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ABSTRACT

A large literature exists on the impact of family structure on children's outcomes, typically focusing on average effects. We build on this with an economic framework that has heterogeneous predictions regarding the potential benefit for children of married parents. We propose that the gains to marriage from a child's perspective depend on a mother's own level of resources, the additional net resources that her partner would bring, and the outcome-specific returns to resources. Data from the Panel Study of Income Dynamics are consistent with the heterogeneous predictions of this framework. In terms of high school completion or avoiding poverty at age 25, the "marriage premium for children" is highest for children of mothers with high school degrees and mothers in their early/mid-20s. For the more advanced outcomes of college completion or high income at age 25, the marriage premium is monotonically increasing with observed maternal age and education.

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I. Introduction

For much of U.S. history, a married-couple family constituted the primary unit of social and economic life for individuals. Married couples birthed and raised children, pooled resources of time and money, and provided for each other into old age. But, this relationship has been breaking down for decades, particularly in the context of childrearing.[1] By 2014, over 40 percent of births in the U.S. took place outside marriage. The rate is particularly high among certain population subgroups: 71 percent among African-Americans, 71 percent among women under age 25, and 62 percent among women with a high school degree or less education.[2] This reflects a dramatic shift over the past 50 years. In 1960, only five percent of children were born to unmarried mothers.

One reason the high-level of non-marital childbearing is an economic issue is because numerous studies show that children raised in single-parent homes fare worse on a number of educational and economic dimensions as compared to children raised in homes with two married biological parents. Conditional on other family and parental characteristics, children who grow up with an unmarried mother have lower levels of educational attainment and higher levels of teen childbearing, among other outcome differences (e.g., McLanahan and Sandefur; 1994; McLanahan 1997; Hoffman, Foster, and Furstenberg, 1993; Amato 2005). As adults, they have

[1] In this paper, we do not explicitly consider the question of what is responsible for driving the rise in non-marital childbearing. Ellwood and Jencks (2004) provide an overview of the theoretical and empirical literature on the rise in non-marital childbearing. They note that traditional economic models have highlighted four potential factors: (i) male earnings (e.g., Wilson and Neckerman, 1986), (ii) female earnings, (iii) the sex ratio, and (iv) public assistance (e.g., Moffitt, 2001). Recent work by Shenov (2015) explores the rise of female relative wages as an explanation for the decline in marriage rates. Ellwood and Jencks (2004) summarize the main noneconomic explanations that have been advanced as including (i) gender role conflict; (ii) limited confidence and personal efficacy; (iii) altered attitudes and social norms; and (iv) technological and legal change (e.g., Akerlof, Yellen, and Katz, 1996). Lundberg and Pollak (2007) provide a thorough review of how the American family has changed between 1960 and 2006.

[2] We calculated these statistics based on data available from the CDC WONDER Online Database, accessed June 20, 2016.

lower levels of employment, lower levels of income, higher rates of non-marital parenting, and higher rates of incarceration (e.g., Hill, Holzer, and Chen, 2009; DeLeire and Lopoo, 2014; Lehrman, Price, and Wilcox, 2016).[3] Though none of these studies completely surmounts the identification challenge inherent in identifying whether the differences are due to marriage, per se, rather than associated unobservable resources or parental characteristics, the strength of the association and its robustness to a myriad of controls for observable factors is at least strongly suggestive of a causal relationship.[4]

The academic literature and policy conversation about non-marital childbearing, however, generally does not distinguish across different instances of non-marital childbearing. Having a child outside of marriage for a 19-year old woman without a high school degree presumably has different implications than it does for a 25-year old with some college, or a 35-year old college graduate. To put it differently, the advantage that marriage would bring to these children is likely to be different across circumstances. Perhaps older and more educated unmarried mothers are able to provide sufficiently for their children alone, such that their children do not suffer any sort of disadvantage in terms of long-term economic outcomes. Perhaps the men who father children with younger, less-educated women are of sufficiently low income and parenting "quality" that such a marriage would not appreciably improve a child's long-term economic prospects.[5]

[3] Recent work in economics has considered whether the incidence of single-mother households is related to racial and gender gaps in behavioral and educational outcomes. Hill, Holzer, and Chen (2009) explore the extent to which racial differences in family structure might explain racial gaps in education, employment, and incarceration outcomes. Autor et al. (2015) and Bertrand and Pan (2013) suggest that the growing gender gap in behavioral and educational outcomes for children is at least partially explained by the relative disadvantage of boys who grow up in single-mother homes.

[4] Hill, Holzer, and Chen (2009) and Lopoo and DeLeire (2014) provide excellent reviews of the literature on family structure and children's outcomes.

[5] Sawhill and Thomas (2002) offer evidence to the contrary; they find that simulated marriages between single-mothers and men with similar characteristics would appreciably reduce child poverty rates.

In this paper, we consider the notion of a "marriage premium for children" through the lens of economics, focusing on potential resources and returns. We introduce this term as a shorthand label for the difference in outcomes between children who are born to married parents as compared to a single-mother. We maintain an empirical focus on mother's marital status at birth mainly for analytical convenience, although a mother's marital status at birth is highly predictive of the family structure a child will experience during his/her childhood in the U.S. We define resources to be those relevant to child development, including parental income, wealth, and time, among other things.[6]

The documented advantage for children, on average, from two-parent homes is consistent with a model where resources are higher, on average, in married, two-parent households. Not only does having two married parents in the household increase the total level of resources by virtue of having two resident parents present, this family structure capitalizes on economies of scale in a household and enables spouses to specialize across market work, home production, and child rearing, as in Becker's seminal model (1981). A straightforward extension of this reasoning indicates that the relative advantage to a child coming from having married parents will vary with maternal circumstances in systematic ways. To be sure, the observed advantage for children is also consistent with a positive selection story: conditional on observables, individuals who have children within marriage might possess inherent, unobservable qualities that benefit child

6 There are a variety of mechanisms beyond income through which children might benefit from living in a married-parent home. Many academic articles have reviewed potential mechanisms, including in an overview piece by Ribar (2015). Studies that have attempted to investigate how much of the disadvantage observed for children from single-parent homes is due specifically to lower household income generally find that the direct effect of income is an important part of the story, but not the full explanation, though this remains an open question. See, for example, McLanahan and Sandefur, 2004; Hill, Holzer, and Chen, 2009; DeLeire and Lopoo, 2014; Lehrman, Price, and Wilcox, 2016. Low levels of income and single-parenthood are often associated with other stress factors that are directly harmful to children's development, such as residential instability, maternal stress, and less positive parenting practices (cf., Mayer, 1997; Kalil et al, 1998; Furstenberg et al, 1999).

development. While we do not discount the role of selection, we are interested in developing a resource-based model that has predictions about when the benefits of a married household may be particularly large from the perspective of the child.

We propose that the gains to marriage from the perspective of a child will depend on (a) the mother's own level of resources, (b) the additional resources that her marriage would bring to the household, and (c) the returns to those additional resources. The resource gain will depend on the nature of marriage markets and the resources of the mother's partner. The return to resources will depend on the nature of the particular production function for outcomes, which will vary across outcome type. This set of factors and interactions among them will generate heterogeneous marriage premiums for children born to mothers with different characteristics and for different types of outcomes. For example, for some women, a partner's additional contributions are not sufficient to alter children's outcomes. While for other women, a partner's contributions are not necessary. For instance, even if a teen mother married the father of her child, their combined resources might not be sufficient to equip their child to attain higher levels of education. In contrast, a highly educated older mother might have sufficient resources as a single mother such that her child suffers no relative disadvantage when it comes to educational attainment.

We explore these relationships empirically, motivated by our proposed marriage premium framework. We rely mainly on data from the Panel Survey of Income Dynamics. This data source allows us to observe adult outcomes for children born in the 1960s, 1970s, and 1980s. We consider two types of long-term outcomes for children. First, we consider "primary" outcomes, which are those that are commonly achieved, such as graduating from high school and having income above the federal poverty threshold at age 25. Second, we consider "advanced" outcomes, which are achieved by fewer people, such as graduating from college and having "high" income (above 400 percent of the federal poverty threshold at age 25). We use these data to estimate

descriptive relationships between these outcomes and mother's age at time of child's birth and level of education, with the goal of documenting patterns of the marriage premium for children across mother's characteristics and outcomes. We do not attempt to identify empirically a causal relationship between marriage as a family structure and children's outcomes; rather, we explore systematic patterns of marital gaps in children's outcomes by baseline maternal characteristics.

The patterns we observe for being out of poverty by age 25 and graduating from high school suggest that the marriage premium takes an inverted U-shaped pattern along the dimensions of maternal age and education. For the youngest and least educated mothers, as well as for the oldest and most educated mothers, there does not appear to be a large marriage premium for children. The greatest marriage premium occurs in the middle of the maternal age and education distribution. This is consistent with the predictions of our model given assortative mating and reasonable expectations about the return to resources for these primary outcomes. The potential resource gain from marriage is not sufficient at the low end, and is unnecessary at the high end, to increase substantially a child's probability of avoiding poverty or completing high school. For mothers in their early to mid-20s and those with a high school degree, marriage is associated with the largest differences in these two outcomes.

For the advanced outcomes of graduating from college and having a high level of income at age 25, the observed marriage premium increases monotonically with maternal age and education. This is also consistent with the predictions of our model given assortative mating and reasonable expectations about the return to resources for an advanced outcome. In the case of these harder-to-obtain outcomes, it appears that marriage is associated with an increasingly higher likelihood for children up to the highest levels of observed maternal age and education. In a final empirical consideration, we consider the extent to which differences in household income explain

the observed premium for both types of outcomes. The data suggest that household income at birth is only partially responsible for these gaps.

II. The "Marriage Premium for Children": A Conceptual Framework

In this section, we present a conceptual framework for thinking about a marriage premium for children as a function of underlying resources and returns to resources. To define terms and notation, let us denote α to be the difference in outcomes between children raised in a household headed by married parents as compared to a single mother. Specifically, we propose that the marriage premium for children (α) will depend crucially on three elements: (a) the mother's own level of resources, (b) the additional resources that marriage would bring to the household, and (c) the returns to those additional resources.

We denote a mother's and father's own level of resources as R^m and R^f and total household resources as R^t: $R^t = R^m + R^f$. We use the term "resources" broadly to signify the range of positive inputs that parents bring to a child's experience. This includes financial resources and parental time, but also includes additional elements such as social and professional networks, positive parenting practices, physical and mental well-being, and home life stability, among others. For unmarried mothers, we impose an expositional simplification such that total household resources are fully captured by mother's own resources ($R^t = R^m$), which is inclusive of any resources she obtains on behalf of her child, whether through her own earnings or time, through government support, through her network of family and friends, etc. If the mother were to marry the father of the child and co-reside, household resources would increase by the net level of resources the

father brings to the household (beyond what he would contribute as a non-resident, unmarried father), R^f.[7]

A. Assortative Mating

The potential resource gain that marrying the father of a child would bring to the household depends on the father's level of resources. That gain will depend on the nature of the market for sexual partners and marriage (which we take to be the same). In the United States, there is a high degree of assortative mating, such that individuals tend to partner with and marry individuals of a similar socioeconomic status (SES) (cf. Schwartz, 2010). We incorporate this into our model by treating resource level as isomorphic to SES and assuming assortative mating based on relative resource position.

In a highly stylized version of assortative mating, women and men match based on their percentile in some underlying resource distribution. If the underlying male and female resource distributions were equal, then assortative mating of the type we have described would result in a doubling of potential household resources if the parents were to marry. That is, R^m at the 25th percentile of the distribution among mothers plus R^f at the 25th percentile of the distribution among fathers would double R^t. These observations lead to the following proposition relevant for thinking about how marriage would heterogeneously increase resources available to a child:

[7] We abstract from the situation of cohabitation among unmarried parents in the model. As a practical matter, in the United States, the situation for children of cohabiting parents tends to fall somewhere in between the more common situations of unmarried/non-cohabiting parents and married parents, but it is generally understood to involve much higher rates of family instability as compared to married families. Manning (2015) reviews the issue of cohabitation and child well-being. She notes that more children born to cohabiting parents see their parents break up by age five, as compared to children born to married parents. Only one out of three children born to cohabiting parents remains in a stable family through age 12, in contrast to nearly three out of four children born to married parents. She further reports that children born to cohabiting parents experience nearly three times as many family transitions as those born to married parents (1.4 versus 0.5).

Proposition 1: *Given assortative mating, the absolute resource gain from marriage ($R^t - R^m = R^f$) is increasing in mother's own resources (R^m): $d(R^t-R^m)/dR^m > 0$.*

B. Production Functions for Children's Outcomes

The production function for child outcomes dictates how beneficial the additional resources that a married father brings to the household are for a child's development and ultimately adult outcomes. Let us assume that the production of positive child outcomes (e.g., educational attainment) responds positively to parental resources such that higher levels of R^t (as inputs) produce increased levels of child educational and socioeconomic achievement (as outcomes, or output.)[8] For simplicity, we introduce the notion of two types of outcomes: *primary* and *advanced* outcomes. Primary outcomes consist of those that one might reasonably consider first order markers of economic success. The majority of individuals would achieve these: progressing at grade for age through school, avoiding a teen birth, completing high school, and living above the poverty line as an adult. Advanced outcomes consist of outcomes achieved by a smaller minority of individuals. Such outcomes would include gaining admittance to a selective college, completing a college degree, and obtaining a high paying job.

[8] A number of authors have attempted to produce credible estimates of the causal relationship between family income and child outcomes using exogenous variation in family income. See, for example, Oreopoulos et al (2008); Dahl and Lochner (2011); Milligan and Stabile (2007), and Loken (2010). Loken, Mogstad, and Wiswall (2012) estimate nonlinear IV and FE models relating family income to child outcomes. Their analysis uses administrative registry data for the entire population of Norway, with information on children's educational attainment and IQ as adults as well as their family income during childhood. They instrument for family income with regional and time variation in the initial discovery of oil in Norway. They find an increasing, concave relationship between family income and children's outcomes. They observe that previous studies based on linear estimators understate the beneficial effect of family income for children because they assign little weight to the large marginal effects at lower levels of income. This econometric point is related to, albeit distinct from, the conceptual point we make below about heterogeneity in the returns to additional parental resources.

The return *r* to the resource gain that comes from marriage (through the addition of R^f to the household) will lead to an improvement in child outcomes *y* as determined by the relationship between the outcome and overall resource level. Let us call this production function *q*. Figure 1A plots the relationship between total household resources R^t and a primary (*p*) and advanced (*a*) outcome. Though we assume simple functional forms q^p *and* q^a for illustrative purposes, the main feature of the figure is that the production function (expressed as a probability function) for the advanced outcome falls to the right of the probability function for the primary outcome. As a father's additional resources are brought into a household headed by a mother with fewer resources (a younger or less educated mother), the probability that the child achieves a primary outcome is increased. The total resource level, however, is still too low for an appreciable change in the likelihood of achieving the advanced outcome. The additional resources from that marriage would have to be extensive to have an impact on an advanced outcome.

In contrast, when a father's additional resources are brought into a household headed by a mother with more resources (for instance, an older or more educated mother), primary outcomes are unlikely to be affected. The mother herself is likely to have sufficient resources to enable her children to achieve that outcome. Her children would benefit by becoming more likely to achieve an advanced outcome if marriage occurs. These observations lead to the following propositions:

Proposition 2: For primary outcomes, the children of lower resourced mothers will experience the largest relative benefit from marriage, as long as fathers have non-negligible resources to contribute to the household.

Proposition 3: For advanced outcomes, the children of higher resourced mothers will experience the largest relative benefit from marriage.

C. *Marriage Premium for Children*

Building on the notation introduced so far, and combining the insights from Propositions 1, 2, and 3, we can write an expression for the marriage premium to children as follows:

$$\propto = r^y * (R^t - R^m) | R^m.$$

This expression indicates that the marriage premium α is a function of the return to resources for a given outcome (r^y) interacted with the difference in total household resources that would result from marriage (R^t-R^m), conditional on the baseline level of resources a mother brings to the household in the non-marital situation.

We have presented this model in terms of a generic "resource" that is essentially isomorphic to income and increases in maternal age and education. An obvious extension of the model would be to consider different types of resources. For example, one could model the marriage premium as a function of separate resources such as income, parental time, and family stability, and make assumptions about whether these resources operate as complements or substitutes. Another straightforward adaptation would be to specify the marriage premium as being net of certain resources, for example, a marriage premium net of income effects. We offer this framework as a basic model that can be readily extended and adapted for more nuanced considerations of the relationship between parents' marital status and children's outcomes.

III. Marriage Gaps in Maternal Characteristics and Baseline Resource Levels

The above discussion emphasized the systematic ways we would expect the marriage premium for children to vary with maternal characteristics and outcome type. Before exploring the heterogeneity in outcomes directly, we provide a preliminary, descriptive look at the data. We first confirm that maternal marital status at the time of a child's birth is highly predictive of a child's family structure at age 14. We then document average marriage gaps in maternal

characteristics, household resources, and children's outcomes and how they have changed over time.

In terms of maternal characteristics, we focus on mother's age and education, with the presumption that older, more-educated mothers offer higher levels of parental resources.[9] As supporting evidence, we calculate from the 2014 American Community Survey that among women with children age 5 or under who work more than 1500 hours per year, those age 35 and over have median annual earnings of $50,000 in 2013 compared to $18,000 for those under age 25. Similarly, college educated mothers in this group earn 2.4 times as much as those with a high school degree, $55,000 relative to $23,000. In addition, research has documented that more educated mothers spend more time with their children (Guryan, Hurst, and Kearney, 2008) and are more likely to alter the composition of that time to suit children's developmental needs (Kalil, Ryan, and Corey, 2012).

We rely primarily on data from the Panel Study of Income Dynamics (PSID) for this and subsequent analyses. The PSID is a nationally representative, family-based dataset that first sampled over 18,000 respondents in 1968. Since then, the survey has followed all of the original participants and all of those who joined their families, including children. The most recent data available at the time of this analysis is from 2013. In these data, we observe maternal characteristics at the time of birth (marital status, age, education, and income) and subsequent outcomes for the children (poverty status, high school completion, and college completion). Because we are interested in observing children's long-term outcomes, we examine the experiences of children born during the 1960s, 1970s, and 1980s. An on-line data appendix details how we construct our analysis sample and variables from the PSID. We augment our PSID

[9] Miller (2009) offers evidence in support of this presumption.

analysis with additional data on births from the 1980 and 2014 Vital Statistics Natality files to document characteristics of mothers for two cohorts, and observe how maternal characteristics have changed over time. The issue of drawing lessons from earlier cohorts to the experience of today's children is something we return to in our final discussion section.

A. Transitions in Family Structure

In our analysis, we focus on mother's marital status at birth. This coincides with our emphasis on the impact of non-marital childbearing, but it also is a strong predictor of subsequent living arrangements for children. This can be seen in Table 1, where we examine children's living circumstances at age 14 with their mother's marital status at birth. We separately examine children born between 1960 and 1979 from those born between 1980 and 1999 (14 years old in 2013, the last year data availability) to gauge the extent of changes over time. Consistent with trends documented elsewhere, the bottom row indicates that fewer children were born to married mothers in the more recent period: 76 percent, down from 83 percent. It also shows that births to cohabiting parents rose over that interval, from 2 percent in the earlier period to 7.7 percent of births in the more recent cohort.[10]

These data indicate that initial family structure at birth is strongly persistent to age 14. Among children born between 1980 to 1999, 75 percent of those born to married mothers are still living in a household comprised of married parents and 65 percent of those born to a single mother are living in a mother only household at age 14. Only 12 percent of children born to single mothers see their parents married at age 14. Being born to cohabiting parents is a less persistent family structure, as has been well-documented elsewhere (see, for example, the review by Manning, 2015). Among children born to cohabiting parents (7.7 percent of children in the

[10] Manning (2015) reports that nearly one-quarter of children born today are to cohabiting parents.

more recent cohort), 28 percent are living with married parents, 33 percent are living with mother only, and 9 percent are living with mother and stepfather at age 14.

B. Mother's Characteristics at the Time of Birth

Our next set of analyses use Vital Statistics natality data to document age and education distributions of marital and non-marital births. These analyses are motivated by the notion that older, more educated mothers are likely to have higher level of resources as compared to younger, less-educated mothers. We look separately at births occurring in 1980 and 2014. The Vital Statistics data include virtually the universe of births in the United States. Figures 2A (1980) and 2B (2014) reveal clearly that the age distribution of married mothers skews to the right as compared to the age distribution of unmarried mothers. In 2014, the modal age of a married mother is 31, as compared to 22 for unmarried births. Mothers were younger in 1980, with the modal age being 25 among married mothers and 19 among unmarried mothers. Looking over time, the data also reveal a reduction in teen childbearing and an increase in childbearing during ages 30 to 44 among all mothers.

To the extent that older and more educated parents bring greater resources to a household, the older ages of mothers in more recent years would imply improved outcomes for all children. But, the gap in mother's modal age between marital and non-marital births has actually jumped from 6 years to 9 years. As much as the universal increase in mother's age could improve outcomes for all, it could also increase the marriage premium for children (if greater maternal age implies higher levels of parenting resources).

We observe a similar pattern in Figures 3A and 3B, which plot the education distribution of mothers by marital status. Married mothers tend to be more highly educated than mothers who give birth outside of marriage. In 2014, the modal married mother was a college graduate: 45.8 percent of married mothers have a college degree or higher. Only 7.2 percent of mothers who are

unmarried at the time of birth have a college degree or higher. The modal unmarried mother at the time of birth is a high school graduate (36 percent). Only 8.5 percent of married mothers have less than a high school degree, as compared to 25 percent of unmarried mothers. As shown in Figure 3A, the 1980 education distributions of both sets of mothers are shifted to the left, with many fewer mothers having a college degree at the time of giving birth and many more having less than a high school degree. Interestingly, the gains in education have been greater among married mothers than among unmarried mothers, so that even though all mothers are more educated now, married mothers are relatively more educated in 2014 than in 1980.

Table 2 reports similar statistics using PSID data, breaking up children into those born to married and unmarried mothers in the 1968-1989 and 1990-2013 windows. Again, education and maternal age are greater for married mothers, rising over time for both married and unmarried mothers, but rising more for married mothers. The data also reveal that a married mother is extremely unlikely to live with her own mother, but it is reasonably common for an unmarried mother. This could reflect her greater need for support, but also greater resources available for her children than if she lived alone.

C. The Resource Gap at the Time of Birth

The remainder of Table 2 provides summary statistics of family income as a direct measure of the resource gap at the time of birth. Here we see that household income at birth is greater for children born to married mothers and the gap in absolute terms is growing over time. For the cohort born between 1990 and 2013, median household income (in year 2013 dollars) is $74,497 for married mothers and $36,575 for unmarried mothers, which is a difference of $37,922. For the earlier cohort, the income advantage of married households was $23,973. The data also show that many more children born to unmarried mothers lived in poverty at the time of birth in both periods; roughly 30 percent of the later cohort and more than 40 percent of the

earlier cohort. In both periods, less than 10 percent of children born to married parents lived in poverty at the time of birth.

We also examine differences in the percentage of childhood (through age 16) spent in poverty. We distinguish children by birth cohorts 1968 to 1979 and 1980 to 1997 and restrict the sample to those births who have reached age 16 by the 2013 date of the last available survey. Children born to married parents, on average, spend just over 90 percent of their childhood years out of poverty, for both cohorts. Children born to an unmarried mother, on the other hand, spend around 60 percent of their child above the poverty line, for both cohorts.

Data from the American Time Use Survey (ATUS) from 2003 through 2014 indicate a resource gap between children born to married and unmarried parents in terms of parental hours spent per week on childcare (not reported in a table).[11] We look at parents' reported time with children and focus on children under age 5. Married mothers spend 18 hours per week caring for their young children compared to 14.9 hours per week for unmarried mothers. Married fathers also spend an additional 1.4 hours per week, on average, caring for their children (9.8 hours per week compared to 8.4 hours per week). These gaps are not measured at the time of birth, as our preceding measures of resources have been, but the correlations over time for pre-school age children are likely to be very high. These average differences reveal that young children of married parents generally spend more time with their parents as compared to children of unmarried parents.[12]

[11] Time spent caring for children is defined as the sum of time spent by parents on basic, educational and recreational childcare. The full sample includes all individuals between the ages of 18 and 55 who report at least one child under the age of 5. The resulting sample includes 8,615 mothers and 6,093 fathers. Means are calculated using fixed demographic weights adjusted to equally represent each day of the week within subgroups.

12 This finding is consistent with the results of a study by Kalil, Ryan, and Shor (2014) that uses the 1997 PSID Child Development Supplement to examine time investment in children across six family structures. The authors

D. Outcome Gaps Associated with Maternal Marital Status

Consistent with the documented fact of children being born to unmarried mothers having fewer resources in their households, the data also indicate that they experience inferior educational and labor market outcomes relative to those children born to married mothers. Table 3 displays these patterns, which relies on data from the PSID, and confirm those reported in previous studies (as cited above). In our analysis, we examine four specific outcomes: being out of poverty at age 25, completing high school by age 20[13], having household income over 400 percent of the poverty level at age 25 (to indicate high income), and completing college by age 25. We separate children into cohorts by birth decade to examine trends over time. In all cases, outcomes for children with parents who were married at birth are better in these dimensions than children with unmarried parents at birth.

One notable pattern in these data is that recent birth cohorts show a larger marriage premium in the likelihood of college completion as compared to earlier cohorts. Children born to unmarried mothers increased their likelihood of completing college from 5.9 to 11.3 percent between the 1960s and 1980s birth cohorts. Children born to married mothers, however, increased their likelihood from 21.8 to 40.7 percent, resulting in about a doubling of the gap between the two groups (from 15.9 to percentage points 29.4). On the other hand, the marriage premium in rates of high school graduation fell slightly. The gap likelihood of being above the poverty threshold rose and then fell, ending up back at its original level.

These patterns are consistent with the predictions of our conceptual model of a heterogeneous marriage premium. Rising out of poverty and graduating from high school are

document that children receive more total care-giving time in married biological parent families than in single mother homes, because households receive little time investment from their nonresident biological fathers.

[13] The PSID data does not allow us to consistently separate GED recipients from traditional high school graduates. As such, this measure captures high school graduation or its equivalent.

primary outcomes within that framework while having a high income and graduating college are advanced outcomes. Increases in parental resources over time are only going to have an impact if a substantial share of some group is below that threshold and is lifted over the bar because of the additional resources brought to the household through marriage. For a primary outcome, a young single-mother might not have sufficient resources to clear that bar on her own, but marriage has the potential to bring additional resources that would raise children over the poverty threshold (as in Thomas and Sawhill, 2002). Older, more educated mothers are likely to have enough resources to avoid poverty even without the additional resources of a spouse.

For an advanced outcome, however, combined resources from marriage potentially increase total household resources by a large amount for a highly educated mother, given she is likely to have fathered a child with a high-resource man (through assortative mating). College completion rates increase with family income.[14] It therefore makes sense that marriages associated with a greater base level of resources from the mother and relatively large resource gains from the father will be associated with increasingly high rates of college attendance, and children from lower-resourced households will fall further behind.

IV. EXPLORING HETEROGENEITY

Our model also has predictions regarding the impact of marriage on mothers with different levels of resources. For primary outcomes, we hypothesize that the marriage premium for children has the shape of an inverted U, at first increasing and then decreasing, as mother's resources increase. For advanced outcomes, we anticipate that a marriage premium for children will exist at higher maternal resource levels. In this section, we report the results of an analysis designed to

[14] Bjorklund-Young (2016) reports that data from the Education Longitudinal Survey – a nationally representative sample of students who were high school sophomores in 2002 – indicate that among students from the lowest quartile of family income, college completion rates are 14 percent, as compared to 60 percent among students from the top quartile of family income.

explore whether descriptive data are consistent with those hypotheses. As we have done throughout the paper, we focus on maternal age and education as indicative of maternal resource level.

A. Descriptive Relationship between Maternal Marital Status and Children's Outcomes

In Tables 4 and 5, we report results of an analysis focusing on the same children's outcomes as reported in Table 3, except here we distinguish mothers by their age and educational attainment at the time of childbearing. All statistics reported are relevant sample means computed from the PSID; we are not attempting to isolate causal findings; rather we explore heterogeneity in raw marriage premiums.

The first thing to notice in Tables 4 and 5 is that for all four outcomes, there is a marriage premium observed for all maternal age and education categories. This is noteworthy, given that one might have suspected older and more educated mothers would have sufficient own resources such that the children of married mothers would not experience an advantage in outcomes relative to the children of unmarried women. The data indicate that is not the case. This result is consistent with previous studies that report the results of regression analyses that control for maternal age and education and still find disadvantages associated with single-motherhood.

The patterns in the data are also consistent with the predictions of the model. For the primary outcomes of being out of poverty and graduating from high school, we see the inverted U-shaped pattern of the marriage premium for children. Table 4 shows that women between the ages of 20 and 24 have children who receive the greatest observed marriage premium for these outcomes. That premium is lower for children of younger and older mothers. Table 5 shows that women with a high school degree or some college have the greatest observed marriage premium in terms of avoiding adult poverty and graduating from high school. Children of high school dropouts and college graduates have lower premiums, albeit still positive.

We see a different pattern when it comes to the advanced outcomes of college completion and having income above 400 percent of the federal poverty threshold (our measure of high income). In Table 4 we see that the marriage premium for advanced outcomes is increasing with maternal age. The children of married mothers age 30 and over are 20.7 percentage points more likely to graduate from college as compared to the children of unmarried mothers in that age group (37.2 percent compared to 16.5 percent). There is a positive age gradient in children's rates of college graduation for married and unmarried mothers, but the gradient is steeper for the children of married mothers. Among the children of unmarried mothers, the percent who complete college by age 25 increases from 6.6 percent to 16.5 percent, moving from teen mothers to mothers age 30 and over. Among the children of married mothers, the percent who complete college by age 25 increases from 13.1 percent to 37.2 percent. A similar pattern holds for the advanced outcome.

Table 5 reveals a similar story: the marriage premium is also increasing with maternal education. The children of married mothers with a college degree are 28.4 percentage points more likely to graduate from college as compared to the children of unmarried mothers with a college degree (57 percent versus 28.6 percent). This gap is consistent with the predictions of our model, though we readily acknowledge the possibility that some of this might reflect unobserved selection, meaning that unmarried, college-educated mothers might be more negatively selected than less-educated unmarried mothers on other resource dimensions. As with maternal age, there is a positive education gradient for both sets of mothers, such that higher levels of maternal education are associated with higher rates of college graduation among children, but the gradient is steeper for the children of married mothers. Among the children of unmarried mothers, the percent who complete college by age 25 increases from 4.9 percent to 28.6 percent, a nearly six-fold increase from the least to most educated mothers. Among the children of married mothers,

the percent who complete college by age 25 increases from 7.4 percent to 57 percent, a nearly eight-fold increase.

B. Multivariate Relationship between Maternal Marital Status and Children's Outcomes

We extend this analysis by estimating regression models that parameterize these statistics and control for the impact that other demographic factors might play in the relationship between mother's marital status and children's outcomes. Specifically, we estimate models where the dependent variables are the same poverty and educational outcomes we have been using throughout this analysis. The key explanatory variables are interaction terms between maternal marital status at birth of child and cubic indicators of either mother's age or years of education at birth. The demographic variables we control for include child's gender, race, ethnicity, and year of birth. We also estimate a separate set of models including average family income in early childhood (through age five).[15] Including this variable can provide an indication of the extent to which this one measure of resources can "explain" any marriage premium for children that we observe in the data.[16] Another important reason to determine the role played by income is to understand the extent to which government transfers could potentially play a role in alleviating the outcome deficits faced by children in single-parent households (cf. Lerman, Price, Wilcox, 2016).

We summarize the results of this analysis, focusing specifically on maternal age at birth of child, in Figures 4A-4D and Figures 5A-5D. Both sets of figures consider each of our four outcomes (poverty status, high school completion, high income status, and college completion; the only difference is that the second set of figures adjust for average family income in early

[15] Appendix Tables 1A and 1B report the full set of regression results.
[16] We note that adding these variables does not satisfy any reasonable standard of identifying a causal impact. We interpret the results from these analyses as regression-adjusted descriptive statistics.

childhood (ages 0-5). In these figures, we plot the simulated marriage premium for children (the predicted difference in children's outcomes between those born to married and unmarried parents) as a function of their mother's age when they were born. The patterns are non-linear because our regression model includes cubic age interactions with maternal marital status.[17] The dotted lines represent 95 percent confidence intervals, constructed using the delta method. We repeat this analysis for mother's educational attainment; due to space constraints, those results are reported in Appendix Figures 1A-1D and 2A-2D.[18]

Figure 4A examines the marriage premium for children when the specific child outcome is having family income above the poverty threshold at age 25. It is consistent with the inverted-U shaped pattern that we hypothesized earlier for a primary outcome and that our earlier descriptive analysis foreshadowed. In fact, for the very youngest mothers and the oldest mothers in this sample, the confidence interval for the marriage premium for children extends to near zero in terms of poverty status. The marriage premium is highest at age 24; children born to married mothers at that age are 15 percentage points more likely to be above the poverty threshold at age 25 compared to children of unmarried mothers.

Note that controlling for demographics has a large impact on the estimated marriage premium for children. In Table 4, those children born to married mothers between the ages of 20 and 24 were 22.6 percentage points more likely to have incomes above the poverty line at age 25. Controlling for demographics as in Figure 4A substantially reduces that gap. Doing so, though, has little impact on the inverted U-shaped pattern of the marriage premium for children. In fact,

[17] We estimate these models using all available data for mothers between the ages of 14 and 45. In the figures, though, we only report simulation results of the marriage premium for children for mothers between the ages of 17 and 35. The reason for this is that there are very few marital births younger than age 17 or non-marital births over age 35. This leads to very imprecise estimates at these ages with standard error bands that are much wider than those between ages 17 and 35 and that always include zero.
[18] Appendix tables A1 and A2 present the regression results themselves that were used to generate these figures.

for children born to mothers under age 18 or over age 32, the estimated marriage premium in terms of children's subsequent poverty outcomes are small and not statistically significant once we control for demographics. These controls introduce something like a level shift down in the profile without altering the general shape of the profile itself.

Figure 4B displays similar patterns for high school completion. The peak age is 22 for the marriage premium for children measured in this way. No statistically significant impact is estimated for those under age 18 or over age 28. The similarity in patterns between Figures 4A and 4B are what we would expect from our model since both represent primary outcomes.

Figures 4C and 4D plot the marriage premium for the advanced outcomes of graduating from college by age 25 or having income greater than 400 percent of the federal poverty threshold at age 25. Consistent with the pattern reported in Table 4, we see that this manifestation of the marriage premium is monotonically increasing in mother's age until the late 20s and then asymptotes to around a 15 to 20 percentage point differential. The magnitude of these estimates varies little after including demographic controls. Children born to older women (presumably with greater resources) continue to benefit in the form of this advanced outcome when their mothers are married.[19] We also explore heterogeneity in the marriage premium for boys and girls, and find the estimates are slightly larger for boys, but we cannot statistically distinguish between the two. For this reason we only examine the pooled impact in the remaining analysis.

Figures 5A through 5D repeat this analysis, but control for family income at birth as well as demographic characteristics.[20] Interestingly, for the two primary outcomes (poverty status and high school completion), the premium to children associated with marriage does not appear to be

[19] If we instead use a continuous measure of log income at age 25 as the outcome of interest, we also see a monotonic increase in the observed marriage premium along the dimensions of maternal age and education.
[20] Following Lopoo and Deleire (2014) and Lerman, Price, and Wilcox (2016) we control for income by dividing our measure of income by the square root of the household size, to account for economies of scale.

accounted for by a simple control for average family income in early childhood. The patterns and levels displayed in Figures 5A and 5B are very similar to those reported in Figures 4A and 4B, respectively. The finding that controlling for family income in early childhood does not appreciably change the estimate marriage premium might indicate that other resources associated with marriage are driving the observed premium. Such resources might include greater family stability, more total parental time, lower levels of maternal stress, among others. It could also be that average family income during early childhood is not a sufficient proxy for family income over a child's life, such that a more comprehensive measure of income would indicate that family income is indeed an important factor in explaining the marriage premium.

In terms of the advanced outcomes, average family income during early childhood seems to be an important contributing factor in determining college completion, but it does not have much of an impact on the estimated premium for having a high income at age 25. Although the pattern in Figure 5C (for college completion) is very similar to Figure 4C, the marriage premium to children asymptotes to a lower value, 15 percentage points rather than 20 percentage when adjusted for family income.

V. DISCUSSION

Numerous empirical studies written across social science disciplines indicate that children raised in married biological parent households tend to do better on a host of outcomes, both during childhood and into adulthood, as compared to children raised by an unmarried mother. Given that marital status is not randomly assigned to an individual, a precise causal estimate of marriage per se remains elusive. Nonetheless, as we noted at the outset, the strength of the association and its robustness to a myriad of controls is at least strongly suggestive of a causal relationship. In this paper, we label this observed difference as the "marriage premium for

children." When viewed through the lens of economics, it becomes clear that such a premium could be both explained and anticipated by an economic consideration of potential resources.

The academic literature and policy conversation about non-marital childbearing has generally not distinguished across different categories of non-marital childbearing. We have proposed a framework for evaluating non-marital childbearing and children's outcomes that has clear heterogeneous predictions. Specifically, we propose that the marriage premium in terms of children's outcomes will depend on a mother's own level of resources, the nature of marriage markets and the additional resources a spouse would bring to the household, and the relevant production function for a specific outcome. Using data from the Panel Study of Income Dynamics (PSID), we find that the predictions of our framework are consistent with the patterns in the data.

We distinguish children's later-life outcomes into those that are primary (high school graduation and not living in poverty) from those that are advanced (college graduation and having a high income). For primary outcomes, the data indicate the largest marriage premiums for children of women who give birth in their early- to mid-20s and for children of high school graduates. The relative marriage advantage is lower for children of mothers who are in their teens or in their 30s, as well as for children of high school dropouts or college graduates. We interpret these patterns as being consistent with the prediction that the incremental resources associated with marriage are too small to have much of an impact for young and less educated mothers, and not necessary at the high end, to substantially increase the likelihood of obtaining a primary outcome. Interestingly, for advanced outcomes, the marriage premium is monotonically increasing with observed maternal age and education. This suggests that even for mothers with a high level of own resources, the additional resources brought into a married household have a

sizeable impact on the likelihood that a child graduates from college and achieves a high level of adult income.

The conceptual framework and descriptive empirical evidence of this paper imply that it is important to distinguish across maternal circumstances when evaluating the issue of non-marital childbearing and children's outcomes. They also have implications for thinking about recent trends toward higher rates of non-marital fertility among older and more educated women. In previous decades, non-marital childbearing was quite uncommon except among women in their teens and among those without a high school degree. However, in recent decades we have witnessed a dramatic rise in non-marital childbearing among women with a high school degree and women in their 20s. Our results from PSID data on cohorts born during the 1960s, 1970s, and 1980s suggest that this is precisely where the marriage premium is largest for children.

The extent to which these results hold lessons for predicting heterogeneity in the marriage premium for children being born to unmarried mothers today will depend on how maternal resources, marriage markets, father resources, and the production function of child outcomes have changed. The key takeaway from our framework and empirical results is that the marriage premium depends crucially on resource context. We have focused on the economic resources that fathers would bring to marriage. This is related to a leading explanation for the high rates of non-marital childbearing among less educated and minority women: the notion that there is a dearth of "marriageable men" in certain segments of the population, generally understood to mean men who would bring economic stability (Wilson 1987; Wilson and Neckerman, 1986). In recent decades, the economic position of the median male in terms of education and earnings has declined, relative to both earlier cohorts (Greenstone and Looney, 2011) and contemporaneous women (Autor and Wasserman, 2013). The declines in employment and earnings have been especially pronounced among men with high school degrees (Autor and Wasserman, 2013;

Kearney and Hershbein 2015). If part of the reason that rates of non-marital childbearing have increased among women with high school degrees is that there has been an erosion in the economic prospects of the men with whom they partner[21], then the marriage premium their children would enjoy is likely to be lower than the premiums we have found among earlier cohorts.

As this discussion highlights, the economic causes of non-marital childbearing are likely related to the resulting economic consequences of non-marital childbearing. Empirically separating out these causes and effects is a challenging task. Much more research is needed into the complex issue of non-marital childbearing and what it implies for the economic well-being of affected children. The framework and empirical results we have put forth in this paper demonstrate the importance of focusing on heterogeneous effects related to potential household resources.

[21] A new paper by Cherlin, Ribar, and Yasktake (2016) provides evidence from the National Longitudinal Survey of Youth, 1997 cohort, supporting this hypothesis.

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Table 1: Family Structure Transition Rates between Birth and Age 14

	Family Structure at Birth: Born 1960-1979			Family Structure at Birth: Born 1980-1999		
Family Structure at Age 14	Married Parents	Cohabitating Parents	Mother Only	Married Parents	Cohabitating Parents	Mother Only
Married Parents	80.5	39.5	15.1	74.9	27.9	11.6
Cohabiting Parents	0.4	17.4	2.9	0.6	10.9	1.2
Mother and Stepfather	6.7	3.1	12.1	7.1	9.1	9.1
Mother Only	9.0	16.3	62.9	12.0	33.3	64.9
Other	3.4	23.7	6.9	5.4	18.8	13.2
Percent in Category	82.8	2.0	15.1	76.1	7.7	15.9

Notes: An observation is a child born in the stated years in the PSID Family structure at birth is based on data from the first survey after the child was born. Living with "Mother Only" includes living with mother and grandparents. "Other" includes living with the father only or with neither parent. Each observation is weighted by the mother's individual level PSID sampling weight for personal characteristics and by the household PSID sampling weight for household level measures.

Table 2. Mother and Household Characteristics in Year of First Birth, PSID Data

	1st Birth 1968-1989			1st Birth 1990-2013		
	Married	Not Married	Gap (M-NM)	Married	Not Married	Gap (M-NM)
Mother's Characteristics						
Age at Birth	25.4	21.2	4.1	28.5	22.2	6.3
Years of Education	13.6	12.6	1.0	14.7	13.0	1.7
Mother Living with Parents	3.0	44.0	-41.0	3.1	38.6	-35.5
Household Income at Birth						
Median Income (2013$)	$49,772	$25,800	$23,973	$74,497	$36,575	$37,922
Percent Not in Poverty	92.4	58.8	33.5	92.6	70.6	22.0
HH Income in Childhood						
Median Income, Ages 0-5 (2013$)	$54,677	$24,561	$30,116	$77,090	$33,406	$43,684
Percentage of Years Not in Poverty, Ages 0-5	90.6	54.0	36.5	91.1	62.7	28.5
Median Income, Ages 0-16 (2013$)	$64,651	$28,848	$35,803	$82,454	$35,430	$47,024
Percentage of Years Not in Poverty, Ages 0-16	90.9	57.2	33.7	91.4	63.6	27.8
Observations	6,126	2,232	---	4,983	3,620	---

Notes: Household income is reported in 2013$ where adjustments have been made using the personal consumption expenditures price index. Income between ages 0-16 is the child's annual household averaged over all available years between the ages of 0 and 16, with the median reported. Also see notes to Table 1.

Table 3. Children's Long-term Outcomes by Child's Year of Birth and Mother's Marital Status at Birth

	Married	Not Married	Gap (M-NM)	Number of Observations
		Percent not in Poverty at 25		
All Sample Years	91.6	72.6	19.0	6,444
Born 1960-1969	91.0	74.0	17.0	2,288
Born 1970-1979	93.3	69.6	23.7	2,016
Born 1980-1989	90.6	74.1	16.5	2,140
		Percent HS Degree by 20		
All Sample Years	88.1	78.1	10	8,225
Born 1960-1969	86.9	74.7	12.2	2,610
Born 1970-1979	89	78.2	10.8	2,502
Born 1980-1989	88.4	78.8	9.6	3,113
		Percent Over 400% of Poverty Level at 25		
All Sample Years	39.7	15.9	23.9	6,444
Born 1960-1969	38.4	17.1	21.3	2,288
Born 1970-1979	41.4	12.6	28.8	2,016
Born 1980-1989	39.5	17.5	22	2,140
		Percent College Degree by 25		
All Sample Years	29.9	9.5	20.4	6,847
Born 1960-1969	21.8	5.9	15.9	2,307
Born 1970-1979	28	8.1	19.9	2,095
Born 1980-1989	40.7	11.3	29.4	2,445

Notes: An observation is a child born in the stated years in the PSID. Each observation is weighted by the child's individual level PSID sampling weight in the year the outcome is observed.

Table 4. Children's Long-Term Outcomes by Mother's Marital Status and Age at Birth of Child

	Married	Not Married	Gap (M-NM)	Number of Observations
		Percent not in Poverty at 25		
Mother <20 at birth	86.9	71.7	15.2	907
Mother 20-24 at birth	91.7	69.1	22.6	2,127
Mother 25-29 at birth	93.4	74.9	18.5	1,794
Mother 30+ at birth	91.2	75.1	16.1	1,533
		Percent HS Degree by 20		
Mother <20 at birth	81.0	74.1	6.9	1,174
Mother 20-24 at birth	87.6	77.3	10.3	2,667
Mother 25-29 at birth	89.7	81.8	7.9	2,286
Mother 30+ at birth	88.7	80.2	8.5	1,981
		Percent Over 400% of Poverty Level at 25		
Mother <20 at birth	24.1	12.6	11.5	907
Mother 20-24 at birth	32.8	15.0	17.8	2,127
Mother 25-29 at birth	46.2	22.3	23.9	1,794
Mother >29 at birth	43.9	19.0	24.9	1,533
		Percent College Degree by 25		
Mother <20 at birth	13.1	6.6	6.5	954
Mother 20-24 at birth	21.9	5.8	16.1	2,241
Mother 25-29 at birth	34.5	15	19.5	1,914
Mother 30+ at birth	37.2	16.5	20.7	1,645

Notes: An observation is a child born between 1960 and 1989 in the PSID. Each observation is weighted by the child's individual level PSID sampling weight in the year the outcome is observed.

Table 5. Children's Long-Term Outcomes by Mother's Marital Status and Mother's Level of Education

	Married	Not Married	Gap (M-NM)	Number of Observations
		Percent not in Poverty at 25		
Less than High School	81.1	64.8	16.3	1,143
High School Degree	90.9	73.7	17.2	2,499
Mother Some College	93.8	76.0	17.9	1,629
Mother College Degree	95.7	80.5	15.2	1,162
		Percent HS Degree by 20		
Less than High School	73.6	67.9	5.6	1,485
High School Degree	87.7	78.5	9.3	3,140
Mother Some College	90.7	82.9	7.7	2,145
Mother College Degree	93.0	88.8	4.2	1,434
		Percent Over 400% Poverty Level at 25		
Less than High School	15.5	8.6	6.9	1,143
High School Degree	37.4	16.5	20.9	2,499
Mother Some College	40.9	17.7	23.2	1,629
Mother College Degree	54.1	29.1	25.0	1,162
		Percent College Degree by 25		
Less than High School	7.4	4.9	2.5	1,212
High School Degree	18.0	4.8	13.2	2,620
Mother Some College	31.1	13.8	17.3	1,745
Mother College Degree	57.0	28.6	28.4	1,259

Notes: An observation is a child born between 1960 and 1989 in the PSID. Each observation is weighted by the child's individual level PSID sampling weight in the year the outcome is observed.

Figure 1A: Hypothetical Impact of Total Household Resources on Probability of Achieving Outcome

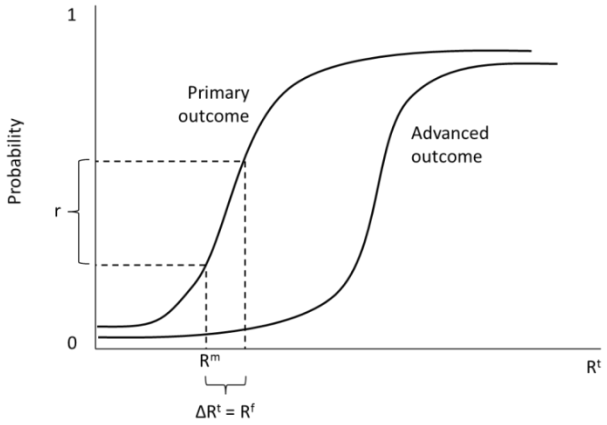


Figure 1B: Marriage Premium for Children

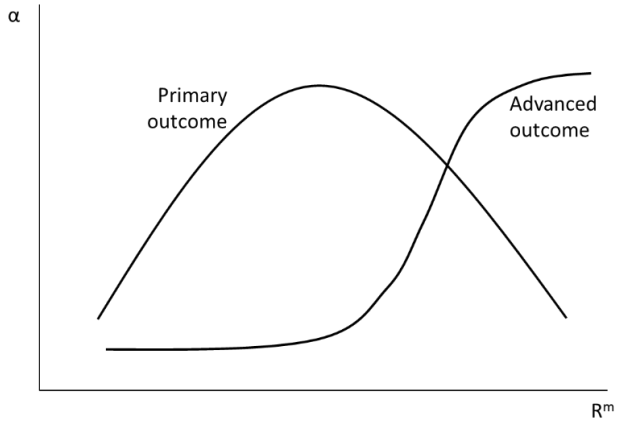
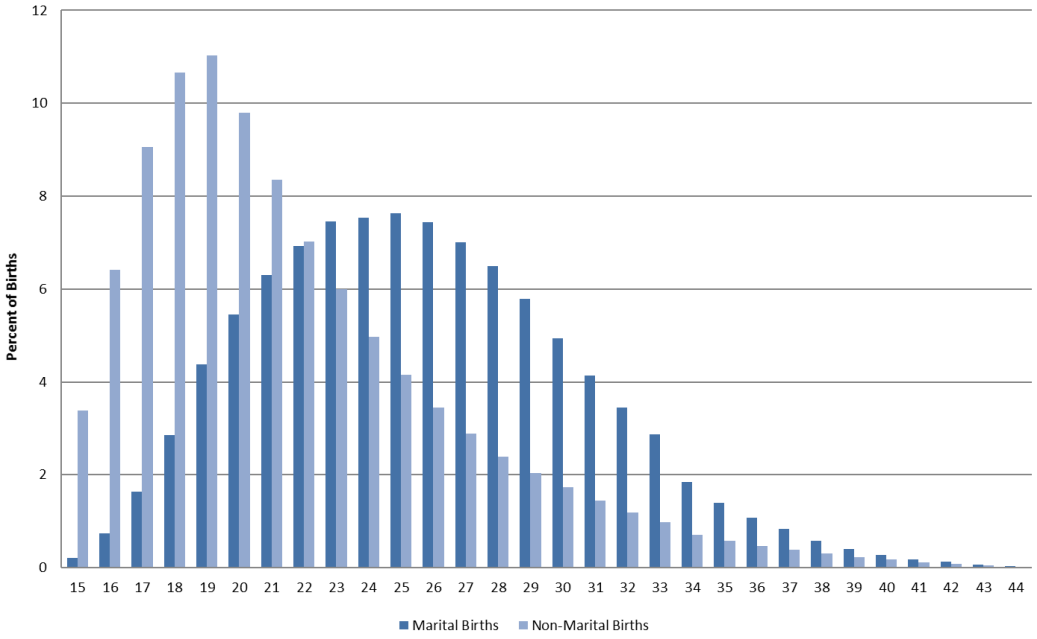
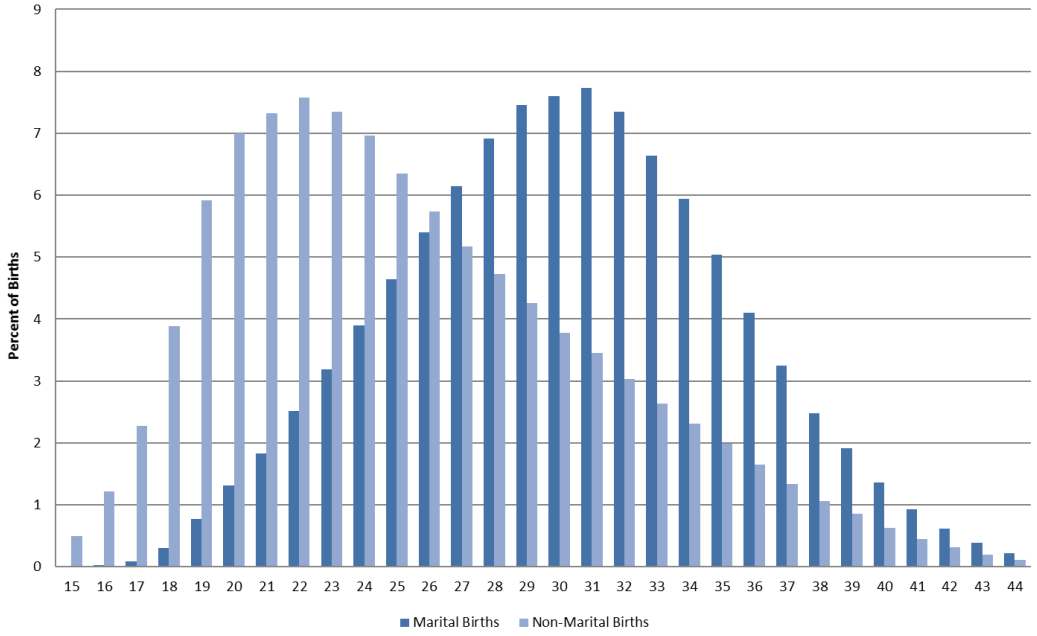


Figure 2A: Distribution of Mother's Age at Birth of Child, by Mother's Marital Status (1980)



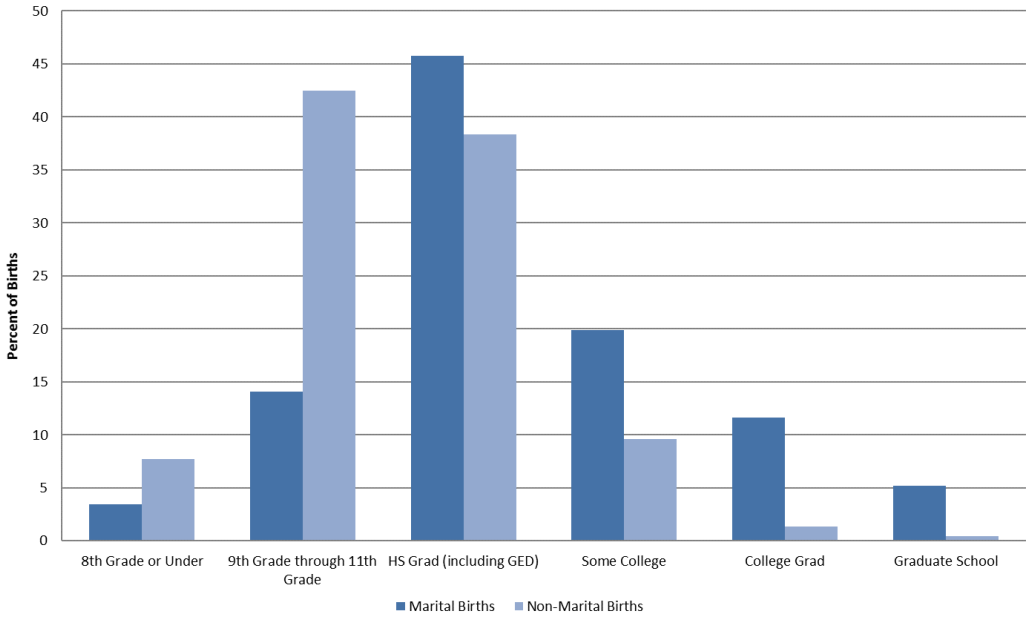
source: Authors' calculations from Vital Statistics Natality microdata.

Figure 2B: Distribution of Mother's Age at Birth of Child, by Mother's Marital Status (2014)



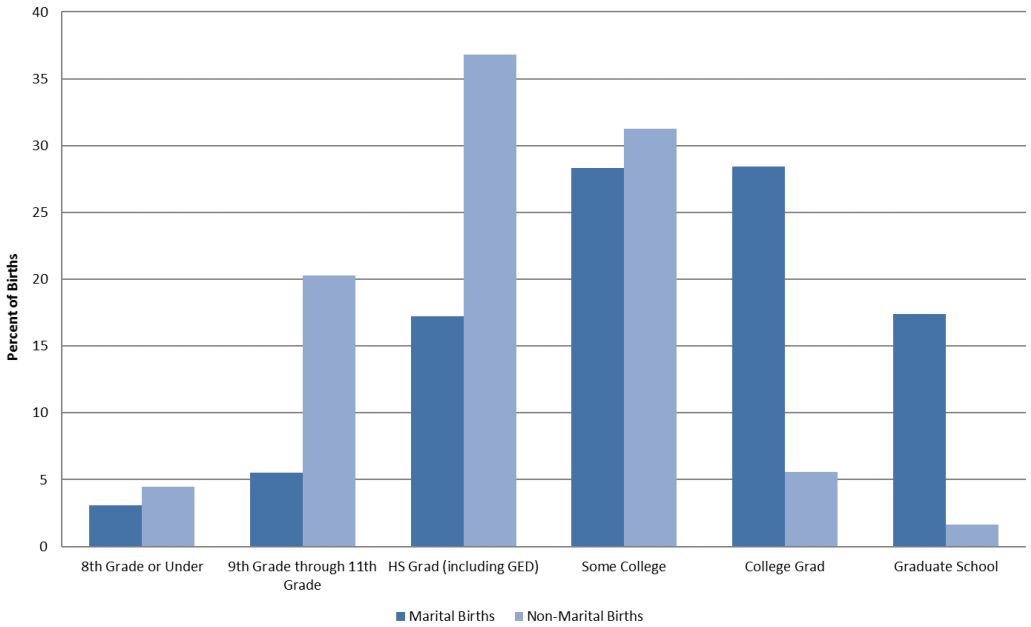
source: Authors' calculations from Vital Statistics Natality microdata.

Figure 3A: Distribution of Mother's Educational Attainment at Birth of Child, by Mother's Marital Status (1980)



source: Authors' calculations from Vital Statistics Natality microdata.

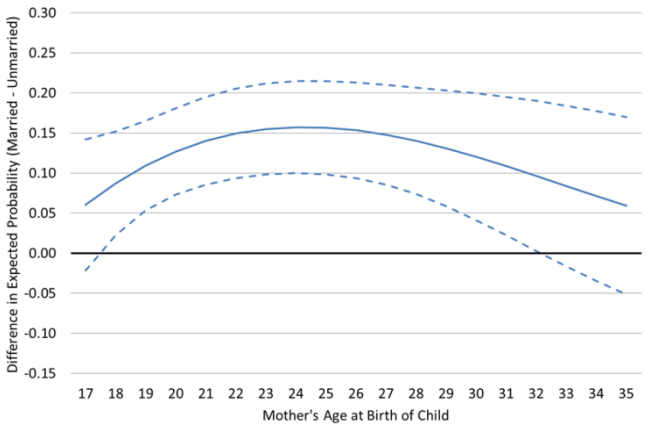
Figure 3B: Distribution of Mother's Educational Attainment at Birth of Child, by Mother's Marital Status (2014)



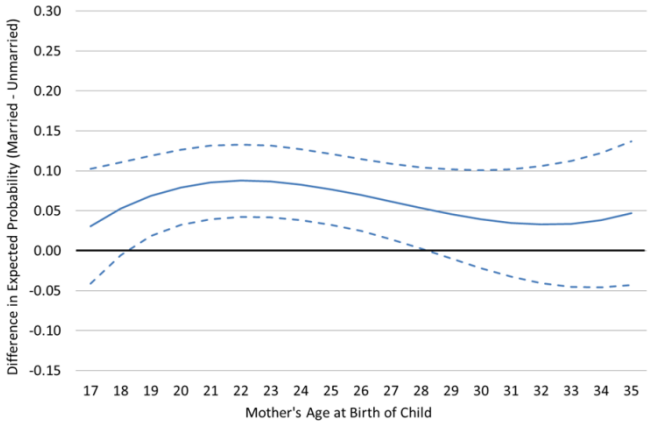
source: Authors' calculations from Vital Statistics Natality microdata.

Figure 4: Mother's Age at Birth of Child and the Marriage Premium for Children
(no income controls)

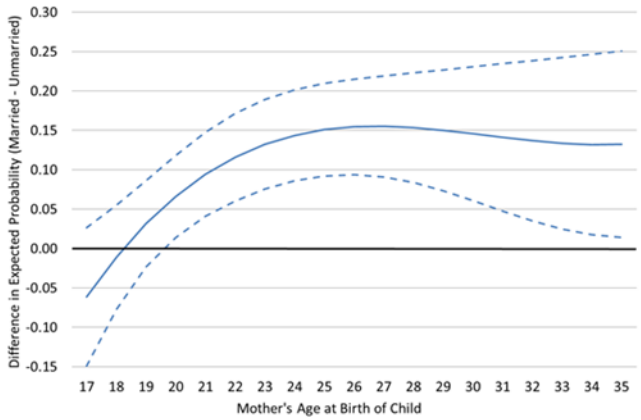
A. Out of Poverty at Age 25



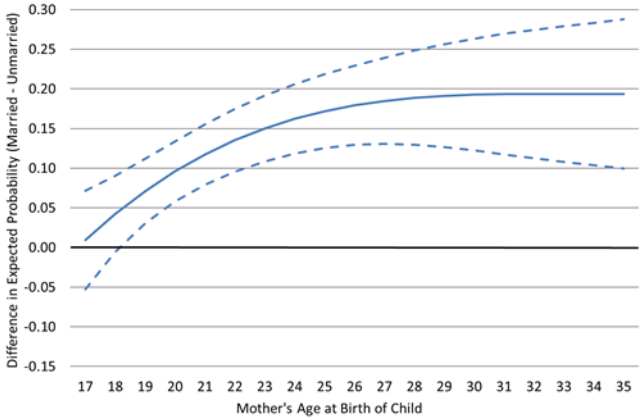
B. High School Degree by Age 20



C. Over 400% of the Poverty Line



D. College Degree by Age 25

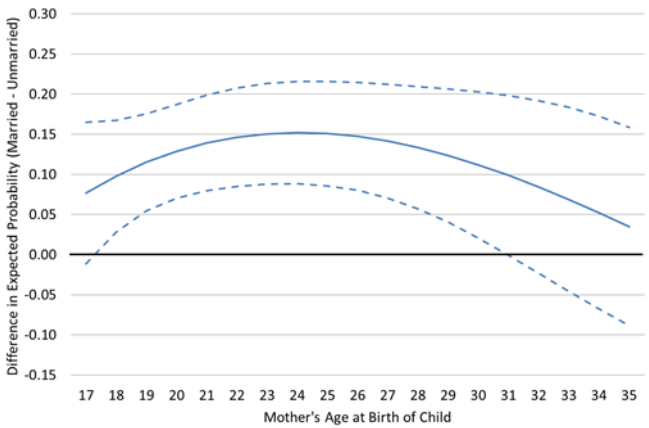


Notes: Difference in predicted probability obtained from regression specifications reported in Appendix Table 1, controlling for gender, race, ethnicity, year of birth. Ninety-five percent confidence intervals are plotted in dashed lines (standard errors were obtained using the Delta Method).

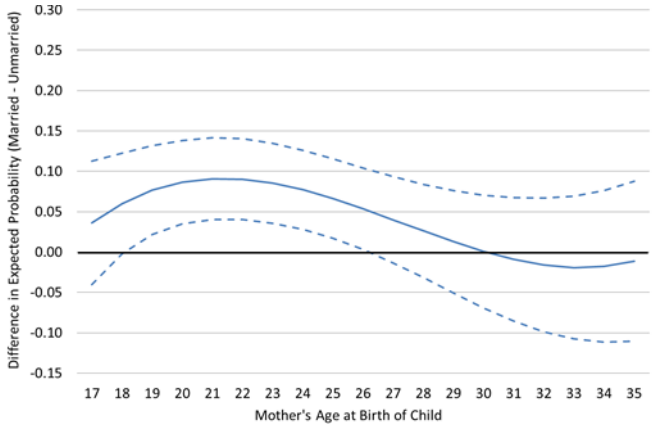
Source: Authors' calculations using data from the PSID.

Figure 5: Mother's Age at Birth of Child and the Marriage Premium for Children
(with income controls)

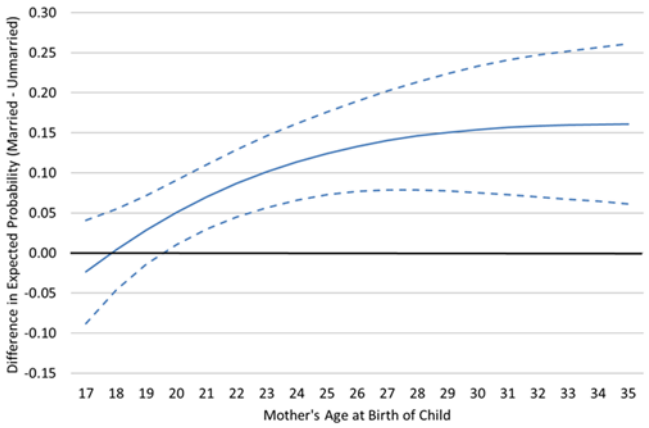
A. Out of Poverty at Age 25



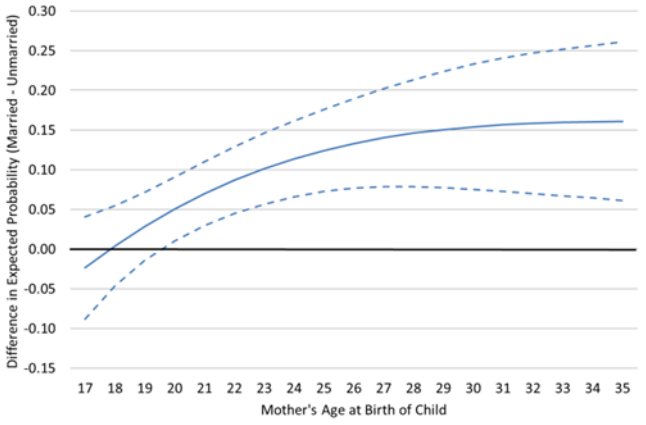
B. High School Degree by Age 20



C. Over 400% of the Poverty Line



D. College Degree by Age 25



Notes: Difference in predicted probability obtained from regression specifications reported in Appendix Table 2, controlling for gender, race, ethnicity, year of birth. Ninety-five percent confidence intervals are plotted in dashed lines (standard errors were obtained using the Delta Method).

Source: Authors' calculations using data from the PSID.

APPENDIX TABLES AND FIGURES

Appendix Table A1.
Mother's Age at Birth of Child and the Marriage Premium for Children Regression coefficients,
(No Income Controls)

	Not In Poverty at 25	HS Degree By Age 20	Over 400 % Poverty Level at 25	College Degree by Age 25
			No Income Controls	
Married at Birth	-1.4754	-1.8588**	-2.8024**	-1.4551*
	(1.0391)	(0.8446)	(1.1948)	(0.7954)
Married*Mother Age	0.1669	0.2281**	0.2991**	0.1507
	(0.1189)	(0.0976)	(0.1365)	(0.0926)
Married*Mother Age^2	-0.0054	-0.0087**	-0.0100**	-0.0046
	(0.0044)	(0.0036)	(0.0050)	(0.0035)
Married*Mother Age^3	0.0001	0.0001**	0.0001*	0.0000
	(0.0001)	(0.0000)	(0.0001)	(0.0000)
Mother Age	-0.0677	-0.1198	-0.1913	-0.1061
	(0.1125)	(0.0875)	(0.1173)	(0.0666)
Mother Age^2	0.0022	0.0053	0.0077*	0.0045*
	(0.0042)	(0.0033)	(0.0043)	(0.0026)
Mother Age^3	-0.0000	-0.0001*	-0.0001*	-0.0001*
	(0.0000)	(0.0000)	(0.0001)	(0.0000)
Constant	1.4118	1.6429**	1.7711*	0.9378*
	(0.9737)	(0.7404)	(1.0146)	(0.5436)
Observations	6,346	8,082	6,346	6,740

Notes: Outcomes weighted by PSID weights corresponding to the year the outcome is observed. Sample restricted to children born between 1960 and 1989, whose mothers were between 14 and 45 with non-missing education. Controls include gender, household race, and year of birth fixed effects. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table A2. Mother's Age at Birth of Child and the Marriage Premium for Children
Regression coefficients, Average Childhood Household Income Controls

	Not In Poverty at 25	HS Degree By Age 20	Over 400 % Poverty Level at 25	College Degree by Age 25
			Income Controls	
Married at Birth	-1.0235	-2.2504**	-2.5108*	-1.1106
	(1.1223)	(0.9184)	(1.2915)	(0.8269)
Married*Mother Age	0.1154	0.2792***	0.2670*	0.1070
	(0.1280)	(0.1068)	(0.1476)	(0.0973)
Married*Mother Age^2	-0.0035	-0.0107***	-0.0089*	-0.0030
	(0.0047)	(0.0040)	(0.0054)	(0.0037)
Married*Mother Age^3	0.0000	0.0001***	0.0001	0.0000
	(0.0001)	(0.0000)	(0.0001)	(0.0000)
Mother Age	-0.0027	-0.1392	-0.1216	-0.0482
	(0.1215)	(0.0966)	(0.1285)	(0.0717)
Mother Age^2	-0.0004	0.0060	0.0050	0.0021
	(0.0045)	(0.0037)	(0.0047)	(0.0029)
Mother Age^3	0.0000	-0.0001*	-0.0001	-0.0000
	(0.0001)	(0.0000)	(0.0001)	(0.0000)
Average HH Inc from 0-5/√HH Size	0.0214***	0.0192***	0.0599***	0.0563***
	(0.0033)	(0.0031)	(0.0069)	(0.0055)
Constant	0.8576	1.7617**	1.1017	0.4087
	(1.0557)	(0.8118)	(1.1120)	(0.5775)
Observations	5,180	6,748	5,180	5,514

Notes: Outcomes weighted by PSID weights corresponding to the year the outcome is observed. Sample restricted to children born between 1960 and 1989, whose mothers were between 14 and 45 with non-missing education. Average household income is computed as the average income between 0 and 5, scaled by the square root of the household size to account for economies of scale. Other controls include gender, household race, and year of birth fixed effects. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table A3. Mother's Education and the Marriage Premium for Children
Regression coefficients, No Income Controls

	Not In Poverty at 25	HS Degree By Age 20	Over 400 % Poverty Level at 25	College Degree by Age 25
			No Income Controls	
Married at Birth	-0.2292	-0.2073	0.0999	0.5435**
	(0.4622)	(0.6629)	(0.3287)	(0.2675)
Married*Mother's Education	0.0674	0.0624	-0.0792	-0.2033**
	(0.1497)	(0.1941)	(0.1101)	(0.0914)
Married*Mother's Education^2	-0.0036	-0.0041	0.0111	0.0214**
	(0.0149)	(0.0179)	(0.0116)	(0.0097)
Married*Mother's Education^3	0.0000	0.0001	-0.0004	-0.0006*
	(0.0005)	(0.0005)	(0.0004)	(0.0003)
Mother's Education	-0.1806	-0.1673	-0.0059	0.0716
	(0.1456)	(0.1865)	(0.0911)	(0.0779)
Mother's Education^2	0.0168	0.0184	-0.0004	-0.0108
	(0.0145)	(0.0172)	(0.0099)	(0.0085)
Mother's Education^3	-0.0004	-0.0005	0.0001	0.0005*
	(0.0004)	(0.0005)	(0.0003)	(0.0003)
Constant	1.3017***	1.0945*	0.2363	-0.0073
	(0.4507)	(0.6405)	(0.2659)	(0.2232)
Observations	6,346	8,082	6,346	6,740

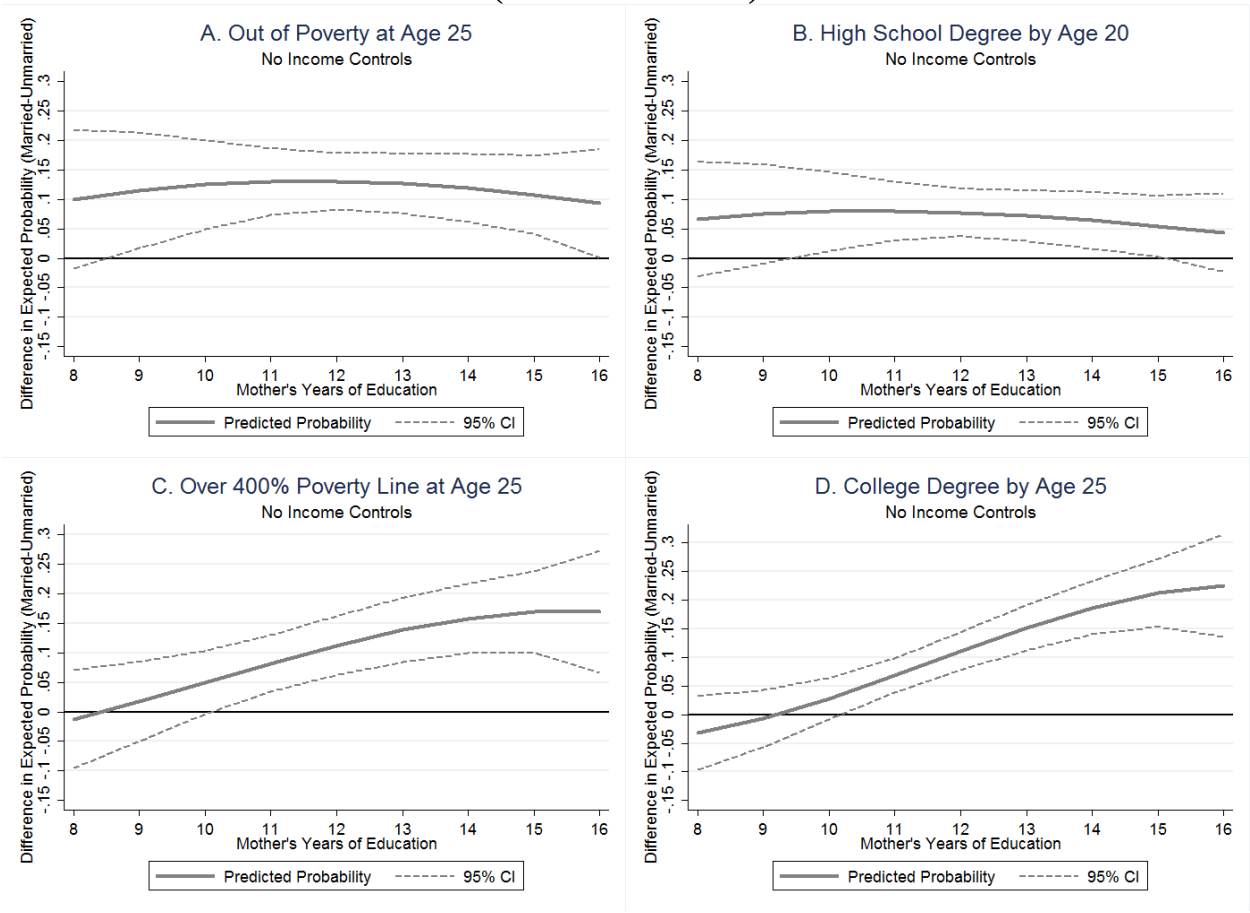
Notes: Outcomes weighted by PSID weights corresponding to the year the outcome is observed. Sample restricted to children born between 1960 and 1989, whose mothers were between 14 and 45 with non-missing education. Controls include gender, household race, and year of birth fixed effects. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table A4. Mother's Education and the Marriage Premium for Children
Regression coefficients, Average Childhood Household Income Controls

	Not In Poverty at 25	HS Degree By Age 20	Over 400 % Poverty Level at 25	College Degree by Age 25
			Income Controls	
Married at Birth	3.1812	-1.9022	2.0334	0.4520
	(2.6609)	(2.0747)	(2.0171)	(1.4976)
Married*Mother's Education	-0.7213	0.5290	-0.5401	-0.1601
	(0.6544)	(0.5165)	(0.5366)	(0.4017)
Married*Mother's Education^2	0.0572	-0.0449	0.0469	0.0157
	(0.0526)	(0.0422)	(0.0461)	(0.0347)
Married*Mother's Education^3	-0.0015	0.0012	-0.0013	-0.0004
	(0.0014)	(0.0011)	(0.0013)	(0.0010)
Mother's Education	0.7636	-0.3720	0.6714	-0.0249
	(0.6411)	(0.5011)	(0.5172)	(0.3843)
Mother's Education^2	-0.0559	0.0411	-0.0541	-0.0003
	(0.0515)	(0.0409)	(0.0444)	(0.0331)
Mother's Education^3	0.0014	-0.0013	0.0015	0.0001
	(0.0014)	(0.0011)	(0.0012)	(0.0009)
Average HH Inc from 0-5/√HH Size	0.0157***	0.0135***	0.0537***	0.0379***
	(0.0030)	(0.0028)	(0.0070)	(0.0046)
Constant	-2.7951	1.5238	-2.6269	0.1976
	(2.6064)	(2.0137)	(1.9500)	(1.4420)
Observations	5,180	6,748	5,180	5,514

Notes: Outcomes weighted by PSID weights corresponding to the year the outcome is observed. Sample restricted to children born between 1960 and 1989, whose mothers were between 14 and 45 with non-missing education. Average household income is computed as the average income between 0 and 5, scaled by the square root of the household size to account for economies of scale. Other controls include gender, household race, and year of birth fixed effects. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

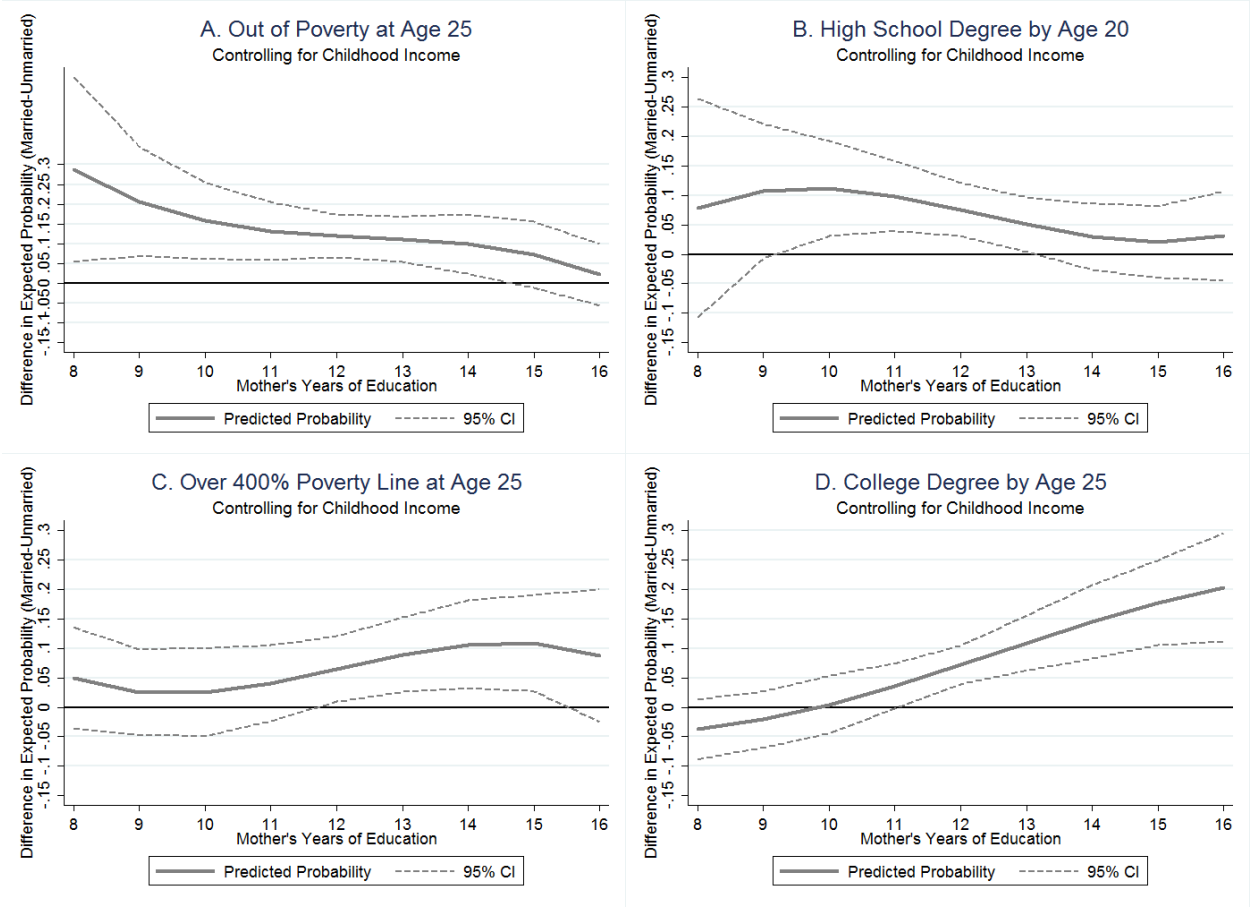
Appendix Figure 1: Mother's Education and the Marriage Premium for Children
(no income controls)



Notes: Difference in predicted probability obtained from regression specifications reported in Appendix Table 3, controlling for gender, race, ethnicity, year of birth. Ninety-five percent confidence intervals are plotted in dashed lines (standard errors were obtained using the Delta Method).

Source: Authors' calculations using data from the PSID.

Appendix Figure 1: Mother's Education and the Marriage Premium for Children
(with income controls)



Notes: Difference in predicted probability obtained from regression specifications reported in Appendix Table 4, controlling for gender, race, ethnicity, year of birth. Ninety-five percent confidence intervals are plotted in dashed lines (standard errors were obtained using the Delta Method).

Source: Authors' calculations using data from the PSID.

PSID Data Appendix

The Panel Study of Income Dynamics (PSID) is composed of several panel and cross-sectional datasets collected at either the household or individual level. We combine information from several of these datasets to identify characteristics of individual's mothers and family setting and link these measures to individuals. Each individual in the PSID is uniquely identified by two variables: the 1968 family interview number and the 1968 person number. Household members and children who enter the household or are born after 1968 are retroactively assigned to the family 1968 interview number and given a 1968 person number.

Using the PSID Family History, Parent Identification, we construct a crosswalk linking an individual to their mother's and father's 1968 interview number and person number. Next using the PSID Family History, Marriage History, we identify the year and month all marriages begin and end as well as the 1968 interview number and person number of the spouse. For our analysis, we restrict this marriage history to all women in the sample, and merge this history onto an individual's record. Using the individual's month and year of birth we are able to identify the mother's marital status at the child's birth, and for any age thereafter by comparing their age to the mother's marriage history.

Using the household level data, we construct a household level dataset that includes various measures of household income and the head of household race for each year. This household level information is then merged onto the individual level panel using the yearly interview number and year. For most of our analysis, we collapse the data to one observation per person to examine the individual's outcome at a given age (20 or 25). When collapsing the data, we preserve the individual sampling weights at each age for which we observe an outcome, and

in all of our analysis use the weights that correspond to the age at which the outcome is measured. Below we provide a table describing the source variables and construction of our key variables.

Appendix Table 5. Key Variables Constructed from the PSID

Variable measure	Source Variables	Construction	Notes
Mother Married at Birth	MH10, MH11, MH13, MH14, MH15, MH16	Using the year and month of marriages, divorces, and separations, we compare the birth of each individual to the timing of their mother's marriage history	Individuals who are born to mothers not in the sample will not have a mother's marriage history. They are excluded from our analysis.
Mother Married Age 14	Month and Year of Marriage, Divorce, and Separation MH10 MH11 MH13 MH14 MH15 MH16	Constructed similar to "mother married at birth", but uses the individual's date of birth and year of birth to determine the status at age 14.	
Mother Married to Biological Father at Birth age 14	Month and Year of Marriage, Divorce, and Separation Spouse ID and Biological Father ID MH10 MH11 MH13 MH14 MH15 MH16 MH7 MH8 PID19 PID20	Constructed similar to "mother married at birth", but also condition on the spouse's id matching the biological father's id	Interview and person numbers are not always provided for the individual's father. In those cases, we code the mother as married, but father unknown. These individuals are included in most marriage analyses, but excluded from transition analyses.
Modal Year of Birth	Year of Birth ER30404 ER30434 ER30468 ER30503 ER30540 ER30575 ER30611 ER30647 ER30694 ER30738 ER30811 ER33106 ER33206 ER33306 ER33406 ER33506 ER33606 ER33706 ER33806 ER33906 ER34006 ER34106 ER34206	Because there are some entry errors or the year of birth is not always reported, we assign the modal year of birth as the year of birth	
Age	Modal year of birth, Survey Year, and Survey date	We construct age as the date of survey minus the date (month and year) of birth.	
Mother's age at birth	ER32011	We subtract the mother's year of birth from the individual's modal year of birth to construct the age at birth	
Mother's	Completed Schooling	In long panel form, we identify	The completed schooling variables are

educational attainment	ER30010 ER30052 ER30076 ER30100 ER30126 ER30147 ER30169 ER30197 ER30226 ER30255 ER30296 ER30326 ER30356 ER30384 ER30413 ER30443 ER30478 ER30513 ER30549 ER30584 ER30620 ER30657 ER30703 ER30748 ER30820 ER33115 ER33215 ER33315 ER33415 ER33516 ER33616 ER33716 ER33817 ER33917 ER34020 ER34119 ER34230	the maximum education ever reported by the mother. In general, we use this measure, although we also have constructed the mother's maximum educational attainment before the birth. This is then merged on to each individual's record using the mother's ID	different before and after 1985. Prior to 1985, years of schooling is only reported for individuals who are no longer in school and under 25. After 1985, the variable is recorded only for individuals 16 and over who are no longer in school. For this reason we prefer the maximum schooling ever reported. The PSID does not differentiate between HS diploma and GED at the individual level.
Living with Mother/Father	Parent ID PID4 PID5 PID19 PID20	Using the 1968 interview and person number of each person living in an individual's interview unit, we match to see if the mother or father is living in the same household.	Mother and Father ID is not provided for every individual. For most of our analysis we restrict our sample to children whose parents' IDs are known.
Family Status	Mother married (to biological father) at birth (age 14), Living with Mother, Living with Father	Using the mother's marital status at birth (or a given age) and "Living with Mother"/ "Living with Father" we can identify if the child is living with one, both, or neither parent, and if the parents are married	
Household Head Race Indicators	Race V181 V801 V1490 V2202 V2828 V3300 V3720 V4204 V5096 V5662 V6209 V6802 V7447 V8099 V8723 V9408 V11055 V11938 V13565 V14612 V16086 V17483 V18814 V20114 V21420 V23276 ER3944 ER6814 ER9060 ER11848 ER15928 ER19989 ER23426 ER27393 ER40565 ER46543 ER51904 ER57659 Ethnicity V11937 V13564 V14611 V16085 V17482 V18813 V20113 V21419 V23275 ER3941 ER6811 ER9057 ER27392 ER40564 ER46542 ER51903 ER57658	We define unique race groups from the household head's race: Non-Hispanic White, Non-Hispanic Black, Hispanic, Non-Hispanic Other, and Missing Race	Prior to 1985, there were 5 recorded categories: White, Black, Spanish-American, Other, and Missing. After 1985 there were two separate race and ethnicity variables. After 1985, we classify anyone who indicates a Hispanic ethnicity as Hispanic, and record them according to their race if no ethnicity is specified. Only the ethnicity of the head of household (and sometimes his wife) is indicated. For simplicity we assign the head's race to all individuals in the household.
Family Income last year	Household Income V81 V529 V1514 V2226 V2852 V3256 V3676 V4154	This household level variable specifies the total household	This variable is available in all survey years. The exact transfers included in this variable

	V5029 V5626 V6173 V6766 V7412 V8065 V8689 V9375 V11022 V12371 V13623 V14670 V16144 V17533 V18875 V20175 V21481 V23322 ER4153 ER6993 ER9244 ER12079 ER16462 ER20456 ER24099 ER28037 ER41027 ER46935 ER52343 ER58152	income in the previous year.	vary from year to year.
Family Income		This variable is constructed by assigning the family income from the following survey to the previous year	After 1997, when the survey became biennial, this variable is not available.
Adjusted Family Income	H&W taxable income V76, V518, V1205, V1906, V2507, V3060, V3472, V3872, V4386, V5297, V5796, V6408, V6998, V7590, V8283, V8891, V10277, V11419, V12818, V13920, V14935, V16435, V17851, V19151, V20451, V21959, ER4146, ER6986, ER9237, ER12069, ER16452, ER20449, ER24100, ER27953, ER40943, ER46851, ER52259, ER58060 Other members taxable income V79, V521, V1222, V1924, V2525, V3078, V3490, V3891, V4406, V5318, V5817, V6428, V7033, V7625, V8318, V8926, V10382, V11561, V12968, V14070, V15085, V16585, V18001, V19301, V20601, V22373, ER4150, ER6990, ER9241, ER12073, ER16456, ER20453, ER24102, ER28009, ER40999, ER46907, ER52315, ER58124	This is constructed by adding the head and wife's taxable income, and all other household member's taxable income	Taxable income is consistently measured across all survey years and included in the total family income measure used above.
Average Income in Childhood	Family Income, Household size	We divide household income by family size and then average over all years available when the child was between 0-5.	We censor household size to 9, in order to match provided poverty cutoffs.
In Poverty at 5	Family Income	We combine the family income measure with the Census Bureau's annual poverty cutoffs for each family size to compute the poverty level at age 25	
In Poverty at 25		Analogous to "in poverty at 5"	
No HS Degree by 20	Completed Education	Using the completed education variables in the panel, we identify the maximum years attained by age 20 and flag an	

		individual as no degree if it is below 12.	
No College Degree by 25	Completed Education	Using the completed education variables in the panel, we identify the maximum years attained by age 25 and flag an individual as a college graduate if it is 16 or greater.	
Individual Weights	ER33430 ER33546 ER33637 ER33740 ER33848 ER33950 ER34045 ER34154 ER34268 ER30019 ER30042 ER30066 ER30090 ER30116 ER30137 ER30159 ER30187 ER30216 ER30245 ER30282 ER30312 ER30342 ER30372 ER30398 ER30428 ER30462 ER30497 ER30534 ER30569 ER30605 ER30641 ER30686 ER30730 ER30803 ER30864 ER33119 ER33275 ER33318	Sample weight constructed by the PSID	