Black-White Differences in Educational Reproduction

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Increases in women's schooling represent one of the most fundamental and wide-reaching socioeconomic changes of recent decades. In most developing countries girls have made large gains in primary and secondary schooling, while young women in many industrialized nations are pursuing post-secondary schooling in unprecedented proportions. Indeed, women now outpace men in rates of college completion in the United States, Canada, and much of Europe. In 2004, for example, women received 58% of all bachelor's degrees awarded in the U.S. and this advantage was even larger for some groups, such as black women, who earned 67% of college degrees received by African Americans (Buchmann and DiPrete 2006). Given the important role that educational attainment plays in processes of social, economic, and health stratification, these expansions in American women's schooling have attracted much attention both in the academic literature and in the popular press (Goldin 1992; Fonda and Berryman 2000; Marklein 2005; DiPrete and Buchmann 2006; Buchmann and DiPrete 2006).

Few studies, however, have explored the implications of women's educational gains for intergenerational mobility and educational inequality in future generations. The intergenerational effects of increases in women's schooling are particularly important because parents' education is an important determinant of children's outcomes (Blau and Duncan 1967, Mare 1981). Individuals with more schooling have children who obtain more schooling—a mechanism that transmits and multiplies the advantages of increased educational attainment across generations. As such, education is seen as a fundamental engine of social change, and educational expansion as a boon at both the individual and population level.

But measuring the intergenerational effects of increases in schooling is complicated by the fact that the processes that *create* generations—such as marriage and childbearing—are endogenous to changes in women's schooling. That is, women with different levels of schooling have substantially different patterns of marriage and fertility. Given that schooling is usually completed early in life, increases in women's schooling quite likely change subsequent marriage and fertility choices as well. Any assessment of the intergenerational effects of increasing women's schooling must account for these endogenous population processes that create the very families within which the advantages of schooling will be transmitted (Mare and Maralani 2006, Maralani and Mare 2005). Consider a hyperbolic example, at least for the United States. If women with college degrees bore half as many children as women with only high school completed, then a large increase in college educated women such as the one we have experienced

in the U.S. would greatly decrease the number of children created in the next generation who could benefit from having highly educated mothers. In this case, ignoring differential fertility by education would overstate the intergenerational effects of women's post-secondary gains.

Patterns of family formation differ not only by educational attainment but also by race-ethnicity and across birth cohorts. Here again recent changes in American families underscore the importance of capturing the interplay between stratification and population processes. In recent decades American families have changed in important ways that are closely tied to women's education and race. For both white and black college educated women, the ages at which women marry and have children have increased across cohorts. College educated women in more recent cohorts do not forgo marriage and childbearing, rather they delay it. Women with less schooling, on the other hand, who postpone marriage and childbearing have relatively lower rates of marriage and fertility at older ages (Martin 2004; Rindfuss, Morgan, and Offutt 1996). There has also been substantial growth in the number of single parent families, primarily among women with less schooling and among African Americans (Ellwood and Jencks 2004). These divergent trends in single parenthood by education and race combined with changing levels and timing of marriage and fertility have transformed patterns of family formation across cohorts. Diverging patterns of marriage and childbearing suggest that the intergenerational effects of a given increase in women's schooling might differ for white and black women and across birth cohorts of American women.

The intergenerational effects of increasing women's schooling also depend on where in the educational distribution increases in schooling occur and by how much. Increasing the schooling of women at the bottom of the education distribution by one or two levels may have different intergenerational effects relative to moving women into the highest education categories. Also, if the underlying educational distribution is skewed towards lower levels of schooling, then even modest gains in the highest education categories can result in large proportional changes to the top of the education distribution. As the education distribution shifts up over time, however, exactly the same increase at the top will represent smaller and smaller gains in the proportion at the top of the distribution. As a result, shifting 5% of the population into college does not necessarily represent the same intervention across groups with different starting distributions of schooling.

Taken together, recent gains in women's schooling and diverging patterns of family formation by race-ethnicity, educational status, and birth cohort have important implications for educational inequality across generations but require a different approach to studying intergenerational effects than typically used. Most studies of social stratification and mobility ignore demographic processes and focus primarily on the associations between parents' statuses and children's statuses. This approach, however, is increasingly of limited value especially with regards to educational inequality. As family processes and educational attainment have become, on the one hand, more closely tied and, on the other hand, more differentiated across subgroups, measuring the intergenerational effects of expansions in schooling requires considering both micro-level mechanisms and endogenous population processes.

This paper offers such an analysis for several birth cohorts of American women. I address the following questions: (1) What are the intergenerational effects of increases in women's schooling? (2) Do intergenerational effects differ for black and white women? (3) Do differences in marriage and fertility patterns by educational status and race-ethnicity amplify or dampen the transmission of educational status? The approach combines a model of educational stratification with a demographic model of population renewal and uses a series of simulations to explore the intergenerational effects of expansions in women's schooling for educational attainment in the next generation. I assess the implications of demographic trends such as delayed fertility and marriage, non-marital fertility, and race and cohort differences in these demographic mechanisms on patterns of intergenerational effects.

To preview the results, the intergenerational effects of increases in women's schooling differ for white and black Americans, and differences depend on underlying demographic patterns, transmission processes, and differences in each group's prior education distribution. Given the same perturbation to women's schooling, intergenerational effects are larger for white daughters at the bottom of the education distribution but larger for black daughters at the top of the education distribution. In general, ignoring endogenous demographic pathways understates the intergenerational effects for white Americans and overestimates them for black Americans. Intergenerational effects increase across birth cohorts for both white and black Americans for daughters at the bottom of the education distribution. For daughters with college completed, intergenerational effects are constant across cohorts for whites and decrease across cohorts for black Americans.

How Generations Are Created and Statuses Transmitted

The intergenerational ties between the schooling of parents and children are a central concern in social stratification research. Much of this research shows that children of better educated parents get more schooling than the children of less educated parents (Jencks et al. 1972; Featherman and Hauser 1978; Mare 1981). Although these studies highlight the importance of the intergenerational transmission of educational status, few include the effect of changes in education on the components of the population renewal process when estimating intergenerational effects (for some exceptions see Mare 1997, Mare 2000, Maralani and Mare 2005, Mare and Maralani 2006). Yet patterns of family formation and family structure can benefit or impinge on children in numerous ways. At the micro level, parents' fertility choices determine the number of siblings with whom each child grows up. Fertility timing determines the ages at which women give birth and part of children's exposure to single parent households. Marriage decisions provide the other part of children's exposure to single parent households and determine the education of children's fathers (for marital births). Thus, these demographic mechanisms determine many family characteristics, beyond maternal education, which predict children's outcomes. Children who live with both parents, for example, obtain more schooling than those living with single mothers (McLanahan and Sandefur 1994). Children with older parents also obtain more schooling (Mare and Tzeng 1989) while children with more siblings, especially ones that are near in age, obtain less schooling on average (Blake 1989; Powell and Steelman 1993). Moreover, children of highly educated women are more likely to have a highly educated father, which amplifies the benefits to children (Mare and Maralani 2006).

But these mechanisms may have different effects across subgroups. For example, the effects of some family characteristics differ for blacks and whites. Relative to mother's schooling, father's schooling has a smaller effect on children's schooling for blacks, while for whites, father's schooling has a larger effect (Kane 1994). Similarly, the association between family size and children's schooling is weaker for blacks than for whites (Kuo and Hauser 1995). And the negative effect of non-intact families on children's schooling is consistently smaller for black children (Hauser and Phang 1993). Race-ethnic differences in social mobility are a particularly important area of research because these differences represent a long standing facet of inequality in the United States (Duncan 1968). Historically, blacks have experienced higher

levels of downward mobility and much lower rates of upward income mobility than whites (Hout 1984; Hertz 2005). Black Americans begin life with lower levels of parental socioeconomic status, have lower average occupational standing, and are less able to convert their educational attainment to higher occupational status (Bielby, Hauser and Featherman 1977; Featherman and Hauser 1976; Hout 1984). Thus, differences in patterns of intergenerational transmission by race are an important part of the landscape of social stratification in the United States.

In addition to micro-level processes, differences in family process by education and race operate at the macro-level as well. Education differences in total fertility, for example, are larger within rather than across race groups. Black women with 12 or fewer years of school completed have a higher total fertility rate (TFR) than their white counterparts while black women with 13 or more years completed have a similar TFR to white women at this same level of schooling (Johnson 1979; Yang and Morgan 2003). This means that increasing women's schooling across these education thresholds would predict a larger drop in total fertility for black women than white women. At the macro level, these education differences in total fertility change population composition differentially for black and white Americans. A static regression-based approach to studying intergenerational effects misses this dynamic.

This effort to measure both the direct effects of parents on children as well as those effects that accrue through population processes that are endogenous to parents' characteristics builds on two literatures. It brings together traditional status attainment research that focuses on intergenerational social mobility with formal demographic approaches of population projection that account for differential fertility (Featherman and Hauser 1978; Jencks et al. 1972, Duncan 1966, Mare 1997, Mare 2000, Matras 1967; Mukherjee 1954; Preston 1974, Lam 1986, Preston and Campbell 1993). In this paper, I build on earlier work that developed new methods for estimating the effects of family socioeconomic background on educational attainment using models that account for marriage and fertility and data from Indonesia (Mare and Maralani 2006, Maralani and Mare 2005). The current paper extends this approach to the American context and incorporates the complex demographic patterns of this setting, including delayed marriage, never marrying, non-marital fertility and differences in these demographic patterns by race in measuring the intergenerational effects of increasing women's schooling. I also consider differences by birth cohort, address the concern that some mechanisms may be jointly determined, and check the robustness of the results to assumptions about the marriage market.

Research Design

The research design combines a demographic model of how a generation of women produces a generation of offspring with a stratification model that describes the association between children's schooling and parent's schooling. This approach captures four mechanisms or pathways for intergenerational effects. Each mechanism is summarized by a statistical model. One pathway is the direct association between parents' schooling and children's schooling, which I call the transmission process. This corresponds to the conventional approach often used to assess the effect of parents' statuses on children's statuses. In this model, child's schooling is the dependent variable and mother's and father's schooling are key independent variables. Other covariates in the transmission model include number of siblings, exposure to single parent households, mother's age at child's birth, and mother's birth cohort. I also consider three additional mechanisms, which relate a woman's education to her marriage and fertility experiences: (i) conditional on her education, the probability that a woman will be married at each age from 15 to 62; (ii) conditional on her education, the education of her husband if she marries; and (iii) conditional on her own education, her marital status, and her husband's education if she is married, the probability of having a birth at each age from 15 to 44.

Each of these four mechanisms – transmission, marriage, assortative mating, and fertility – contributes to the total intergenerational effect of increases in women's schooling. Taken together, these mechanisms relate the education distribution of women in one generation to the education distribution of the next generation.[1] In addition to the micro-level effects discussed above, these demographic mechanisms also have macro level effects by determining the number and types of families that are produced in the population from one generation to the next.

The statistical models that describe the relationships between women's education and these pathways of intergenerational effects are estimated using individual level data and control for differences by age and cohort. I estimate each model separately by race. I use the parameter estimates generated by these models to calculate expected probabilities of marriage, fertility, and transmission of educational status. I use these estimates in a series of simulations that compare

[1] For simplicity, I have omitted maternal and child mortality from the current analysis. Although black-white differences in infant mortality are an enduring dimension of inequality in the U.S., previous work suggests that the estimated intergenerational effects that accrue via differences in maternal and child survival are modest, even in a developing country where educational differences mortality are moderately high (Maralani and Mare 2005).

the combined or total effect of changes to women's schooling in the parent generation on the schooling of the next generation. The simulations isolate the effects of various parts of the population renewal process such as marriage or fertility and examine how these processes amplify or dampen the effects of improvements to women's schooling for the next generation.

Formal Model

The ideas described above can be formalized as follows. To begin, assume that schooling is completed before marriage and or first birth and that women can marry whatever kind of men (at least with respect to education) that they or their families choose. For women and children, completed schooling is specified in four discrete but ordered categories: 0-11 years, 12 years, 13-15 years, and 16 or more years. For husbands, completed schooling has three discrete but ordered categories: 0-11 years, 12 years, 13 or more years.[2] Let C_j be the children in the offspring generation with education level *j* and W_i be the number of women in the mother generation with education level *i*. Let $r_{jka|i}$ be the number of children who attain education level *j*, with a father with education level *k*, born at mother's age *a*, per woman who has attained education level *i.* This can be thought of as an intergenerational transmission rate weighted by differential fertility and marriage. I set husbands'/fathers' education (*k)* equal to zero if a woman is not married. Thus, $i = 1, \ldots, 4$; $j = 1, \ldots, 4$; $k = 0, \ldots, 3$. Let age, *a*, range from 15 to 62 in single years. Then,

$$(1) \qquad C_j = \sum_{i=1}^{4} \sum_{k=0}^{3} \sum_{a=15}^{62} r_{jka|i} W_i \ .$$

Given the $r_{jka|i}$ one can compute the expected number of children of education level *j* born to a mother with education level *i*. If one knows the educational distribution of women at a given point in time, then this equation can project the educational distribution of children in the next generation. One can also simulate the change in C_j if the distribution of W_i were modified or if the distribution of W_i differed by cohort or race.

Marriage, fertility, and intergenerational transmission affect the $r_{jka|i}$ as follows:

$$(2) \qquad r_{jka|i} = p^{H}_{k|ai} p^{F}_{kai} p^{T}_{j|kai} ,$$

where the components denote the following:

[2] There are too few African American men with college education, especially in the older birth cohorts, to support the four category version of schooling used for women and children.

- $p^{H}_{k|ai}$ denotes the probability that a woman in the ith education category has a partner in the kth education category when she is age *a.* When *k* equals zero, this is the probability that she is unmarried. When *k* is greater than zero, this is the probability that she is married to a man in the given education category.
- p^{F}_{kai} denotes the probability that a woman in education category *i* who has a husband in category *k* (or who is unmarried if *k*=0) has a birth at each age *a.* p^{F}_{kai} is constrained to zero for ages 45 to 62. The model does not allow for multiple births.
- $p^{T}_{j|kai}$ denotes the probability that a child born to a woman in the ith education category at age *a* with a man in the kth education category (or unmarried if *k*=0) achieves the jth level of schooling.

In this model only women's educational attainment is exogenous. The joint distribution of marital status, husband's schooling, fertility, and offspring's schooling is endogenously determined by women's schooling.

The model specified above is highly flexible. It allows women to delay or forgo marriage and or fertility. Thus, a given change in women's schooling can change the relationships at the individual level as well as at the population level by changing the numbers and types of families that are produced. Specified in single years of age, the model allows age-specific variation in the likelihood of being married as well as marital and nonmarital fertility. It also distinguishes between the ages at which children's parents are married and those in which the mother is unmarried as a result of never marrying, divorce, or widowhood. In this way, the model allows for an accounting of the number of years children are expected to live in a two-parent household from birth through age 18, conditional on women's schooling.

The model also makes some simplifications. It does not include a formal treatment of divorce or remarriage, nor does it distinguish between biological and step fathers. It ignores genetic ties between generations, maternal and child mortality, interracial marriage, and uses a woman's completed education at all ages, rather than the education she actually had at each specific age (see Maralani and Mare 2005 for a formal treatment of mortality in the Indonesian context). While it is possible to include each of these complications in the approach described above, these are omitted here for the sake of simplicity. The current model captures the

mechanisms most sensitive to changes in women's schooling and formalizes the changes that occur via both levels and timing through these mechanisms. Despite these simplifications, the current model goes far beyond the standard approach in specifying a more complete set of pathways between the statuses of parents and those of their children.

The model allows education to affect fertility, but in the U.S., the effect of fertility on schooling has also been of central concern. Although there is much debate about whether or not fertility has a causal effect on completed schooling, there is nonetheless a large literature that focuses on the negative effects of early fertility on educational attainment (Rindfuss, Bumpass, and St. John 1980; Hofferth et al. 2001; see Hoffman 1998 for a review of the controversy). Although the effects of fertility on schooling are important, the approach described here focuses only on the effect of changes in education on future fertility and marriage.

In its simplest form, the model assumes a marriage market in which men's attainments are entirely endogenous to those of women, and women can marry men with whatever level of education they choose. This allows the men's education distribution to change freely in response to changes in the women's education distribution. This assumption may be violated if, for example, there is a policy that subsidizes the schooling of girls but not that of boys. Alternatively, if the women's educational distribution is advantaged relative to men's distribution as is currently the case in the United States, then the marriage market may be constrained in ways not captured by the model. Theories of constrained marriage markets have been especially important in discussions of African American family patterns (Wilson 1987). To examine the sensitivity of the results to assumptions about the marriage market, I also consider a constrained marriage market in which gains in women's schooling are not matched by similar gains in men's schooling. In this hypothetical marriage market, the male education distributions are constrained to the observed sample distributions for white and African American men.

Estimation Method

I estimate the components of equation (2) using three separate statistical models: one for marital status, one for assortative mating, and a joint model of fertility and educational transmission. The first two models estimate the first term in equation (2), $p^{H}_{k|ai}$, in two independent parts: a binary

logit model predicting the probability of being married at each age, and conditional on being married, an ordered logit model predicting the probability of having a husband in each education category. The remaining two terms representing the fertility and transmission processes (p^F_{kai} and $p^T_{j|kai}$) are estimated jointly using a two-equation random effects model with one latent variable and a factor loading. The fertility equation is a binary logit model predicting the probability of a birth at each age (the birth may be marital or nonmarital). The children's schooling equation is an ordered logit model predicting the probability of having a child in each education category. Many sample women have observations in both the fertility and child schooling samples and women with more than one eligible child have multiple observations in the child schooling sample. The fertility and child schooling equations are related in the following way (*a* indexes age, *w* indexes women, *m* indexes different children of the same woman, and μ is a woman-specific random factor):

(3) $\text{Fertility}_{aw} = f(\beta X_{aw}+\mu_{w+}\ \omega_{aw})$,

(4) $\text{Child's Education}_{mw} = g(\gamma Z_{mw} + \lambda\mu_w + \eta_{mw})$,

where $\mu_w \sim N(0, \sigma^2)$; $\omega_{aw,} \perp \eta_{mw} \perp \mu_w$; and $E(\omega_{aw,}) = E(\eta_{mw}) = 0$. β and γ, which are vectors, and σ^2 and λ, which are the variance of the random factor and the factor loading in the transmission equation, are parameters to be estimated. Equations (3) and (4) are estimated simultaneously using maximum likelihood. This joint structure allows for a woman-specific unobserved factor that is shared across women's fertility levels and their children's schooling. This specification allows these processes to be correlated within individual women.

I control for birth cohort and age in all models, and allow all parameters to vary by race in order to capture differences across groups in these demographic processes. Table 1 presents a summary of the statistical models used to compute the components of equation (2). These statistical models describe the relationship between women's schooling and various intergenerational mechanisms, and how these differ for black and white Americans. The goal is not to build a complete behavioral model for each mechanism. Rather, for each model, I use specifications that capture important interactions or nonlinearities and that reproduce the meaningful patterns present in the observed data.

I use predicted probabilities from these statistical models and actual or hypothetical values of observed characteristics of women and their husbands to compute an estimate of $r_{jka|i}$. That is,

$$(5) \qquad \hat{r}_{jka|i} = \hat{p}^{H}_{ka|i}\hat{p}^{F}_{kai}\hat{p}^{T}_{j|kai},$$

where ^ denotes predicted values and all other notation is as defined above. Given the $\hat{r}_{jka|i}$ for each woman in the parent generation, the expected number of persons in the offspring generation who attain education level j is the sum over all women's and husbands' education categories and women's ages, or $\widehat{C}_j = \sum_i \sum_k \sum_a \hat{r}_{jka|i} W_i$. As discussed in further detail below, I compute the $\widehat{C}_j$ under several scenarios that vary with the hypothetical change in the education distribution of the women's generation and which of the effects of women's education on marriage, fertility, and child's schooling (specified in the $\hat{r}_{jka|i}$) are allowed to operate in the simulation.

Data and Empirical Context

The analysis uses the 1968 to 2003 public use waves of the Panel Study of Income Dynamics (PSID). The PSID is a longitudinal survey that began in 1968 with a representative sample of U.S. individuals and their families. For the past three decades, the survey has followed original sample members and all new family members, tracking children from their families of origin to their new households. The survey includes extensive socioeconomic and demographic information and its multigenerational structure is well-suited to the types of models of intergenerational transmission presented above. I exclude the Latino and Immigrant samples from the analyses because these subsamples were observed for substantially fewer years than the original 1968 sample.

Although the PSID offers a unique opportunity to study intergenerational processes in the United States, the data are not without weaknesses. Two important shortcomings include high attrition in the first and second waves (14% and 11.5% respectively) and selective collection of family histories in order to reduce response burdens. As a result, the data include a moderately high amount missing data, and a large number of people who flow into and out of the sample

from one year to the next. Several studies confirm, however, that differential attrition in the PSID is small and that response rates are largely invariant across individual characteristics (Hill 1992). Once weighted with the 1968 sampling weights, the data are generally representative of the original 1968 sampling population.

The analyses use observations from women ages 0 to 49 in the original 1968 PSID household and the children of these women. I form four overlapping samples for estimating the statistical models. Many women contribute information to all four samples, and women observed in only some years or samples are included for the ages they are observed. Table 2 describes the educational attainment distributions and sample sizes of the women (and their husbands and children) used in estimating each statistical model.

The most comprehensive sample is the one used for estimating the probability of being married at each age (marital status sample). This sample includes 3,322 white and 2,734 black women ages 15 to 62. A woman is considered married at a given age if she reports being married at any point during the specified age. The assortative mating sample is a subset of the marital status sample, namely those women who ever married and for whom the PSID recorded husband's education. I use these samples to analyze the probability of being married at each age, and for those who marry and have valid education for their husbands, the probability of marrying a man in each educational category.[3]

The fertility sample is a subset of the marital status sample with valid fertility histories. This sample includes 3,175 white and 2,297 black women.[4] The children's education (transmission) sample is a sample of children who ever resided in a PSID household and who were observed until at least age 25 to capture completed schooling. As with husbands, the PSID does not collect information on the education of children who have never resided in a PSID household. Although these children's births are captured in the fertility histories, their education

[3] For women with multiple marriages (about 18% of women in the marriage sample), I use the education of the man to whom a woman was married for the longest time between her ages 15 and 44 (inclusive). If that man's education is missing, I use the education of the man from her next longest marriage. If an ever-married woman has no husbands who have ever resided in a PSID family, then husband's education is missing for that woman (8% of sample women). Each woman is assigned only one husband, and this husband is the same in both the fertility and transmission sample. The husband does not have to be the biological father of the woman's children, nor does he have to be present when the child is born. If, for example, a woman was married twice between ages 15 and 44, first for 3 years and then for 15, she is recorded as being married for 18 years but has only one husband's education for all married ages, that of the man from the 15-year marriage.

[4] If a woman has more than one birth at a given age, either because of twinning or births that are spaced less than a year apart, these are treated as having one birth at that age (1.4% of all births, N=182).

is only observed if they resided in the household. Children's education is observed for approximately 81% of the children listed in the fertility histories.

As shown in Table 2, the marriage and fertility samples have a more advantaged educational distribution than the transmission sample because these former samples have a larger share of women from more recent birth cohorts. The transmission sample is restricted to women old enough to have at least one child age 25 and older. In general, about one fifth of the sample white women have 0-11 years of schooling, another two fifths have a high school degree, and one fifth have 13-15 years and 16 or more years, respectively. Black sample women are less advantaged educationally. About one third have 0-11 years of education, between 35 and 40% have only a high school degree and about one fifth have some college. Fewer than 10% of the black women in the sample(s) have a college degree or higher. Similarly, their husbands are more educationally disadvantaged than the husbands of white sample women. For both whites and blacks, children have higher educational attainments than their parents, although white children obtain more schooling especially with regards to college completion.

I divide women into three birth cohorts and control for cohort in all models. These cohorts represent women born 1919-1938, 1939-1953 and 1954-1968, or alternatively, women ages 30-49, 15-29 and 0-14, respectively, in the first survey wave in 1968. Appendix Table A1 describes these cohorts and their characteristics in more detail. Because few women in the youngest cohort are old enough to have children who are age 25 and older, I exclude this cohort from the transmission sample entirely. As expected, women's education has been increasing across cohorts for both whites and blacks and marriage and fertility levels have been declining.

Table 3 summarizes the observed distributions of the four outcome variables by women's education. Marriage timing differs substantially by women's education for both whites and blacks. About 65% of white women in the lowest education category are married at age 20 compared to 17% of women in the highest education category. By age 30, however, differences between education groups narrow substantially. At this age, 87% of white women with 0-11 years of schooling are married compared to 78% of white women with college degrees. These patterns are similar for black sample women although the likelihood of being married is lower at all ages and across all education categories. Moreover, at age 30, the gap in the proportion married across education categories disappears for black women.

The distribution of husband's schooling shows positive assortative mating for both white and black Americans, although patterns differ between groups. White women are most likely to marry a man in the same education category. Black women are most likely to marry a man with the same schooling if they have 12 or fewer years of schooling. Black women with 13 or more years tend to marry men with somewhat less schooling. As shown in Table 2, about 34% of black women have 13 or more years of schooling compared to only 25% of their husbands.

Fertility declines monotonically by educational attainment for both whites and blacks. Average number of children ever born is about equal for white and black women with college degrees (about 1.8) while black women with fewer than 12 years of schooling have an average of 3.4 children compared to about 2.9 for similarly educated white women. Children's schooling shows two patterns. First, educational attainment has increased across generations. Second, children whose mothers have more schooling obtain high levels of schooling themselves. These patterns hold true for both groups.

Empirical Results

Parameter Estimates

Appendix Tables A.2 to A.4 present parameter estimates from the multivariate statistical models presented above that describe each of the mechanisms included in the intergenerational process (marital status, assortative mating, fertility and transmission). Figures 1 to 5 summarize the results of these models. Women's, husbands', and children's education are measured in the categories described above. I report robust standard errors for all models and correct for the clustering of multiple observations for the same woman. For each mechanism, I show results separately for the two oldest cohorts (1919-1938 and 1939-1953) to highlight changing patterns over time. The simulations use these two birth cohorts. For simplicity, I describe results only for daughters. There are no meaningful differences in the effects of women's schooling on children's schooling by sex of child.

Figure 1 shows the predicted probability of being married at each age by women's education and race for the highest and lowest education categories. The predicted values for the other education groups fall within these bounds. The figure shows well-known differences in

marriage levels by education and race. In both birth cohorts, white women with less than high school completed are more likely to be married at each age than their black counterparts. For women with a college degree in the 1919-1938 birth cohort, levels of marriage by race are similar until the mid 30s but higher for whites from age 35 onward. By the 1939 birth cohort, marriage levels have declined for both groups although more sharply for black women such that black college educated women have lower predicted probabilities of being married at each age relative to their white counterparts. But highly educated black women continue to have higher likelihoods of being married between ages 25 and 55 than black women with less than high school completed.

Age patterns of marriage are similar across groups. For both black and white women with fewer than 12 years of schooling, the probability of being married rises quickly from age 15 to 20, then peaks and declines slowly. Women with a college degree, in contrast, are much less likely to be married before age 20. Instead, their probabilities of being married rise sharply in their 20s and peak at age 30. These age patterns by educational status are similar across cohorts, despite the decline in the overall likelihood of marriage across cohorts for both groups.

Figure 2 shows predicted patterns of assortative mating by educational attainment. In both cohorts and for both groups, women with more schooling are more likely to marry men who have more schooling. White women are more likely to marry a man with more schooling than black women, and white women with college degrees are much more likely to marry a man with at least some college than are black women. Husbands in the black sample have a more disadvantaged education distribution than wives, which means that opportunities for marrying men with high levels of schooling are more limited for black women in these cohorts. These differences are particularly sharp in the 1919-1938 birth cohort where white women with a college degree have a predicted probability of having a husband with at least some college of about 0.77 compared to 0.26 for black women. Differences narrow in the 1939-1953 birth cohort but are still substantial (.84 versus 0.50). These patterns are similar for women with 13-15 years of schooling as well.

Figure 3 shows age-specific patterns of marital fertility by education for white and black women. Figure 4 shows corresponding patterns for nonmarital fertility. Predicted probabilities of having a marital birth are moderately higher for whites than for blacks across each education

group.[5] Age patterns of fertility are similar across groups. Women in the lowest education categories are more likely to have marital births at earlier ages. After age 25, however, women with more schooling have higher predicted odds of having a marital birth. For women with 0-11 years of schooling, the likelihood of having a marital birth peaks in the early 20s and declines steadily thereafter. For women with 16 or more years of schooling, the likelihood of having a marital birth peaks at later ages. In the 1919-1938 cohort, white women with 13 to 15 years of schooling have the highest predicted probability of having a marital birth at age 25 and those with college degrees have the highest likelihood around age 30. Across both cohorts from age 29 to 44, college educated white women have the highest predicted probabilities of having a birth at each age. Black women show similar patterns except that the probability of having a birth peaks earlier for college educated women and education differences in the probability of having a birth after age 30 are less pronounced. Also, black women with 13 or more years of schooling have lower predicted probabilities of marital fertility in their 30s than their white counterparts. For both whites and blacks, the overall likelihood of having a marital birth at each age declines for college educated women across birth cohorts. For women with less than high school completed, the likelihood of having a marital birth increases across birth cohorts before age 21, but decreases from ages 21 onward.

In contrast to marital fertility, black women have substantially higher predicted probabilities of nonmarital fertility than whites across the different education groups. Age patterns of nonmarital fertility differ across education groups in roughly the same ways as age patterns of marital fertility. For both white and black women in the 1919 birth cohort, the probability of having a nonmarital birth peaks at age 20 for women with 12 or fewer years of schooling and at later ages for those with more schooling. However, those in the lowest education category have the highest likelihood of this type of birth at all ages for both groups. Cohort changes in nonmarital fertility are small for whites but moderately large for black Americans. Relative to the 1919 cohort, black women in the 1939-1953 cohort have higher predicted probabilities of having a nomarital birth at earlier ages and lower likelihoods at ages 25 and older.

[5] Although Figure 3 shows predicted probabilities of marital fertility for the full age range, very few women with a college degree are actually married and having births between ages 15 to 20. These estimates are out of sample predictions that should be interpreted with caution.

Figure 5 shows the relationship between mother's and daughter's education. For both blacks and whites, women with more schooling are more likely to have daughters who complete more schooling. This is especially true for college educated black women whose daughters are more likely than daughters of similarly educated white women to complete college themselves. Black women with some college completed also have higher likelihoods of having daughters with more rather than less schooling relative to their white counterparts. Among women with 12 or fewer years of schooling, white women are more likely to have daughters who complete college than similarly educated black women. For black women, these relationships are stable across cohorts. For white women, *conditional on mother's education*, daughters have lower predicted probabilities of completing at least some college in the 1939 cohort relative to the 1919 cohort. That is, the marginal effect of women's schooling differs across cohorts.[6] For whites, women's education increased across cohorts but children's schooling did not increase as fast as these gains in mother's schooling would have predicted. This translates to a negative coefficient of cohort for whites once mother's schooling is controlled.

Figure 5 holds father's schooling fixed at high school completed. Although not shown here, having a father with more schooling has a larger marginal effect on the likelihood of having children with more schooling for white families. Among whites, each higher education category of fathers is associated with higher predicted probabilities of having a child who obtains more schooling. For black families, the marginal effect of having a father with less than high school versus high school completed is essentially zero and the positive marginal effect of having a father with some college completed is smaller in magnitude than it is for white children.

Two additional aspects of the joint fertility and transmission model that deserve explanation are the estimates for the variance of the latent factor and the factor loading (shown at the end of Appendix Table A.5). The estimated variance for whites is quite small and not statistically significant. Even when multiplied by the relatively large loading in the transmission equation, the resulting effect of the factor is small. This suggests that the correlation between the fertility and transmission processes in the random effects model is small for the white sample. In contrast, the estimated variance of the latent factor is larger in magnitude and statistically

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[6] The model does not specify an interaction between women's schooling and birth cohort, and this interaction term is not significant if included. However, the model's nonlinear form means that, when transformed, predicted probabilities within categories of women's education differ across cohorts.

significant for blacks suggesting that accounting for the correlation between fertility and transmission will have a larger effect for this group of women.

Taken together, these results show that key components of the intergenerational process differ substantially by women's education and race groups. At the micro level, these relationships might suggest higher direct transmission of educational status for highly educated black women relative to their white counterparts. Indeed, if the analysis had no demographic component, we might conclude that having a college educated mother was associated with larger intergenerational gains for black Americans. But as the simulations below will show, these micro relationships are just one component of a more complete set of intergenerational pathways. Conventional estimates of intergenerational effects usually ignore these demographic mechanisms and how they differ across groups. A more complete assessment of the intergenerational effects of women's schooling, however, depends on the interplay of all these processes. The following section incorporates all these mechanisms in estimating the effect of women's schooling on the schooling of the next generation.

Simulations

I assess the effects of increasing women's education on the educational attainment of the next generation through a series of micro simulations. The simulations allow a given change in women's schooling to change both marriage and fertility patterns and transmission probabilities across generations. The simulations use predicted probabilities, which correspond to the components of equation (2), calculated using the parameter estimates shown in Appendix Tables A.2-A.5 and described in the Figures 1-5. Each simulation has two parts: (i) a hypothetical change in women's schooling and (ii) a particular set of demographic mechanisms that are included in assessing intergenerational effects. Each simulation is carried out separately for whites and blacks and for each of the two older birth cohorts (1919-1938 and 1939-1953) using women from the marriage sample (see Appendix Table A.1 for each starting sample size). I inflate these starting samples by a factor of ten to reduce random noise in the simulations. For each simulation, I impose a hypothetical change to the women's education distribution by drawing at random without replacement a subsample equal to 5% of these women and increasing their education to a higher level. For example, to estimate the effect of moving 5% of the 1919-

1938 white sample women from less than high school to 12 years of schooling, I move a random draw of 560 women ((1126*10) * .05) from the 0-11 years education category to the 12 years category. The other 95% of the women retain all their original values. The choice of moving 5% of sample women is somewhat arbitrary. The goal is to choose a level that is large enough to see population level results but still realistic in its scale. As a point of reference, Head Start, a national early childhood intervention program, is approximately of this scale.

The simulations are conducted at the individual level. For each woman, I use predicted probabilities from the statistical models to draw marriage, fertility and transmission statuses at each age. The simulations account for the unobserved heterogeneity component predicted by the joint model of fertility and transmission by drawing an individual random component for each sample woman. This draw is held fixed even when a woman's education and the other endogenous processes are allowed to change. This component allows for correlation between a woman's predicted fertility probabilities and her children's predicted schooling.

I combine these estimates with the remaining assumptions that I want to examine—specifically, whether marriage and fertility are taken into account—to predict the number of children born in each educational category in the subsequent generation. I then form a ratio of the simulated offspring educational distribution to the baseline distribution predicted by the sample women's observed schooling to see how a given simulation increases or decreases the proportion of children in each schooling level, relative to making no changes in women's schooling. Using the ratio of the proportions of daughters in each education category is only one of several options for characterizing the "effect" of a given change in women's schooling. I use this approach to emphasize the change in the relative shape of the distribution, rather than changes in levels in each education category. Although the simulations alter the schooling of exactly 5% of sample women, the size of the *proportional changes* in each education category varies greatly depending on the starting number of women and daughters in each category. I describe each component of the simulations in more detail below.[7]

Changes in Women's Education Distribution. I simulate the "effect" of increases in women's schooling by computing the expected offspring education distribution for each of five actual or hypothetical distributions of women's educational attainment: (i) the education

[7] Moving 5% of the total sample is not the same as moving 5% of women in a given *educational category*. For perturbations at the top of the educational distribution, upgrading the schooling of a number equal to 5% of the sample is a near doubling of the number of women in that education category especially for the 1919-1938 cohort.

distribution of the sample women, as observed; (ii) move 5% of sample women from 0-11 years to 12 years completed; (iii) move 5% of sample women from 12 years to 13-15 years completed; (iv) move 5% of sample women from 13-15 years to 16 or more years completed; and (v) move 5% of sample women from 0-11 years to 16 or more years completed. I then compare the distribution of children's schooling predicted by each perturbed women's education distribution (ii to v) to the distribution of children's schooling predicted by the observed women's education distribution (i). Perturbations (ii) to (iv) shift women's schooling at one particular transition. Perturbation (v) is akin to shifting the entire education distribution upward.

Combinations of Mechanisms. Each simulation is carried out for various combinations of the demographic mechanisms included in equation (2). These demographic mechanisms correspond to the different components of the population renewal process that are endogenous to changes in women's schooling. Conventional estimates of the intergenerational effect of mothers' schooling on offspring's schooling are based on the observed conditional joint distribution of parents' and offspring's schooling. This does not allow changes in women's schooling to alter their marriage or fertility experiences. In terms of the components of equation (2), this suggests that changes in women's schooling will only affect children's schooling through the transmission process—that is, the direct individual level effect of mother's schooling on child's schooling. Given an increase in women's schooling, children gain the benefit of having more educated mothers, but they retain their observed values for father's schooling, number of siblings, the number of years spent living with two parents between birth and age 18, and mother's age at birth. These characteristics are not allowed to change despite the upgrading of women's education. The population level effects are also suppressed. Women cannot change when or whom they marry, forgo marriage or fertility, or change how many children they produce. I call this combination the *"Transmission Only"* combination.

The other mechanisms in equation (2), when they are allowed to vary, modify conventional estimates by taking account of different components of the fertility or marriage processes. For example, the "*Transmission, Fertility, Marriage"* combination allows for micro level changes in mother's education, father's education, mother's age at birth, number of siblings, and the number of years a child lives with two parents from age zero to 18, women's and husband's education in fertility, plus population level effects of differential fertility, childlessness and never marrying. In contrast, the "*Transmission, Fertility Timing, Marriage"*

combination allows for all the same pathways in the preceding combination except that it holds fertility levels (both number of siblings in transmission and macro differences in differential fertility) fixed at the observed levels. The *"Transmission, Marriage"* combination, which allows pathways through marriage but not fertility, allows for changes in mother's and father's education in transmission but no changes through fertility levels or timing at either the micro or macro level. The *"Transmission-Fertility"* combination allows for changes in mother's education in transmission and fertility, number of siblings, mother's age at birth, and the part that fertility timing that contributes to number of years lived with two parents plus population level effects of differential fertility and childlessness. This combination holds husband's/father's education fixed at the observed levels. These five preceding combinations are a subset of the 12 combinations estimated and described in the appendix.

Assumptions about Marriage Markets. In its simplest form, the model described in equations (1) and (2) assumes a simple marriage market, one in which men's attainments increase along with women's attainments, and women can marry whatever man they choose, at least with regards to education. To check the sensitivity of the results to these assumptions, I estimate a set of simulations in which men's schooling is constrained to the observed sample men's schooling distribution and this distribution is not allowed to change when women's schooling is perturbed.[8] When women's schooling increases, this creates a relative shortage of highly educated men in the marriage market. In this case the simulation implements a queue. The education categories are ordered from highest to lowest, and within each education level, women are ordered at random. Women with the highest education level get "first pick" of the highly educated men and these husbands are distributed without replacement. Once all of the highly educated men are matched, the remaining women who would "prefer" to marry a highly educated man must instead take a husband from the next lower education level. If no men remain available at that level either, women must draw from the next lower education category. This queue proceeds from the highest education level to the lowest level until all the women who desire husbands are matched. Although this constrained market is an extreme case, it nonetheless provides a lower bound for the effect of marriage in the presence of highly unmatched educational marriage markets and high assortative mating.

[8] To be technically precise, the men's schooling distribution is constrained to that predicted by drawing from the predicted assortative mating probabilities using the women's baseline education distribution. This produces a distribution that is very close to but not necessarily identical to that of the actual observed sample husbands.

Disentangling Differences in Composition from Differences in Effects. Black-white differences in the intergenerational effects of improvements to women's education occur for two reasons. First, because the two groups of women have different baseline educational distributions a given perturbation results in different proportional changes in the relative numbers of women in the different education categories. Second, the relationship between women's schooling and the components of the intergenerational process differs between groups. Blacks have much higher rates of non-marriage and nonmarital fertility, and lower levels of predicted marital fertility by women's schooling. They also have higher predicted probabilities of having college educated children given highly educated mothers.

In order to assess the relative contribution of each of these parts to the overall pattern of racial differences in intergenerational effects, I also compute simulation results for a third sample of women: the black sample standardized to the education distribution of white women. Standardizing the black women's education distribution produces a more favorable baseline education distribution for husbands as well. In simulations where the marriage market is constrained, the husbands' schooling distribution is constrained to this more favorable baseline. Although this does not provide a full formal decomposition of the relative contributions of levels versus effects, it begins to disentangle differences between blacks and whites in the effects of women's schooling on the marriage, fertility and transmission processes from differences in the relative distribution of women in the different education categories.

Results. Appendix Tables A.5 to A.7 show the full set of simulation results for 12 combinations of mechanisms estimated for daughters for the two older birth cohorts. Tables A.5 and A.6 show results for white and black women using their observed starting education distributions. Table A.7 shows results for the black samples with each cohort's education distribution standardized to the corresponding white distribution. Table 4 summarizes the main findings for the 1939-1953 women's birth cohort for two perturbations to women's schooling: one that moves 5% of the women from 0-11 to 12 years and one that moves 5% of the women from 0-11 years to 16 or more years. Table 4 shows the estimated effects for only the lowest and highest categories of daughter's education (0-11 years and 16 or more years). The results shown in row 1 include the full set of intergenerational pathways specified in the model. This represents the most complete estimate of the intergenerational effects of increasing women's education. Rows 2 to 5 hold one or more demographic pathways fixed. Row 2 eliminates the effect of

differential fertility. Row 3 drops the effect of both differential fertility and changes in fertility timing. Row 4 allows pathways through fertility (both levels and timing) but does not allow changes in marital status or assortative mating. Row 5 ignores all marriage and fertility pathways. As a reference, row 6 shows the results from a simulation that includes no demographic pathways, and uses a stand alone model of transmission not estimated jointly with fertility (model not shown). This replicates a conventional stratification model that ignores any endogenous or correlated demographic mechanisms.[9] Rows 7 to 9 show the same combinations as those described in rows 1 to 3, but under the assumption of a constrained marriage market.

Columns one and two show results for whites for a simulation that moves women from less than high school to high school completed. This shift in white women's schooling for the 1939-1953 birth cohort predicts an 8-10% decrease in the proportion of girls with less than high school completed but very small changes for girls with college completed in the next generation. This perturbation represents a moderate shift in these women's education distribution. It reduces the number of women at the very bottom of the education distribution by about a third, and therefore the proportion of daughters with low levels of schooling, but it does not move women into educational categories that contribute many daughters to the top of the children's education distribution. The different combinations of pathways (rows 1 through 5) suggest that differences in fertility and marriage patterns between these women's education groups (less than high school and high school) do not play a large role in estimates of intergenerational effects. For these categories of daughter's schooling, changes in women's schooling predict similar results regardless of which demographic mechanisms are included. Results are also similar using the conventional independent model of transmission shown in row 6 as the reference.[10]

Columns three and four show results for a more drastic change to women's schooling. In this simulation, 5% of the sample white women are moved from the lowest education category into the highest education category. For this cohort of white women, this represents a more than 20% increase in the number of women with college degrees. Not surprisingly, results are larger at both the bottom and top of the daughters' schooling distribution. Every combination of mechanisms leads to larger reductions in the proportion of daughters with 0-11 years of schooling. The reduction is largest for combinations that allow changes through marriage

[9] This reference model is an independent ordered logit with the covariates shown in Table 1 under "Transmission."
[10] This simulation also predicts a 6% increase in the proportion of daughters with some college completed, a category not show in Table 4, using the full set of pathways (see Appendix Table A.5).

pathways (marital status and husbands' schooling) and the transmission process but ignore the effects that accrue through reductions in fertility levels (18% reduction in rows 2 and 3). In these combinations, women continue to produce as many children as predicted by their observed rather than upgraded educational level. This produces more children who go on to gain the benefits of parents with more schooling compared to combinations that allow for reductions in fertility levels. These positive macro level effects of ignoring differential fertility swamp the disadvantages that accrue at the micro level from having more siblings than predicted by the improvement in women's schooling. Ignoring the effects that accrue through marriage (rows 4, 5, 6) predicts a 15% reduction in daughters at the bottom of the education distribution. Allowing all combination of effects (row 1) predicts a 14% reduction in daughters with 0-11 years of schooling.

This shift in women's schooling also has larger effects for the top of the daughters' education distribution (column 4). Women with college completed are very likely to produce daughters who complete college, and this simulation moves women to that education category. Combinations that ignore the benefits that accrue to children through marriage processes produce the smallest effects (rows 4, 5, 6). These combinations do not account for the fact that increasing women's schooling improves the schooling of children's fathers as well, which amplifies the intergenerational effects of increases to women's schooling. As before, a combination that includes the effects of marriage timing, assortative mating, and fertility timing but ignores the offsetting effects of differential fertility predicts the largest gains in highly educated daughters (10% increase, row 2). Overall, these patterns are similar for both cohorts of white women although intergenerational effects increase across cohorts for daughters with less than high school completed (see Appendix Table A.5). For whites, the main differences across cohorts are produced by widening gaps in differential fertility, upward shifts in the women's baseline education distribution, and changing transmission probabilities within women's education categories (shown in Figure 5). On net, for these cohorts of white women, ignoring all demographic mechanisms would result in an underestimate of intergenerational effects primarily through the mechanism of positive assortative mating.

Columns five to eight show results for black women. For these women, moving 5% of the sample from less than high school to high school completed produces small effects for both the bottom and top of the girls' education distribution. The contribution of the different

demographic mechanisms is also quite small. This shift in women's schooling represents a quite modest improvement to the black women's education distribution. Many women remain in the lower education categories despite the shift. Moreover, unlike white women, black women with high school completed have similar predicted probabilities of having daughters in the lower education categories as women with only 0-11 years completed (see Figure 5). Taken together, this means that this particular perturbation to women's schooling does not translate to much change for the daughter's education distribution for this cohort of black women.

In contrast, moving women from the bottom of the education distribution to the very top predicts reductions of about 10% in the ratio of daughter at the bottom of the education distribution and about 11-16% in daughters at the top of the education distribution (columns 7 and 8). This change in women's schooling produces moderate improvement to the bottom of the daughters' education distribution and substantial improvement to the top of their distribution. Combinations that ignore the offsetting effects of reduced fertility levels produce the largest gains for daughters (rows 2 and 3). These combinations suggest that such an improvement to women's schooling would produce about a 10% decrease in the proportion of daughters with the lowest levels of schooling and about a 15-16% increase in the proportion of daughters with college degrees. Recall the graphs in Figures 3 and 4. In this cohort, college educated black women had substantially lower predicted fertility than women in the lowest education category. That relationship is ignored here and these women are predicted to produce many more daughters than they probably would. Combinations that allow for the offsetting effects of changes in fertility levels predict an 11% increase in the proportion of daughters with college degrees (rows 1 and 4). A combination that ignores both fertility and marriage (row 5) produces similar results to one that includes both these mechanisms (row 1) suggesting that these pathways have offsetting effects for this cohort. A conventional model that ignores any endogenous or correlated demographic mechanisms (row 6) overestimates substantially the intergenerational effects of increases to women's schooling for black women in both this cohort and the 1919-1938 cohort (see Appendix A.6).

As was the case for whites, intergenerational effects increase across cohorts for daughters with less than high school completed for black families as well (see Appendix A.6). For daughters with college completed, in contrast, intergenerational effects decrease across cohorts for blacks while these remained about constant for whites. These cohort differences are produced

by changing fertility patterns by education status and upward shifts in the black women's education distribution. Unlike for whites, the micro relationship between women's schooling and children's schooling (shown in Figure 5) does not differ across cohorts for blacks. Instead, differences in endogenous demographic mechanisms and population composition explain cohort differences in intergenerational effects for black Americans.

Columns 9 to 12 show the results for the black sample women, but with their education standardized to the white women's distribution. This begins to disentangle the relative contribution of differences in baseline education distributions versus differences in the effects of women's schooling on the overall pattern of racial differences in intergenerational effects. Once standardized, the proportion of black women in the bottom education category in this cohort is nearly halved (13.8% versus 25.1%) and the proportion in the highest category more than doubles (24.5% versus 11.1%). This adjustment in the women's education distribution does not change the estimated results for the simulation that moves women from 0-11 years to 12 years of schooling. The effect of this increase in women's schooling has nearly no intergenerational effects for daughters' schooling in either the black sample with the observed or standardized education distribution. Thus, differences in results for this simulation between white and black women are not explained by compositional differences. Rather, for black women in these sample cohorts, marriage, fertility and transmission patterns are similar for women with less than high school and high school completed where as education differences in these demographic processes are larger for their white counterparts.

Differences in baseline education distributions play a larger role when considering the more drastic simulation, which moves 5% of women from less than high school to college completed. When the education distribution of black women is standardized to that of white women, the predicted reductions in the proportion of daughters in the lowest education category are generally larger than those for the unstandardized black sample and closer to the estimates for whites. The exception is for combinations that allow changes in fertility levels (rows 1 and 4). Here, standardization diminishes the effects for girls with 0-11 years of school completed but instead amplifies effects for daughters with 12 years completed (results shown in Appendix A.7). Thus, overall, the predicted intergenerational effects for daughters at the bottom of the education distribution would be generally larger if the black sample women had the education distribution of the white sample women. In contrast, standardization attenuates predicted increases in the

proportion of black daughters at the very top of the education distribution, especially in models that ignore differential fertility. These results tend to fall between the results for whites and the results for black Americans with their observed education distribution. The pattern of the results across combinations, however, is similar to that of the unstandardized blacks because this is largely determined by the relative associations of women's schooling and the various intergenerational pathways rather than the underlying education distributions.

Rows 7 to 9 show results for the three models that include pathways through marriage, but under the constraint that the male education distribution remains fixed at the observed level. Consistent with the patterns described above, constraining women's marriage options attenuates predicted effects more for white than black women because marriage has a larger effect for this group. But while the intergenerational effects of increases to women's schooling are attenuated in these models, they are not eliminated. For the simulation that moves 5% of the white women from the lowest to the highest education category, the combination that includes all pathways predicts a 7% decrease in the proportion of daughters with less than high school completed and a 4% increase in the proportion with college completed (columns 3 and 4, row 7). For black women, constraining the marriage market leaves results largely unchanged for both the observed sample and the standardized sample. Constraining the marriage market also does not change the pattern of results with respect to the different combinations of demographic pathways.

Summary and Conclusion

The intergenerational effects of increases in women's schooling accrue through several mechanisms. In addition to the direct individual benefits to children of having a mother with more schooling, increasing women's schooling changes patterns of family formation and structure in ways that also influence the schooling of children. Some of these effects are at the individual or family level, including changes in the number of siblings a child has or the education of her father. Other effects are at the population level. Given an increase in schooling, some women may forgo marriage and fertility altogether while others may change their marriage or fertility patterns. These changes alter the numbers and types of children that are created at the population level and inform the distribution of schooling across generations. The analyses

described above capture these demographic mechanisms and provide a more complete assessment of the intergenerational effects of increasing women's schooling.

In the United States, patterns of family formation and structure differ greatly by women's education and race. Moreover, the effects of family characteristics on children's schooling differ for white and black children. Understanding black-white differences in the intergenerational effects of increases in women's schooling requires both an accounting of the demographic mechanisms that are endogenous to women's schooling and an understanding of how these processes differ by race. The results show that ignoring all endogenous demographic processes (the conventional independent transmission model) underestimates the predicted intergenerational effects of increasing women's schooling for white Americans and overestimates them for black Americans. For both white and black Americans, the intergenerational benefits of increasing women's schooling increases across birth cohorts for daughters with less than high school completed. In contrast, for daughters with college completed, the benefits of increasing women's schooling are constant across cohorts for whites and decrease across cohorts for blacks. For both groups, shifting up the entire education distribution has larger intergenerational effects than moving women across adjacent educational thresholds (such as from some college to college completed).

For white women, positive assortative mating amplifies the benefits of increases in women's educational attainment. Increases in fathers' schooling predict additional gains in children's schooling above and beyond those predicted by increasing mothers' schooling. In contrast, the effects of fathers' education are not as large for black children. Instead, black children with college educated mothers get an especially large boost to their predicted schooling at the micro level. But highly educated black women have lower fertility than black women with less schooling. Therefore, while at the micro level reductions in fertility translate to fewer siblings (a positive micro level effect), at the macro level reductions in fertility reduce the number of children produced in the population who go on to benefit from having highly educated mothers. These population level effects of differential fertility attenuate the benefits accrued at the micro level. This offset of differential fertility is larger for black Americans because differences in fertility by education are larger for black versus white women.

The simulations show that the starting education distribution of women and where in the distribution women's schooling increases have important implications for both the magnitude of

effects and where in the children's education distribution changes will occur. If the initial women's education distribution is particularly disadvantaged, there are few women at the highest categories. Moving women into this education category, therefore, results in large changes in the offspring generation both because this change amounts to a drastic improvement to women's schooling and because these women are most likely to produce children who will obtain high levels of schooling. Simulations using the black sample women with their baseline education distributions standardized to that of white women clarify this point. The predicted intergenerational effects for this standardized group are closer to those estimated for white women than that of the black sample with their observed education distribution.

Simulating the marriage market in a detailed way is a complex task that requires a two-sex model rather than the one-sex model employed here as well as computing the market's equilibrium. Although that task is beyond the scope of this paper, the analyses above check the robustness of the results to assumptions about the marriage market by asking how these might change under the extreme assumption that men's schooling does not improve at all for a given increase in women's schooling. Constraining the marriage market in this way attenuates results for white women, has nearly no effect for black women, and generally reproduces the pattern of results found in the unconstrained marriage market. The results also suggest that a more realistic specification of the marriage market, which likely falls somewhere between the simple and extreme assumptions tested here, might widen the gap in the predicted intergenerational effects of increasing women's schooling by predicting higher intergenerational effects for black rather than white Americans for the top of the daughter's schooling distribution, at least for these sample cohorts.

Although the analyses described above employ a complex model of intergenerational effects that incorporates many key family mechanisms usually ignored in conventional analyses, the model also makes important simplifications that should temper our interpretation of the results. These simplifications include ignoring genetic ties between parents and children, ignoring differential mortality, and assuming that the marriage process is independent of the fertility and transmission processes. Ignoring genetic ties between parents and children is likely to overstate the estimated micro-level effect of mother's education on child's education (transmission process). But the results above suggest that even in the absence of any direct effect of women's schooling on children's schooling the *intergenerational* effects of increasing

women's schooling accrue through many different pathways and are unlikely to be zero. Ignoring differential mortality is likely to underestimate the benefits of increasing women's schooling. If differential mortality differs by race, then this omission also misses another way in which intergenerational pathways differ for white and black Americans. If the random effects structure used to relate the fertility and transmission processes is misspecified, then the model may not adequately account for the correlated nature of these mechanisms. Finally, all simulation studies ultimately assume that the parameters used are correct and causal, despite judicious caution in the language used to interpret the results. Simulations offer a way to consider counterfactuals not available in the observed data at the risk of using parameters that might be incorrect. The estimated parameters used above reproduce the patterns present in the observed data. Nonetheless, they are potentially biased estimates of the "true" causal parameters and should be interpreted with caution.

Despite these simplifications, the analyses show important features of educational transmission across generations, the intervening role of demographic processes, and how these processes differ for black and white Americans. By comparing results across groups and cohorts, the analyses provide a richer description of intergenerational processes and a more dynamic and complete view of the process of educational stratification. The approach also assesses the effect of recent demographic shifts such as delayed fertility timing, non marital fertility and delayed and or forgone marriage on intergenerational effects. The results show that gains in women's schooling such as those we have experienced in the United States bode well for improving the education of future generations for both white and black Americans.

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Table 1. Summary of Statistical Models Used in Analyses, PSID 1968-2003

Mechanism	Model	Dependent Variable	Specification
Marital Status	Binary Logit	Married (yes/no) in single years, ages 15 to 62	Woman's Education Age Birth Cohort Woman's Education * Age, Cohort * Age, Age in 4 piece spline (knots at 20, 30, 40)
Assortative Mating	Ordered Logit	Husband's education in categories: 0-11, 12, 13+	Woman's Education Birth Cohort
Fertility	Binary Logit estimated jointly with Transmission	Probability have birth at each age from 15 to 44	Woman's Education Age Birth Cohort Husband's Education Data Source dummy Women's Education*Age Cohort*Age Age in 4 piece spline (knots at 20, 25, 30) Latent factor with variance σ^2 (loading normalized to 1)
Transmission (Child's Education)	Ordered Logit estimated jointly with Fertility	Child's education in categories: 0-11, 12, 13-15, 16+	Woman's Education Birth Cohort Husband's Education Mother's Age at Child's birth Number of Siblings Child Sex No. years lived in 2 parent family from ages 0-18 Latent factor with variance σ^2 and loading λ to be estimated

Notes: The Fertility and Transmission models are estimated jointly using a two-equation random effects model with one latent variable and a factor loading estimated by maximum likelihood. See text for details. All models are estimated separately for whites and blacks. Birth cohorts are 1919-38, 1939-53, and 1954-68.

Table 2. Educational Attainment Distributions of Samples Used in Estimation of Statistical Models (Percent), PSID 1968-2003

	Marital Status	Assortative Mating		Fertility		Child's Education		
Educational Attainment	Woman	Woman	Husband	Woman	Husband	Woman	Husband	Children
Whites								
Less than high school (0-11 yrs)	17.0	16.6	21.7	16.3	20.0	18.7	25.2	8.7
High school only (12 yrs)	41.5	42.7	33.9	41.5	31.2	48.1	35.1	34.2
Some college (13-15 yrs)	20.3	20.4	18.6	20.4	17.1	18.8	15.6	25.5
Completed College (16 plus yrs)	21.1	20.4	25.8	21.7	23.8	14.4	23.6	31.6
No Husband					7.9		0.6	
Total	99.9	100.1	100.0	99.9	100.0	100.0	100.1	100.0
# Observations	3,322	2,941		3,175		1,138		2,937
Blacks								
Less than high school (0-11 yrs)	32.7	31.6	37.3	30.1	25.5	38.2	44.7	13.7
High school only (12 yrs)	38.1	34.8	37.9	38.4	26.4	41.9	28.4	42.9
Some college (13-15 yrs)	20.9	23.6	17.7	22.4	12.5	12.4	9.8	30.5
Completed College (16 plus yrs)	8.3	10.0	7.2	9.1	5.1	7.5	4.9	12.9
No Husband					30.4		12.3	
Total	100.0	100.0	100.1	100.0	99.9	100.0	100.1	100.0
# Observations	2,734	1,588		2,297		607		1,844

Notes: Totals do not sum to 100 due to rounding. Data are weighted to adjust for sample design. Husband is defined as the man to whom a woman was married for longest period between ages 15 and 44.

Table 3. Distribution of Outcomes by Women's Educational Attainment, PSID 1968-2003

	Married at age 20	Married at age 30	Husband's Education (%) 0-11	12	13 +	Children Ever Born	Children's Education (%) 0-11	12	13-15	16+
Whites										
Woman's Education:										
0-11 years	64.5	87.2	58.7	31.5	9.8	2.9	24.0	46.9	19.5	9.7
12 years	54.5	87.9	22.5	48.2	29.3	2.5	5.8	38.4	27.5	28.4
13-15 years	40.2	84.1	8.9	25.9	65.2	2.3	3.1	23.2	30.1	43.6
16+ years	17.1	77.6	2.7	13.9	83.5	1.8	1.0	12.0	21.9	65.1
Blacks										
Woman's Education:										
0-11 years	43.7	62.5	68.3	23.7	8.0	3.3	20.3	47.1	24.9	7.7
12 years	36.3	59.1	29.1	49.3	21.6	2.4	8.1	44.0	38.4	9.5
13-15 years	33.5	63.4	18.0	39.9	42.1	2.2	5.7	30.5	40.6	23.2
16+ years	16.6	62.4	13.2	38.0	48.9	1.7	1.6	18.4	14.6	65.4

Notes: Data are weighted to adjust for sample design. Marriage and fertility estimates are based on women observed to age 40 or older. A woman is considered married at a given age if she reports being married at any point during the specified age. Husband is defined as the man to whom a woman was married for the longest period between ages 15 and 44.

Table 4. Ratio of Simulated to Baseline Daughters' Education Distribution for Selected Changes in Women's Education and Combinations of Mechanisms, 1939-1953 Birth Cohort, PSID 1968-2003

	Whites				Blacks				Blacks Standardized			
	Simulation: <12 to 12		Simulation: <12 to 16+		Simulation: <12 to 12		Simulation: <12 to 16+		Simulation: <12 to 12		Simulation: <12 to 16+	
	Daughters' Education				Daughter's Education				Daughter's Education			
	<12	16+	<12	16+	<12	16+	<12	16+	<12	16+	<12	16+
Combinations:					UNCONSTRAINED MARRIAGE MARKET							
1. Transmission, Fertility, Marriage	0.92	1.02	0.86	1.08	0.96	1.02	0.91	1.11	0.99	1.02	0.97	1.09
2. Trans., Fertility Timing, Marriage	0.90	1.02	0.82	1.10	0.97	1.01	0.90	1.16	0.96	1.01	0.86	1.11
3. Trans., Marriage	0.90	1.02	0.82	1.09	0.97	1.01	0.90	1.15	0.96	1.01	0.86	1.10
4. Trans., Fertility	0.90	0.98	0.85	1.05	0.95	1.01	0.91	1.11	0.98	1.02	0.95	1.10
5. Trans. Only	0.92	1.01	0.85	1.05	0.97	1.01	0.90	1.12	0.97	1.01	0.87	1.07
6. Trans. Only (Independent Model)	0.92	1.02	0.85	1.06	0.96	1.01	0.89	1.16	0.97	1.01	0.86	1.12
					CONSTRAINED MARRIAGE MARKET							
7. Trans., Fertility, Marriage	0.97	1.01	0.93	1.04	0.94	1.01	0.94	1.11	0.98	1.01	0.97	1.10
8. Trans., Fertility Timing, Marriage	0.93	1.02	0.88	1.07	0.97	1.01	0.91	1.15	0.96	1.00	0.88	1.10
9. Trans., Marriage	0.93	1.02	0.88	1.07	0.97	1.01	0.91	1.14	0.96	1.00	0.88	1.09

NOTES: See text for description of different combinations and specifics of the constrained marriage market.

Figure 1. Predicted Probability of Being Married by Age, Women's Education, Race, and Birth Cohort Based on Model Shown in Appendix Table A.2, PSID 1968-2003

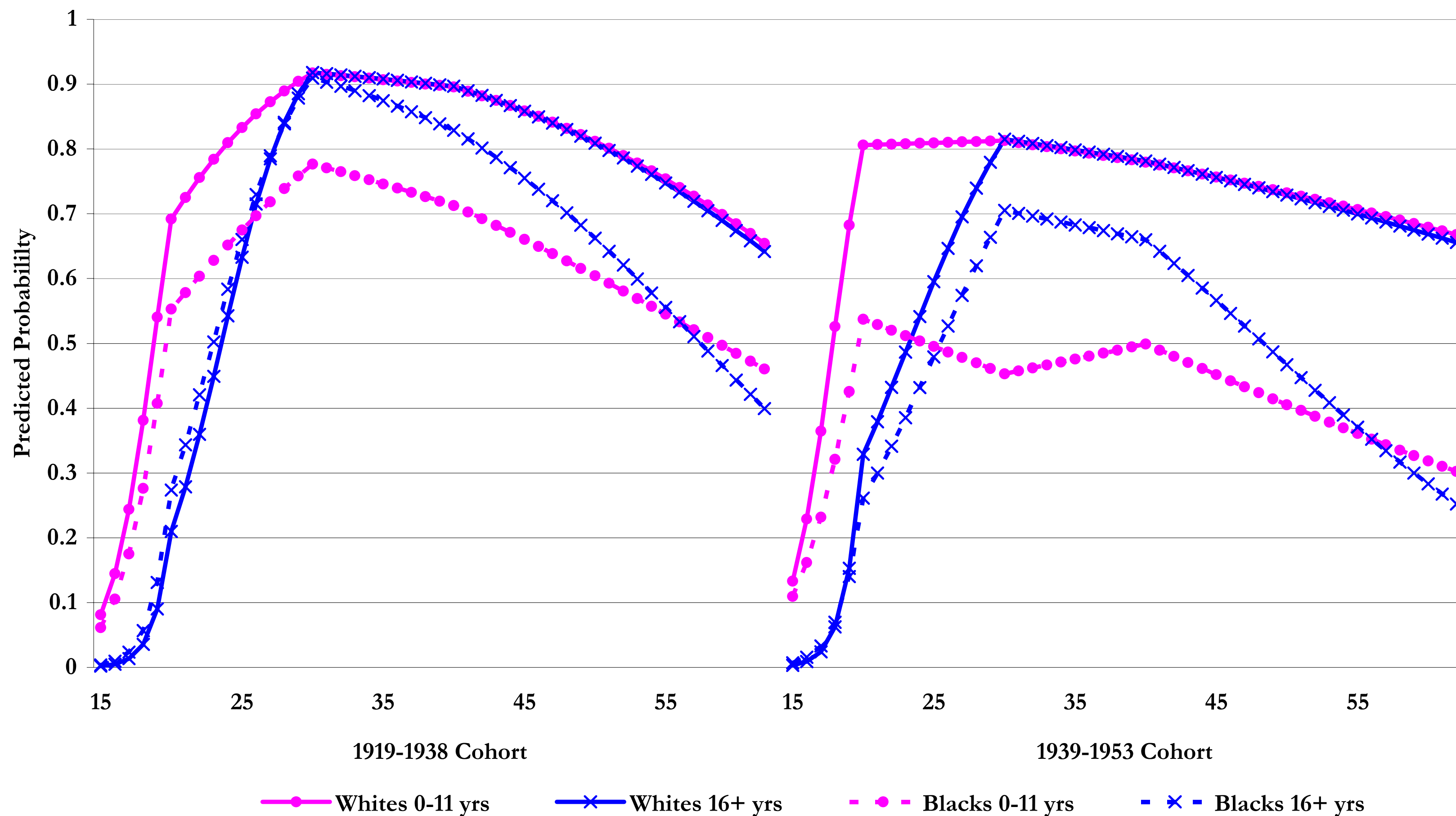


Figure 2. Husband's Predicted Education Given Wife's Education by Race and Birth Cohort Based on Model Shown in Appendix Table A.3, PSID 1968-2003

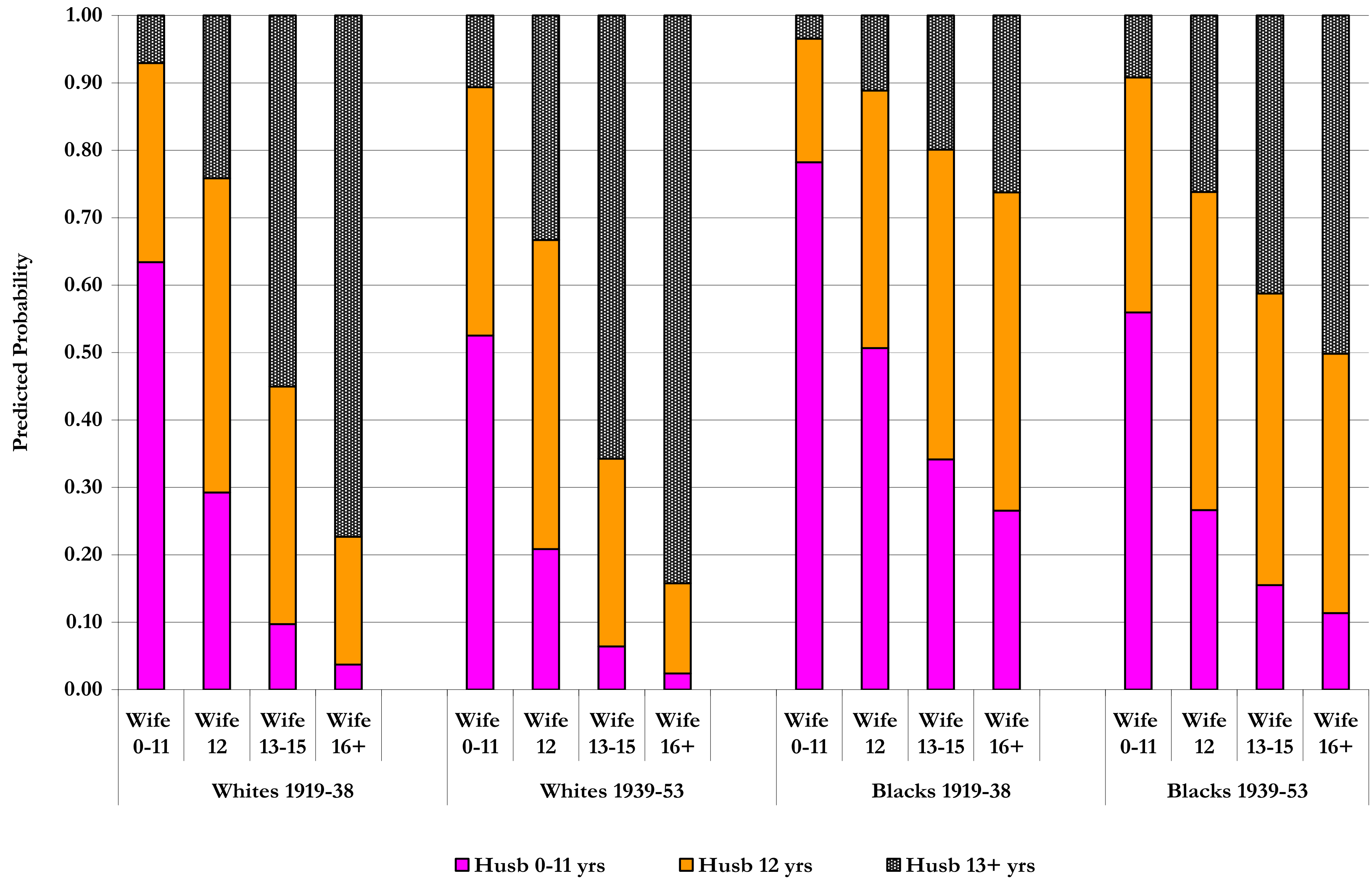


Figure 3. Predicted Probability of Having a Marital Birth by Age, Women's Education, Race, and Birth Cohort Based on a Joint Model of Fertility and Children's Education Shown in Appendix Table A.4 (Husband's Education=12 years), PSID 1968-2003

Figure 4. Predicted Probability of Having a Nonmarital Birth by Age, Women's Education, Race, and Birth Cohort Based on a Joint Model of Fertility and Children's Education Shown in Appendix Table A.4, PSID 1968-2003

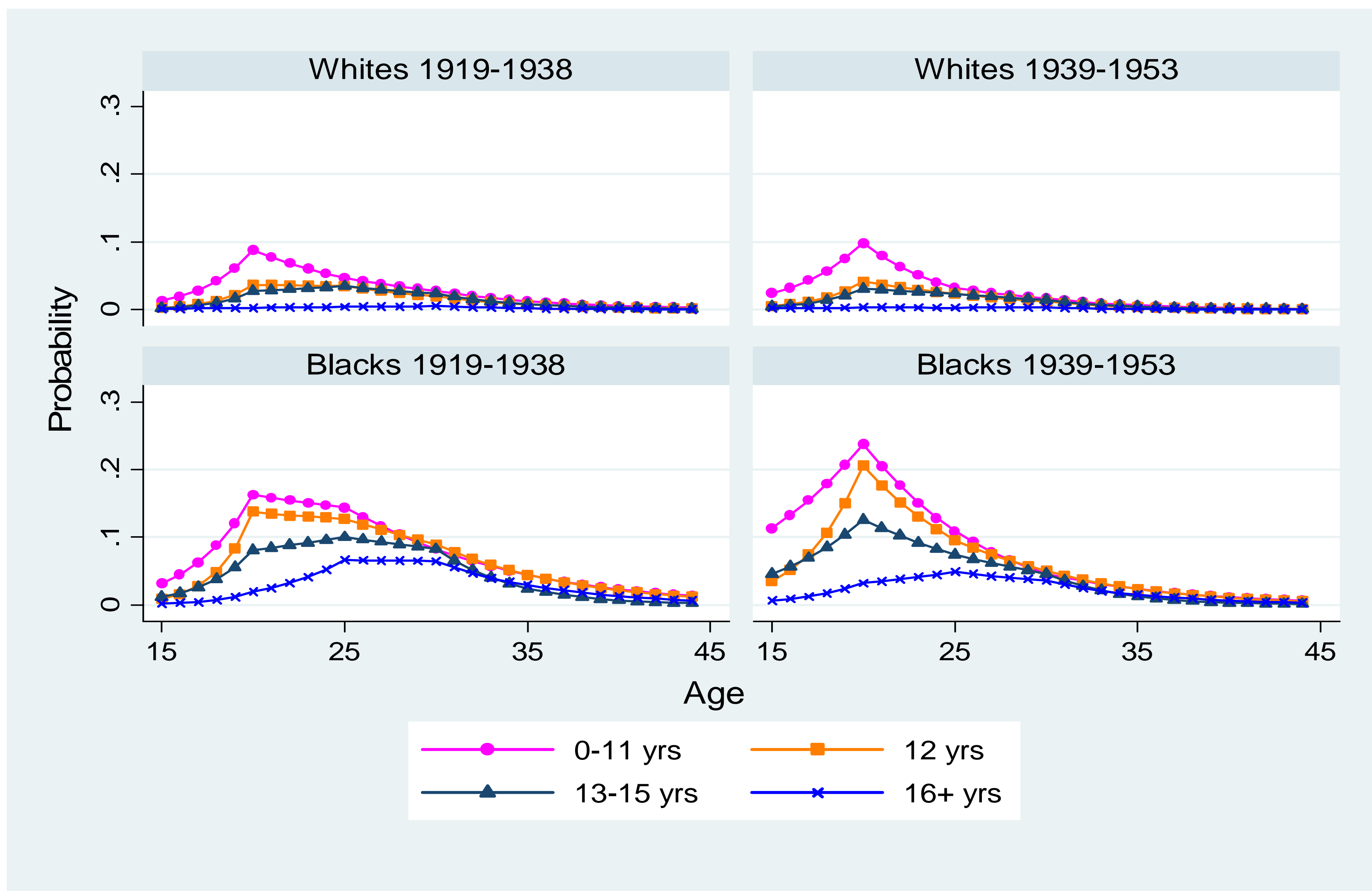
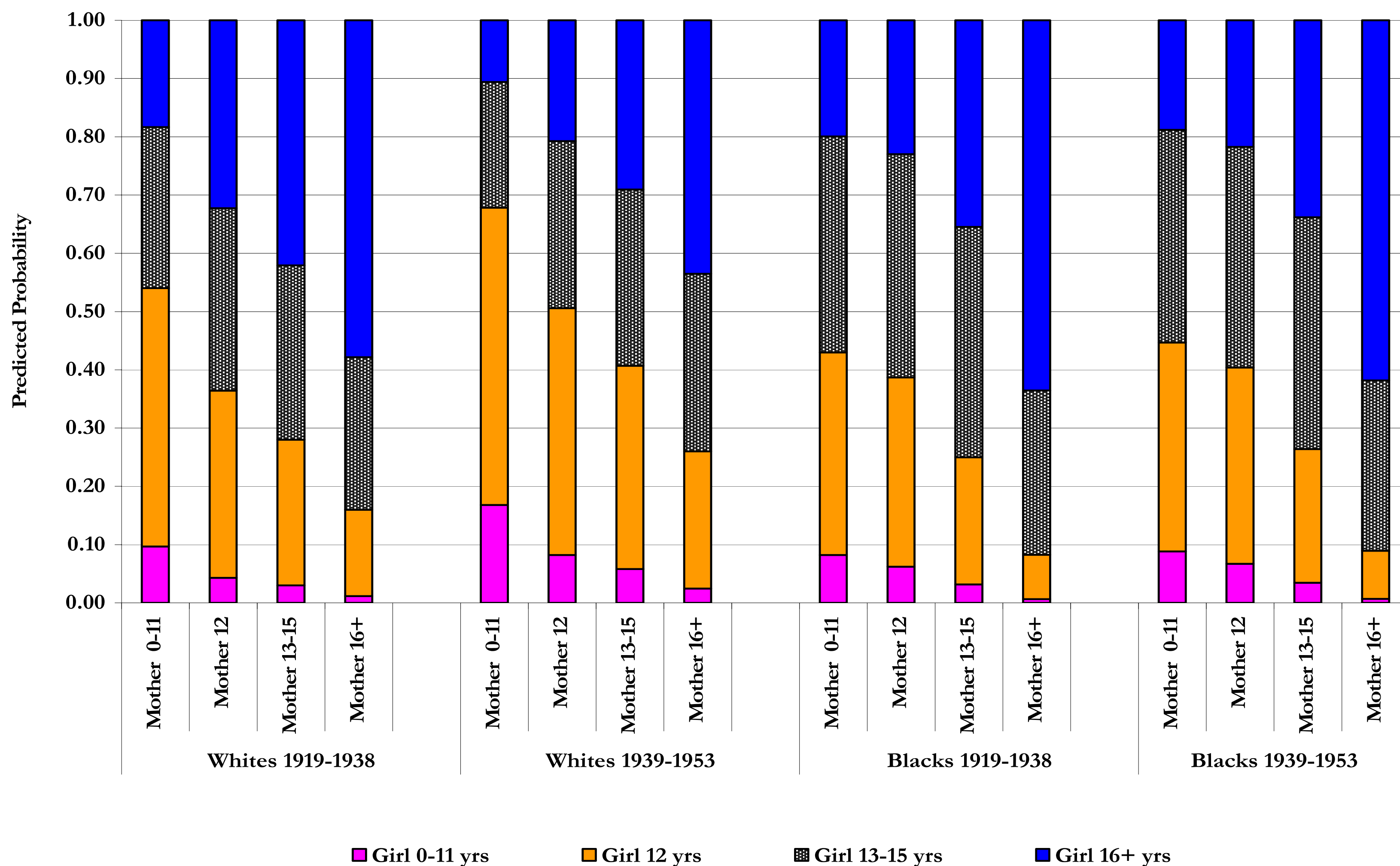


Figure 5. Daughter's Predicted Education Given Mother's Education by Race and Birth Cohort Based on a Joint Model of Fertility and Children's Education Shown in Appendix Table A.4 (Father's ed.=12 yrs; Siblings=2; No. yrs lived with 2 parents=19 yrs; Mom age at birth=25), PSID 1968-2003



Appendix Table A.1. Cohort Summaries, PSID 1968-2003

	Cohort 1	Cohort 2	Cohort 3
Birth Year	1919-1938	1939-1953	1954-1968
Age in 1968	30-49	15-29	0-14
Age in 2003	65-84	50-64	35-49
Whites			
Education (%)			
0-11 years	28.0	13.8	8.7
12 years	47.8	40.5	35.9
13-15 years	12.6	21.2	27.7
16 plus years	11.7	24.5	27.8
# Women in Marriage Sample	1126	1111	1085
# Children ever born	2.8	2.2	1.9
Blacks			
Education (%)			
0-11 years	55.4	25.1	21.1
12 years	29.8	44.0	39.9
13-15 years	9.9	19.8	30.2
16 plus years	4.8	11.1	8.8
# Women in Marriage Sample	727	816	1191
# Children ever born	3.1	2.5	2.2

Notes: Data are weighted to adjust for oversampling and attrition.

Appendix Table A.2. Parameter Estimates for Binary Logit Model Predicting Marital Status, PSID 1968-2003

Dependent variable: Married (0/1)	Whites			Blacks		
	β	SE	z	β	SE	z
Age (spline)						
1. 15-20	1.012	0.04	26.4	0.744	0.08	9.2
2. 20-30	0.249	0.02	15.3	0.163	0.03	6.4
3. 30-40	-0.057	0.01	-3.8	-0.113	0.02	-4.8
4. 40 plus	-0.054	0.01	-7.0	-0.032	0.02	-1.9
Woman's Education						
1. 0-11 years	7.696	0.76	10.1	3.245	1.51	2.1
2. 12 years (reference)						
3. 13-15 years	-1.390	1.11	-1.3	-3.720	1.97	-1.9
4. 16 plus years	-1.201	1.76	-0.7	-4.482	3.14	-1.4
Woman's Ed 1 * Age (spline)						
Woman's Ed 1 * Age 1	-0.365	0.04	-8.9	-0.156	0.08	-2.0
Woman's Ed 1 * Age 2	-0.089	0.02	-5.0	-0.060	0.02	-2.5
Woman's Ed 1 * Age 3	0.032	0.02	1.7	0.079	0.02	3.6
Woman's Ed 1 * Age 4	-0.015	0.01	-1.3	-0.016	0.02	-0.9
Woman's Ed 3 * Age (spline)						
Woman's Ed 3 * Age 1	0.039	0.06	0.7	0.206	0.10	2.0
Woman's Ed 3 * Age 2	0.057	0.02	3.3	0.013	0.03	0.5
Woman's Ed 3 * Age 3	-0.024	0.02	-1.3	0.023	0.03	0.8
Woman's Ed 3 * Age 4	-0.001	0.01	-0.1	-0.017	0.03	-0.7
Woman's Ed 4 * Age (spline)						
Woman's Ed 4 * Age 1	-0.027	0.09	-0.3	0.171	0.16	1.1
Woman's Ed 4 * Age 2	0.125	0.02	7.5	0.165	0.04	4.0
Woman's Ed 4 * Age 3	0.032	0.02	2.0	0.039	0.04	1.0
Woman's Ed 4 * Age 4	-0.018	0.01	-1.5	-0.058	0.04	-1.6
Cohort						
1. 1919-1938 (ref.)						
2. 1939-1953	0.360	0.81	0.5	2.720	1.57	1.7
3. 1954-1968	2.082	0.83	2.5	0.987	1.54	0.6
Cohort 2 * Age (spline)						
Cohort 2 * Age 1	0.013	0.04	0.3	-0.139	0.08	-1.7
Cohort 2 * Age 2	-0.155	0.02	-8.7	-0.137	0.03	-5.1
Cohort 2 * Age 3	0.005	0.02	0.3	0.052	0.02	2.1
Cohort 2 * Age 4	0.043	0.01	4.4	0.011	0.02	0.6
Cohort 3 * Age (spline)						
Cohort 3 * Age 1	-0.122	0.04	-2.8	-0.119	0.08	-1.5
Cohort 3 * Age 2	-0.112	0.02	-6.3	-0.090	0.03	-3.2
Cohort 3 * Age 3	0.059	0.02	3.4	0.057	0.03	2.2
Cohort 3 * Age 4	0.048	0.03	1.8	0.096	0.03	2.8
Constant	-19.822	0.74	-26.9	-14.793	1.57	-9.4
# Observations (person years)		112881			82181	
Log Likelihood		-51776			-47805	

Notes: Data are weighted to adjust for sample design. Standard errors are adjusted for clustering.

Appendix Table A3. Parameter Estimates for Model Predicting Husband and Education (Ordered Logit), PSID 1968-2003

Dependent variable: Husband's Education (0-11 yrs, 12 yrs, 13 plus yrs)

	Whites			Blacks		
	β	SE	*z*	*β*	SE	*z*
Woman's Education						
1. 0-11 years	-1.434	0.11	-13.0	-1.252	0.24	-5.1
2. 12 years (reference)						
3. 13-15 years	1.346	0.11	12.3	0.684	0.23	3.0
4. 16 plus years	2.369	0.13	18.3	1.044	0.34	3.1
Cohort						
1. 1919-1938 (ref.)						
2. Born 1939-1953	0.449	0.09	4.7	1.040	0.29	3.6
3. Born 1954-1968	0.546	0.10	5.6	1.226	0.29	4.2
Cut Points						
Cut 1	-0.884	0.08		0.027	0.28	
Cut 2	1.144	0.08		2.077	0.32	
# Observations	2941			1588		
Log Likelihood		-2558			-1481	

Notes: Data are weighted to adjust for sample design. Standard errors are adjusted for clustering.

Appendix Table A4. Parameter Estimates for Model of Predicting Fertility (Binary Logit) and Children's Schooling (Ordered Logit) Using Two-Equation Random Effects Model of Fertility and Children's Schooling, PSID 1968-2003

	Whites			Blacks		
Dependent variable: Birth (0/1)	β	SE	z	β	SE	z
Age (spline)						
1. 15-20	0.533	0.05	9.9	0.589	0.09	6.4
2. 20-25	-0.014	0.02	-0.7	-0.028	0.07	-0.4
3. 25-30	-0.123	0.02	-6.9	-0.088	0.05	-1.7
4. 30 plus	-0.193	0.01	-15.1	-0.157	0.03	-5.2
Woman's Education						
1. 0-11 years	3.105	1.06	2.9	4.617	1.24	3.7
2. 12 years (reference)						
3. 13-15 years	0.086	1.51	0.1	3.381	1.74	1.9
4. 16 plus years	6.839	2.07	3.3	0.165	2.62	0.1
Woman's Ed 1 * Age (spline)						
Woman's Ed 1 * Age 1	-0.133	0.05	-2.4	-0.218	0.07	-3.3
Woman's Ed 1 * Age 2	-0.126	0.03	-4.7	-0.006	0.06	-0.1
Woman's Ed 1 * Age 3	0.010	0.03	0.3	-0.051	0.05	-1.0
Woman's Ed 1 * Age 4	0.020	0.02	1.0	0.012	0.03	0.4
Woman's Ed 3 * Age (spline)						
Woman's Ed 3 * Age 1	-0.019	0.08	-0.3	-0.183	0.09	-2.0
Woman's Ed 3 * Age 2	0.060	0.03	2.0	0.074	0.06	1.3
Woman's Ed 3 * Age 3	0.042	0.03	1.6	0.038	0.06	0.6
Woman's Ed 3 * Age 4	-0.028	0.02	-1.3	-0.108	0.04	-2.5
Woman's Ed 4 * Age (spline)						
Woman's Ed 4 * Age 1	-0.381	0.11	-3.6	-0.078	0.13	-0.6
Woman's Ed 4 * Age 2	0.106	0.04	2.5	0.286	0.10	2.9
Woman's Ed 4 * Age 3	0.176	0.03	6.2	0.079	0.09	0.9
Woman's Ed 4 * Age 4	-0.020	0.02	-1.2	-0.012	0.04	-0.3

Continues on next page

Appendix Table A4. Parameter Estimates for Model of Predicting Fertility (Binary Logit) and Children's Schooling (Ordered Logit) Using Two-Equation Random Effects Model of Fertility and Children's Schooling, PSID 1968-2003, Continued

Dependent variable: Birth (0/1) *continued*	Whites			Blacks		
	β	SE	z	β	SE	z
Husband's Education						
0. No husband	-2.154	0.12	-17.5	-0.394	0.13	-3.1
1. 0-11 years	0.089	0.04	2.0	0.280	0.12	2.4
2. 12 years (reference)						
3. 13 plus years	0.080	0.04	2.1	0.146	0.11	1.3
Cohort						
1. Born 1919-1938 (reference)						
2. Born 1939-1953	2.145	0.97	2.2	4.127	1.58	2.6
3. Born 1954-1968	4.537	1.00	4.5	5.749	1.49	3.9
Cohort 2 * Age (spline)						
Cohort 2 * Age 1	-0.101	0.05	-2.0	-0.181	0.08	-2.1
Cohort 2 * Age 2	-0.106	0.02	-4.2	-0.170	0.06	-2.6
Cohort 2 * Age 3	-0.024	0.02	-1.0	-0.060	0.06	-1.1
Cohort 2 * Age 4	-0.035	0.02	-1.9	-0.009	0.03	-0.3
Cohort 3 * Age (spline)						
Cohort 3 * Age 1	-0.234	0.05	-4.4	-0.282	0.08	-3.5
Cohort 3 * Age 2	-0.071	0.03	-2.5	-0.076	0.06	-1.2
Cohort 3 * Age 3	0.036	0.02	1.5	-0.031	0.05	-0.6
Cohort 3 * Age 4	-0.010	0.02	-0.6	-0.036	0.04	-1.0
Data Source (binary)	-1.076	0.07	-14.5	-1.386	0.14	-10.0
Woman's Ed * No Husband						
Woman's Ed 1 * No Husb	0.643	0.18	3.5	0.060	0.17	0.4
Woman's Ed 3 * No Husb	-0.060	0.20	-0.3	-0.430	0.22	-2.0
Woman's Ed 4 * No Husb	-2.050	0.34	-6.1	-0.805	0.44	-1.8
Constant (Fertility Equation)	-11.696	1.06	-11.1	-13.189	1.75	-7.5

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Appendix Table A4. Parameter Estimates for Model of Predicting Fertility (Binary Logit) and Children's Schooling (Ordered Logit) Using Two-Equation Random Effects Model of Fertility and Children's Schooling, PSID 1968-2003, Continued

Dependent variable: Child's Education (0-11 yrs, 12 yrs, 13-15 yrs, 16 plus yrs) *continued*	Whites			Blacks		
	β	SE	z	β	SE	z
Woman's Education						
1. 0-11 years	-0.860	0.17	-4.9	-0.262	0.25	-1.0
2. 12 years (reference)						
3. 13-15 years	0.590	0.17	3.5	0.723	0.43	1.7
4. 16 plus years	1.340	0.20	6.8	2.332	0.97	2.4
Husband's Education						
0. No Husband	-1.434	0.74	-1.9	-0.494	0.38	-1.3
1. 0-11 years	-0.549	0.16	-3.5	-0.005	0.32	-0.01
2. 12 years (reference)						
3. 13 plus years	1.270	0.16	8.1	0.549	0.44	1.3
Number of siblings	-0.481	0.06	-7.4	-0.468	0.07	-7.2
No. yrs lived with 2 parents ages 0-18						
0-10 yrs (1=yes)	-0.647	0.28	-2.3	-1.191	0.32	-3.7
11-18 yrs (1=yes)	-0.512	0.16	-3.1	-0.384	0.24	-1.6
19 yrs (reference)						
Mother's age at child's birth	0.001	0.01	.11	0.002	0.02	0.14
Child Sex (Female=1)	0.160	0.09	1.8	0.583	0.17	3.5
Cohort						
1. Born 1919-1938 (reference)						
2. Born 1939-1953	-0.777	0.14	-5.4	-0.096	0.27	-0.35
Cut Points						
Cut 1	-4.603	0.39		-3.742	0.53	
Cut 2	-1.510	0.36		-0.915	0.55	
Cut 3	0.228	0.36		1.138	0.59	
σ^2 (variance of latent factor)	0.038	0.021		0.302	0.051	
λ (loading for random factor)	6.968	1.892		2.636	0.394	
# level one units		87905			58693	
# level two units (women)		3178			2305	
Log Likelihood		-483240.9			-67568.4	

Notes: Fertility observations are person years. Data are weighted to adjust for sample design. Standard errors are adjusted for clustering.

Appendix Table A5. Ratios of Simulated to Observed Daughters' Education Distributions for a Given Change in Women's Schooling for White Women by Birth Cohort, PSID 1968-2003

	Whites 1919-1938				Whites 1939-1953			
	Daughters' Education				Daughters' Education			
	0-11 yrs	12 yrs	13-15 yrs	16+ yrs	0-11 yrs	12 yrs	13-15 yrs	16+ yrs
Simulation	Transmission, Fertility, Marriage							
0-11 to 12 yrs	0.93	0.99	1.03	1.02	0.92	0.96	1.06	1.02
12 yrs to 13-15 yrs	0.99	0.97	1.03	1.03	1.00	0.98	1.01	1.01
13-15 yrs to 16+ yrs	1.02	0.98	1.01	1.01	0.99	0.97	1.03	1.01
0-11 yrs to 16+ yrs	0.92	0.94	1.03	1.08	0.86	0.95	1.04	1.08
	Transmission, Fertility Timing, Marriage							
0-11 to 12 yrs	0.94	0.99	1.01	1.02	0.90	0.99	1.03	1.02
12 yrs to 13-15 yrs	0.98	0.99	1.00	1.03	0.97	0.98	1.02	1.03
13-15 yrs to 16+ yrs	0.99	0.99	0.99	1.03	0.99	0.98	0.99	1.03
0-11 yrs to 16+ yrs	0.90	0.95	1.02	1.09	0.82	0.94	1.04	1.10
	Transmission, Marriage							
0-11 to 12 yrs	0.94	0.99	1.01	1.03	0.90	0.99	1.03	1.02
12 yrs to 13-15 yrs	0.98	0.99	1.00	1.03	0.97	0.98	1.02	1.03
13-15 yrs to 16+ yrs	0.99	0.99	0.99	1.03	0.99	0.98	0.99	1.03
0-11 yrs to 16+ yrs	0.90	0.95	1.02	1.09	0.82	0.94	1.04	1.09
	Transmission, Fertility							
0-11 to 12 yrs	0.92	0.98	1.05	1.01	0.90	0.99	1.07	0.98
12 yrs to 13-15 yrs	1.01	0.98	1.00	1.03	0.98	0.99	1.00	1.01
13-15 yrs to 16+ yrs	1.00	0.98	1.02	1.01	0.98	0.99	1.03	0.99
0-11 yrs to 16+ yrs	0.90	0.96	1.05	1.05	0.85	0.98	1.03	1.05
	Transmission, Fertility, Assortative Mating							
0-11 to 12 yrs	0.92	0.98	1.06	1.00	0.88	0.99	1.05	1.02
12 yrs to 13-15 yrs	0.99	0.97	1.04	1.02	0.95	0.99	1.02	1.02
13-15 yrs to 16+ yrs	1.01	0.97	1.01	1.03	0.99	0.98	1.03	1.00
0-11 yrs to 16+ yrs	0.87	0.95	1.04	1.09	0.86	0.93	1.05	1.09
	Transmission, Fertility, Marital Status							
0-11 to 12 yrs	0.95	0.98	1.04	1.01	0.95	0.98	1.05	1.00
12 yrs to 13-15 yrs	0.98	0.99	1.01	1.01	0.96	1.01	0.98	1.01
13-15 yrs to 16+ yrs	1.02	0.98	1.02	1.01	0.99	0.99	1.01	1.01
0-11 yrs to 16+ yrs	0.94	0.96	1.05	1.04	0.87	0.97	1.03	1.06

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Appendix Table A.5 Continued. Ratios of Simulated to Observed Daughters' Education Distributions for Given Change in Women's Schooling for White Women by Birth Cohort, PSID 1968-2003

	Whites 1919-1938				Whites 1939-1953			
	Daughters' Education				Daughters' Education			
	0-11 yrs	12 yrs	13-15 yrs	16+ yrs	0-11 yrs	12 yrs	13-15 yrs	16+ yrs
Simulation	Transmission, Fertility Timing, Assortative Mating							
0-11 to 12 yrs	0.94	0.99	1.01	1.02	0.90	0.99	1.03	1.02
12 yrs to 13-15 yrs	0.98	0.99	1.00	1.03	0.97	0.98	1.02	1.03
13-15 yrs to 16+ yrs	0.99	0.99	0.99	1.03	0.99	0.98	0.99	1.03
0-11 yrs to 16+ yrs	0.90	0.95	1.02	1.09	0.82	0.94	1.04	1.10
	Transmission, Fertility Timing, Marital Status							
0-11 to 12 yrs	0.95	1.00	1.01	1.02	0.92	1.00	1.01	1.02
12 yrs to 13-15 yrs	0.98	0.99	1.00	1.01	0.99	0.99	1.01	1.01
13-15 yrs to 16+ yrs	0.99	0.99	0.99	1.02	0.99	0.99	0.99	1.02
0-11 yrs to 16+ yrs	0.91	0.98	1.02	1.05	0.85	0.97	1.05	1.05
	Transmission, Assortative Mating							
0-11 to 12 yrs	0.94	0.99	1.01	1.03	0.90	0.99	1.03	1.02
12 yrs to 13-15 yrs	0.98	0.99	1.00	1.03	0.97	0.98	1.02	1.03
13-15 yrs to 16+ yrs	0.99	0.99	0.99	1.03	0.99	0.98	0.99	1.03
0-11 yrs to 16+ yrs	0.90	0.95	1.02	1.09	0.82	0.94	1.04	1.10
	Transmission, Marital Status							
0-11 to 12 yrs	0.95	1.00	1.01	1.02	0.92	1.00	1.01	1.02
12 yrs to 13-15 yrs	0.99	0.99	1.00	1.01	0.99	0.99	1.01	1.01
13-15 yrs to 16+ yrs	0.99	0.99	0.99	1.02	0.99	0.99	1.00	1.02
0-11 yrs to 16+ yrs	0.91	0.98	1.02	1.05	0.85	0.97	1.05	1.05
	Transmission, Fertility Timing							
0-11 to 12 yrs	0.95	1.00	1.01	1.02	0.92	1.00	1.01	1.01
12 yrs to 13-15 yrs	0.98	0.99	1.01	1.01	0.99	0.99	1.01	1.01
13-15 yrs to 16+ yrs	0.99	0.99	0.99	1.02	0.99	0.99	0.99	1.02
0-11 yrs to 16+ yrs	0.91	0.98	1.02	1.05	0.85	0.97	1.05	1.05
	Transmission Only							
0-11 to 12 yrs	0.95	1.00	1.01	1.02	0.92	1.00	1.01	1.01
12 yrs to 13-15 yrs	0.99	0.99	1.00	1.02	0.99	0.99	1.01	1.01
13-15 yrs to 16+ yrs	0.99	0.99	0.99	1.02	0.99	0.99	0.99	1.02
0-11 yrs to 16+ yrs	0.91	0.98	1.02	1.05	0.85	0.97	1.05	1.05

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Appendix Table A5 Continued. Ratios of Simulated to Observed Daughters' Education Distributions for Given Change in Women's Schooling for White Women by Birth Cohort, PSID 1968-2003

	Whites 1919-1938				Whites 1939-1953			
	Daughters' Education				Daughters' Education			
	0-11 yrs	12 yrs	13-15 yrs	16+ yrs	0-11 yrs	12 yrs	13-15 yrs	16+ yrs
Simulation	Transmission, Fertility, Marriage (Constrained)							
0-11 to 12 yrs	0.95	0.99	1.02	1.02	0.97	0.97	1.04	1.01
12 yrs to 13-15 yrs	0.99	0.98	1.01	1.02	0.99	1.00	1.01	1.00
13-15 yrs to 16+ yrs	1.00	1.00	0.99	1.01	1.02	0.97	1.03	1.00
0-11 yrs to 16+ yrs	0.98	0.96	0.99	1.07	0.93	0.96	1.03	1.04
	Transmission, Fertility Timing, Marriage (Constrained)							
0-11 to 12 yrs	0.95	1.00	1.01	1.02	0.93	1.00	1.02	1.02
12 yrs to 13-15 yrs	1.00	0.99	0.99	1.02	1.01	0.98	1.01	1.02
13-15 yrs to 16+ yrs	1.00	0.99	0.98	1.03	1.00	0.99	0.99	1.03
0-11 yrs to 16+ yrs	0.94	0.97	1.01	1.07	0.88	0.96	1.02	1.07
	Transmission, Marriage (Constrained)							
0-11 to 12 yrs	0.95	1.00	1.01	1.02	0.93	1.00	1.02	1.02
12 yrs to 13-15 yrs	1.00	0.99	0.99	1.02	1.01	0.98	1.01	1.02
13-15 yrs to 16+ yrs	1.00	0.99	0.98	1.03	1.00	0.99	0.99	1.03
0-11 yrs to 16+ yrs	0.94	0.97	1.00	1.07	0.88	0.96	1.02	1.07
	Transmission, Fertility, Assortative Mating (Constrained)							
0-11 to 12 yrs	0.95	0.98	1.04	1.00	0.92	0.99	1.03	1.02
12 yrs to 13-15 yrs	1.01	0.98	1.01	1.01	1.01	1.00	0.97	1.02
13-15 yrs to 16+ yrs	1.01	0.98	1.02	1.01	1.00	0.98	1.01	1.02
0-11 yrs to 16+ yrs	0.95	0.96	1.04	1.05	0.90	0.97	1.05	1.03
	Transmission, Fertility Timing, Assortative Mating (Constrained)							
0-11 to 12 yrs	0.95	1.00	1.01	1.02	0.93	1.00	1.02	1.02
12 yrs to 13-15 yrs	1.00	0.99	0.99	1.02	1.00	0.98	1.00	1.02
13-15 yrs to 16+ yrs	1.00	0.99	0.98	1.03	1.00	0.99	0.99	1.03
0-11 yrs to 16+ yrs	0.94	0.97	1.00	1.07	0.88	0.96	1.02	1.07
	Transmission, Assortative Mating (Constrained)							
0-11 to 12 yrs	0.95	1.00	1.01	1.02	0.93	1.00	1.02	1.02
12 yrs to 13-15 yrs	1.00	0.99	0.99	1.02	1.00	0.98	1.01	1.02
13-15 yrs to 16+ yrs	1.00	0.99	0.98	1.03	1.00	0.99	0.99	1.03
0-11 yrs to 16+ yrs	0.94	0.97	1.00	1.07	0.88	0.96	1.02	1.07

Appendix Table A6. Ratios of Simulated to Observed Daughters' Education Distributions for a Given Change in Women's Schooling for Black Women by Birth Cohort, PSID 1968-2003

	Blacks 1919-1938				Blacks 1939-1953			
	Daughters' Education				Daughters' Education			
	0-11 yrs	12 yrs	13-15 yrs	16+ yrs	0-11 yrs	12 yrs	13-15 yrs	16+ yrs
Simulation	Transmission, Fertility, Marriage							
0-11 to 12 yrs	0.97	1.00	0.99	1.05	0.96	1.00	1.00	1.02
12 yrs to 13-15 yrs	0.97	1.00	0.98	1.06	0.98	1.00	0.99	1.04
13-15 yrs to 16+ yrs	0.99	1.00	0.96	1.11	0.99	1.02	0.96	1.04
0-11 yrs to 16+ yrs	0.96	0.96	0.99	1.15	0.91	0.97	1.01	1.11
	Transmission, Fertility Timing, Marriage							
0-11 to 12 yrs	0.99	0.99	1.01	1.01	0.97	1.00	1.01	1.01
12 yrs to 13-15 yrs	0.98	0.98	1.01	1.04	0.97	0.98	1.01	1.04
13-15 yrs to 16+ yrs	0.99	0.98	0.99	1.09	0.99	0.98	0.98	1.08
0-11 yrs to 16+ yrs	0.94	0.96	1.01	1.15	0.90	0.94	1.02	1.16
	Transmission, Marriage							
0-11 to 12 yrs	0.99	0.99	1.01	1.01	0.97	1.00	1.01	1.01
12 yrs to 13-15 yrs	0.98	0.98	1.01	1.04	0.97	0.98	1.01	1.04
13-15 yrs to 16+ yrs	0.99	0.98	0.99	1.09	0.99	0.98	0.99	1.07
0-11 yrs to 16+ yrs	0.94	0.96	1.01	1.15	0.90	0.94	1.02	1.15
	Transmission, Fertility							
0-11 to 12 yrs	0.96	1.00	1.00	1.02	0.95	1.02	0.99	1.01
12 yrs to 13-15 yrs	0.96	0.99	1.00	1.07	0.98	0.99	1.02	1.00
13-15 yrs to 16+ yrs	1.00	0.99	0.97	1.11	0.99	0.99	0.98	1.07
0-11 yrs to 16+ yrs	0.95	0.97	0.99	1.14	0.91	0.97	1.00	1.11
	Transmission, Fertility, Assortative Mating							
0-11 to 12 yrs	0.94	1.00	1.02	1.00	0.95	0.99	1.01	1.03
12 yrs to 13-15 yrs	1.01	0.98	0.99	1.07	0.97	0.99	1.02	1.01
13-15 yrs to 16+ yrs	1.00	0.99	0.97	1.11	0.99	0.99	0.97	1.07
0-11 yrs to 16+ yrs	0.97	0.96	0.98	1.18	0.93	0.97	1.00	1.10
	Transmission, Fertility, Marital Status							
0-11 to 12 yrs	0.97	1.00	1.00	1.04	0.97	1.01	0.99	1.02
12 yrs to 13-15 yrs	0.97	0.99	1.00	1.04	0.98	1.01	0.98	1.03
13-15 yrs to 16+ yrs	0.99	0.99	0.98	1.10	0.97	1.02	0.98	1.02
0-11 yrs to 16+ yrs	0.98	0.97	0.99	1.15	0.96	0.97	1.00	1.09

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Appendix Table A6 Continued. Ratios of Simulated to Observed Daughters' Education Distributions for a Given Change in Women's Schooling for Black Women by Birth Cohort, PSID 1968-2003

	Blacks 1919-1938				Blacks 1939-1953			
	Daughters' Education				Daughters' Education			
	0-11 yrs	12 yrs	13-15 yrs	16+ yrs	0-11 yrs	12 yrs	13-15 yrs	16+ yrs
Simulation	Transmission, Fertility Timing, Assortative Mating							
0-11 to 12 yrs	0.99	0.99	1.01	1.01	0.97	1.00	1.01	1.01
12 yrs to 13-15 yrs	0.98	0.98	1.01	1.04	0.98	0.99	1.01	1.02
13-15 yrs to 16+ yrs	0.99	0.98	0.99	1.09	0.99	0.98	0.98	1.08
0-11 yrs to 16+ yrs	0.94	0.96	1.01	1.15	0.90	0.94	1.02	1.14
	Transmission, Fertility Timing, Marital Status							
0-11 to 12 yrs	0.99	0.99	1.01	1.01	0.97	1.00	1.00	1.01
12 yrs to 13-15 yrs	0.98	0.98	1.01	1.04	0.97	0.98	1.01	1.04
13-15 yrs to 16+ yrs	0.99	0.98	0.99	1.09	0.99	0.98	0.99	1.07
0-11 yrs to 16+ yrs	0.94	0.96	1.01	1.14	0.90	0.94	1.02	1.15
	Transmission, Assortative Mating							
0-11 to 12 yrs	0.99	0.99	1.01	1.01	0.97	1.00	1.01	1.01
12 yrs to 13-15 yrs	0.98	0.98	1.01	1.04	0.98	0.99	1.01	1.03
13-15 yrs to 16+ yrs	0.99	0.98	0.99	1.09	0.99	0.98	0.98	1.08
0-11 yrs to 16+ yrs	0.94	0.96	1.01	1.15	0.90	0.95	1.02	1.14
	Transmission, Marital Status							
0-11 to 12 yrs	0.99	0.99	1.01	1.01	0.97	1.00	1.01	1.01
12 yrs to 13-15 yrs	0.98	0.98	1.01	1.04	0.97	0.98	1.01	1.04
13-15 yrs to 16+ yrs	0.99	0.98	0.99	1.08	0.99	0.98	0.99	1.07
0-11 yrs to 16+ yrs	0.94	0.96	1.01	1.14	0.90	0.95	1.02	1.13
	Transmission, Fertility Timing							
0-11 to 12 yrs	0.99	0.99	1.01	1.01	0.97	1.00	1.00	1.01
12 yrs to 13-15 yrs	0.98	0.98	1.01	1.04	0.98	0.99	1.01	1.02
13-15 yrs to 16+ yrs	0.99	0.98	0.99	1.08	0.99	0.98	0.98	1.08
0-11 yrs to 16+ yrs	0.94	0.96	1.01	1.14	0.90	0.95	1.02	1.12
	Transmission Only							
0-11 to 12 yrs	0.99	0.99	1.01	1.01	0.97	1.00	1.00	1.01
12 yrs to 13-15 yrs	0.99	0.98	1.01	1.03	0.98	0.99	1.01	1.02
13-15 yrs to 16+ yrs	0.99	0.98	0.99	1.09	0.99	0.98	0.98	1.08
0-11 yrs to 16+ yrs	0.94	0.96	1.01	1.14	0.90	0.95	1.02	1.12

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Appendix Table A6 Continued. Ratios of Simulated to Observed Daughters' Education Distributions for a Given Change in Women's Schooling for Black Women by Birth Cohort, PSID 1968-2003

	Blacks 1919-1938				Blacks 1939-1953			
	Daughters' Education				Daughters' Education			
	0-11 yrs	12 yrs	13-15 yrs	16+ yrs	0-11 yrs	12 yrs	13-15 yrs	16+ yrs
Simulation	Transmission, Fertility, Marriage (Constrained)							
0-11 to 12 yrs	0.97	1.01	1.00	1.02	0.94	0.99	1.02	1.01
12 yrs to 13-15 yrs	0.98	1.01	0.98	1.06	0.97	0.99	1.00	1.03
13-15 yrs to 16+ yrs	0.99	0.99	0.97	1.11	0.98	1.01	0.98	1.03
0-11 yrs to 16+ yrs	0.97	0.98	0.99	1.11	0.94	0.99	0.97	1.11
	Transmission, Fertility Timing, Marriage (Constrained)							
0-11 to 12 yrs	0.99	0.99	1.01	1.01	0.97	1.00	1.00	1.01
12 yrs to 13-15 yrs	0.99	0.98	1.01	1.04	0.98	0.98	1.01	1.03
13-15 yrs to 16+ yrs	0.99	0.98	0.99	1.09	0.99	0.98	0.99	1.07
0-11 yrs to 16+ yrs	0.95	0.96	1.01	1.15	0.91	0.94	1.01	1.15
	Transmission, Marriage (Constrained)							
0-11 to 12 yrs	0.99	0.99	1.01	1.01	0.97	1.00	1.01	1.01
12 yrs to 13-15 yrs	0.99	0.98	1.01	1.04	0.98	0.98	1.01	1.04
13-15 yrs to 16+ yrs	0.99	0.98	0.99	1.08	0.99	0.98	0.99	1.07
0-11 yrs to 16+ yrs	0.95	0.96	1.01	1.14	0.91	0.95	1.01	1.14
	Transmission, Fertility, Assortative Mating (Constrained)							
0-11 to 12 yrs	0.94	1.01	1.00	1.02	0.92	1.01	1.01	1.02
12 yrs to 13-15 yrs	0.99	0.99	1.00	1.03	0.97	1.00	1.01	1.01
13-15 yrs to 16+ yrs	1.01	0.98	0.98	1.10	1.02	0.99	0.99	1.03
0-11 yrs to 16+ yrs	0.93	0.99	0.98	1.13	0.93	0.98	1.00	1.08
	Transmission, Fertility Timing, Assortative Mating (Constrained)							
0-11 to 12 yrs	0.99	0.99	1.01	1.01	0.98	1.00	1.01	1.01
12 yrs to 13-15 yrs	0.99	0.98	1.01	1.04	0.98	0.99	1.01	1.02
13-15 yrs to 16+ yrs	0.99	0.98	0.99	1.08	0.99	0.98	0.98	1.08
0-11 yrs to 16+ yrs	0.95	0.96	1.01	1.14	0.91	0.95	1.02	1.13
	Transmission, Assortative Mating (Constrained)							
0-11 to 12 yrs	0.99	0.99	1.01	1.01	0.98	1.00	1.00	1.01
12 yrs to 13-15 yrs	0.99	0.99	1.01	1.03	0.98	0.99	1.01	1.02
13-15 yrs to 16+ yrs	0.99	0.98	0.99	1.08	0.99	0.98	0.98	1.08
0-11 yrs to 16+ yrs	0.95	0.96	1.01	1.14	0.91	0.95	1.02	1.13

Appendix Table A7. Ratios of Simulated to Observed Daughters' Education Distributions for a Given Change in Women's Schooling by Birth Cohort for Black Women with Education Standardized to White Women's Education Distribution, PSID 1968-2003

	Blacks Standardized 1919-1938				Blacks Standardized 1939-1953			
	Daughters' Education				Daughters' Education			
	0-11 yrs	12 yrs	13-15 yrs	16+ yrs	0-11 yrs	12 yrs	13-15 yrs	16+ yrs
Simulation	Transmission, Fertility, Marriage							
0-11 to 12 yrs	0.95	0.98	1.04	1.00	0.99	0.96	1.02	1.02
12 yrs to 13-15 yrs	0.96	0.98	1.01	1.03	0.97	0.97	1.02	1.02
13-15 yrs to 16+ yrs	0.98	0.96	1.02	1.05	1.06	0.98	0.99	1.03
0-11 yrs to 16+ yrs	0.93	0.93	1.03	1.11	0.97	0.92	1.02	1.09
	Transmission, Fertility Timing, Marriage							
0-11 to 12 yrs	0.99	0.99	1.01	1.01	0.96	0.99	1.01	1.01
12 yrs to 13-15 yrs	0.98	0.99	1.00	1.03	0.96	0.97	1.01	1.03
13-15 yrs to 16+ yrs	0.99	0.97	0.99	1.07	0.99	0.98	0.98	1.05
0-11 yrs to 16+ yrs	0.92	0.94	1.01	1.13	0.86	0.93	1.02	1.11
	Transmission, Marriage							
0-11 to 12 yrs	0.99	0.99	1.01	1.01	0.96	0.99	1.01	1.01
12 yrs to 13-15 yrs	0.98	0.99	1.00	1.03	0.96	0.97	1.01	1.03
13-15 yrs to 16+ yrs	0.99	0.97	0.99	1.07	0.99	0.98	0.99	1.05
0-11 yrs to 16+ yrs	0.92	0.94	1.01	1.13	0.86	0.93	1.03	1.10
	Transmission, Fertility							
0-11 to 12 yrs	1.00	0.97	1.04	0.98	0.98	0.97	1.02	1.02
12 yrs to 13-15 yrs	0.97	0.97	1.03	1.02	0.99	0.97	1.03	1.01
13-15 yrs to 16+ yrs	0.96	0.97	1.00	1.06	1.05	0.96	1.00	1.05
0-11 yrs to 16+ yrs	0.90	0.94	1.03	1.10	0.95	0.91	1.02	1.10
	Transmission, Fertility, Assortative Mating							
0-11 to 12 yrs	0.98	0.95	1.05	1.01	0.96	0.96	1.04	1.01
12 yrs to 13-15 yrs	0.98	0.96	1.02	1.05	0.99	0.96	1.04	1.00
13-15 yrs to 16+ yrs	0.96	0.97	1.02	1.05	1.04	0.96	0.99	1.04
0-11 yrs to 16+ yrs	0.92	0.94	1.02	1.11	0.92	0.93	1.04	1.06
	Transmission, Fertility, Marital Status							
0-11 to 12 yrs	1.00	0.97	1.03	1.00	0.93	0.97	1.04	1.01
12 yrs to 13-15 yrs	0.98	0.98	1.02	1.02	0.96	0.96	1.04	1.01
13-15 yrs to 16+ yrs	1.01	0.96	1.01	1.07	1.00	0.99	0.99	1.04
0-11 yrs to 16+ yrs	0.95	0.94	1.02	1.10	0.94	0.90	1.04	1.10

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Appendix Table A7 Continued. Ratios of Simulated to Observed Daughters' Education Distributions for a Given Change in Women's Schooling by Birth Cohort for Black Women with Education Standardized to White Women's Education Distribution, PSID 1968-2003

	Blacks Standardized 1919-1938				Blacks Standardized 1939-1953			
	Daughters' Education				Daughters' Education			
	0-11 yrs	12 yrs	13-15 yrs	16+ yrs	0-11 yrs	12 yrs	13-15 yrs	16+ yrs
Simulation	Transmission, Fertility Timing, Assortative Mating							
0-11 to 12 yrs	0.95	0.99	1.02	1.00	0.97	0.99	1.01	1.01
12 yrs to 13-15 yrs	0.98	0.99	1.00	1.02	0.97	0.98	1.01	1.02
13-15 yrs to 16+ yrs	0.99	0.97	0.99	1.07	0.99	0.98	0.98	1.05
0-11 yrs to 16+ yrs	0.92	0.94	1.01	1.13	0.86	0.94	1.03	1.09
	Transmission, Fertility Timing, Marital Status							
0-11 to 12 yrs	0.99	0.99	1.01	1.01	0.96	1.00	1.01	1.01
12 yrs to 13-15 yrs	0.98	0.99	1.00	1.02	0.96	0.98	1.01	1.03
13-15 yrs to 16+ yrs	0.99	0.97	0.99	1.07	0.99	0.98	0.98	1.05
0-11 yrs to 16+ yrs	0.92	0.94	1.01	1.12	0.86	0.93	1.03	1.09
	Transmission, Assortative Mating							
0-11 to 12 yrs	0.99	0.99	1.01	1.01	0.97	1.00	1.01	1.01
12 yrs to 13-15 yrs	0.98	0.99	1.00	1.03	0.97	0.98	1.01	1.02
13-15 yrs to 16+ yrs	0.99	0.97	0.99	1.07	0.99	0.98	0.98	1.05
0-11 yrs to 16+ yrs	0.92	0.94	1.01	1.12	0.86	0.94	1.03	1.09
	Transmission, Marital Status							
0-11 to 12 yrs	0.99	0.99	1.01	1.01	0.96	1.00	1.01	1.01
12 yrs to 13-15 yrs	0.98	0.99	1.00	1.02	0.96	0.98	1.01	1.03
13-15 yrs to 16+ yrs	0.99	0.97	0.99	1.07	0.99	0.98	0.98	1.05
0-11 yrs to 16+ yrs	0.92	0.94	1.01	1.12	0.86	0.94	1.03	1.09
	Transmission, Fertility Timing							
0-11 to 12 yrs	0.96	0.99	1.02	1.00	0.97	1.00	1.01	1.00
12 yrs to 13-15 yrs	0.98	0.99	1.00	1.02	0.97	0.99	1.01	1.02
13-15 yrs to 16+ yrs	0.99	0.97	0.99	1.07	0.99	0.98	0.98	1.05
0-11 yrs to 16+ yrs	0.92	0.94	1.01	1.12	0.87	0.94	1.03	1.08
	Transmission Only							
0-11 to 12 yrs	0.99	0.99	1.01	1.01	0.97	1.00	1.00	1.01
12 yrs to 13-15 yrs	0.98	0.99	1.00	1.02	0.97	0.99	1.01	1.01
13-15 yrs to 16+ yrs	0.99	0.97	0.99	1.07	0.99	0.98	0.98	1.05
0-11 yrs to 16+ yrs	0.92	0.94	1.01	1.12	0.87	0.94	1.04	1.07

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Appendix Table A7 Continued. Ratios of Simulated to Observed Daughters' Education Distributions for a Given Change in Women's Schooling by Birth Cohort for Black Women with Education Standardized to White Women's Education Distribution, PSID 1968-2003

	Blacks Standardized 1919-1938				Blacks Standardized 1939-1953			
	Daughters' Education				Daughters' Education			
	0-11 yrs	12 yrs	13-15 yrs	16+ yrs	0-11 yrs	12 yrs	13-15 yrs	16+ yrs
Simulation	Transmission, Fertility, Marriage (Constrained)							
0-11 to 12 yrs	0.96	0.97	1.03	1.01	0.98	0.97	1.04	1.01
12 yrs to 13-15 yrs	0.99	0.97	1.02	1.01	0.99	0.96	1.02	1.02
13-15 yrs to 16+ yrs	0.95	0.99	0.98	1.07	1.08	0.96	1.01	1.02
0-11 yrs to 16+ yrs	0.94	0.95	1.00	1.12	0.97	0.94	1.00	1.10
	Transmission, Fertility Timing, Marriage (Constrained)							
0-11 to 12 yrs	0.99	0.99	1.01	1.01	0.96	0.99	1.01	1.00
12 yrs to 13-15 yrs	0.98	0.99	1.00	1.03	0.96	0.98	1.01	1.03
13-15 yrs to 16+ yrs	0.99	0.97	0.99	1.07	0.99	0.98	0.98	1.05
0-11 yrs to 16+ yrs	0.93	0.95	1.00	1.13	0.88	0.93	1.02	1.10
	Transmission, Marriage (Constrained)							
0-11 to 12 yrs	0.99	0.99	1.01	1.01	0.96	1.00	1.01	1.00
12 yrs to 13-15 yrs	0.98	0.99	1.00	1.03	0.97	0.98	1.01	1.03
13-15 yrs to 16+ yrs	0.99	0.97	0.99	1.07	0.99	0.98	0.98	1.05
0-11 yrs to 16+ yrs	0.93	0.95	1.00	1.13	0.88	0.94	1.02	1.09
	Transmission, Fertility, Assortative Mating (Constrained)							
0-11 to 12 yrs	0.99	0.96	1.05	0.99	0.99	0.96	1.04	1.00
12 yrs to 13-15 yrs	0.98	0.99	0.99	1.05	1.03	0.95	1.03	1.02
13-15 yrs to 16+ yrs	0.99	0.97	1.00	1.07	1.04	0.96	0.98	1.06
0-11 yrs to 16+ yrs	0.91	0.95	1.02	1.09	1.00	0.91	1.04	1.07
	Transmission, Fertility Timing, Assortative Mating (Constrained)							
0-11 to 12 yrs	0.97	0.99	1.01	1.02	0.97	1.00	1.01	1.00
12 yrs to 13-15 yrs	0.98	0.99	1.00	1.02	0.97	0.99	1.01	1.02
13-15 yrs to 16+ yrs	0.99	0.97	0.99	1.07	0.99	0.98	0.98	1.05
0-11 yrs to 16+ yrs	0.93	0.95	1.01	1.12	0.87	0.94	1.03	1.08
	Transmission, Assortative Mating (Constrained)							
0-11 to 12 yrs	0.99	0.99	1.01	1.01	0.97	1.00	1.01	1.00
12 yrs to 13-15 yrs	0.98	0.99	1.00	1.02	0.97	0.99	1.01	1.02
13-15 yrs to 16+ yrs	0.99	0.97	0.99	1.07	0.99	0.98	0.98	1.05
0-11 yrs to 16+ yrs	0.93	0.95	1.01	1.12	0.88	0.94	1.03	1.08