

**“Heterogeneous Effects of College on Family Formation Patterns among Women”**

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Educational attainment is a significant predictor of women’s family formation patterns (Becker 1991; Rindfuss, Bumpass, and St. John 1980; Rindfuss, Morgan, and Offut 1996) and labor force participation (Bianchi 1995). Overall, education delays family formation and increases participation in the labor force. While highly educated women have postponed both marriage and parenthood in recent decades, less-educated women have postponed marriage more than parenthood. As a result, non-marital births have risen dramatically among less-educated women relative to highly educated women. Despite a substantial literature on the effects of education on family formation patterns among women, few studies evaluate potential heterogeneity in these effects. Women’s significantly increasing level of educational attainment (Buchman and DiPrete 2006) motivates renewed and careful attention to the impact of education on family formation patterns, particularly among college-educated women who have a low likelihood of college completion. Women at the margin of college completion are those for whom the expansion of higher education exerts its greatest impact.

*Heterogeneity in the Effects of College*

Research on college effects on family patterns has recognized that evaluating the impact of college requires accounting for the nonrandom selection of women who complete college and those who do not. Rindfuss, Bumpass, and St. John (1980), for instance, contend that the observed relationship between education and marriage and fertility is the outcome of a complex, potentially reciprocal causal process. If observed and unobserved factors are correlated both with selection into higher education and with family formation patterns, estimates of the effects of education based on comparisons of marriage and fertility between women with and without higher education will be biased. This bias is conventionally called “selection bias.”

What has not received attention in this literature is that social scientists increasingly recognize two types of selection bias. The first type is due to heterogeneity in preexisting conditions or attributes that are associated with both the treatment condition (educational attainment) and the outcome (family formation), such as career and family aspirations. The second is due to heterogeneity in the effects of education, or systematic differences between women who do and who do not attain a college education in family formation patterns. In the prior literature on the effects of college on family formation among women, homogeneous effects have generally been assumed, i.e. the effect of completing college is the same across different members in the population. A more realistic conceptualization is that there is underlying heterogeneity in the effects of education (Brand and Xie 2007; Card 1999; Heckman, Urzua, and Vytlačil 2006). In other words, women may differ not only in background attributes but also in the effect a college education has upon them.

A simple and straightforward approach to studying population heterogeneity is to find empirical patterns of treatment effects as a function of observed covariates. Some studies that

have recognized heterogeneity in effects of college on women's family formation patterns simply examine the interaction between education and specific covariates that influence the probability of attaining a college education, such as race and class. For instance, a deficit of marriageable men is believed to be especially acute among uneducated blacks, primarily because of a larger sex differential in mortality among blacks and because of the high incarceration and institutionalization rates of black men (South and Lloyd 1992; Wilson 1987). Moreover, women's marriage opportunities are limited by a lack of men with desirable economic characteristics, especially stable employment prospects (Oppenheimer 1988; Wilson 1987; South and Lloyd 1992). As non-marital childbearing is more common under conditions in which there are few marriageable men, Black and Hispanic women and women with disadvantaged social backgrounds, who have a lower likelihood of completing college, have significantly higher risks of non-marital births than white, advantaged women (Morgan and Rindfuss 1999; Upchurch, Lillard, and Panis 2002; Willis 1999; Wu et al. 2001).

Although studies that examine interactions with race and class offer some evidence as to heterogeneity in the effects of education on women's family formation patterns, for the question of comparing returns to college between those who complete college and those who do not the most meaningful interaction is between college completion and the propensity of completing college (Brand and Xie 2007; Heckman, Urzua, and Vytlačil 2006). In the discussion that follows, we ask what predictions we can make as to the interaction between college completion and the propensity of completing college on family patterns.

### *Theories about Heterogeneous Effects of College*

Premised on principles of self-selection and comparative advantage, the human capital thesis is that the most "college worthy" individuals, in the sense of having the highest returns to college, are, rationally, the most likely to select into college (Becker 1964; Carneiro, Heckman, and Vytlačil 2007; Mincer 1974; Willis and Rosen 1979). In terms of earnings, the theory clearly predicts that individuals with the highest propensity for college education have the highest returns. What the human capital theory predicts as to heterogeneous effects of college on family formation patterns among women is less clear. We might speculate that women with higher propensities to complete college secure higher economic returns to college by having lower rates of intermittent labor force participation and lower rates of fertility than women with lower propensities to complete college. Or, we might hypothesize that women with higher propensities to complete college will be more likely to find economically desirable mates, and secure high "returns" to college through assortative mating.

The human capital model is not the only theory that guides research on who benefits most from college. A key theme that emerges from the extremely rich sociological literature on the determinants of college education is that many non-economic factors predict college attainment, as college-going behavior is governed not only by rational choice, but by cultural and social norms and circumstances (Brand and Xie 2007; Coleman 1988). For some persons in socially advantaged positions, college is a culturally expected outcome and thus less exclusively and intentionally linked to economic gain than it is for people in less advantaged groups, for whom college education is a novelty that may well demand economic justification (Boudon 1974). As low-skilled, less-educated workers increasingly face limited labor market prospects, the earnings prospects for college-educated workers from disadvantaged backgrounds had they not attended college is particularly bleak, yielding an acutely significant benefit to obtaining a college degree among these individuals. In other words, sociological research suggests heterogeneity in the

return to a college education such that those individuals with relatively disadvantaged social backgrounds, or those with the lowest probability of completing college, benefit the *most*, rather than the least, from completing college. Brand and Xie (2007) find empirical support for the hypothesis that those individuals least likely to obtain a college education benefit most from college in terms of economic rewards.

What might the sociological literature suggest as to the impact of college on family formation patterns among women? If women with a low probability of completing college have the strongest economic incentive, we would hypothesize women with *lower* propensities to complete college try to secure higher economic returns to college by lower rates of intermittent labor force participation and lower rates of fertility than women with higher propensities to complete college. In fact, prior research has suggested that women from disadvantaged social backgrounds face a limited supply of marriageable men that share their race or social background, as well as their high educational attainment, leading to a lower likelihood that low propensity educated women may marry, or marry men with economic resources sufficient for traditional gender roles within the family (Becker 1991). By contrast, we hypothesize that women from advantaged social backgrounds may be more likely to assume traditional family roles (although at later ages) due to a greater likelihood that they marry and marry men with economic resources sufficient for role-specialization within the family, and that they come from families in which their mothers assumed traditional gender roles. Finally, the effect of college for low propensity women on fertility will be larger than high propensity women due to the counterfactual position – women from disadvantaged social backgrounds in the absence of college degree are the most likely to have early, non-marital births. In summary, just as Brand and Xie (2007) find that individuals with the lowest probability of completing college have the highest economic returns to college, we expect that women with the lowest probability of completing college experience the largest impact of college upon their patterns of family formation.

### *Research Plan*

We utilize an innovative methodological approach to study the heterogeneous effects of college on family outcomes. First, we summarize in estimated propensity scores systematic differences in covariates between women who do and do not attend college and generate balanced propensity score strata (i.e., balanced such that the average value of each covariate between college and non-college women does not differ). Second, we estimate stratum-specific event history models to uncover effects of college education. Third, we examine patterns of effects across propensity score strata using a hierarchical linear model. We conduct a series of auxiliary, sensitivity analyses to aid interpretation of the results, including examination of additional covariates that yield insight into the heterogeneous selection mechanisms into college.

In this study, we utilize the propensity score in identifying heterogeneous treatment effects of college education on women's marriage and fertility patterns. We realize that a focus on heterogeneity in treatment effects by observed covariates is limited, as we overlook heterogeneity in treatment effects due to unobserved variables. Still, without the ignorability assumption, strong parametric or exclusion assumptions are needed about unobservable variables. We do not think that the ignorability assumption is true. Rather, we appreciate that analyses under the ignorability assumption are the most that the data can tell us without additional unverifiable assumptions. We treat the ignorability assumption as provisional and the resultant findings tentative.

We use panel data from the National Longitudinal Survey of Youth 1979 (NLSY). The NLSY is a nationally representative sample of 12,686 respondents who were 14-22 years old when they were first surveyed in 1979. The NLSY consists of three sub-samples: (1) a cross-sectional sample of 6,111 respondents designed to be representative of non-institutionalized civilian 1979 youth; (2) a sample of 5,295 respondents designed to over-sample civilian Hispanic, black and economically disadvantaged 1979 youth; and (3) a sample of 1,280 respondents who were enlisted in the military as of 1978. These individuals were interviewed annually through 1994 and are currently interviewed on a biennial basis. The NLSY has been used extensively for study of access to and the impact of education.

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