in income is more or less the same as (or slightly lower than) what we would expect given gender differences in income distributions. In addition, only among couples in which both spouses have advanced degrees, the tendency for women to marry up in income is much lower than what would be expected given the composition of the marriage markets. Thus, educational hypogamy does not necessarily imply women's income advantage in marriage. In fact, women who marry down in education tend to choose spouses more heavily on the basis of "money", suggesting that the traditional male-breadwinner norm still persists in contemporary American marriages.

This paper provides a more comprehensive assessment of changes in assortative mating in the United States. Given women's changing status in the educational arena and in the labor market, this study contributes to the literature by investigating the gender differences and trends in valuations of educational and economic traits by prospective spouses over the decades. The gender reversal in education from a male advantage to a female advantage has clearly reshaped the marriage market in which women used to encounter potential marriage partners with similar or higher levels of education than themselves. Women's rise in education has indeed contributed to an increase in incidence of educational hypogamy. Those educationally hypogamous marriages have, however, remained traditional in the sense that they still primarily occur when more-educated wives marry up in terms of income. Thus, with increases in women's high likelihoods of economic independence implied by their good education, women do not necessarily choose spouses on the basis of "love" rather than "money." Rather, given a relative decline of similarly-educated men, women seek to maximize gains from marriage by evaluating potential spouses more on the basis of their income especially when women look for spouses among men who have less education than themselves. The exchange between women's better education and men's higher income suggests that the role of the remarkable advances in women's educational attainment in redefining gender roles in American families may be more limited than often thought.

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Table 1. Percentage Distributions of Education and Income, by Gender and Year

	Husbands		Wives	
	1980	2008-2012	1980	2008-2012
Educational Attainment				
High school or less	52.18	31.32	53.87	22.85
Some college	28.05	34.30	29.53	35.49
College graduates	12.65	26.44	12.16	30.20
Advanced degrees	7.12	7.94	4.44	11.47
Income Deciles				
1	3.28	4.84	18.10	15.34
2	5.36	7.37	13.28	13.29
3	6.59	8.72	13.40	10.97
4	8.43	9.86	12.49	10.32
5	8.53	10.27	10.58	9.38
6	9.94	11.16	10.20	9.48
7	11.85	11.36	8.17	8.99
8	13.28	10.93	6.55	8.21
9	15.21	11.86	4.77	7.74
10	17.54	13.63	2.44	6.28
Sample size	38,016	37,686	38,016	37,686

Notes: Totals may not sum to 100.00 due to round error. Date are weighted in 2008-2012.
Source: The 5% sample from the 1980 census and the American Community Survey (ACS) 2008 – 2012 5-year sample (IPUMS).

Table 2: Cross-Classification of Educational and Income Assortative Marriage, by Year

	Income Assortative Marriage			
Educational Assortative Marriage	Hypogamy	Homogamy	Hypergamy	Total
1980				
Hypogamy	**18.02**	**12.50**	**69.48**	16.22
Homogamy	**13.56**	**12.14**	**74.30**	62.33
Hypergamy	**15.97**	**10.83**	**73.21**	21.45
Total	14.80	11.92	73.28	N = 38,016
2008-2012				
Hypogamy	**31.68**	**17.65**	**50.66**	31.63
Homogamy	**21.37**	**18.65**	**59.97**	51.81
Hypergamy	**16.51**	**14.39**	**69.10**	16.56
Total	23.83	17.63	58.54	N = 37,686

Notes: Hypogamy refers to marriages where wives are more educated or in higher income deciles than husbands. Homogamy refers to marriages where husbands and wives have the same level of education or income. Hypergamy refers to marriages where husbands are more educated or in higher income deciles than wives. **Numbers** in **bold** are row percentages, indicating percentages of income assortative marriages by educational pairing of spouses.

Table 3. Fit Statistics for Log-Linear Models of Educational and Age Assortative Marriage

Model		*df*	Deviance	BIC
1	Marginals*Y + HEDU*H_p*Y + WEDU*W_p*Y	3,042	49,072.61	14,897.07
2	Model 1 + HEDU*WEDU	3,033	14,655.97	-19,418.45
3	Model 2 + EduO*Y	3,029	14,456.77	-19,572.71
4	Model 3 + EduC*Y	3,028	14,322.25	-19,695.99
5	Model 4 + EduHypo*Y	3,027	14,308.03	-19,698.98
6	Model 5 + $\|H_p - W_p\|$	3,018	6,981.54	-26,924.37
7	Model 6 + $\|H_p - W_p\|$*Y	3,009	6,781.41	-27,023.38
8	Model 7 + $\|H_s - W_s\|$	3,008	6,602.67	-27,190.88
9	Model 8 + $\|H_s - W_s\|$*Y	3,007	6,601.85	-27,180.47
10	Model 8 + IncHyper	3,007	6,256.31	-27,526.01
11	Model 10 + IncHyper*Y	3,006	6,211.78	-27,559.31
12	Model 11 + EduO*IncHyper + EduHypo*IncHyper	3,001	6,036.82	-27,678.09
13	Model 12 + EduO*IncHyper*Y + EduHypo*IncHyper*Y	2,996	5,983.85	-27,674.89

Notes : *N* = 38,106 + 37,686 = 75,792; cells = 3,200. *df* = degrees of freedom. Income is log median income in 2012 dollars in each decile. Model terms are as follows (*df* are in parentheses): HEDU = husbands' education (3); WEDU = wives' education (3); H_p = husbands' income decile (9); W_p = wives' income decile (9); Y = year (1); EduO = variable diagonal parameters indicating educational homogamy (4); EduC = educational crossings parameters (3); EduHypo = educational hypogamy parameter (1); $|H_p - W_p|$ = absolute value of difference between husbands' income decile and wives' income decile (9); $|H_s - W_s|$ = absolute value of difference between husbands' log income and wives' log income (1); IncHyper = income hypergamy parameter (1). Data are from the 1980 census and the American Community Survey (ACS) 2008 – 2012 5-year sample.

Table 4. Selected Parameters from Model 12				
Selected Parameters	β		Std. Err.	Exp(β)
Changes in educational homogamy				
Both spouses with high school education or less * Year (2012)	0.11		0.093	1.12
Both spouses with some college education * Year (2012)	0.80	***	0.074	2.23
Both spouses with college degrees * Year (2012)	-0.26	***	0.074	0.77
Both spouses with advanced degrees * Year (2012)	0.20	*	0.079	1.22
Changes in crossings parameters[a]				
Crossings parameter between high school educatio or less and some college * Year (2012)	0.56	***	0.065	1.75
Changes in Educational Hypogamy				
Educational Hypogamy * Year (2012)	0.28	***	0.073	1.32
$\|H_p - W_p\|$				
$\|H_p - W_p\| = 1$	-0.53	***	0.027	0.59
$\|H_p - W_p\| = 2$	-0.65	***	0.027	0.52
$\|H_p - W_p\| = 3$	-0.76	***	0.027	0.47
$\|H_p - W_p\| = 4$	-0.89	***	0.027	0.41
$\|H_p - W_p\| = 5$	-1.04	***	0.028	0.35
$\|H_p - W_p\| = 6$	-1.20	***	0.029	0.30
$\|H_p - W_p\| = 7$	-1.41	***	0.033	0.24
$\|H_p - W_p\| = 8$	-1.57	***	0.039	0.21
$\|H_p - W_p\| = 9$	-1.42	***	0.047	0.24
Changes in $\|H_p - W_p\|$				
($\|H_p - W_p\| = 1$) * Year (2012)	0.06		0.034	1.06
($\|H_p - W_p\| = 2$) * Year (2012)	-0.05		0.035	0.95
($\|H_p - W_p\| = 3$) * Year (2012)	-0.11	**	0.035	0.90
($\|H_p - W_p\| = 4$) * Year (2012)	-0.18	***	0.036	0.84
($\|H_p - W_p\| = 5$) * Year (2012)	-0.22	***	0.038	0.80
($\|H_p - W_p\| = 6$) * Year (2012)	-0.25	***	0.041	0.78
($\|H_p - W_p\| = 7$) * Year (2012)	-0.14	**	0.046	0.87
($\|H_p - W_p\| = 8$) * Year (2012)	0.02		0.054	1.02
($\|H_p - W_p\| = 9$) * Year (2012)	-0.05		0.068	0.95
$\|H_s - W_s\|$	0.04	***	0.003	1.04
Income Hypergamy	0.33	***	0.033	1.39
Changes in income hypergamy				
Income Hypergamy * Year (2012)	-0.24	***	0.037	0.79
Interaction between educational and income assortative mating				
Both spouses with high school education or less * Income Hypergamy	0.22	***	0.028	1.25
Both spouses with some college education * Income Hypergamy	0.07	*	0.029	1.07
Both spouses with college degrees * Income Hypergamy	0.05		0.032	1.05
Both spouses with advanced degrees * Income Hypergamy	-0.15	**	0.051	0.86
Educational hypogamy * Income Hypergamy	0.26	***	0.026	1.30

Notes: Std. Err. = Standard Errors. $|H_p - W_p|$ = absolute value of difference between husbands' and wives' income decile; $|H_s - W_s|$ = absolute value of difference between husbands' and wives' log income (income is median income in 2012 dollars in each decile). [a]Interactions terms between the other two crossings parameters and year are omitted because of collinearity.
***$p < 0.001$; **$p < 0.01$; $p < 0.05$

Table 5. Observed Income Hypergamy Ratios and Expected Income Hypergamy Ratios under Loglinear Model of Quasi-symmetry

Type of Couple	1980	2008-2012
More educated husband and less educated wife		
Observed	4.59	4.29
Expected	4.96	4.37
Observed / Expected	0.92	0.98
Less educated husband and more educated wife		
Observed	3.86	1.63
Expected	3.12	1.38
Obs/Exp	1.24	1.18
Both have high school or less education		
Observed	6.88	3.58
Expected	5.22	3.42
Observed / Expected	1.32	1.05
Both have some college education		
Observed	4.30	3.14
Expected	4.05	2.78
Observed / Expected	1.06	1.13
Both have college degrees		
Observed	3.46	2.31
Expected	3.57	2.19
Observed / Expected	0.97	1.05
Both have advanced degrees		
Observed	1.97	1.84
Expected	2.56	2.15
Observed / Expected	0.77	0.85