Is My Parent's Divorce to Blame for My Failure in Life? A Joint Model of Child Educational Attainments and Parental Divorce

Shirley H. Liu*

July 16, 2007

Abstract

This study examines the potential causal effect of parental divorce on child educational attainments, using annual data on individuals covering the entire time span between birth until the completion of ones schooling drawn from the Panel Study of Income Dynamics (PSID). A joint hazard model of schooling attainment and parental marital dissolution is estimated, allowing for correlations between unobserved factors that affect the parents' human capital investment choices toward their children and their decision to divorce. After accounting for dynamic variations in family socioeconomic circumstances, experiences, and family unobserved heterogeneity, this study finds no evidence that divorce negatively affects children's long-term educational attainments. The findings suggest that the differences in educational attainments between children of divorced and intact parents are not attributable to divorce, but rather the underlying mechanism that triggered divorce in the first place.

Keywords: Divorce, Adolescent Outcome, Educational Attainment, Joint Hazard Model

JEL Classification: $J12$, $J13$, $J24$

*Department of Economics, University of Miami, P.O. Box 248126, Coral Gables, FL 33124-6550, U.S.A.; Telephone: 011-1-305-284-4738; Fax: 011-1-305-284-6550; Email: s.liu2@miami.edu. Valuable comments were received from David Ribar, Philip Robins, Debra Dwyer, Warren Sanderson, Mark Montgomery, Frank Heiland, Hope Corman, Kelly Noonan, and Al Holtman. All remaining errors are mine.

1 Introduction

The startling growth in divorce rates and the number of children involved[1] has became an object of grave concern among policy makers and spawned voluminous research in the social sciences. Compared to individuals raised in intact families, individuals who experienced parental divorce while growing up are commonly found to have lower educational attainments, a precursor of unemployment and poverty in adulthood. These findings are frequently cited by advocates to promote marriage and restrict access to divorce.[2] However, although the negative association between parental divorce and child outcomes are well-documented,[3] even after accounting for preexisting disadvantages (Sandefur et al., 1992; McLanahan and Sandefur, 1994), evidence on whether divorce in itself has a causal impact on children is far from conclusive.

Divorce may be a consequence of a long process of relationship deterioration between the spouses, during which the quality of parenting and therefore children involved may suffer. Hence, parents' divorce and adverse child outcomes may both be driven by common unobserved factors.[4] However, attempts to account for the endogeneity of divorce is challenged by both data and methodological limitations. First, prior family histories informative of the processes of parental relationship dissolution and child investment behavior tend to be observed only during a brief period (i.e., late childhood, adolescence, ...etc) in many datasets. Consequently the findings may only apply to the targeted age groups (Manski et al., 1992; Todd and Wolpin, 2003). Secondly, while a natural experiment in this context is infeasible for obvious ethical concerns, finding a suitable instrument proves to be extraordinarily difficult. Alternative identification methods such as quasi-experiments using individuals

[1] The number of divorces per year increased from $393,000$ in 1960 to $1,182,000$ in 1990; while the number of children involved in parental divorces increased from $463,000$ in 1960 to $1,075,000$ in 1990. Note that the collection of detailed data on marriage and divorce in the U.S. was suspended by the NCHS beginning in January 1996 (See Federal Register Notice, Dec. 15, 1995). Limitations in the information collected by the states as well as budgetary considerations necessitated this action. Hence, we cite from the most recent comprehensive analyses published in Advance Report of Final Marriage Statistics, 1989-90 and Advance Report of Final Divorce Statistics, 1989-90.

[2] At the federal level, President Bush's Welfare Reauthorization Plan commits millions of funding to projects promoting the stability of marriage. Several states have also passed covenant marriage legislations to discourage divorce. Covenant marriage legislation mandates that couples agree upon marriage to limited grounds of divorce. It has been passed in the states of Louisiana, Arkansas, and Arizona, and proposed in the states of Oregon, Georgia, Texas, Oklahoma, Florida, New Hampshire, Indiana, and Michigan.

[3] Children from divorced families are generally found to have worse educational, behavioral, and psychological outcomes compared to children raised in continuously intact two-parent families (Furstenberg and Cherlin, 1991; Emery, 1999). Furthermore, the gap seems to persist well into adulthood (Amato and Keith, 1991).

[4] An extreme example such as mental or physical cruelty (Kitson and Sussman, 1982), may increase the probability of divorce and have long-term implications on children.

experienced with parental bereavement as a reference group have been proposed, but the underlying assumption that parental death is exogenously driven may be inappropriate. Finally, sibling fixed effect models which utilizes variations between siblings rely on data of families with at least two children. The findings may be limited in their generalizability since families that are relatively unstable tend to have fewer children and divorce sooner (Lillard and Waite, 1993).

This study investigates the potential casual link between parental divorce and child educational attainment, using data on a total of $3,044$ individuals from $2,004$ families drawn from the Panel Study of Income Dynamics (PSID). Annual family socioeconomic circumstances and experiences are observed for each individual beginning at birth until his/er completion of formal schooling, spanning a total of 32 years. Parental divorce and child investment decisions are modeled as a joint duration process, allowing for dynamic variations in family circumstances and correlation between the unobservables triggering divorce and affecting child development. The findings show that unobserved factors that increase the likelihood of divorce, rather then divorce itself, explain the differences in attainments between children from intact vs. divorced families.

The joint model complements existing methodologies used in the literature by incorporating the advantages of each technique mentioned above into the joint model. Similar to the sibling fixed effects models, shared family factors across siblings can be controlled for by clustering at the family level. In addition, state marriage and divorce legislations identified as potential instruments in previous research are used as additional exclusionary restrictions. In line with the quasi-experimental approach, individuals from bereaved families are included as an additional control group. Finally, by using a random sample of individuals who experienced divorce at all ages while growing up, rather than specific age groups, the findings in this study may be more generalizable for understanding the overall impact of parental divorce on children.

2 Review of Findings and Methodologies

Individuals experienced with parental divorce while growing up are less likely to complete high school, attend college, and hold a job (Amato et al., 1995; Biblarz and Raftery, 1999; Garasky, 1995; McLanahan, 1985), however whether parental divorce is to blame remains an open question. Cherlin

et al. (1991) find that observable disadvantages prior to divorce can explain a significant portion, but not all, of the differences in child outcomes. While the literature base widely recognized that there may be unobservables driving both parental divorce and child outcomes (Haveman and Wolfe, 1995), and various estimation strategies have been employed to address this issue (Ribar, 2006), there is little consensus as to whether divorce in itself has a causal effect on child attainments.

Pre-existing disadvantages have been found to partially explain the differences in outcomes between children from divorce and intact families (Painter and Levine, 2000), and for some the inferior outcomes were visible even prior to divorce (Cherlin et al., 1991). To disentangle the effect of divorce from other mediating factors, ideally one would have access to information on all past and present parental inputs and family experiences (Todd and Wolpin, 2003). However, most available datasets including many prominent longitudinal surveys, do not provide entire family histories of individuals since birth while growing up.[5] In turn, family structure changes and home environment are only observable for the observational period, making it difficult to separate the effect of divorce from prior disadvantages.Empirical studies are typically limited to examining the effect of divorce either during childhood or adolescence, but never both.[6] Given that these studies are based on different age groups, comparisons are nearly impossible and the results may not be generalizable for other age groups.

Reconciling existing findings is further complicated by the use of different methodological approaches in dealing with the endogeneity of divorce. Gruber (2004) utilizes state level differences in divorce legislations as instruments for divorce. However, such instruments may not be able to detect any effects on divorce if few people are on the margin where the inconvenience of more stringent divorce requirements matter. Furthermore, Card (1999) and Heckman et al. (1999) point out that relying on instruments may also fail if there are differences in response to an event across people which subsequently affect their decision-making. Exogenous differences in divorce stringency may induce those who foresee large divorce gains to divorce in areas with arduous restrictions, whereas those who foresee small gains may divorce in areas with fewer restrictions: The size of the effect on well-being will vary systematically with the otherwise exogenous costs of divorce.

[5] E.g., The National Education Longitudinal Survey (NELS) provides information on children from eighth grade onwards, and the National Longitudinal Survey of Youth (NLSY) begins interviewing individuals of age 14 or older.

[6] E.g., Cherlin et al. (1991) use data on individuals who experienced parental divorce during middle childhood, while Corak (2001) and Painter and Levine (2000) focus only on the effect of family structure changes during teenage years.

Fixed effects models applied to data on siblings account for their shared family background and upbringing. Identification generally relies on the difference in time exposed to divorce across siblings. Sandefur and Wells (1999), Ermisch and Francesconi (2001), Bjorklund et al. (2006) and Ginther and Pollak (2003) all find that the correlation between family structure and child outcomes is reduced but remains significant, while no significant effect found by Gennetian (2005) and San de Galdeano and Vuri (2006). However, factors that are fixed across siblings and biases associated with unobserved factors that vary across siblings cannot be identified nor corrected. In addition, Ribar (2006) points out that the stable non-intact families, which are most common in longitudinal datasets but may not be representative of non-intact families in general, do not contribute useful variation.

Recently some researchers have introduced children from bereaved families as an additional control group to identify the effect of divorce on children. Under the assumption that parental bereavement is generally due to exogenous reasons, differences in outcomes between children from divorced and bereaved families are interpreted as the causal effect of divorce. Lang and Zagorsky (2000), Fronstin et al. (2001), and Corak (2001) find significant differences in child outcomes between these two family types, and cite it as evidence of a large selection effect of divorce. However, interpreting the differences in child outcomes between divorced and bereaved families as the causal effect of divorce may be inappropriate: First, the assumption that parental loss through death is exogenous is questionable;[7] Secondly, the differences in child outcomes may reflect differences in socioeconomic support systems and parenting behaviors between these two types of families, rather than selection.

This study examines the potential causal effect of divorce on child educational attainment by modeling parents' investment in children's human capital and marriage dissolution as a joint duration process.[8] Duration models (as opposed to static methods) are able to keep track of the sequence and the evolution of experiences in the course of one's family life and schooling. To account for the endogeneity of divorce, correlations between unobserved factors that influence each of these decisions are allowed and the two processes are estimated jointly. In addition, we incorporate (1) mother fixed-effects, (2) state level divorce legislations as additional exclusionary restrictions, and (3) children

[7]For example, physical violence can either lead to divorce, but in extreme cases it can lead to spousal homicide (Stevenson and Wolfers, 2003).

[8]Hazard models have been used to estimate the effect of family structure on premarital childbearing behavior of teenagers (Wu and Martinson, 1993), but not in modeling children's educational attainments.

from bereaved families as an additional reference group to enhance the identifiability of the model.

3 Data and Study Sample

This study uses longitudinal data on a sample of individuals and their parents drawn from the Panel Study of Income Dynamics (PSID), 1968 - 2001.[9] The PSID began interviewing a nationally representative cross-sectional sample of individuals residing in $5,500$ households across the United States in 1968. Follow-up interviews were conducted annually, and are still on going.[10] The PSID is well suited for this study because first, complete histories of socioeconomic conditions and other background characteristics for each individual are continuously (annually) observed from birth until the completion of his/er schooling. Second, marital status information of all individuals is collected at each interview. This together with a complete retrospective marital and fertility history allow us to precisely date marital status changes (including remarriages).[11] Finally, the sample of married couples with children is large, with a sizable portion of these families experiencing divorce during the observational period. The entire age range of children at risk of experiencing divorce is represented.

The study sample includes only individuals born within the first eleven waves (1968 - 1978) into the original core of PSID households. Restricting the sample in this manner allows sufficient time to observe each individual's final educational attainment, as measured by one's years of schooling completed.[12] For an individual to be included in our sample, one must satisfy all four of the following

[9]The PSID is sponsored and distributed by Inter-University Consortium for Political and Social Research, University of Michigan, Ann Arbor, MI.

[10]Individuals who left or join the original sample of households are also included and followed.

[11]Starting in 1985, the PSID collects information on retrospective relationship histories of individuals in the 1968 families: *Relationship History File*, 1985 - 2001. This information is used to construct marriage history information for the parents of our study sample. To construct parental marriage history information, information included in the same file between married pairs is linked to the parent-child pair. Individuals for whom mother's marital history is either missing or incomplete are dropped.

[12]Due to the PSID study design, information on the exact grade completed in each year for a given individual is not reported, unless the individual has completed all formal education. Given this setup, the exact grade of schooling attained for each individual at each age is largely missing. To deal with this issue, we checked whether the time in which the final grade of schooling attained and reported was appropriate given the age of the individual. If the final grade of schooling reported is within two grade-levels that are reasonable for an individual of a given age, then such individuals are included. The assumption made is that even if an individual takes a few years longer to achieve a certain grades of schooling, i.e. dropping out or left behind for a short period, it is the fact that he or she completed the particular grade of schooling that is important. Given the data limitation, this study cannot address the issue of repeated spells of schooling. The estimates would likely reflect a lower bound of the divorce effect, if children from divorced families on average are more likely to take more than two years to complete any particular grades of schooling, or be left behind in school for an extended period.

additional criteria: (1) mother's marital history is identified; (2) born within the marriage of one's biological parents; and (3) household socioeconomic information is available annually during the observational period; and (4) experienced parental divorce prior to completion of all formal schooling.

Table (1) presents the summary statistics and variable definitions. The final sample consists of $3,044$ individuals from $2,004$ family units, all born within the marriage of their biological parents. Multiple children are observed for 60% of the family units. Approximately 20% of individuals (26% of the families) experienced parental divorce while growing up. [13] A sizable portion of the divorced mothers, roughly 48% of the sample, eventually remarried.

4 Econometric Model

Parents' child investment and marital dissolution are modeled as joint decision processes. The two outcomes are represented by the durations since a child's birth until the occurrences of a child's schooling completion and parents' divorce, respectively. The timing until each event, while at risk, is modeled as a continuous-time hazard function. The hazard function describes the conditional probability that the event will take place at time t, given that it has not yet occurred by time t, conditional on observable characteristics and family level heterogeneity.

For each set of parents i, the duration of schooling for their j^{th} child ($T^s_{i,j}$) and the duration of their marriage (T^m_i) are modeled jointly. The time dimension is defined with respect to the age of each child in a family. For child j from family i, the hazard of schooling exit ($h^s_{i,j}$) and the hazard of the parent's marital dissolution (h^m_i) are specified as (in logs):

$$\ln h^s_{i,j}(t) = \pi_{s0} + \pi'_{s1} Dur^s_{i,j}(t) + \pi'_{s2} X^s_{i,j}(t) + \pi'_{s3} M_{i,j}(t) + \varepsilon^s_i \quad (1)$$

$$\ln h^m_i(t) = \pi_{m0} + \pi'_{m1} Dur^m_i(t) + \pi'_{m2} X^m_i(t) + \pi'_{m3} Z_i(t) + \varepsilon^m_i \quad (2)$$

The pair of baseline piecewise-linear spline variables, $Dur^s(t)$ and $Dur^m(t)$, accounts for potential underlying duration dependence.[14] The baseline schooling exit hazard, $Dur^s(t)$, reflects a child's ac-

[13] Children from divorced families experienced divorce at different ages while growing up: 38% by the age of 6, 35% between the age of 6 to 12, and 27% after the age of 12 (Not shown).

[14] Duration dependence refers to when the hazard changes continuously with time.

cumulation of human capital, hence the risk of schooling exit (i.e. dropping out of school) is expected to rise as the child grows up. The baseline divorce hazard, $Dur^m(t)$, accounts for the accumulation of marital-specific capital and information about the quality of their match. The risk of divorce may initially rise and then eventually decline as the marriage endures (Lillard and Waite, 1993).[15]

4.1 Exit Hazard of Schooling

To examine whether the effect of parental divorce is causal in determining the poor child outcomes, influences from observed factors such as pre-existing socioeconomic disadvantages, must first be ruled out (Painter and Levine, 2000). The quality of their match not only affects a couples' decision of whether to stay married, but may also influence parents' investment strategies toward their children before and after divorce. Therefore, the quantity and quality of both parental time and material investments, and the timing of these investments, are important factors in determining child educational outcomes and correlated with family structure.

The vector $X_{i,j}(t)$ consists of both time-varying and time-invariant measures to account for parents' investments in children. Family-specific measures (i.e., constant across all siblings) include parents' educational backgrounds, household income, number of offspring within the marriage, and race. Since the observational unit of the exit hazard of schooling is constructed with respect to each child, several measures vary across siblings (child-specific): Gender, birth order, mother's age at

[15]For a general specification of the baseline duration dependence, the piece-wise linear specification building on the Gompertz proportional hazard is employed. (For notational convenience, the subscripts (i, j) are suppressed here). π_{s1} and π_{m1} are vectors of slope coefficients associated with the vectors of linear spline variables, Dur^s and Dur^m, respectively. The spline variable for the k^{th} interval between λ^s_{k-1} and λ^s_k in the schooling duration, and the spline variable for the l^{th} interval between λ^m_{l-1} and λ^m_l in the marriage duration are given by:

$$\begin{aligned} Dur^s_k(t) &= max[0, min(t-\lambda^s_{k-1}, \lambda^s_k - \lambda^s_{k-1})] \\ Dur^m_l(t) &= max[0, min(t-\lambda^m_{l-1}, \lambda^m_l - \lambda^m_{l-1})] \end{aligned}$$

The nodes (or cut-off points) are chosen to be at 6, 10, and 12 for the schooling duration (i.e. $\lambda^s_1 = 6$, $\lambda^s_2 = 10$, $\lambda^s_3 = 12$, $\lambda^s_4 = \infty$) to denote important breaks in formal education at 6^{th}, 10^{th} and 12^{th} grades; and the nodes for parental marriage duration are 5, 10, and 15 (i.e. $\lambda^m_1 = 5$, $\lambda^m_2 = 10$, $\lambda^m_3 = 15$, $\lambda^m_4 = \infty$). The estimates reported in this study are robust to the choice of the cut-off points and the number of nodes chosen. The baseline duration splines are:

$$\begin{aligned} \pi'_{s1} Dur^s(t) &= \sum_{k=1}^{4} \pi_{s1,k} \cdot Dur^s_k(t) \\ \pi'_{m1} Dur^m(t) &= \sum_{l=1}^{4} \pi_{m1,l} \cdot Dur^m_l(t) \end{aligned}$$

childbirth, number of children or adults living in the household at age t,[16] urban residence at age t, and geographical location of current residence at age t.

Family structure changes are represented by the vector $M_{i,j}(t)$, which includes two time-varying binary variables, $Divorce_{i,j}(t)$ and $Remarriage_{i,j}(t)$. $Divorce_{i,j}(t)$ is equal to 1 if the parents of child j from family i report to be divorced when the child is of age t (and thereafter). This is to account for the effect of divorce, its timing,[17] and the duration of exposure to parental divorce on the exit hazard of child schooling. Many divorced parents eventually remarry, and about half of the children from divorced families experience living with a stepparent while growing up (Furstenberg and Cherlin, 1991).[18] $Remarriage_{i,j}(t)$ is equal to 1 if the mother is in a subsequent marriage when the child is at age t, to account for potential advantages (or disadvantages) associated with having a stepparent.[19]

Finally, conditional on observed characteristics, children from some families may be more likely to dropout of school early, due to differences in endowments or parenting behavior. These individuals will tend to have lower educational attainments (or shorter schooling durations). Unobserved characteristics that may influence attainments of all children within a family are captured in the error term, ε_i^s, the effect of which is removed from the schooling exit.

4.2 Hazard of Marital Dissolution

Weiss and Willis (1997) theorize that couples divorce if the gains from being single exceed that of staying married. Parents face substantially higher costs of dissolving their marriage compared to childless couples, since having children represents a long-term commitment to the marriage and requires continuous investments. Assuming that the quality of children is a desired martial specific

[16] "Children" refers to individuals at most 17 years of age; and "Adults" refers to those at least 18 years old.

[17] Liu (2004) examines the timing of parental divorce on child educational attainments, by allowing for separate baseline hazards for children whose parents divorced at varying age ranges.

[18] "Divorce" and "Remarriage" defined here refer to legal divorces and marriages only. While parental separation is also potentially an event of interest, for many in the PSID, this information tends to be missing. In addition, since separation can be either a formal or an informal arrangement, and not necessarily legally required prior to divorce, it is unclear whether the missing information on separation is due to under-reporting or that the couple never separated. Given that the focus of this study is on the effect of "divorce", the main results are based on the legal definition of divorce only. However, we also examine the effect of "disruptions", which treat both (reported) separations and divorces as similar events, on the educational attainment of children. The results are reported in the next section.

[19] Potential benefits to children of having a stepparent may include additional parenting time and resources, and flexibility in the coordination of supervision. However, there may also be disadvantages associated with living with a stepfather, such as higher risks of sexual abuse for girls (Russell, 1984; Gordon, 1989).

capital, parents may internalize the potential gains (or costs) for their children when making the decision of whether to divorce.

Costs of divorce include potential loss of economic resources and social networks, besides legal fees. There are also non-pecuniary costs to be considered. During the process of divorce, children can suffer from separation from one parent, parental hostility, and residential dislocation (Painter and Levine, 2000). However, on the margin, there may also be gains to divorce. Divorce usually does not occur when marital relations are good, but rather when it deteriorates.[20] Couples may react to the stress by arguing constantly, choose not to communicate, or in the extreme case resort to violence. Hence removing children from a potentially hostile home environment can also be beneficial.

The risk of marital dissolution depends on a vector of explanatory variables, $X_i^m(t)$, including: Order of the marriage, number of children within the marriage, mother's age at marriage, parental educational backgrounds, (log) average household annual income,[21] and race. Higher order marriages are more likely than first marriages to end in divorce (Hetherington et al., 1998). Lillard and Waite (1993) find that instability within a marriage decreases a couple's commitment to have children, hence the number of children within a marriage may be correlated the overall quality of the match. Race is included to account for racial differences in marriage market opportunities.[22] Additional exclusionary restrictions, $Z_i(t)$, are included in the divorce hazard. Differences in the dates that each state enacted no-fault and/or unilateral divorce legislations[23] and state divorce rates provide sources of both longitudinal and cross-sectional variation, as suggested by Gruber (2004).[24]

Some couples may be more divorce-prone relative to others, even conditional on observed characteristics. Parents who are less committed to their families may be less effective as parents and as spouses (Lillard and Waite, 1993), and may be more likely to divorce earlier. Unobserved couple

[20] Economic distress, extra-marital affairs, substance abuse, and behavioral or medical problems (among others) are frequently cited as causes for divorce (Manski et al., 1992).

[21] Our results are robust to how household income is defined. Estimation results using (log) time-varying annual household income is reported in Appendix Table 1.

[22] Rank and Davis (1996) find that the racial differences in marriage and divorce rates can be explained by racial differences in marital attitudes and perceived outside opportunities.

[23] Our study sample were born and grew up in a period that coincides with dramatic changes in divorce policies in the U.S.. The state of California passed the first "No Fault" divorce legislation in 1970, and many states further passed legislations for "Unilateral" divorce. Both types of legislation alleviated the costly process of divorce by removing the necessity of fault grounds, with the main difference being that while no fault divorce still requires the mutual consent of both partners, unilateral divorce only requires the consent of one of the partners.

[24] Data on state divorce legislations are obtained from Friedberg (1998).

heterogeneity is incorporated in the residual term, ε_i^m.

4.3 Simultaneity

The estimated effect of divorce may be biased if the endogeneity of divorce is ignored (Pindyck and Rubinfeld, 2000). Two unobserved heterogeneity components are included in the model, ε_i^s and ε_i^m, each representing the effects of unmeasured latent risk factors that are not included in the model and a source of correlation between the two processes. They are assumed to be jointly normal:

$$\begin{pmatrix} \varepsilon^s \\ \varepsilon^m \end{pmatrix} \sim N\left(\begin{pmatrix} 0 \\ 0 \end{pmatrix} \quad , \quad \begin{pmatrix} \sigma_s^2 & \rho\sigma_s\sigma_m \\ - & \sigma_m^2 \end{pmatrix} \right)$$

The estimated correlation coefficient of the two heterogeneity terms, $\widehat{\rho}$, is expected to be positive, given that unobserved factors that increase parents' propensity to divorce, should also increase the probability that the individual completes fewer grades of schooling.

4.4 Estimation

The baseline survivor functions[25] for the schooling duration of child j of family i , and the duration of parents' marriage of family i, are (for notational convenience, the subscript i is suppressed):

$$S_{0j}^s(t) = exp\{-\int_{\tau_{0j}^s}^{t} exp\{\pi_{s0} + \pi_{s1}' Dur_j^s(v)\}dv\} \tag{3}$$

$$S_0^m(t) = exp\{-\int_{\tau_0^m}^{t} exp\{\pi_{m0} + \pi_{m1}' Dur^m(v)\}dv\} \tag{4}$$

respectively, where τ_{0j}^s and τ_0^m are the child's age at the beginning of schooling and his/er parents' marriage. The corresponding survivor functions (conditional on the heterogeneity terms) are:

$$S_j^s(t|\Omega(t),\varepsilon^s) = \prod_{i=1}^{K_j^s}[\frac{S_{0j}^s(t_{jk+1}^s)}{S_{0j}^s(t_{jk}^s)}]^{exp\{\pi_{s2}' X_j^s(t_{jk}^s) + \pi_{s3}' M_j(t_{jk}^s) + \varepsilon^s\}} \tag{5}$$

$$S^m(t|\Omega(t),\varepsilon^m) = \prod_{i=1}^{K^m}[\frac{S_0^m(t_{k+1}^m)}{S_0^m(t_k^m)}]^{exp\{\pi_{m2}' X^m(t_k^m) + \pi_{m3}' Z(t_k^m) + \varepsilon^m\}} \tag{6}$$

[25]The survival probability of an event at time t is the probability that the event had not yet occurred by t.

representing the conditional probabilities of censored marriage and schooling durations. The vector $\Omega(t)$ denotes the full history of the covariates ($X_j^s(t)$, $X^m(t)$, $M_j(t)$, $Z(t)$) since the beginning of schooling or the parents' marriage until age t. The sub time intervals in which the time-varying covariates are constant are denoted by k ($k = 1, ..., K_j^s$ or K^m). For completed spells, the conditional density functions are given by the product of the conditional survivor and hazard functions:

$$f_j^s(t|\Omega(t), \varepsilon^s) = S_j^s(t|\Omega(t), \varepsilon^s) h_j^s(t|\varepsilon^s) \tag{7}$$

$$f^m(t|\Omega(t), \varepsilon^m) = S^m(t|\Omega(t), \varepsilon^m) h^m(t|\varepsilon^m) \tag{8}$$

These survivor and density functions may be combined into the conditional likelihood functions covering both the censored and uncensored cases. Let $p \in (s, m)$:

$$L_j^p(\varepsilon^p) = \begin{cases} S(t_{j**}^p, \Omega(t_{j**}^p), \varepsilon^p) \text{ if Censored} \\ f(t_{j*}^p, \Omega(t_{j*}^p), \varepsilon^p) \text{ if Uncensored} \end{cases} \tag{9}$$

where t_{j*}^p denotes complete duration and t_{j**}^p denotes the time at censoring.

The joint probabilities of observed outcomes conditional on the vector of unobserved heterogeneity components $(\varepsilon^s, \varepsilon^m)$ is the product of the individual conditional probabilities: $L_{ij}^s(\varepsilon^s)$ and $L_i^m(\varepsilon^m)$ for family i. Because the heterogeneity components are included to represent the common part of behavior after controlling for the covariates, the conditional probabilities are independent (Lillard and Waite, 1993). Consequently, the contribution to the joint likelihood of family i's complete set of outcomes is the integral of the joint conditional likelihood over the range of the jointly normal heterogeneity terms, given there are a total of N families, is:

$$L = \int_{\varepsilon^s} \int_{\varepsilon^m} \frac{\phi(\frac{\varepsilon^s}{\sigma_s}, \frac{\varepsilon^m}{\sigma_m} | \rho \varepsilon^s \varepsilon^m)}{\sigma_s \sigma_m} \times \prod_i^N \prod_j^J (L_{ij}^s(\varepsilon^s) L_i^m(\varepsilon^m)) d\varepsilon^s d\varepsilon^m \tag{10}$$

where J denotes the total number of children.

The following features of this model are useful for reducing the bias in estimated effect of divorce. First, the exit hazard of schooling is a function of time-varying covariates, which accounts for dynamic changes in observable factors surrounding the child while growing up. Second, the timing of divorce

is incorporated in the child's exit hazard of schooling. To account for the potential endogeneity of divorce, the process of parental marital dissolution is explicitly modeled and estimated jointly with the exit hazard of child schooling. Endogeneity in this case means that the risk of schooling exit (or "dropping out") is determined simultaneously within the system and may correlate with unobservables affecting parental marital dissolution. Each of the two heterogeneity terms, ε_i^s and ε_i^m, represents time-invariant unmeasured factors within the family that are not included in the model and a source of correlation across the two equations.

The coefficient vectors $(\pi_{s0}, \pi_{s1}, \pi_{s2}, \pi_{s3}, \pi_{m0}, \pi_{m1}, \pi_{m2}, \pi_{m3}, \sigma_s, \sigma_m, \rho)$ are estimated within the model using Full Information Maximum Likelihood via the aML Multiprocess Multilevel Modeling software (Lillard and Panis, 2003). The piecewise linear Gompertz distribution, which is flexible and imposes very little restrictions on the baseline hazard, is assumed here. The separate identification of the variances, σ_s^2 and σ_m^2, generally rely on the presence of multiple outcome spells (Brien et al., 1999). Recall that our interest is to understand the implications of divorce between the biological parents, and since it is rare that the same couple marry each other multiple times, only single marriage spells are observed. Nevertheless, 60% of the families in our sample have multiple children and we are able to identify the model by exploiting variation in the schooling outcomes across siblings.[26]

5 Estimation Results

This section presents the estimation results of the joint hazard model of child schooling attainments and parental marital dissolution specified in Equations (1) and (2).[27] To illustrate the importance of endogenizing parental divorce, the child's exit hazard of schooling as specified in Equation (1) is first estimated separately, which assumes that parental divorce is exogenous.[28] The results are then compared to the estimates of the joint model. The estimated coefficient of parental divorce,

[26]The normality assumption on the heterogeneity terms also provide identifying information (Brien et al., 1999).

[27]The results presented here do not separate children from bereaved families (5% of total sample) as a separate category from the control group, i.e., children from intact families. Nevertheless, the estimated results are robust to treating parental bereavement as a separate control group (Available upon request from the author).

[28]The single equation exit hazard of schooling is estimated including the unobserved heterogeneity component, ε^s. This procedure is similar to the one developed by Butler and Moffit (1982) for random-effect panel probit models. In this framework, the hazard function is specified conditional on ε^s, and integrates over the distribution of possible values of ε^s.

Divorce(t), on the exit hazard of child schooling, is presented in Table (2).[29,30]

5.1 Effect of Divorce on Child Educational Attainment

The estimated effect of parental divorce in the single-equation schooling exit hazard is presented in the first column in Table (2). After accounting for demographic characteristics, the estimated effect of divorce on the exit hazard of child schooling is 0.349. This means that a child who experienced divorce while growing up would achieve $1 - \exp^{-0.349} = 29\%$ fewer years of schooling, compared to a child with similar demographic backgrounds growing up in an intact family. Household income tends to be lower for divorced families (Duncan and Hoffman, 1985).[31] Even if the non-custodial parent is committed to providing child support, the economic costs of maintaining two households are much higher. In turn, fewer resources are available for these children. Consistent with previous findings, controlling for household income reduces the estimated effect of divorce, but the effect remains significant.[32]

In addition, non-monetary investments in children, such as time spent with children and parental supervision, may change due to divorce. On the one hand, the absent parent may spend less time with the child, even if he or she exercises full visitation rights (Fronstin et al., 2001). The added household responsibilities may induce the custodial parent to increase labor force participation, therefore spend less time (or quality time) with her children. However, time investments in children need not decrease significantly due to potential substitution of parenting time by other relatives. The custodial parent may enter into living arrangements, such as moving in with grandparents or other family members,

[29] Separations are also examined and discussed later in this section.

[30] Detail of results, as in Model (*c*) of Table (2), are presented as Model (1) in the Appendix.

[31] Despite the stricter child support laws passed recently, about 50% of non-custodial fathers who are required to pay child support do not pay the full amount, and 25% of these fathers do not pay at all (Peters et al., 1993).

[32] Household income is defined as the sum of income from all sources of every adult living in the same household as the child at time t, to account for resources immediately available to the child at each point in time. Treating household income as a time-varying covariate controls for variations of resources over time. However, since this variable is highly collinear with changes in family structure and number of adults living in the same household at time (t), as living situations change with parental divorce, a permanent measure of household income, the (log) average annual household income, is used in the main specification. The complete estimates of the joint model using either the permanent income (Model 1) and the time-varying income (Model 2) measures are presented in Appendix Table (1). The results are robust to either measures of household income. It is worth noting that the estimated effect of "Number of adults living in the household" is negative and significant if permanent income is used, but not when time-varying household income is used. This may indicate that children benefit by having additional adults in the household, and the benefit is largely transitional attributable to additional resources available due to living arrangements changes.

for additional help with taking care of her children. The quality of time investments may also improve after divorce, as marital conflicts have potentially ended, and the parents may devote more attention to their children's needs. Controlling for home investments[33] further reduces the magnitude of the effect of parental divorce. After controlling for a full set of observable characteristics and how they vary with changes in family structure over time, the estimated effect of divorce on the exit hazard of child schooling is positive, but no longer significant.

Investment in children's human capital and parents' marital dissolution may both be endogenous to unobserved factors. The estimated effect of divorce on child schooling duration of the joint model is presented in the second column of Table (2).[34] In addition, the extent in which the two processes are inter-related is examined. The significance of the heterogeneity components, and more importantly, the correlations of these components across the two equations are estimated.

Once the correlation between divorce and child attainments is controlled for, parental divorce is no longer associated with increasing the exit hazard of child schooling (i.e. higher probability of dropping out of school early) compared to children from intact families. The unobserved factors that jointly influence children's schooling attainments and parents' divorce outcome largely explain the lower educational attainments of children experienced with divorce. The correlation coefficient between the unobserved error terms, ρ, is positive and significant, regardless of the specification chosen. This is consistent with the hypothesis that unobserved factors that increase the likelihood of divorce are also likely to increase the child's probability of dropping out of school early, and hence have lower educational attainments.

The negative coefficient estimate of divorce in the joint model may be surprising, however the sign of the divorce effect on child outcomes is theoretically ambiguous. While separating from a parent can reduce available socioeconomic and parenting resources for children, shielding them from parental conflicts and stress may be beneficial. However, under the assumption that the joint model potentially accounts for these unobserved factors (e.g., stress, marital conflicts), it is unlikely that

[33]The variables included in "Home Investments" are the following: Total number of children (including all persons under the age of 18) and adults living in the same household at time *t* are included to proxy for available parental time that may be devoted to a child. Parents' educational background and mother's age at childbirth are indicative of the quality of the investments and parents' ability to utilize these inputs efficiently. Birth order of the child may be important in determining the amount and potential competition for parental investments.

[34]The complete set of estimates of the fully specified joint model, as in (*C*) in Table (2), is presented as Model (1) in Appendix Table (1). Details of estimates of specifications (*A*) and (*B*) are available upon request from the author.

the estimated effect reflects such benefits. Therefore, if there were potential benefits associated with getting a divorce, it may be working through other channels.

It is unlikely that changes in available resources offer an explanation. The estimated effect of divorce is magnified once household income is included. This is reasonable since the pressure of economic hardship may increase the chance of divorce for low-income couples.[35] This combined with further reduction of available resources after the divorce have a negative impact on child attainments.[36] However, differences in home investments potentially offer an explanation. South (2001), using the PSID, finds that wife's educational attainment decreases marital stability. We also find that others who are more educated are relatively more likely to divorce compared to less educated mothers.[37] Since mothers are the likely custodial parent, those who are more able to protect and care of their children on their own may be more likely to divorce if the quality of the match is poor. Although past studies report that divorced mothers display lower levels of monitoring and discipline than those who are married, substantial variability in parenting practices are found (Simons et al., 1993), with a majority of divorced mothers display competent parenting skills (Simons, 1996). In addition, potential substitution of parenting time by other relatives[38], as living arrangements may change after divorce, can also help to mediate the effect of the loss of parenting time by the absent parent.

5.2 Separation and Remarriages

Divorce is a legal break of ties between family members, as oppose to separations. After separating, couples may decide to divorce if marital relations appear irreparable. This implies that marriages with more severe conflicts may be more likely to end in divorce. Children may still suffer from the antagonistic parental relations during separation; given there may be more contact between couples and their children during separation compared to after a divorce. Although separation from a parent may be stressful, children may learn to cope with the absence of a resident parent during this time. By

[35] The estimated effect of (log) household income on the hazard of parental divorce is reported in Appendix Table (1). Higher household income is associated with lower probability of divorce.

[36] Newman (1988) finds that children's responses to declines in varied according to their mother's coping strategies and their ages at the time of divorce.

[37] Estimated effect of mother's educational background is presented in Model (1) in the Appendix.

[38] An increasing share of mothers enter into cohabitation arrangements following the divorce (Bumpass et al., 1995). Parenting time provided by non-marital partners is also a potential source of additional time investments for these children.

the time parents formalize their divorce, the negative effect of the disruption may have been lessened.

In the previous section, we considered the effect of formal divorce only, which begins at the actual divorce date. Formal divorce may be preceded by a period of separation (formal or informal), and the estimated effect of divorce on child attainments may include the effects of separation. Table (3) presents the estimated effect of family disruptions on child educational attainments, in which both formal divorces and separations are considered as "disruptions".[39] In line with estimates of divorce, after controlling for demographic characteristics, household income, and home investments, family disruptions are no longer associated with lower educational attainments in children.

The long-term effect of divorce may be confounded by the effects of subsequent remarriages (Bronstein et al., 1993). About half of the divorced mothers in our sample eventually remarried. Children who grow up in stepparent families are found to have worse educational outcomes (McLanahan and Sandefur, 1994; Biblarz and Raftery, 1999; and Boggess, 1998), and less adjusted compared to children in first marriage families, although the differences tend to be small and are not always found (Kurdek and Sinclair, 1988). While having a stepparent may provide additional resources for children, the presence of a stepparent may also cause conflict between the biological parent and the child (Hetherington and Henderson, 1997). In addition, child investments made by a stepparent may be insufficient compared to a biological parent (Hofferth, 2003; McLanahan and Sandefur, 1994). Appendix Table (2) presents the estimates of the fully specified joint model with and without controlling for remarriage. Remarriage has no significant impact on child attainments, independent from the effect of divorce and socioeconomic status.

6 Summary and Conclusion

Children of divorced parents are generally found to have lower educational attainments compared to their counterparts raised in intact families. While socioeconomic and other observed disadvantages associated with divorce partially explains the child outcome differences between the two family types, evidence on whether divorce in itself has a causal effect on children remains inconclusive, as factors

[39]The period of disruption is defined beginning at either the separation date or the divorce date, whichever is earlier. The variable "Disruption(t)" is defined as to be equal to 1 if the biological parents are either separated or divorced at time t.

that drive both the divorce and child outcomes are often unobserved and not easily accounted for.

This study examines whether parental divorce has a causal effect on the educational attainment of children involved. Using annual data on a representative sample of children and their families since childbirth until the completion of their schooling, we model child's schooling attainments and parents' marital dissolution as joint decision processes, where unobservables triggering divorce and affecting child development are assumed to be correlated. After accounting for both observed and unobserved characteristics, we find no evidence that the lower educational attainments is attributable to parents' divorce *per se*, but rather due to unobserved factors that are correlated with divorce. This result is robust to a more general definition of relationship dissolution, by treating spousal separation and divorce both as family "disruptions".

While further research is into the mechanisms through which parents' divorce affects child attainments is needed, our findings provide some evidence that divorce in itself does not negatively affect children's educational outcomes. The reasons for dissolving a marriage tend to be family-specific and usually observed only by the parties involved. Assuming that parents are altruistic and internalize potential gains (and costs) of dissolving their marriage on their children when deciding to divorce, on the margin there may be benefits to divorce (at least for some). If our goal is to help children from divorced families to become self-reliant adults, policy-makers need to be mindful that divorce in itself may be a consequence, rather than a culprit, of the same underlying mechanism that causes the inferior child outcomes. Simply restricting access to divorce without consideration of individual needs and circumstances can be irresponsible; it may also risk jeopardizing the welfare of many families and their children.

References

Amato PR, Keith B. Parental divorce and the well-being of children: A meta-analysis. Psychological Bulletin 1991; 110; 26–46.

Amato PR, Loomis LS, Booth A. Parental divorce, marital conflict, and offspring well-being during early adulthood. Social Forces 1995; 73; 895–915.

Biblarz TJ, Raftery AE. Family structure, educational attainment, and socioeconomic success: Rethinking the pathology of matriarchy. American Journal of Sociology 1999; 105; 321–365.

Bjorklund A, Ginther DK, Sundstrom M. Family structure and child outcomes in the United States and Sweden. Economica 2006; 4; 605–624.

Boggess S. Family structure, economic status, and educational attainment. Journal of Population Economics 1998; 11; 205–222.

Brien MJ, Lillard LA, Waite LJ. Interrelated family-building behaviors: Cohabitation, marriage, and nonmarital conception. Demography 1999; 36; 535–551.

Bronstein P, Clauson J, Stoll MF, Abrams CL. Parenting behavior and children's social, psychological, and academic adjustment in diverse family structures. Family Relations 1993; 42; 268–276.

Bumpass LL, Raley KR, Sweet JA. The changing character of stepfamilies: Implications of cohabitation and nonmarital childbearing. Demography 1995; 32; 425–436.

Butler JS, Moffitt R. A computationally efficient quadrature procedure for the one-factor multinomial probit model. Econometrica 1982; 50; 761–764.

Card D. 1999. The causal effect of education on earnings. In Ashenfelter O, Card D (Eds), Handbook of labor economics, vol.3. Amsterdam: Elsevier Science; 1999. p. 1801-1863.

Cherlin AJ, Furstenberg FF Jr., Chase-Lansdale PL, Kiernan KE, Robins PK, Morrison DR, Teitler JO. Longitudinal studies on effects of divorce on children in Great Britain and the United States. Science 1991; 252; 1386–1389.

Corak M. Death and divorce: The long-term consequences of parental loss on adolescents. Journal of Labor Economics 2001; 19; 682–715.

Duncan GJ, Hoffman SD. A reconsideration of the economic consequences of marital dissolution. Demography 1985; 22; 485–498.

Emery RE. Marriage, divorce, and children's adjustment. Beverly Hills, California: Sage Publications Inc.; 1999.

Ermisch JF, Francesconi M. Family structure and children's achievements. Journal of Population Economics 2001; 14; 249–270.

Friedberg L. Did unilateral divorce raise divorce rates? Evidence from panel data. American Economic Review 1998; 88; 608–627.

Fronstin P, Greenberg DH, Robins PK. Parental disruption and the labour market performance of children when they reach adulthood. Journal of Population Economics 2001; 14; 137–172.

Furstenberg FF Jr., Cherlin AJ. Divided families: What happens to children when families part? Cambridge, Massachusetts: Harvard University Press; 1991.

Garasky S. The effects of family structure on educational attainment: Do the effects vary by age of the child? American Journal of Economics and Sociology 1995; 54; 89–105.

Gennetian LA. One or two parents? Half or step siblings? The effect of family structure on young children's achievement. Journal of Population Economics 2005; 18; 415–436.

Ginther DK, Pollak RA. Does family structure affect children's educational outcomes? National Bureau of Economic Research Working Paper 9628; 2003.

Gordon M. The family environment of sexual abuse: A comparison of natal and stepfather abuse. Child Abuse and Neglect 1989; 13; 121–130.

Gruber J. Is making divorce easier bad for children? The long-run implications of unilateral divorce. Journal of Labor Economics 2004; 22; 799–834.

Havemen R, Wolfe B. The determinants of children's attainments: A review of methods and findings. Journal of Economic Literature 1995; 33; 1829–1878.

Heckman JJ, Honore, BE. The identifiability of the competing risks model. Biometrika 1989; 76; 325–330.

Heckman JJ, Lalonde RJ, Smith JA. 1999. The economics and econometrics of active labor market programs. In: Ashenfelter O, Card D (eds), Handbook of labor economics, vol.3. Amsterdam: Elsevier Science; 1999. p. 1865–2097.

Hetherington ME, Henderson S. 1997. Fathers in stepfamilies. In: Lamb ME (ed), The role of the father in child development. New York: Wiley; 1997. p. 212–226.

Hetherington ME, Bridges M, Insabella GM. What matters? What does not? Five perspectives on the association between martial transitions and children's adjustment. American Psychologist 1998; 53; 167–184.

Hofferth S. Are stepfathers bad for children? Paper presented at the Conference on Marriage and Family Formation among Low-Income Couples: What do we know from research? Sponsored by the National Poverty Center, Washington D.C.; 2003.

Kitson GC, Sussman MB. Marital complaints, demographic characteristics, and symptoms of marital distress in divorce. Journal of Marriage and the Family 1982; 44; 87–101.

Kurdek LA, Sinclair RJ. Adjustment of young adolescents in two-parent nuclear, stepfather, and mother-custody families. Journal of Consulting and Clinical Psychology 1988; 56; 91–96.

Lang K, Zagorsky JL. Does growing up with a parent missing really hurt? Journal of Human Resources 2000; 36; 253–273.

Lillard LA, Waite LJ. A joint model of marital childbearing and marital disruption. Demography 1993; 30; 653–681.

Liu SH. Parental Divorce and Its Timing on Child Educational Attainment: A Dynamic Approach. University of Miami Department of Economics Working Papers 2004.

Manski CF, Sandefur GD, McLanahan S, Powers D. Alternative estimates of the effect of family structure during adolescence on high school graduation. Journal of the American Statistical Association 1992; 87; 25–37.

McLanahan S. Family structure and the reproduction of poverty. American Journal of Sociology 1985; 90; 873–901.

McLanahan S, Sandefur GD. Growing up with a single parent. Cambridge, Massachusetts: Harvard University Press; 1994.

Newman KS. Falling from grace: The experience of downward mobility in the American middle class. New York: The Free Press; 1988.

Painter G, Levine DI. Family structure and youth's outcomes: Which correlations are causal? Journal of Human Resources 2000; 35; 524–549.

Peters HE, Argys LM, Maccoby EE, Mnookin RH. Enforcing divorce settlements: Evidence from child support compliance and award modifications. Demography 1993; 30; 719–735.

Pindyck RS, Rubinfeld DL. Econometric models and economic forecasts. New York: McGraw-Hill; 2000.

Rank MR, Davis LE. Perceived happiness outside of marriage among black and white spouses. Family Relations 1996; 45; 435–441.

Ribar DC. What do social scientists know about the benefits of marriage? A review of quantitative methodologies. IZA Discussion Papers DP No. 998, Institute for the Study of Labor (IZA); 2006.

Russell DEH. The prevalence and seriousness of incestuous abuse. Child Abuse and Neglect 1984; 8; 15-22.

Sandefur GD, McLanahan S, Wojtkiewicz RA. The effects of parental marital status during adolescence on high school graduation. Social Forces 1992; 71; 103–121.

Sandefur GD, Wells T. Does family structure really influence educational attainment? Social Science Research 1999; 28; 331–357.

Sanz de Galdeano A, Vuri D. Does parental divorce affect adolescents' cognitive development? Evidence from longitudinal data. IZA Discussion Papers DP No. 1206, Institute for the Study of Labor (IZA); 2006.

Simons RL, Beaman J, Conger RD, Chao W. Stress, support, and antisocial behavior trait as determinants of emotional well-being and parenting practices among single mothers. Journal of Marriage and the Family 1993; 55; 385–398.

Simons RL. Understanding differences between divorced and intact families: Stress, interaction, and child outcome. Thousand Oaks, California: Sage Publlications Inc.; 1996.

South SJ. Time-dependent effects of wives' employment on marital dissolution. American Sociological Review 2001; 66; 226–245.

Stevenson B, Wolfers J. Bargaining in the shadow of the law: Divorce laws and family distress. National Bureau of Economic Research Working Paper No. 10175; 2003.

Todd PE, Wolpin KI. On the specification and estimation of the production function for cognitive achievement. The Economic Journal 2003; 113; F3–F33.

Weiss Y, Willis RJ. Match quality, new information, and marital dissolution. Journal of Labor Economics 1997; 15; S293–S329.

Wu LL, Martinson BC. Family structure and the risk of a premarital birth. American Sociological Review 1993; 58; 210–232.

Table 1: Variable Definition and Means

Variable Name	**Definition**	**Mean (Standard Dev.)**
Outcome Variable		
Child Educational Attainment	Highest grade attained	12.31(1.470)
Explanatory Variables		
(*Time-Invariant*)		
Intact	1 if family stayed intact	0.745(0.436)
Divorced	1 if family divorced	0.207(0.405)
Bereaved	1 if family bereaved	0.048(0.214)
Age at Divorce ($0 \leq$ Age < 6)	1 if parents divorced between birth and age 6	0.079(0.269)
Age at Divorce ($6 \leq$ Age < 10)	1 if parents divorced between ages 6 and 10	0.051(0.221)
Age at Divorce ($10 \leq$ Age < 12)	1 if parents divorced between ages 10 and 12	0.022(0.146)
Age at Divorce ($12 \leq$ Age)	1 if parents divorced after age 12	0.056(0.229)
Race: White	1 if race is White	0.682(0.466)
Race: Black	1 if race is Black	0.224(0.417)
Race: Other	1 if race if Other	0.094(0.292)
Female	1 if child is female	0.481(0.500)
Birth Order	Birth order of the child	2.369(1.842)
Mother's Education	Highest grade attained by mother	11.89(3.323)
Father's Education	Highest grade attained by father	11.86(3.836)
Mother's Age at Marriage	Mother's age at this marriage	20.53(3.890)
Mother's Age at Childbirth	Mother's age at childbirth	25.39(5.647)
Number of Children	Total number of children within this marriage	3.211(1.844)
Marriage Order	Order of this marriage (mother)	1.058(0.250)
2^{nd} or Higher Order Marriage	1 if this is a second or higher order marriage (mother)	0.057(0.232)
Mother Remarry	1 if mother eventually remarried	0.091(0.289)
Catholic	1 if family religion "Catholic"	0.345(0.475)
Baptist	1 if family religion "Baptist"	0.258(0.438)
Average HH Income	Average annual household income (1000s in 1984 $)	25.67(17.73)
Average State Divorce Rate	Average annual state divorce rate (state of residence)	5.071(1.452)
NF Div. State (% MarDur)	Reside in No-Fault Div. State (% of Marriage Duration)	0.900(0.121)
UNI Div. State (% MarDur)	Reside in Unilat. Div. State (% of Marriage Duration)	0.503(0.429)
(*Time-Variant*)		
Divorce(t)	1 if parents are divorced at time *t*	0.120(0.325)
Remarried(t)	1 if mother is remarried at time *t*	0.040(0.195)
ln HH Income (t)	ln(Total Household Income at time *t*)	7.806(4.269)
Children(t)	Total number of children living in the household at time *t*	2.377(1.406)
Adults(t)	Total number of adults living in the household at time *t*	2.362(0.964)
State Divorce Rate(t)	State divorce rate at time *t* (state of residence)	5.049(1.572)
No-Fault Divorce State(t)	1 if living in No-Fault divorce state at time *t*	0.929(0.257)
Unilateral Divorce State(t)	1 if living in Unilateral divorce state at time *t*	0.550(0.498)
North East(t)[1]	1 if household living in the northeast at time *t*	0.150(0.357)
North Central(t)[1]	1 if household living in north central at time *t*	0.201(0.400)
South(t)[1]	1 if household living in the south at time *t*	0.427(0.495)
West(t)[1]	1 if household living in the west at time *t*	0.222(0.416)
Urban(t)[2]	1 if household living in an urban area at time *t*	0.334(0.472)
Num. of Individuals $= 3,044$		
Num. of Families $= 2,004$		

Notes:
1. PSID regional classification is used;
2. The location of residence is defined as "Urban" if the population of the largest city in the county of residence exceeds $100,000$.

Table 2: Effect of Parental Divorce on the Exit Hazard of Child Schooling: Estimated Coefficient of [Divorce(t)] and the Correlation Coefficient [ρ]

	Single-Eq. Schooling Hazard Model (Divorce = Exogenous)	**Joint Hazard Model** (Divorce = Endogenous)	
	Coefficient	Coefficient	ρ
Controls			
(A) Demographics	0.349^{*}	-0.623^{*}	0.783^{*}
	(0.111)	(0.177)	(0.178)
(B) Demographics + Avg. HH Inc	0.257^{*}	-0.754^{*}	0.830^{*}
	(0.111)	(0.174)	(0.177)
(C) Demographics + Avg. HH Inc + Home Inv.	0.084	-0.479^{*}	0.484^{*}
	(0.116)	(0.209)	(0.183)

Notes:

1. Estimated coefficient on (Divorce(t)) from three specifications of the exit hazard of child schooling are reported here. All three specifications control for mother's subsequent remarriage (mother remarried(t)) in the exit hazard of child schooling;

2. The control variables are: "Demographics" = Demographic characteristics, which include child gender, birth cohort, racial background, region of residence, and urban residence; "Avg. HH Inc" denotes (log) average annual household income; and "Home Inv." = Home Investment Controls, which include parental education background, mother's age at childbirth, number of children living in the household, number of adults living in the household, and birth order of the child;

3. Standard errors reported in the parentheses.

4. $*$ = Statistical significance at the 5% level;

5. Specification (*C*) is our preferred model and the complete estimation results are presented in the Appendix and referred to as Model (1).

Table 3: The Effect of Marital Disruptions on the Exit Hazard of Child Schooling: Estimated Coefficient of [Disruption(t)] and the Correlation Coefficient [ρ]

Controls	**Single-Eq. Schooling Hazard Model** (Disruption = Exogenous) Coefficient	**Joint Hazard Model** (Disruption = Endogenous) Coefficient	ρ
Controls			
(A) Demographics	0.389^{*}	-0.578^{*}	0.780^{*}
	(0.108)	(0.178)	(0.190)
(B) Demographics + Avg. HH Inc	0.295^{*}	-0.728^{*}	0.846^{*}
	(0.109)	(0.174)	(0.191)
(C) Demographics + Avg. HH Inc + Home Inv.	0.139	-0.360	0.404^{*}
	(0.113)	(0.211)	(0.172)

Notes:

1. "Disruption(t)" = 1 if parents are either separated or divorced at time t. Estimated coefficient on (Disruptions(t)) from three specifications of the exit hazard of child schooling are reported here. All three specifications control for mother's subsequent remarriage (mother remarried(t)) in the exit hazard of child schooling;

2. The control variables are: "Demographics" = Demographic characteristics, which include child gender, birth cohort, racial background, region of residence, and urban residence; "Avg. HH Inc" denotes (log) average annual household income; and "Home Inv." = Home Investment Controls, which include parental education background, mother's age at childbirth, number of children living in the household, number of adults living in the household, and birth order of the child;

3. Standard errors reported in the parentheses;

4. $*$ = Statistical significance at the 5% level.

Appendix Table 1: Joint Hazard Model of Child Schooling and Parental Marital Dissolution: Alternative Measures of Household Income

	Model 1		**Model** 2	
	Single Equation Model	Joint Model	Single Equation Model	Joint Model
Schooling Hazard ($\ln h^s(t)$)†				
Divorce(t)	0.084	−0.480*	0.057	−0.451*
	(0.116)	(0.209)	(0.114)	(0.204)
Mother Remarried(t)	0.192	0.151	0.244	0.204
	(0.143)	(0.143)	(0.144)	(0.146)
Female	−0.345*	−0.347*	−0.343*	−0.344*
	(0.052)	(0.052)	(0.052)	(0.052)
Birth Order	0.184*	0.193*	0.168*	0.175*
	(0.022)	(0.022)	(0.022)	(0.023)
Race: Black	−0.279*	−0.272*	−0.334*	−0.325*
	(0.094)	(0.095)	(0.093)	(0.094)
Race: Other	0.052	0.017	0.083	0.056
	(0.120)	(0.127)	(0.118)	(0.123)
Mother's Education (<12 Years)	0.750*	0.709*	0.739*	0.710*
	(0.096)	(0.100)	(0.096)	(0.099)
Mother's Education (≥ 16 Years)	−0.469*	−0.425*	−0.418*	−0.385*
	(0.127)	(0.130)	(0.127)	(0.129)
Father's Education (<12 Years)	0.264*	0.104	0.246*	0.109
	(0.101)	(0.116)	(0.100)	(0.110)
Father's Education (≥ 16 Years)	−0.664*	−0.804*	−0.629*	−0.765*
	(0.124)	(0.131)	(0.122)	(0.129)
Mother's Age at Childbirth	−0.057*	−0.057*	−0.056*	−0.056*
	(0.008)	(0.008)	(0.008)	(0.008)
Num. Children in HH(t)	0.086*	0.084*	0.080*	0.078*
	(0.025)	(0.025)	(0.025)	(0.025)
Num. Adults in HH(t)	−0.077*	−0.079*	−0.033	−0.034
	(0.029)	(0.029)	(0.030)	(0.030)
ln[Average HH Income]	−0.087*	−0.126*		
	(0.025)	(0.032)		
ln[HH Income(t)]			−0.209*	−0.215*
			(0.038)	(0.038)
$Dur^s 0-11$	1.577	1.521	1.585	1.593
	(1.371)	(1.360)	(1.378)	(1.384)
$Dur^s 11-15$	1.181*	1.186*	1.167*	1.169*
	(0.079)	(0.080)	(0.079)	(0.079)
$Dur^s 15-17$	1.526*	1.525*	1.510*	1.509*
	(0.055)	(0.055)	(0.055)	(0.055)
$Dur^s 17+$	0.555*	0.557*	0.535*	0.536*
	(0.038)	(0.038)	(0.038)	(0.039)
Constant	−23.90	−22.70	−22.66	−22.51
	(14.92)	(14.79)	(15.01)	(15.08)

(Continued)

Notes:

1. Standard errors reported in parenthesis;

2. $*$ = Significance at the 5% level;

† Additional controls (not reported) include birth cohort indicators, geographical region of residence, and indicator variables for missing information in father's education.

Appendix Table 1 (Continued): Joint Hazard Model of Child Schooling and Parental Marital Dissolution: Alternative Measures of Household Income

	Model 1		**Model** 2	
	Single Equation Model	Joint Model	Single Equation Model	Joint Model
Divorce Hazard $(\ln h^m(t))^b$				
2^{nd} or Higher Order Marriage		1.318*		1.354*
		(0.363)		(0.384)
Mother's Age at Marriage		−0.104*		−0.107*
		(0.026)		(0.027)
Num. Children in This Marriage (>1)		−0.788*		−0.817*
		(0.236)		(0.250)
Mother's Education (<12 Years)		−0.514*		−0.510*
		(0.192)		(0.198)
Mother's Education (≥ 16 Years)		0.343		0.338
		(0.226)		(0.234)
Father's Education (<12 Years)		−2.106*		−2.153*
		(0.427)		(0.459)
Father's Education (≥ 16 Years)		−1.504*		−1.555*
		(0.378)		(0.408)
ln[Avg. HH Income]		−0.329*		−0.303*
		(0.109)		(0.100)
Avg. State Divorce Rate		−0.022		−0.021
		(0.057)		(0.059)
NF Div. State (% of MarDur)		−0.139		−0.158
		(0.533)		(0.549)
UNI Div. State (% of MarDur)		0.095		0.098
		(0.176)		(0.181)
Catholic		−0.465*		−0.495*
		(0.172)		(0.180)
Baptist		−0.069		−0.074
		(0.150)		(0.155)
Race: Black		0.045		0.048
		(0.160)		(0.164)
Race: Other		−0.354		−0.355
		(0.267)		(0.273)
$Dur^m 0-5$		0.421*		0.431*
		(0.092)		(0.100)
$Dur^m 5-10$		−0.007		−0.001
		(0.060)		(0.063)
$Dur^m 10-15$		0.058		0.061
		(0.043)		(0.044)
$Dur^m 15+$		0.005		0.007
		(0.022)		(0.023)
Constant		−0.037		−0.305
		(1.227)		(1.155)
σ_s	1.113*	1.138*	1.082*	1.102*
	(0.056)	(0.059)	(0.056)	(0.058)
σ_m		1.398*		1.473*
		(0.546)		(0.583)
ρ		0.484*		0.439*
		(0.183)		(0.169)
Log Likelihood	−5499.53	−8105.77	−5486.37	−8093.51

Footnote:

1. Standard errors reported in parenthesis;

2. $*$ = Statistical significance at the 5% level.

Appendix Table 2: Joint Hazard Model of Child Schooling and Parental Marital Dissolution: The Effect of Remarriage

	Model 1		**Model** 3	
	Single Equation Model	Joint Model	Single Equation Model	Joint Model
Schooling Hazard ($\ln h^s(t)$)†				
Divorce(t)	0.084	-0.480^*	0.167	-0.436^*
	(0.116)	(0.209)	(0.102)	(0.204)
Mother Remarried(t)	0.192	0.151		
	(0.143)	(0.143)		
Female	-0.345^*	-0.347^*	-0.344^*	-0.346^*
	(0.052)	(0.052)	(0.052)	(0.052)
Birth Order	0.184^*	0.193^*	0.182^*	0.192^*
	(0.022)	(0.022)	(0.022)	(0.022)
Race: Black	-0.279^*	-0.272^*	-0.295^*	-0.283^*
	(0.094)	(0.095)	(0.093)	(0.094)
Race: Other	0.052	0.017	0.045	0.011
	(0.120)	(0.127)	(0.120)	(0.127)
Mother's Education (<12 Years)	0.750^*	0.709^*	0.744^*	0.703^*
	(0.096)	(0.100)	(0.095)	(0.099)
Mother's Education (≥ 16 Years)	-0.469^*	-0.425^*	-0.470^*	-0.424^*
	(0.127)	(0.130)	(0.127)	(0.130)
Father's Education (<12 Years)	0.264^*	0.104	0.267^*	0.101
	(0.101)	(0.116)	(0.101)	(0.116)
Father's Education (≥ 16 Years)	-0.664^*	-0.804^*	-0.664^*	-0.810^*
	(0.124)	(0.131)	(0.124)	(0.131)
Mother's Age at Childbirth	-0.057^*	-0.057^*	-0.057^*	-0.058^*
	(0.008)	(0.008)	(0.008)	(0.008)
Num. Children in HH(t)	0.086^*	0.084^*	0.088^*	0.086^*
	(0.025)	(0.025)	(0.025)	(0.025)
Num. Adults in HH(t)	-0.077^*	-0.079^*	-0.072^*	-0.075^*
	(0.029)	(0.029)	(0.028)	(0.029)
ln[Average HH Income]	-0.087^*	-0.126^*	-0.083^*	-0.124^*
	(0.025)	(0.032)	(0.026)	(0.032)
$Dur^s 0-11$	1.577	1.521	1.578	1.590
	(1.371)	(1.360)	(1.371)	(1.378)
$Dur^s 11-15$	1.181^*	1.186^*	1.181^*	1.183^*
	(0.079)	(0.080)	(0.079)	(0.079)
$Dur^s 15-17$	1.526^*	1.525^*	1.525^*	1.524^*
	(0.055)	(0.055)	(0.055)	(0.055)
$Dur^s 17+$	0.555^*	0.557^*	0.553^*	0.556^*
	(0.038)	(0.038)	(0.038)	(0.038)
Constant	-23.90	-22.70	-23.95	-23.46
	(14.92)	(14.79)	(14.92)	(15.00)

(Continued)

Notes:

1. Standard errors reported in parenthesis;

2. $*$ = Statistical significance at the 5% level;

† Additional controls (not reported) include birth cohort indicators, geographical region of residence, and indicator variables for missing information in father's education.

Appendix Table 2 (Continued): Joint Hazard Model of Child Schooling and Parental Marital Dissolution: The Effect of Remarriage

	Model 1		**Model** 3	
	Single Equation Model	Joint Model	Single Equation Model	Joint Model
Divorce Hazard ($\ln h^m(t)$)				
2^{nd} or Higher Order Marriage		1.318*		1.314*
		(0.363)		(0.359)
Mother's Age at Marriage		−0.104*		−0.103*
		(0.026)		(0.025)
Num. Children in This Marriage (>1)		−0.788*		−0.780*
		(0.236)		(0.233)
Mother's Education (<12 Years)		−0.514*		−0.516*
		(0.192)		(0.191)
Mother's Education (≥ 16 Years)		0.343		0.344
		(0.226)		(0.225)
Father's Education (<12 Years)		−2.106*		−2.100*
		(0.427)		(0.421)
Father's Education (≥ 16 Years)		−1.504*		−1.501*
		(0.378)		(0.373)
ln[Avg. HH Income]		−0.329*		−0.328*
		(0.109)		(0.108)
Avg. State Divorce Rate		−0.022		−0.022
		(0.057)		(0.057)
NF Div. State (% of MarDur)		−0.139		−0.141
		(0.533)		(0.531)
UNI Div. State (% of MarDur)		0.095		0.094
		(0.176)		(0.175)
Catholic		−0.465*		−0.455*
		(0.172)		(0.171)
Baptist		−0.069		−0.065
		(0.150)		(0.149)
Race: Black		0.045		0.048
		(0.160)		(0.159)
Race: Other		−0.354		−0.352
		(0.267)		(0.265)
$Dur^m 0-5$		0.421*		0.420*
		(0.092)		(0.091)
$Dur^m 5-10$		−0.007		−0.007
		(0.060)		(0.060)
$Dur^m 10-15$		0.058		0.058
		(0.043)		(0.042)
$Dur^m 15+$		0.005		0.005
		(0.022)		(0.022)
Constant		−0.037		−0.051
		(1.227)		(1.216)
σ_s	1.113*	1.138*	1.110*	1.139*
	(0.056)	(0.059)	(0.056)	(0.059)
σ_m		1.398*		1.390*
		(0.546)		(0.535)
ρ		0.484*		0.503*
		(0.183)		(0.185)
Log Likelihood	−5499.53	−8105.77	−5500.45	−8106.34

Notes:

1. Standard errors reported in parenthesis;

2. $*$ = Statistical significance at the 5% level.