A Joint Model of Marriage and Partner Choice

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Abstract

OLS estimates of partner choice equations are biased when the unobservables determining partner choice are correlated with the unobservables determining the likelihood of marriage. This paper presents an example.. A theoretical model generates a two-equation model empirical model in which unobservables are correlated *a priori*. Estimates of the model using data from the PSID indicate that men and women select positively into marriage. OLS Estimates of the effects of education and race (black relative to white) on partner's education are biased downward.

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I. Introduction

There is a long literature in economics, and in the social sciences more broadly, describing the determinants of marriage. Other papers explain the choice of spouse. However, these two outcomes are determined simultaneously: a woman's decision to marry depends upon the selection of husbands available to her in the marriage market. When unobservables determining the likelihood of marriage and the spouse's characteristics are correlated, OLS estimates of the partner choice equation will be biased. There has, as of yet, been little attention to this point.[1]

In this paper I propose an example in which the two sets of unobservables will be correlated a priori. Given her own attributes and marriage market conditions, a woman's optimal partner is chosen by trading off partner quality for a fraction of marital output. She chooses to marry by comparing her consumption when married to this optimal partner with her consumption when single. The theory implies a selection model in which her parents' religion and religiosity when she was growing up, and the sex composition of her children, enter into the marriage, but not the partner choice equations.

I estimate the model with data from the Panel Study of Income Dynamics (PSID). Parallel analyses are undertaken for both men and women. Men and women are both positively selected into marriage on the basis of unobservables. The selection effect is larger for men than women. The results suggest that failing to consider issues of selection when estimating partner choice equations leads to downward bias in estimates of the effect of high school completion and race on partner education.

[1] One paper that does look at selection issues in equations estimated for samples of married couples include Foster (2002) who estimate the effect of parents' characteristics on desired education for children in rural Bangladesh. Clark and Etile (2006) model whether a spouse smokes. Neal (2004) and Willis (1999) allow for selection into marriage when modeling nonmarital childbearing; Rosenzweig (1999) allows for selection into marriage when modeling nonmarital childbearing.

Section II describes the theoretical model of marriage and partner choice which underlies the econometric analysis. Section III describes the econometric model and discusses econometric issues. Section IV describes the data, and Section V presents the results. Section VI concludes.

II. Economic Model of Marriage and Partner Choice

This is a partial equilibrium model of the marriage market, which is described from the perspective of a woman. The empirical model will be estimated for both women and men.

Women maximize utility, which depends on consumption (*C*) and marital status (*M*).

$$U = U(C, h(X, Z, \phi \bullet M) \quad (1)$$

C is a continuous variable, and M is a dummy variable which equals 1 if she is married and 0 if she is not. The function *h(.)* reflects her preferences for marriage, and depends on observables, X and Z, and unobservables, ϕ.

Each woman brings three types of attributes to the marriage market. First, there is a vector X of characteristics, such as education, that are observable to both the market and to the researcher. There are also two types of unobservables - characteristics that are observable to the market, but not to the researcher. μ_L represents intelligence and the other standard unobservables in earnings equation that favorably impact labor market outcomes. μ_H represents characteristics such as beauty and domestic skills that are more closely associated with home productivity. As Becker (1973) points out, unobservable attributes such as intelligence and appearance (as well as observables such as education) potentially impact both labor market and home productivity.

This problem is separable and is solved in two stages. The first step is to solve for a woman's optimal partner, given her observables, her unobservables, and the marriage market. The second step is to determine whether or not she will marry by comparing her utility when married to her optimal partner and her utility when single.

The market poses a tradeoff between share of marital output, $\alpha \in (0,1)$, and husband quality, Q. Individuals face a range of (Q, α) pairs, and the fraction of output, α, is negotiated prior to marriage. The choice is summarized by the expression:

$$\alpha = \alpha(Q; X, \mu_L, \mu_H, \pi) \tag{2}$$

where π represents market conditions favorable to women and the tradeoff between quality and division of output is reflected by the assumption $\alpha_Q < 0$. α is increasing in *X*, π, and the μ's.[2]

A married woman's consumption is described by the expression:

$$C_M = \alpha(Q; X, \mu_L, \mu_H) \cdot g(Q; X, \mu_L, \mu_H) \tag{3}$$

where $g(Q; X, \mu_L, \mu_H)$ is marital output, which depends on husband quality and wife's characteristics.

Given her abilities and market conditions, the maximum consumption a woman can obtain in marriage is obtained from the solution of the problem:

$$\max_Q \ C_{Mar} = \max_Q \ \alpha(Q; X, \mu_M, \mu_H, \pi) g(Q; X, \mu_M, \mu_H) \tag{4}$$

The solution of this problem is:

$$Q^* = Q^*(X, \mu_M, \mu_H, \pi) \tag{5}$$

A single woman's consumption depends on her observables, *X*, and the two unobservable components:

$$C_S = f(X, \mu_L, \mu_H) \tag{6}$$

She will marry if her utility from marrying her optimal husband outweighs her utility from being single[3]; i.e., if:

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[2] Several economists, most notably Duncan Thomas (1990) argue that a spouse's education reflects his or her bargaining power within the household.

$$\tilde{M} = U(C_M(Q^*), h(Z, X, \phi)\cdot 1) - U(C_S, 0) > 0 \tag{7}$$

or, in reduced form,

$$\tilde{M} = \tilde{M}(X, Z, \pi, \mu_L, \mu_H, \phi) > 0 \tag{8}$$

III. Estimation

The econometric model of marriage and partner choice is obtained by linearizing equations (5) and (8):

$$Q^* = X\beta_Q + \pi\gamma_Q + \varepsilon_Q \tag{9a}$$

$$\tilde{M} = X\beta_M + \pi\gamma_M + Z\delta_M + \varepsilon_M \tag{9b}$$

X, π, and Z are vectors of observables, and β_k, γ_k and δ_k ($k \in \{Q, M\}$) are the respective vectors of coefficients. $\tilde{M} > 0 \Leftrightarrow M = 1$ indicates that a woman is married. The error terms in (9a) and (9b) can be expressed in terms of the unobservables μ_L, μ_H and ϕ, and constants *a, b, c, d* and *e*:

$$\varepsilon_Q = a\mu_L + b\mu_H \tag{10a}$$

$$\varepsilon_M = c\mu_L + d\mu_H + e\phi \tag{10b}$$

The selection model is estimated under maximum likelihood, assuming that ε_M and ε_Q are distributed bivariate normal. As Heckman (1977) points out, estimating (9a) under OLS yields biased estimates. When ε_M and ε_Q are distributed bivariate normal:

$$E[Q \mid M = 1] = \beta_Q X_Q + \pi\gamma_Q + E[\varepsilon_Q \mid M = 1]$$

$$= \beta_Q X_Q + \pi\gamma_Q + \text{cov}(\varepsilon_Q, \varepsilon_M)\lambda(X\beta_M + \pi\gamma_M + Z\delta_M) \tag{11}$$

where $\lambda(X\beta_M + \pi\gamma_M + Z\delta_M)$ is the inverse mills ratio. Standard errors are corrected for the fact that there are repeated observations on individuals.

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[3] I refer to the continuous latent variable associated with the outcome marriage as $\tilde{M}$ rather than the conventional *M**, to distinguish it from the "*" referring to the optimal choice, as Q* in (5).

Because Z is included in (9b) but not (9a), the model is identified (in addition to the identification through nonlinearity).

The covariance between the error terms can be expressed as:

$$\mathrm{cov}(\varepsilon_Q, \varepsilon_M) = \mathrm{cov}\left(a\mu_L + b\mu_H, c\mu_L + d\mu_H + e\phi\right)$$

$$= ac\sigma^2_{\mu_L} + (ad + bc)\sigma_{\mu_L,\mu H} + bd\sigma^2_{\mu H} + ae\sigma_{\mu_{L,\phi}} + be\sigma_{\mu_{LH\phi}} \qquad (12)$$

When (12) is positive we have positive selection: On net, the unobservables associated with attaining a high quality spouse are positively correlated with the unobservables affecting the propensity to marry. When the unobservable endowments leading to a greater likelihood of marriage and stronger performance in the marriage market are positively correlated $(\sigma_{\mu_L,\mu_H} > 0)$ the bias will be more positive. If the correlation between marriage market and labor market unobservables is higher for men than for women, then the selection bias is more apt to be positive for men. The covariance will be higher when unobservables affecting labor market outcomes and unobservables affecting marriage market outcomes are more correlated. μ_L has a stronger effect on the former, and μ_H has a stronger effect on the latter.[4]

However, if, say, *c* is sufficiently negatively, or if the two μ's are sufficiently negative correlated, then we have negative selection. Then, married women have less favorable unobservables than single women. .

A test for the presence of selection is a test of whether:

$$\rho(\varepsilon_Q, \varepsilon_M) \equiv \mathrm{cov}(\varepsilon_Q, \varepsilon_M)/(\sigma_{\varepsilon_Q}\sigma_{\varepsilon_M}) \neq 0 \qquad (13)$$

While we cannot estimate the parameters, *a, b, c, d* and *e* individually, we can conjecture about the sign and relative magnitude of (12) (and therefore (13)) in various cases. For instance, by

[4] Appearance does affects labor market outcomes (Hammermesh, 1994, 1998, 2000). This does not impact the identification but does affect the interpretation of the results.

assumption, μ_L and μ_H increase value in the marriage market and φ measures preferences for marriage. This implies that *a*, *b* and *e* > 0, respectively.

For men, observables associated with labor market success are also positively associated with marriage (Korenman and Neumark, 1991). For women, the relationship between (potential) career success and marriage (net of motherhood) is less clear (Korenman and Neumark 1991, Breusch and Gray 2004, Light 200), but it appears to be less positive for women than men. If unobservables μ_L have the same relationship with marriage that observables such as education and other human capital variables, $c_{Men} > c_{Women}$ and $c_{Men} > 0$. While it is hard to say if ability in home production is associated with greater likelihood of marriage for men, it is likely that it is for women; i.e., that $d_{Women} > 0$, and that the effect is larger for women than for men; i.e., $d_{Women} > d_{Men}$.

Unless the individual covariance terms in (12) are strongly negative, or *d* is sufficiently negative, which seem unlikely, (12) will be positive for men. Moreover, the elements of the first term will tend to be substantially larger for men than for women: labor market success is far more likely to be associated with favorable labor market outcomes, and the unexplained variance in earnings is larger for men than for women. Therefore, we would expect (13) to be larger for men than for women.

To some extent, the omitted variables in the two equations can be proxied by parents' education. On one hand, there could be explicit matching on parents' characteristics, as discussed in Fernandez (2004). Alternatively, parents' education may proxy for some unmeasurable individual characteristics (Lam and Schoeni, 1993).

IV. Data

The analysis uses data from the Panel Study of Income Dynamics (PSID). The PSID is a panel data set which began in 1968 as a sample of 5000 households in the 48 contiguous states of the United States. The individuals in these households, and splitoff households, were resurveyed annually until 1997, at which point they were surveyed every other year.

The dependent variable, spouse quality (Q) is measured as years of education. Regressors include a woman's own characteristics (X) and marriage market characteristics (π). Own characteristics include age (*Age)* and race (*White*). Own education is entered in some specifications linearly (*Education*) . In other specifications, education is entered as a pair of dummy variables corresponding to 12 and 16 years of education (*Own_High, Own_Coll).* Region of residence (*South/Northeast/Northcentral*; omitted category is *West*) represents the marriage market characteristics, π . As parents' education is reported as a categorical variable in the PSID, the measures used indicate whether each parent graduated high school (*Mom_High, Dad_High*) and college (*Mom_Coll* and *Dad_Coll*).

Two types of variables are included in Z . Subset Z_1 includes measures of the religion and religiosity of the subject's father, or the head of the household when she was growing up. Subset Z_2 is a measure of the gender of her children.

There is substantial precedent for using religion and religiosity as instruments in models of the effect of family status on some outcome (e.g., Lundberg and Plotnick,1985; Plotnick; 1990, 1992). Gruber (2005) uses religious market density to explain the likelihood of marriage and divorce. Parental, rather than own religiosity is used here in order to capture the effect of external social norms in shaping individual's marriage decisions. Using variables based on parental responses when the subject herself was a child also diminishes concerns about correlation of the element of Z_1 with ε_Q .

Religiosity is characterized in terms of number of times the parent attended religious services. The categories are *None*, *Some* (less than once per week), *More*, (about once per week), and *Lot* (more than once per week). The four religion categories I use are *Protestant_1*, *Protestant_2*, *Catholic* and *Other*. *Protestant_1* includes Lutherans, Methodists, Episcopalians and Presbyterians, or "mainline protestants" (Lehrer 2000 and others). The possible responses vary by round on the PSID. Appendix Tables A-1 and A-2 map the original PSID responses into the religiosity and religion categories.

Bedard and Deschenes (2005) use child sex to instrument for women's marital status in a study of the effect of divorce on women's economic status. The motivation for using child sex in Z_2 is the set of findings reported in the literature that child sex affects the likelihood of marriage, and the likelihood of divorce (Morgan et al, 1988; Lundberg and Rose, 2003; Dahl and Moretti, 2004). The measure of the sex composition used is *First_Boy_Minus_First_Girl.* This is the difference between the dummy variable indicating whether the first child born is a boy and the dummy variable indicating whether the first child born is a girl. Because the mean of this variable will be approximately zero for women with children and women with no children, issues of endogenous fertility with respect to the sex composition of the children are minimized.

I use data on individuals between age 25 and 35, inclusive, from 1983 forward. While it would be desirable to look at a longer period and wider age range, there was not sufficient coverage of the religion and religiosity variables for individuals who were marriageable age outside this window. "Nonsample individuals" – those who married into or moved into PSID households or splitoff households – were excluded from the sample to avoid endogeneity problems. This yielded samples of 20008 women and 18101 men, respectively after deleting observations with missing values.[5] Means and standard deviations of key variables are reported in Appendix Table 3.

V. Results

Women

The results for women are reported in Tables 1 and 2. Table 1 reports the benchmark OLS results. The baseline OLS specification, reported in column 1, includes own *Education*, *White,* and dummy variables for *Region*, *Year* and *Age*. Every year of education a woman gets increases her expected husband's education by somewhat more than a half (0.562, t=21.78) of a year. Race is significant as well: being white increases husband's education by somewhat less than half (0.534, 5=4.21) of a year.

Parents' education variables are introduced into the model in Column 2[6] . Mother's education has no significant effect, although a woman's father's education increases her spouse's education substantially. If her father graduated high school, her husband's education is about a third of a year (0.354, t=2.73) higher. If her father graduated college as well, her husband's education is nearly a half a year (0.452, t=2.58) higher on top of that. This echoes Lam and Schoeni's (1993) finding, using data from Brazil, that a woman's father's education is positively related to her husband's earnings. The coefficients on *Education* and *White* fall somewhat when parents' education is introduced, suggesting that these variables reflect some of the unobserved heterogeneity that was picked up by *Education* and *White* in the simpler specification.

[5] For women (men), 1109 (1047) observations were deleted because of missing region, 20 (30) for missing race, 810 (730) for missing education, 2404 (2064) for missing religiosity and 972 (569) for missing religion.

[6] The sample size is smaller when parents' education is included. I estimated the models in columns 1 and 3 using the sample from columns 2 and 4, respectively, in order to gauge whether differences were attributable to the difference in the sample or the difference in the specification. The results for the analysis reported in this table and others indicate that the differences are due to the difference in the specification rather than sample.

Columns 3 and 4 repeat the analyses in columns 1 and 2, respectively, the only exception being that education is entered non-linearly: as a pair of dummy variables for high school (*Own_High)* and college (*Own_Coll*). The results indicate that relationship is non-linear: the college education coefficients are nearly twice as large as the high school coefficients. As with the linear education specification, the effect of own education is attenuated when parents' education is included.

Results of the selection models are reported in Table 2. Having a first son relative to a daughter leads to a *lower* likelihood of marriage (z=1.62 to z=1.94 in columns 1 and 4, respectively).

Inferences about biases in OLS coefficients can be made by comparing the OLS and selection corrected results. Despite the fact that women are positively selected into marriage, the selection corrected *Education* and *Own_Coll* coefficients are similar to the respective OLS coefficients. The selection corrected coefficient on *Own_High* coefficient is somewhat greater than the OLS coefficient. The selection correct coefficient on *White* is substantially greater than the OLS coefficient. For instance, in terms of the column 2 results, the selection corrected estimate .840 (z=3.65) is more than double the OLS estimate of .393 (t=3.00). This suggests that the selection bias arises mainly with respect to the effect of the twelfth year of education and race.

Men

The OLS education coefficents for men reported in Table 3 and similar to those for women in Table 1. However, the results for race and for parents' education are different. There is no significant effect of race on spouse quality in the specifications that do not exclude parents' education. The estimates that control for education suggest that being which lowers the education of a man's optimal feasible partner. For men, mother's, as well as father's education helps a man obtain a more educated spouse.

The results suggest marked selection bias on the OLS results in several respects. The OLS *Education* coefficient from Column 2 in Table 5 was 0.474; the comparable selection corrected estimates were both 0.512 – indicating that the OLS estimate was biased downward by .038 or 7.4 percent. More striking is the difference in the coefficient on *White.* While the OLS coefficients were small and insignificant or even negative, the selection model yields estimates ranging from .357 (z=2.47) to .570 (z=3.95). There is significant positive selection for men: $\rho(\varepsilon_Q, \varepsilon_M)$ ranges from 0.71 to 0.78, and $\text{cov}(\varepsilon_Q, \varepsilon_M)$ ranges from 1.34 to 1.45.

Discussion

Own education, parents' education, and *White,* are associated with marrying a high quality partner: Coefficients on own education, when entered linearly and as a pair of dummy variables are positive in all specifications for both men and women. Parents' education coefficients are either positive or not significant. The effect of being white is positive in all specifications except the OLS specification for men, where it is either insignificant or negative.

In terms of the effects of these variables on the likelihood of marriage, education overall increases the likelihood of marriage, as does having completed twelve years of education. However, given that a man, or a woman, has a high school degree, having a college degree does not increase the likelihood of marriage in this sample. Conditional on own education, parents' education has a negative effect on the likelihood of marriage, if any.

In Section II it was conjectured that there would be positive selection for both men and women. Also, as the characteristics associated with success in the marriage market are more closely associated with human capital unobservables for men than for women, the selection effect, $\text{cov}(\varepsilon_Q, \varepsilon_M)$, would be more positive for men. This is supported in the results, in which the correlations between the error terms range from 1.37 to 1.45 for men and from 0.83 to 1.31 for women.

How do we interpret the differences between the OLS and selection corrected estimates? In the very simplest case, when a variable increases the likelihood of marriage, and $\mathrm{cov}(\varepsilon_Q, \varepsilon_M) > 0$, we would then expect to find the OLS coefficient to be smaller than the corrected coefficient. For instance, suppose education increases the likelihood of marriage (which it does), and unobservables associated with marriage are positively correlated with unobservables associated with spouse quality (which they are). The OLS education coefficient reflects not only the effect of education but the fact that those who respond to the incentive at the margin have less favorable unobservables than those who were married anyway. The selection model explicitly separates the two effects.

The differences between the OLS and selection corrected education coefficients are modest, but tend to be greater for men than for women. For men, the (column 1) selection corrected estimate of the effect of *Education* is 3.5 percentage points, or 7.3 percent greater than the OLS estimate. For women, the difference is 1.9 percentage points, or 3.3 percent. Breaking the education variables into dummy variables for high school and college reveals that the differences vary by level of education. The (column 3) coefficients on *Own_Coll* are very similar in the OLS and corrected specifications for both men and women. However, the *Own_High* coefficient is 30 percentage points (35.4 greater) than the OLS estimate for men, and 35 percentage points (45) percent greater than the OLS coefficient for women.

Differences in the effects of race are striking. OLS estimates of the coefficients on *White* are substantially lower than selection corrected effects. For instance, for men, the OLS result in column (4) of Table 5 is -0.213 (t=1.89), suggesting that white men marry less educated women than non-white men. However, the comparable selection corrected effect from Table 6 is 0.357 (z=2.47), and the coefficient on *White* in the marriage equation is positive and significant.

Intuitively, if we could take a non-white man at the margin of marriage and make him white he would marry, but he would bring with him lower unobservables (ε_Q) – such as perhaps unmeasured family background - on average, than the men who were already married.

The comparisons for women are dramatic as well: the column (4) OLS estimate of the *White* coefficient from Table 2 is 0.340 (t=2.47). Unlike the estimate for men, this is positive. However, it is still far smaller than the corrected estimate: approximately one-third of the Table 4 corrected coefficient of 0.969 (z=4.24). Inferences based on OLS coefficients would be terribly off. It is notable that *White* has a particularly strong effect on the likelihood of marriage in the first stage equations (this is obscured because of the interactions). In general, researchers should interpret with caution estimated OLS partner choice coefficients on variables that also have a strong effect on the likelihood of marriage.

VI. Conclusion

Uncorrected, and selection corrected, models of partner choice for men and women are estimated with data from the PSID. Both men and women select positively into marriage. The OLS race coefficient is biased downward considerable; some education coefficients are biased as well.

As expected, men are more positively selected into marriage than women. This is consistent with the notion that the unobservables relating to quality of spouse and likelihood of marriage are more closely aligned for men than for women.

The difference between the OLS and selection correction effects of race and high school completion on partner quality raises questions about estimates of partner choice models or marriage matching patterns in general when selection effects have not been taken into account.

The results have implications for policy measures, such as reducing the marriage penalty in the tax code and funding counseling programs for marriages in conflict, aimed at stemming the decline in marriage. There is positive selection into marriage in terms of unobservables as well as readily measured observables such as education. Estimates of selection based on observables such as race and education will not fully account for the degree of selection into marriage. We cannot expect the individuals responding, at the margin to marriage promotion policies to realize the same outcomes as those who entered into marriage autonomously.

References

Becker, Gary S. (1973) "A Theory of Marriage: Part I." *Journal of Political Economy* 81, 813-46.

Becker, Gary S. (1981) *A Treatise on the Family* (Cambridge: Harvard University Press).

Bedard, Kelly and Olivier Deschenes (2005) "Sex Preferences, Marital Dissolution, and the Economic Status of Women." *Journal of Human Resources* 40:2 411-434.

Behrman, Jere, Mark R. Rosenzweig and Paul Taubman (1994) "Endowments and the Allocation of Schooling in the Family and in the Marriage Market: The Twins Experiment" *Journal of Political Economy* 102:6, 1131-74.

Blau, Francine D. (1998) "Trends in the Well-Being of American Women, 1970-1995, *Journal of Economic Literature* 36.

Breusch, Trever and Edith Gray, "Does Marriage Improve the Wages of Men and Women in Australia?" http://acsr.anu.edu.au/APA2004/papers/7D_Breusch.pdf.

Clark, Andrew and Fabrice Etile (2006) "Don't Give Up On Me Baby: Spousal Correlation in Smoking Behavior, *Journal of Health Economics*, 958-978.

Dahl, Gordon and Enrico Moretti (2004) "The Demand for Sons: Evidence from Divorce, Fertility and Shotgun Marriage." NBER Working Paper 10281.

Fernandez, Raquel, Alessandra Fogli and Claudia Olivetti (2004) "Mothers and Sons: Preference Formation and Female Labor Force Dynamics", *The Quarterly Journal of Economics*. 119:4, 1249-1299.

Foster, Andrew (2002) "Marriage Market Selection and Human Capital Allocations in Rural Bangladesh", mimeo, Brown University.

Goldin, Claudia (2006) "The Quiet Revolution that Transformed Women's Employment, Education and the Family" *American Economic Review.* 96:2 1-26.

Gray, Jeffrey S. (1997) "The Fall in Men's Return to Marriage: Declining Productivity Effects or Changing Selection?" *Journal of Human Resources* 32:3, 481-504.

Grossbard-Schechtman, Shoshana (1993) *On the Economics of Marriage: A Theory of Marriage, Labor and Divorce* (Westview Press, Boulder, CO).

Gruber, Jonathan, (2005) "Religious Market Structure, Religious Participation and Outcomes: Is Religion Good for You?" NBER Working Paper 11377.

Hamermesh, Daniel (1994) "Beauty and the Labor Market," *American Economic Review*.

Hamermesh, Daniel (1998) "Beauty, Productivity and Discrimination; Lawyers' Looks and Lucre," *Journal of Labor Economics*.

Hamermesh, Daniel (2000) "Business Success and Businesses' Beauty Capital," *Economics Letters*.

Korenman, Sanders and David Neumark (1991) “Does Marriage Really Make Men More Productive?” *Journal of Human Resources*, 282-307.

Neumark, David and Sanders Korenman (1994). "Sources of Bias in Women's Wage Equations: Results Using Sibling Data." *Journal of Human Resources* 29(2):379-405.

Lam, David (1988) “Marriage Markets and Assortative Mating with Household Public Goods: Theoretical Results and Empirical Implications” *Journal of Human Resources* 23(4) 462-87.

Lam, David and Robert Schoeni (1993) “Effects of Family Background on Earnings and Returns to Schooling: Evidence from Brazil” *Journal of Political Economy* 101(4) 213-43.

Lehrer, Evelyn (2000) “Religion as a Determinant of Entry into Cohabitation and Marriage.” In Linda Waite, Christine Bachrach, Michelle Hindin, Elizabeth Thomson, and Arland Thornton (eds.) *The Ties that Bind: Perspectives on Marriage and Cohabitation*. Hawthorne: Aldine de Gruyter, p. 227-252.

Light, Audrey (2004) “Gender Differences in the Marriage and Cohabitation Income Premium” *Demography* 41:2 263-284

Lundberg, Shelly and Robert Plotnick (1985) “Adolescent Pre-Marital Childbearing: Do Economic Incentives Matter” 13:2 177-200.

Lundberg, Shelly and Elaina Rose (1998) “The Determinants of Specialization within Marriage”, mimeo, University of Washington.

Lundberg, Shelly and Elaina Rose (2003) “Child Gender and the Transition to Marriage,” *Demography* 40:2, 333-350.

Mare, Robert (1991) “Five Decades of Educational Assortative Mating,” *American Sociological Review* 56 15-32.

Morgan, S. Philip, Diane Lye and Gretchen Condron (1988) “Sons, Daughters and the Risk of Marital Disruption”, *American Journal of Sociology* 94:1, 110-29.

Morgan, S. Philip, and Michael S. Pollard (2002) “Do Parents of Girls Really Have a Higher Risk of Divorce?” Paper presented at the annual meetings of the Population Association of America.

Neal, Derek. 2004. "The Relationship Between Marriage Market Prospects and Never-Married Motherhood." *Journal of Human Resources* 39(4): 938-957.

Pencavel, John (1998) “Assortative Mating by Schooling and the Work Behavior of Wives and Husbands” *American Economic Review* 88:2, 326-29.

Plotnick, Robert (1990), “Welfare and Out-Of-Wedlock Childbearing: Evidence from the 1980’s” *Journal of Marriage and the Family* 52:3 735-46.

Plotnick, Robert (1992), "The Effects of Attitudes on Teenage Pre-Marital Childbearing and its Resolution" *American Sociological Review* 57:6 800-811.

Pollak, Robert (2000), "Theorizing Marriage," in *The Ties that Bind: Perspectives on Marriage and Cohabitation,* ed. Linda J. Waite, New York: Walter de Gruyter, Inc. 111-125.

Qian , Zhenchao (1998) "Changes in Assortative Mating: The Impact of Age and Education, 1970-1990" *Demography* 35:3, 279-92.

Rosenzweig, Mark R (1999) "Welfare, Marital Prospects, and Nonmarital Childbearing" *Journal of Political Economy* 107:S6.

Rosenzweig, Mark R. and Kenneth I. Wolpin (2004) "Natural 'Natural Experiments' in Economics," *Journal of Economic Literature*. 38:4 827-874.

Schwartz, Christine R. and Robert D. Mare (2005) "Trends in Educational Assortative Marriage from 1940 to 2003", forthcoming, *Demography.*

Thomas, Duncan (1990) "Intrahousehold Resource Allocation: An Inferential Approach", *Journal of Human Resources* 25:4 635-64.

Willis, Robert (1999) "A Theory of Out-of-Wedlock Childbearing" *Journal of Political Economy* 107:S6.

Table 1
OLS (Women)
Dependent Variable: Husband's Education

	(1)	**(2)**	**(3)**	**(4)**
Education	0.562 (21.78)	0.513 (17.82)		
Education ≥ 12 (Own_High)			1.288 (7.19)	1.051 (6.03)
Education ≥ 16 (Own_Coll)			2.138 (16.00)	1.888 (13.1)
White	0.534 (4.21)	0.393 (3.00)	0.555 (4.14)	0.340 (2.47)
Mom High		0.108 (0.82)		0.263 (1.92)
Mom Coll		-0.051 (-0.27)		-0.054 (-0.28)
Dad High		0.354 (2.73)		0.421 (3.05)
Dad Coll		0.452 (2.58)		0.61 (3.09)
Other Regressors	(a)	(a)	(a)	(a)
N Obs.	8553	8310	8553	8310

(a) Dummies for individual's age, region of residence (South, Northeast, Northcentral), and year of observation. Standard errors corrected for multiple observations by individual.

Table 2
Selection Model
Dependent Variable: Husband's Education

	1		2		3		4	
Stage	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Education	0.044 (3.57)	0.581 (21.8)	0.047 (3.38)	0.532 (17.7)				
Education ≥ 12 (Own_High)					0.384 (5.21)	1.588 (8.05)	0.404 (5.13)	1.345 (6.74)
Education ≥ 16 (Own_Coll)					0.026 (.38)	2.131 (14.9)	0.047 (0.65)	1.910 (12.5)
White	0.442 (2.45)	1.062 (5.31)	0.366 (1.92)	0.840 (3.65)	0.444 (2.51)	1.261 (6.43)	0.354 (1.89)	0.969 (4.24)
Mom High			0.028 (0.43)	0.111 (0.83)			0.038 (0.59)	0.261 (1.85)
Mom Coll			-0.265 (-2.78)	-0.160 -(0.77)			-0.25 (-2.61)	-0.194 (-0.89)
Dad High			-0.029 (-0.46)	0.331 (2.48)			-0.05 (-0.78)	0.371 (2.55)
Dad Coll			-0.017 (-0.20)	0.440 (2.43)			0.0165 (0.19)	0.610 (3.16)
First_Boy_Minus_ First_Girl	-0.045 (-1.62)		-0.052 (-1.82)		-0.047 (-1.74)		-0.054 (-1.94)	
Other Prot.	-0.153 (-1.44)		-0.187 (-1.64)		-0.118 (-1.14)		-0.155 (-1.4)	
Catholic	0.111 (0.68)		0.115 (0.65)		0.193 (1.17)		0.195 (1.07)	
Other	-0.327 (-0.89)		-0.552 (-1.22)		-0.35 (-1.01)		-0.604 (-1.42)	
Some	-0.471 (-2.70)		-0.527 (-2.90)		-0.52 (-3.04)		-0.579 (-3.20)	
More	0.451 (3.18)		0.467 (3.15)		0.444 (3.22)		0.455 (3.12)	
Alot	-0.126 (-1.36)		-0.099 (-1.01)		-0.115 (-1.27)		-0.084 (-0.87)	
*White * Other Prot*	0.371 (2.76)		0.371 (2.63)		0.346 (2.69)		0.344 (2.53)	
*White * Catholic*	-0.222 (-1.24)		-0.246 (-1.29)		-0.292 (-1.63)		-0.319 (-1.63)	
*White * Other*	0.125 (0.31)		0.414 (0.86)		0.132 (0.35)		0.449 (0.99)	
*White * Some*	0.637 (3.09)		0.715 (3.34)		0.642 (3.17)		0.726 (3.43)	
*White * More*	-0.559 (-2.63)		-0.517 (-2.31)		0.528 (2.61)		-0.489 (-2.30)	
*White * A lot*	0.133 (0.76)		0.089 (0.48)		0.115 (0.69)		-0.073 (-0.42)	
P-value	<0.001		<0.001		<0.001		<0.001	
N obs: Full/Uncen.	20008	8553	18761	8310	20008	8553	18761	8310
$\rho(\varepsilon_Q,\varepsilon_M) \mid \sigma(\varepsilon_Q,\varepsilon_M)$ *(SE)* $\mid$ *(SE)*	0.50 (0.13)	0.97 (0.29)	0.44 (0.17)	0.83 (0.35)	0.62 (0.10)	1.31 (0.27)	0.58 (0.14)	1.18 (0.34)

Table 3
OLS (Men)
Dependent Variable: Wife's Education

	(1)	(2)	(3)	(4)
Education	0.546 (22.32)	0.474 (16.78)		
Education ≥ 12 (Own_High)			1.134 (7.90)	0.844 (5.96)
Education ≥ 16 (Own_Coll)			2.197 (17.76)	1.892 (13.70)
White	0.009 (0.08)	-0.175 (-1.60)	0.011 (0.10)	-0.213 (-1.89)
Mom High		0.238 (2.16)		0.278 (2.52)
Mom Coll		0.291 (1.51)		0.329 (1.72)
Dad High		0.279 (2.53)		0.383 (3.51)
Dad Coll		0.304 (1.94)		0.365 (2.27)
Other Regressors	(a)	(a)	(a)	(a)
N Obs.	7592	7303	7592	7303

(a) Dummies for individual's age, region of residence (South, Northeast, Northcentral), and year of observation. Standard errors corrected for multiple observations by individual.

Table 4
Selection Model (Men)
Dependent Variable: Wife's Education

	1		**2**		**3**		**4**	
Stage	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Education	.065 (5.29)	0.586 (22.8)	0.059 (4.22)	0.512 (17.2)				
Education ≥ 12 (Own_High)					0.48 (7.05)	1.535 (10.1)	0.432 (5.9)	1.209 (8.05)
Education ≥ 16 (Own_Coll)					0.025 (0.37)	2.164 (15.86)	0.043 (0.60)	1.890 (12.5)
White	0.274 (1.46)	0.583 (4.13)	0.372 (2.01)	0.402 (2.78)	0.221 (1.15)	0.582 (3.98)	0.30 (1.53)	0.357 (2.47)
Mom High			0.074 (1.10)	0.292 (2.34)			0.057 (0.85)	0.310 (2.51)
Mom Coll			-0.106 (-1.10)	0.152 (0.72)			-0.091 (-0.96)	0.216 (1.04)
Dad High			0.064 (0.98)	0.318 (2.59)			0.064 (0.98)	0.418 (3.46)
Dad Coll			-0.177 (-2.12)	0.147 (0.87)			-0.142 (-1.7)	0.237 (1.37)
First_Boy_Minus_ First_Girl	0.030 (1.05)		0.029 (1.04)		0.035 (1.18)		0.032 (1.11)	
Other Prot.	-0.108 (-0.92)		-0.015 (-0.13)		-0.12 (-0.99)		-0.035 (-0.29)	
Catholic	-0.113 (-0.69)		-0.093 -(0.56)		-0.12 (-0.71)		-0.129 (-0.74)	
Other	-0.169 (-0.53)		-0.145 (-0.46)		-0.287 (-0.95)		-0.27 (-0.89)	
Some	-0.146 (-0.85)		-0.099 (-0.61)		-0.20 (-1.14)		-0.158 (-0.93)	
More	-0.115 (-0.83)		-0.127 (-0.90)		-0.13 (-0.94)		-0.151 (-1.06)	
Alot	0.068 (0.68)		0.063 (0.58)		0.087 (0.86)		0.082 (0.75)	
*White * Other Prot*	0.273 (1.95)		0.153 (1.08)		0.302 (2.16)		0.19 (1.31)	
*White * Catholic*	0.076 (0.42)		0.039 (0.21)		0.087 (0.47)		0.070 (0.36)	
*White * Other*	-0.187 (-0.52)		-0.136 (-0.37)		0.031 (0.09)		0.067 (0.19)	
*White * Some*	0.237 (1.21)		0.182 (0.97)		0.274 (1.37)		0.22 (1.14)	
*White * More*	-0.105 (-0.55)		-0.141 (-0.72)		-0.062 (0.32)		-0.09 (-0.48)	
*White * A lot*	-0.0056 (-0.04)		0.080 (0.49)		-0.042 (-0.27)		0.047 (0.28)	
P-value	0.024		0.104		0.020		0.06	
N obs: Full/Uncen.	18101	10509	16440	9137	18101	10509	16440	9137
$\rho(\varepsilon_Q,\varepsilon_M)$ | $\sigma(\varepsilon_Q,\varepsilon_M)$ *(SE)* | *(SE)*	0.75 (0.07)	1.40 (0.21)	0.78 (0.07)	1.45 (0.21)	0.72 (0.07)	1.37 (0.21)	0.76 (0.07)	1.41 (0.21)

Appendix Table 1
Coding of "Religiosity"

Year	Question	Orig. Code	Possible Responses	Coded As…
1968	How often do you (HEAD) go to church?	0	Never	Never[a]
		1	Once in a while, a few times a year, not often, seldom	Some
		2	About once a month, sometimes	More
		3	Every few weeks, several times a month, once or twice a month, often	Lot
		4	Every few weeks, several times a month, once or twice a month, often	Lot
		5	More than once a week, once a week plus	Lot
		6	NA	Missing
1969	How often do you (HEAD) go to church?	0	Never	Never[a]
		1	Hardly ever	Some
		2	About once a month, sometimes	More
		3	Every few weeks, several times a month	Lot
		4	Every week, once a week	Lot
		5	More than once a week, once a week plus	Lot
		9	NA	Missing
1970, 1971, 1972	How often do you (HEAD) go to religious services?	0	Never	Never[a]
		1	Once a week or more	Lot
		2	Once a month	More
		3	Less than once a month	Some
		9	NA	Missing

[a] "Never" is omitted category.

Appendix Table 2
Coding of "Religion"

Year	Question	PSID	Possible Responses	Variable
1970 - 1984	Do you have a religious preference? Is your religious preference Protestant, Catholic, Jewish, or what? What denomination is that?	1	Baptist	Prot_2
		2	Episcopalian	Prot_1
		3	Methodist (including African Methodist)	Prot_1
		4	Presbyterian	Prot_1
		5	Lutheran	Prot_1
		6	Congregationalist & Disciples of Christ; United Church of Christ; Dutch Reform; Friends, Quaker; Latter Day Saints, Mormon; Unitarian; Universalists; Bahai, Evangelical & Reform, Christian Church	Prot_2
		7	Other Protestant; Protestant but NA denomination	Prot_2
		8	Catholic	Catholic
		9	Jewish	Other
		0	NA, DK, Other, None	Missing
1985 - 1993	Is your religious preference Protestant, Catholic, or Jewish, or what? What denomination is that?	1	Roman Catholic	Catholic
		2	Jewish	Other
		3	Baptist	Prot_2
		4	Lutheran	Prot_1
		5	Methodist; African Methodist	Prot_1
		6	Presbyterian	Prot_1
		7	Episcopalian	Prot_1
		8	Protestant, Unspec.	Prot_2
		9	Other Protestant	Prot_2
		10	Other Non-Christian: Muslim, Rastafarian	Other
		11	Latter Day Saints; Mormon	Prot_2
		12	Jehovah's Witnesses	Prot_2
		13	Russian/Greek Orthodox	Prot_2
		14	"Christian"	Prot_2
		15	Unitarian; Universalist	Prot_2
		16	Christian Science	Prot_2
		17	Seventh Day Adventist	Prot_2
		18	Pentecostal	Prot_2
		19	Amish, Mennonite	Prot_2
		20	Quaker, Friends	Prot_2
		99	NA/DK	Missing
		00	Inap.; none, atheist, agnostic	Missing
1994 - 2001	*(Additional options to prior set.)*	21	Church of God	Prot_2
		22	United Church of Christ; Congregational Church	Prot_2
		23	Reformed, Christian Reformed	Prot_2
		24	Disciples of Christ; United Christian; First Christian; Christian Holiness	Prot_2
		25	Churches of Christ	Prot_2
		97	Other	Other

Appendix Table 3
Mean (Standard Deviation)

	Women	**Men**
Own Education	12.82 (2.10)	12.77 (2.18)
At Least High School (Own_High) *(Education ≥ 12)*	0.851 (0.36)	0.830 (0.38)
At Least College (Own_Coll) *(Education ≥ 16)*	0.160 (0.37)	0.176 (0.38)
Partner Education W: (N = 8553) M: (N = 7592)	13.23 (2.15)	13.19 (1.88)
Mother High School W: (N = 18761) M: (N = 16440)	0.612 (0.49)	0.674 (0.47)
Mother College W: (N = 18761) M: (N = 16440)	0.088 (0.28)	0.114 (0.32)
Father High School W: (N = 18761) M: (N = 16440)	0.547 (0.50)	0.604 (0.49)
Father College W: (N = 18761) M: (N = 16440)	0.133 (0.34)	0.161 (0.37)
Age	29.97 (3.11)	29.91 (3.12)
South	0.478 (0.50)	0.440 (0.50)
Northeast	0.154 (0.36)	0.145 (0.35)
Northcentral	0.213 (0.41)	0.242 (0.43)
White	0.537 (0.50)	0.602 (0.49)
First_Boy_Minus_First_Girl	-0.0005 (0.83)	0.049 (0.72)
Other Prot.	0.552 (0.50)	0.536 (0.50)
Catholic	0.227 (0.42)	0.242 (0.43)
Other	0.023 (0.15)	0.028 (0.17)
Some	0.858 (0.35)	0.844 (0.36)
More	0.707 (0.45)	0.686 (0.46)
Alot	0.586 (0.49)	0.577 (0.49)
Sample size	20008	18101