The Effect of the Loss of a Parent on the Future Earnings of a Minor Child

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Abstract

Forensic economists frequently estimate the economic losses arising from the loss of a parent. Estimates are also often estimated associated with wrongful injuries to a minor child. After reviewing other literature in economics and psychology, we quantify the effect of the absence of a parent on a child's future earnings by expanding the Kane-Spizman model (2001) to examine how the loss of a parent to death, separation, or divorce affects the future earnings of a minor child. After this quantitative exercise, we next discuss data limitations and issues of interpretation of the meaning of the results. We find that the earnings loss is smaller for minor children when a parent of the opposite sex dies then when that parent is absent due to divorce or separation.

I. Introduction

Forensic economists are often called upon to estimate the loss of services, guidance and income to minor children resulting from the personal injury or death of a parent. A methodology exists for valuing these losses.[1] Receiving much less attention is the effect of the loss of a parent on the future earnings of a minor child. The reason this topic has not received much attention in the forensic literature is no doubt that a child's future loss of earnings due to the absence of a parent is not an element of damages in cases involving the wrongful death of a parent. Should it be one of the elements of damage? If the death of a parent has a large negative effect on the future earnings of the decedent's children, then it could be argued that good public policy would require such a loss to be added to the list of damages that can be claimed in such cases.

A forensic economist may also be interested in the effect of the absence of a parent on educational attainment when applying the Kane-Spizman (2001) model to predict lost earnings capacity in the case of wrongful injury to a child. In this study, it was shown that educational attainment and lifetime earnings are predicted to be higher when both biological parents are present in the household when the child is 14 years old. This study, however, did not address the differential effects on child outcomes of the loss of a parent to divorce, separation, or death.

The purpose of this paper is to examine how the absence of a biological parent due to death or marital breakdown affects the future earnings of a minor child. In Section II, we review some other literature in economics and psychology that directly or indirectly bears on the question of how losing a parent impacts a child's future educational attainment and earnings. In Section III, we examine one approach to quantifying the effect of the loss of a parent on a child's future earnings by expanding the model that has been proposed by Kane and Spizman for estimating the educational attainment of a minor child, based on the child's personal and family characteristics

[1] See Tinari (1998) and Ireland and Depperschmidt (1999).

and the socioeconomic circumstances of the child's parents. The data used to estimate this model is discussed in Section IV. Empirical results are presented in Section V. Following this quantitative exercise, in Section VI, we discuss some problems and issues that arise with the approach described in Section III. We conclude in Section VII that our results suggest that the absence of a biological parent due to marital or relationship discord has a significant effect on projected lifetime earnings. The effect of the loss of a parent to death, however, has an effect that appears to vary by the gender of the child. Lifetime educational attainment appears to not be adversely affected if the father of a female child or the mother of a male child is absent in the household as a result of his or her death. (Lifetime educational attainment is adversely affected if a parent of the same gender as the child dies.)

II. Studies of the Effect of the Loss of Parent on a Child's Future Earnings

A practicing forensic economist might be predisposed to think that the absence of a parent through death, abandonment, or divorce of a biological parent would have a negative impact on educational attainment of the surviving child, and, as a consequence, the child's future earnings. This section reviews some studies addressing this and other linkages.

Ginther and Pollak (2003) examine the connection between family structure and the educational attainment of children. They find that children who grow up in traditional families (children that are biological children of both parents) tend to have a better educational outcome than children that grow up in single-parent and blended families. A blended family includes stepchildren and the biological children of both parents in the new family who all live together. They find that the children in a blended family have educational outcomes that are similar to each other. These results are consistent with McLanahan and Sandefure (1994) who found that children who grow up with both biological parents do better than children growing up in single-parent family or with stepparents. Deleire and Kalil (2002) reach a similar conclusion. However, they find that when a teenager is living with a single mother in a multigenerational family (at least one

grandparent) the developmental outcome for that teenager is as good as (or even better than) it is for teenagers from intact married families.

The research reported in these three papers does not distinguish among blended families arising from divorce, death or some other means. Other studies have tried to make this distinction. Amato, P and K. Bruce (1991) estimated the impact of a child being separated from a biological parent on adult socioeconomic attainment. Their study uses data from the National Survey of Families and Households (1987-88). The independent variables were divorce, parental death, never having a father and other separations. They find that parental divorce for white male children, white female children and black female children lowered educational attainment, earnings, the standard of living and asset ownership. They found there was no difference for black male [children] between being raised in a single parent household and being raised in an intact family. However, they found that regardless of race and gender, "No significant associations were observed for death of a parent." (p. 196). These results are consistent with earlier studies by Amato (1988) and Wadsworth and Maclean (1986), which also found that parental divorce/separation but not the death of a parent was associated with lower educational attainment.

Menning (2002) examined the effect of two activities of absent parents on a child's educational attainment. The first was the effect on educational attainment of the absent parent who was involved with their child on an interpersonal level and the effect of the absent parent contributing financial support to the child. He found that both of these factors independent of each other had no affect on educational attainment. However, both activities combined (an absent parent who was involved with the child and provided financial contributions to the child) increased the probability that the child would finish high school or go on to some college.

Biblarz and Gottainer (2000) examined whether the negative effects for children are greater when single motherhood results from divorce rather than death of the father. They found that children of divorced single mothers have significantly lower levels of occupational status, education and happiness in adulthood when compared to single mother families due to death of the father. They found there was no difference between children living with two-biological-parent families and children living with widowed single-mothers.[2] The authors conclude that the death of a parent may have little impact on a child's future earnings because the child typically still has the same (or perhaps even greater) financial means to acquire the human capital necessary to succeed. When a child's father dies, the widow is likely to receive life insurance and Social Security survivor's benefits for the minor children. These benefits help insure that the child's educational opportunities can be maintained at the same level as is true of children from intact families. Children of divorced mothers do not have the same safety net as children of deceased parents.

Using Canadian data, Corak (2001) initially found that, on average, children (specifically teenagers) of divorced families had significantly lower incomes and earnings than children in families where a parent had died. However, after controlling for different background variables the differences in income and earnings were almost eliminated or much diminished. Lang, K., and J. Zagorsky, (2001) used a variety of family background control variables to see if children growing up without a biological parent do worse, on average, than other children. With the control variables they find little support that a parent's presence during childhood affects economic well being in adulthood. This is especially true when they considered the impact of parental death.

Swallen and Hass (2002) utilized a data set of people born between 1931 and 1941 who were middle age (at the time of the study) and whose parents died when they were less than 19 years of

[2] The only exception was that children from single mothers due to death of father had slightly lower odds of completing high school.

age. They found "For men, early parental death exerts no additional effect on lifetime social economic status, for women, however, we find that early parental death is an independent factor that predicts lower wealth accumulation and educational attainment." The reduction of educational attainment for women was .316 fewer years as a result of a parent dying during childhood. Most of their study deals with educational attainment and human capital formation due to the death of a parent.

The main problem with the Swallen and Hass data is that the sample population was born during the Depression of the 1930s and World War II. When their parents died, given the social norms of that generation, especially with respect to educational opportunities for females, one must be careful, if not totally skeptical in generalizing their results to more current labor cohorts.

III. Assessing the Effect of Losing a Parent Via the Impact on Educational Attainment

There is a literature that examines the factors that influence the educational attainment that a child will eventually achieve based on familial and demographic characteristics. Statistical models have been developed to provide quantitative predictions about the probability that a child will achieve various levels of educational attainment.[3]

One method of predicting the educational attainment of a minor child involves the use of the ordered probit educational attainment model of Kane and Spizman (2001). The ordered probit specification is given by:

$$Z_i = X_i \beta + \mu_i$$

The unobservable variable *Zi* represents the benefits and/or costs of alternative levels of educational attainment. X_i is a vector of family background and demographic variables that influence Z_i. Because Z_i is unobservable, an indicator variable is used to show the actual

[3]The most recent papers in the forensic economic literature are Jepsen and Jepsen (2001) and Kane and Spizman (2001). The reference sections of these papers list earlier papers in the forensic economics literature and papers in the general economics journals.

educational level for each individual in the sample. In the version of this model used in the current study, it is assumed that individual *i* acquires:[4]

- less than a high school degree if $Zi \leq \theta_1$
- a high school diploma or GED if $\theta_1 < Zi \leq \theta_2$
- 1-3 years of college if $\theta_2 < Zi \leq \theta_3$
- an Associate's degree if $\theta_3 < Zi \leq \theta_4$
- a 4-year college degree if $\theta_4 < Zi \leq \theta_5$
- a Master's degree if $\theta_5 < Zi \leq \theta_6$
- a Ph.D., M.D., J.D, or equivalent degree if $Zi > \theta_6$

The estimated coefficients for the ordered probit model are used to estimate the probability of the minor child reaching each alternative educational level.[5] The probability of attaining each alternative level of educational attainment is listed in Table I.

(Insert Table I)

Once these probabilities are estimated, population average earnings for the particular educational category may be used to estimate lifetime earnings streams for the minor child.

[4] This specification differs slightly from that used in Spizman and Kane (1992), and in Kane and Spizman (2001) in that the initial threshold value is specified as θ_1 instead of zero. This alternative specification is becoming more common in the literature, partly as a result of its adoption in the Stata statistical software package. The two alternative specifications are equivalent. The current specification, however, does not contain a separate constant term (the estimated value of θ_1 is the negative of the constant term in the earlier specification).

[5] For a complete discussion of the development of the ordered probit model first used by forensic economists see Spizman and Kane (1992).

IV. Data

The model described above is estimated using data from the *National Longitudinal Survey of Youth, 1979* (NLSY79). This is a national sample of 12,686 individuals aged 14-22 when they were initially interviewed in 1979. The participants in this study were re-interviewed annually until 1994 and bi-annually since then. The most recent publicly available data is from the 2004 follow-up survey of this sample. Earlier releases of this data collection have been used by forensic economists to examine the determinants of educational attainment.[6] Since more recent surveys have filled in more data on educational attainment and other relevant variables for sample respondents, the current study is based on a substantially larger sample (10,199 individuals) than was available in prior studies using this (or similar) data.[7]

Table II contains a listing of the variables and the sample means of these variables for the male and female subsamples. Most of these variables have been discussed in Spizman and Kane (1992), Gill and Foley (1996), and Kane and Spizman (2001). The main differences in the current study are:

- the "Both Parents" variable used in Gill/Foley and Kane/Spizman has been replaced by a set of dummy variables that represent the presence of a biological father, a biological mother,[8] or no biological parent[9] in the household when the respondent was 14 years old. (The excluded category in this set of dummy variables is the case in which both biological parents are present in the household.)

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[6] Gill and Foley (1996) first utilized the 1979-1992 waves of this survey in their update and expansion of the Spizman-Kane (1991) model. Kane and Spizman (2001) used the 1979-1998 waves of this survey in their analysis.

[7] The Spizman and Kane (1991) model was estimated using a sample of 7,862 individuals that were participants in the *National Longitudinal Study of the High School Class of 1972*. Gill and Foley (1996) used a sample of 7,207 observations from the NLSY79. The Kane and Spizman (2001) model was estimated using a sample of 7,023 individuals.

[8] The dummy variable "Biological mother only" is defined to equal one if the biological mother is present and the biological father is absent (an equivalent interpretation holds for the "Biological father only" variable). This variable equals one regardless of the presence of absence of another adult partner in the household.

[9] The "Other" variable used in this analysis reflects a wide variety of cases, including individuals that were adopted, living with foster parents, in group homes, in correctional facilities, with step-parents (and no biological parents), with friends, other relatives, or on their own at age 14. While the effect of each of these living arrangements on the respondent's educational attainment is likely to be different, none of these categories, however, contains a large enough sample to analyze separately.

- the introduction of the "Deceased mother" and "Deceased father" variables. Unfortunately, insufficient information is available to determine the age of the respondent at the time of the parent's death. Information on the death of a parent is available (for a reasonably large sample of respondents) only at specific dates, beginning with the 1979 survey. Since a large proportion of the sample did not respond to this question in 1979, this variable was set to equal 1 if the respondent reported that the parent was deceased in 1979, or did not respond to this question and reported that the parent was deceased by 1980.[10]
- an additional educational attainment category is included for the category of Associate's degree. (in the earlier studies by Gill and Foley (1996) and Kane and Spizman (2001), this category was consumed within the 1-3 years of college category).

V. Results

Table 3 contains the estimated parameters of the ordered probit model described above. For variables that are identically defined, the results of this model are, not surprisingly, similar to those appearing in Gill and Foley (1996) and Kane and Spizman (2001). The most interesting results are those representing the more detailed breakdown of household structure.

Since the excluded family structure category is the presence of both biological parents in the household, the coefficients on each of the family structure variables provides a measure of the predicted change in Z_i that occurs when the condition holds. A negative coefficient implies an increased probability of the respondent not completing high school and a reduced probability of attaining an advanced degree. An inspection of Table II indicates that the absence of one or both biological parents from the household has a significant adverse effect on educational attainment.

[10] Thus, deaths of parents that occurred between the 1979 and 1980 surveys are not reflected in this variable unless the respondent did not complete this section of the 1979 survey. This variable indicates that the parent died at some time between the respondent's conception (or birth, in the case of female parents) and 1979 (and in a few cases, 1980). Given the age of NLSY79 respondents, this means that the parent died before the child reached an age of 14 and 23 (depending on the age of the respondent at the start of the NLSY79 survey).

One reason for the absence of a parent in the household is the death of the parent. Since the deceased parent only appears in households in which one of the parents is missing, the effect of a missing parent caused by the death of that parent on the predicted value of Z_i may be determined by summing the coefficients for the absence of that parent and the death of that parent. It appears that the death of a parent of a gender opposite of the respondent has no adverse effect on predicted educational attainment.[11] The death of a parent of the same gender as the respondent has an effect that is not significantly different than the effect of the loss of that parent due to divorce or separation.

Example I: male child

To illustrate the implications of this model, it will be helpful if we consider an example. Consider a Catholic Hispanic minor male child living in an urban area whose mother has a high school degree and father has a 4-year college degree. The father works in a professional occupation. It is assumed that this household has a newspaper subscription, a magazine subscription, and at least one person with a library card. If both parents are present in the household at age 14, the estimated value of $\hat{Z}_i$ is equal to:

$$\begin{aligned}\hat{Z}_i &= 0.094(1) + 0.232(0) + 0.051(1) + 0.217(1) + 0.384(0) + 0.640(0) + 0.237(0) \\ &+ 0.442(0) + 0.645(1) + 0.259(1) + 0.151(0) + 0.250(0) + 0.291(0) + 0.335(1) \\ &+ 0.562(0) + 0.373(0) - 0.202(0) - 0.446(0) - 0.185(0) + 0.673(0) + 0.067(0) \\ &+ 0.097(1) + 0.338(1) + 0.177(1) = 2.213\end{aligned}$$

[11] In fact, the sum of the coefficients in these two cases are positive, suggesting a slight increase in expected educational attainment when the parent of the opposite gender dies (as compared to the case in which the household remains intact with both biological parents present).

Substituting this value of $\widehat{Z}_i$ (and the predicted values of $\widehat{\theta}_i$) into the formulas listed in Table I makes it possible to estimate the probability of each alternative level of educational attainment. These estimated probabilities appear in Table IV.

To examine the effect of the absence of family structure on the child's projected educational attainment, it will be helpful to repeat this procedure using alternative assumptions concerning educational attainment (holding other characteristics constant). The results of this exercise are presented in Table V.[12] As the discussion above suggests, these results suggest that a male child's expected educational attainment is adversely affected by the absence of a biological father (regardless of the reason). The effect of the absence of a biological mother, however, appears to depend on the cause of the mother's absence. If the mother's absence is due to her death, there appears to be no adverse effect on her son's educational attainment. His expected educational attainment will be lower, however, if she is absent for other reasons (*e.g.*, divorce or separation).

Example 2: female child (same characteristics)

Table VI contains the results of a similar exercise conducted for a female child with the same characteristics. The results are again quite similar. Expected educational attainment is lower when one of the biological parents is absent. This effect, however, does not occur if the biological father is deceased.

[12] All other characteristics are held constant except for the presence or absence of a biological parent at age 14.

IV. Problems of Interpretation

There can also be wide differences in the age of the child when the “missing parent” or “deceased parent” condition begins. The missing parent variable in the data used for estimation relates to the parental situation when the child is 14 years of age. However, it could make a difference whether (a) the mother never even knew who the father was, with the child being born not living with both parents, as compared to (b) having one parent disappear from the household when the child is older, say, age 7, and (c) the other extreme, where the "not living with both parents" condition did not begin until the child was age 14. And for some children living with both parents at age 14, the child may not have been living with both parents at some later time, *e.g.*, at age 15 or at age 17, prior to graduating from high school. Such a child would be lumped together with children who always lived with both parents until completing high school.

Because of these ambiguities, there is some uncertainty as to what can really be learned from the exercise that produced Table 5 and 6 about the effect of a parent being absent. On the surface, at least, it does still appear that the death of a parent may have a different effect on lifetime earnings than the absence of a parent due to relationship problems between the parents. These results are generally consistent with the results found in the studies by economists and psychologists reviewed above.[13]

[15]Bruce and Anderson (2004) use Canadian data and an approach very much like the one used here finds a statistically significant but relatively small effect of living with both parents until age 15. “In particular, among both males and females, those who lived with both parents were approximately 6 percent less likely to drop out of school before completing high school and 9 percent more likely to complete university than were those who living with only one parent.” (p. 14).

V. Conclusion

Our initial inquiry into the question of the effect of a parent's absence on the future earnings of a minor child as an adult was based on the presumption that there would be some reduction of the child's lifetime earnings when one of the child's parents dies. We also believed that a practicing forensic economist might want to explore the magnitude of this loss in wrongful death cases involving the death of a parent. If there was a substantial future loss to a child resulting from the death of a parent, an argument could be made that this type of loss should be included among the elements of damage in wrongful death cases, and children of deceased parents should be compensated for that future earnings loss in addition to other more traditional losses forensic economists compute in such cases.

We have shown that the Kane/Spizman ordered probit model provides a method of estimating the loss of a child's lifetime earnings resulting from the death of a parent. Other research on this issue finds that the loss due to death of a parent may be small compared to the loss due to the absence of a parent due to other factors. We have found that the magnitude of this difference varies with the gender of the child and the gender of the deceased parent. When a parent of the opposite gender dies, the effect on a child's lifetime earnings is relatively small. The absence of a role model of the same gender, however, reduces expected educational attainment whether it is the result of relationship discord or death.

Thus, when dealing with the effect of the death of a parent of the opposite gender, the common practice of not estimating this loss appears to be sensible and defensible. The effect, however, may be quite different when the parent that dies is of the same gender as the child. In this case, the effect on the child's lifetime earnings could be substantial.

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Table I
Probabilities of Alternative levels of Educational Attainment

Outcome	Probability[14]
Less than High School Degree	$\Phi(\hat{\theta}_1 - \hat{Z}_i)$
High School or GED Degree	$\Phi(\hat{\theta}_2 - \hat{Z}_i) - \Phi(\hat{\theta}_1 - \hat{Z}_i)$
1-3 Years of College	$\Phi(\hat{\theta}_3 - \hat{Z}_i) - \Phi(\hat{\theta}_2 - \hat{Z}_i)$
Associate's Degree	$\Phi(\hat{\theta}_4 - \hat{Z}_i) - \Phi(\hat{\theta}_3 - \hat{Z}_i)$
4-Year College Degree	$\Phi(\hat{\theta}_5 - \hat{Z}_i) - \Phi(\hat{\theta}_4 - \hat{Z}_i)$
Master's Degree	$\Phi(\hat{\theta}_6 - \hat{Z}_i) - \Phi(\hat{\theta}_5 - \hat{Z}_i)$
Ph.D. Degree (or equivalent)	$1 - \Phi(\hat{\theta}_6 - \hat{Z}_i)$

[14] $\Phi(\bullet)$ is the cumulative density function for the standard normal density function.

Table II
Description of Variables and Estimated Means

Variable	Description	Males	Females
Highest Degree			
No HS degree	= 1 has not completed either a high school degree or GED	0.126	0.098
High School (or GED)	= 1 if either a high school degree or a GED	0.554	0.510
1-3 years college	= 1 if 1-3 years of college but no college degree	0.081	0.108
Associate's degree	= 1 if the respondent reports completing an Associate's degree	0.057	0.080
4-year degree	= 1 if the respondent reports completing a BA or BS degree	0.134	0.150
Masters	= 1 if the respondent reports a Master's degree	0.035	0.048
PhD	= 1 if the respondent reports a PhD, JD, MD, DDS, or equiv.	0.015	0.007
Demographic variables			
Hispanic	= 1 if the respondent reports primary racial/ethnic identification as Hispanic	0.145	0.152
Black	= 1 if the respondent reports primary racial/ethnic identification as Black	0.213	0.212
Urban14	= 1 if lived in a town or city when 14 years old	0.780	0.786
Mother's Education			
High School	= 1 if the respondent's mother completed 12 years of schooling	0.434	0.412
1-3 years of college	= 1 if the respondent's mother completed 13-15 years of schooling	0.097	0.096
4-year college degree	=1 if the respondent's mother completed 16 or more years of schooling	0.081	0.076
Father's Education			
High School	= 1 if the respondent's father completed 12 years of schooling	0.341	0.339
1-3 years of college	= 1 if the respondent's father completed 13-15 years of schooling	0.096	0.092
4-year college degree	=1 if the respondent's father completed 16 or more years of schooling	0.144	0.137
Adult's Occupation			
Professional	= 1 if the adult male or female present in the household when the respondent was 14 worked in a professional or managerial occupation	0.239	0.231
Sales or Clerical	= 1 if the adult male or female present in the household when the respondent was 14 worked in a sales or clerical occupation	0.199	0.199
Religion raised			
Baptist	= 1 if Baptist	0.259	0.264
Protestant	= 1 if the respondent reported that he or she had been raised as a Protestant, Episcopalian, Lutheran, Methodist, or Presbyterian	0.239	0.232
Catholic	= 1 if Roman Catholic	0.341	0.353
Jewish	= 1 if Jewish	0.010	0.011
Other	= 1 if other religion	0.105	0.108
Bio. parents in home (age 14)			
Biological mother only	= 1 if the biological mother is present and the biological father is absent when the respondent is 14 years old	0.196	0.202
Biological father only	= 1 if the biological father is present and the biological mother is absent when the respondent is 14 years old	0.031	0.023
Neither bio parent	= 1 if neither biological parent was present at age 14	0.027	0.030
Mother deceased	= 1 if the respondent's mother is reported as being deceased in either the 1978 or 1980 survey	0.025	0.023
Father deceased	= 1 if the respondent's father is reported as being deceased in either the 1978 or 1980 survey	0.150	0.158
Other			
Newspapers	= 1 if a household member received newspapers regularly when the respondent was 14 years old	0.798	0.783
Magazines	= 1 if a household member received magazines regularly when the respondent was 14 years old	0.607	0.590
Library Card	=1 if any household member had a library card when the respondent was 14 years old	0.718	0.745
Observations		5133	5066

Table III
Ordered Probit Equation

	Males		Females	
Variables	**coefficient**	***t*-stat**	**coefficient**	***t*-stat**
Hispanic	0.094*	1.78	0.192***	3.70
Black	0.232***	5.19	0.400***	9.16
Urban14	0.051	1.30	-0.093**	-2.38
Mother's Education: High School	0.217***	5.31	0.348***	8.71
Mother's Education: 1-3 years of college	0.384***	6.07	0.505***	8.17
Mother's Education: 4-year college degree	0.640***	8.95	0.784***	10.74
Father's Education: High School	0.237***	5.90	0.229***	5.79
Father's Education: 1-3 years of college	0.442***	7.29	0.379***	6.27
Father's Education: 4-year college degree	0.645***	10.56	0.569***	9.30
Professional	0.259***	5.87	0.274***	6.23
Sales or Clerical	0.151***	3.69	0.099**	2.44
Baptist	0.250***	3.05	0.094	1.03
Protestant	0.291***	3.54	0.209**	2.29
Catholic	0.335***	4.11	0.187**	2.06
Jewish	0.562***	3.38	0.442***	2.62
Other religion	0.373***	4.20	0.175*	1.81
Biological mother only	-0.202***	-4.39	-0.206***	-4.62
Biological father only	-0.446***	-4.27	-0.246*	-1.95
Neither bio parent	-0.185*	-1.89	-0.349***	-3.76
(Biological father only) x (mother deceased)	0.673***	3.27	0.133	0.61
(Biological mother only) x (father deceased)	0.067	0.084	0.201**	2.52
Newspapers	0.097**	2.22	0.146***	3.42
Magazines	0.338***	9.35	0.225***	6.19
Library Card	0.177***	4.71	0.186***	4.78
$\hat{\theta}_1$	-0.094		-0.439	
$\hat{\theta}_2$	1.778		1.376	
$\hat{\theta}_3$	2.058		1.717	
$\hat{\theta}_4$	2.291		2.020	
$\hat{\theta}_5$	3.180		2.922	
$\hat{\theta}_6$ $\hat{\theta}_6$	3.788		3.872	
χ^2 (24)	1326.79***		1294.72***	

*significant at a 10% significance level.
**significant at a 5% significance level.
***significant at a 1% significance level.

Table IV
Estimated probabilities of alternative levels of educational attainment (both bio parents present)

Outcome	Probability[15]
Less than High School Degree	$\Phi(-0.85-2.226)=\Phi(-3.076)=0.001$
High School or GED Degree	$\Phi(1.789-2.226)-\Phi(-3.076)=0.331-0.001=0.330$
1-3 Years of College	$\Phi(2.304-2.226)-\Phi(1.789-2.226)=0.5311-0.3311=0.200$
4-Year College Degree	$\Phi(3.194-2.226)-\Phi(2.304-2.226)=0.8335-0.5311=0.3024$
Master's Degree	$\Phi(3.802-2.226)-\Phi(3.194-2.226)=0.9425-0.8335=0.109$
Ph.D. Degree (or equivalent)	$1-\Phi(3.082-2.226)=1-0.9425=0.0575$

Table V
Case I (male): Probabilities under alternative family structures

Outcome	Probabilities				
	Both bio parents present	Bio father absent	Bio father deceased	Bio mother absent	Bio mother deceased
Less than High School Degree	0.011	0.018	0.015	0.031	0.006
High School or GED Degree	0.321	0.390	0.367	0.473	0.248
1-3 Years of College	0.107	0.111	0.110	0.110	0.097
Associate's Degree	0.093	0.092	0.092	0.085	0.090
4-Year College Degree	0.302	0.269	0.280	0.221	0.330
Master's Degree	0.109	0.083	0.092	0.057	0.141
Ph.D. Degree (or equivalent)	0.058	0.038	0.044	0.022	0.089

[15] $\Phi(\bullet)$ is the cumulative density function for the standard normal density function.

Table V1
Case I (female): Probabilities under alternative family structures

Outcome	Probabilities				
	Both bio parents present	Bio father absent	Bio father deceased	Bio mother absent	Bio mother deceased
Less than High School Degree	0.007	0.012	0.007	0.013	0.009
High School or GED Degree	0.249	0.314	0.250	0.327	0.284
1-3 Years of College	0.120	0.130	0.121	0.132	0.126
Associate's Degree	0.119	0.120	0.119	0.120	0.120
4-Year College Degree	0.318	0.287	0.318	0.280	0.302
Master's Degree	0.154	0.117	0.153	0.109	0.133
Ph.D. Degree (or equivalent)	0.033	0.020	0.033	0.019	0.026