Educational attainment of siblings in stepfamilies

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Abstract

In this paper, we compare the educational attainment of birth and nonbirth children of women in the US Panel Study of Income Dynamics (PSID). We find that children raised by step, adoptive, or foster mothers obtain significantly less education, on average, than do the birth children of the same women. Nonbirth children of a woman receive, on average, 1 year less schooling than do her birth children, with the educational break occurring at the time children finish high school and begin college. © 2001 Elsevier Science Inc. All rights reserved.

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1. Introduction

A large body of research shows that children who grow up with only one birth parent are disadvantaged across a broad range of outcomes, as compared with children who grow up with both birth parents. They are less likely to complete high school and college, less likely to find stable employment in young adulthood, more likely to divorce, more likely to have children outside marriage, and more likely to have poor mental health in adulthood (Amato & Keith, 1991; Biblarz & Raftery, 1999; Cherlin, Chase-Lansdale, & McRae, 1998; McLanahan & Sandefur, 1994). These findings are consistent across different racial and ethnic groups and across different social classes. In addition, effects are similar for boys and girls and for children whose parents separate in early childhood, as well as in adolescence.

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Of particular interest is the finding that children from stepparent families do just as poorly as children from single-mother families. Given that income accounts for much of the disadvantage associated with single parenthood, and that stepfamilies are similar to original two-parent families in terms of their socioeconomic status, sociologists and economists would expect children in stepfamilies to be doing about as well as children in original two-parent families. Yet, they are not. Indeed, once income is taken into account, children in stepfamilies generally do worse than children in single-mother families (Biblarz & Raftery, 1999; McLanahan & Sandefur, 1994).

There are several reasons why children in stepfamilies might do worse than children in original two-parent families. One possibility is that adults who divorce and remarry are less effective (or competent) as parents than adults who remain married. According to this argument, the problem lies not with the stepfamily structure itself but with the people who sort themselves into this structure. Another possibility is that stepfamilies are less well institutionalized than traditional nuclear families. Cherlin (1978) argued that stepfamilies lack affirmative support and clear social norms that define and thereby legitimate parent–child relationships. The lack of clear directives makes it difficult for stepparents to exercise authority and undermines parental obligations toward the child. A third possibility is that parents invest less in their stepchildren than in their biological children. According to the evolutionary biology perspective, "Genetic relatedness is a predictor of conflict and enhanced cooperation because the genetic posterities of blood relatives co-vary (are promoted by common exigencies) in direct proportion to their degree of relatedness" (Daly & Wilson, 1988, p. 519). Finally, some researchers argue that stepchildren do worse because they are scarred by their parents' divorce or separation. This hypothesis, however, cannot account for why children in stepparent families do worse than children in single-parent families, after income is taken into account.

How do stepmother families differ from stepfather families? Nearly all of the previous research on family structure has focused on father absence, in part because single-mother families have been more common than single-father families, and in part because of concern over mother-headed families raised in the Moynihan Report (1965). More recently, however, sociologists and economists have begun to examine the effects of mother absence on children and to compare these effects with those of father absence. Using data from four national surveys, Biblarz and Raftery (1999) showed that mother absence was much more detrimental than father absence to children's educational and occupational attainment. These researchers found that once parents' socioeconomic status was taken into account, children raised by single mothers were much better off than children raised by single fathers or fathers and stepmothers, and were just as likely to succeed as children raised by both birth parents. Biblarz and Raftery concluded that the pattern of effects across family types and over time was consistent with an evolutionary perspective which emphasizes the importance of the birth mother in the provision of children' resources. Furthermore, being raised by a single birth mother was better than being raised by a birth mother and stepfather because stepfathers competed with children for mother's time, which lowered maternal investment.

Recent work on the determinants of children's human capital investments has found that the absence of a child's birth mother puts the child at risk, even in households with two

parents. Investments that are typically made by a child's mother — in food, health, and education, for example — were made at a lower level when the child was raised by a nonbirth mother. Case, Lin, and McLanahan (1999, 2000) found that, holding constant household income, size, and age composition, as well as parents' education and socio-economic status, significantly less money was spent on food at home when the household contained a step, adoptive, or foster child of the mother figure in the household. Using data from the US Panel Study of Income Dynamics (PSID) over an 18-year period, they found that, on average, if a birth child of the mother were replaced by a stepchild, the household would spend 5% less on food eaten at home. The food expenditure questions in the PSID were asked at the level of the household, and it was not possible to say whether the lower spending on food translated into lower food consumption for the nonbirth child, or lower food consumption for all household members.

To focus directly on investments made in individual children, Case and Paxson (2001) used data from the 1988 National Health Interview Survey Child Health Supplement (NHIS-CH) to examine the health investments made in a woman's step, foster, and adopted children relative to birth children. They found, controlling for household size, income, and other characteristics, that children living with stepmothers were significantly less likely than children living with birth mothers to have received routine doctor and dentist visits, or to have had a place for usual medical care, or for sick care. If children living with stepmothers had regular contact with their birth mothers, however, their health care did not suffer relative to that reported for children who resided with their birth mothers.

These studies are useful in that they focus on investments made in children, rather than on children's outcomes. However, because the NHIS-CH followed only one child in a household and the PSID food question was asked at the household level, it is not possible to identify whether the findings in these studies are attributable to a lower level of parenting skills among women who become stepmothers, or to the difficulty parents and children face in negotiating rights and obligations in stepfamilies or, as Biblarz and Raftery conclude, to differential investments in biological and nonbiological children.

In this paper, we add to what is known about the relative investments made in stepchildren, by comparing the educational attainment of birth and nonbirth children of women in two-parent families observed raising both types of children in the PSID. By comparing the outcomes of children of the same mother, we are able to go beyond previous research, which has identified the effect of stepmothers by comparing the children of different mothers. We find that children raised by step, adopted, or foster mothers obtain significantly less education, on average, than do the birth children of those same women. The nonbirth children of a woman receive 1 year less schooling, on average, than do her birth children, with the educational break generally occurring at the time children finish high school and begin college. Consistent with a model based on evolved preferences, we cannot reject that the lower educational attainment of a woman's nonbirth children is identical for step, adopted, and foster children. In addition, we find that mother absence has a much larger, more significant, and more robust effect on children's education than does father absence.

Our analysis allows us to rule out some of the explanations for why children raised by stepparents fare less well than children raised by birth parents. If stepmothers were, on

average, less able mothers, or if stepchildren obtained less schooling because of a lack of clear norms in stepfamilies, then we would expect to see the birth children of a woman with stepchildren also obtaining less education. However, this is not what we observe. The birth children of a woman raising step (or adopted or foster) children receive, on average, the same years of education as the birth children of women raising only birth children.

Economic models of the determinants of educational attainment often assume that a decision maker, often the child's parent, weighs the relative merits of investing in each child's education, and invests so as to optimally trade off the efficiency of the investment of (possibly fixed) resources with the equity of the allocation between his or her children. (See Behrman, 1997; Bergstrom, 1997.) Generally, these models assume that parents are neutral in their regard for each child. While this assumption may be plausible when all children in the household are birth children of the parent figures, it seems less realistic when some children are birth children and others are stepchildren. Our findings are consistent with an economic model of educational investment in which child neutrality does not hold.

There is a small literature examining the impact of stepparenting on educational outcomes. Beller and Chung (1992) examined the effect of stepfathers on the probability of finishing high school and attending college. Zvoch (1999) used the National Education Longitudinal Survey to document that, relative to children raised by two birth parents, children raised by a birth parent and a stepparent were allocated fewer resources to support post-secondary education — a result robust to controls for children's achievement, household SES status, and the number of financial dependents in the household. However, neither Beller and Chung nor Zvoch controlled for differences in the educational investments made in children raised in the same household, something we are able to do using the PSID in the analysis below.

We begin with a discussion of the PSID data, and our coding of child–parent relationships. We then present results on educational attainment by type of mother, and follow with a more detailed analysis of educational attainment by mother–father type.

2. Data and variable construction

We investigate differences in education of birth and nonbirth children using data from the US PSID. The PSID is a longitudinal study of individuals and families that has annually interviewed household members since 1968. The original sample of 4800 households has grown (through marriage, divorce, children growing up, and forming their own households) to well over 6000 households in the late 1990s. The PSID contains two subsamples. One is a nationally representative sample (the SRC sample) and the other oversamples poor households (the SEO sample). (Data from the PSID are publicly available. See http://www.isr.u-mich.edu/src/psid.)

The PSID 1968–1985 Relationship file contains information on all pairwise relationships for all individuals who were ever part of, or derived from, the same original 1968 households. We identify all individuals who were ever a birth, adoptive, step, or foster child during the years from 1968 to 1985. (Appendix A provides a detailed description of variable construction.) We exclude children who had reached age 20 by 1968, because we want to

observe these respondents' relationships to their parents when they were children. Our results are robust to choosing an age 18 cut-off in place of an age 20 cut-off. Our interest is in completed education, and so we exclude children who have not reached age 23 by 1997, the last year for which we have data. Thus, children would have to have been born before 1975 to be studied here.

Parental assignments are based on a hierarchy of attachment between parent and child. We identify children as having been raised by their birth mothers if they are observed living with their birth mother and never living with a different type of mother. In this way, our "birth parent" indicators signify that the child was raised solely by a birth parent. For children who lived apart from a birth parent, we assume that the level of attachment between parent and child is strongest for adopted children, less strong for stepchildren, and less still for foster children. If a child reports having lived with a foster mother, but not with a step or adoptive mother, we code this child as having been raised by that foster mother. (In addition to adults who take on a legal responsibility to foster a child, the PSID names a second set of parents as foster parents. It asks adults to state whether they are helping to raise a child in the household. Such an adult is identified by the PSID as a "foster parent" if the adult is living with, but not married to, the birth, step, or adoptive parent of that child.) If a child reports ever having lived with a stepmother, but not with an adoptive mother, we assign the stepmother as the mother who raised the child. If a child reports having lived with an adoptive mother, we code the child as having been raised by that adoptive mother. Fathers are assigned in an analogous fashion. Table 7 presents the precise assignment rules we follow.

The only exception to our coding is in four cases in which a stepchild was later adopted by his or her stepparent. We continue to code these children as stepchildren. The results presented below are entirely insensitive to the way that these four cases are treated.

The assignment method described above is ad hoc, and one could argue for alternative assignment rules. As a check on the robustness of our results, we also made assignments based on the length of time in the 1968–1985 period that we observed the child living with any given woman, and assigned as the child's "mother" the woman we observed the child living with for the longest period of time. The assignments of mothers and fathers change very little using this alternative rule, and our results are robust to this alternative assignment.

Table 1 presents the data we use in our analysis. The children we follow were born between 1948 and 1974 and have, on average, completed 12.9 years of schooling. Eighty-five percent of them have completed at least 12 years of schooling; 33% have completed at least 14 years; and 16% have completed at least 16 years of schooling. Half of the sample is male, and roughly half come from the SEO sample of the PSID, which contains an oversample of low-income households. Ninety-five percent of children are assigned their birth mother as their "mother figure" and 65% are assigned their birth fathers as their "father figure." Two percent of children are assigned to stepmothers, and 7% to stepfathers. Between 1% and 2% of parents are adoptive.

In our regression analysis, we include four variables that characterize a child's relationship to the rest of the family. We include indicators of whether the child is the oldest among a woman's children, and whether the child is the youngest. To calculate the effect of family structure, it will be important to include these indicators, if birth order is an important

Table 1
PSID sample characteristics

Outcome variables	variable means
Educational attainment	12.90
Indicator: at least 12 years of schooling	0.849
Indicator: at least 14 years of schooling	0.326
Indicator: at least 16 years of schooling	0.156
Control variables	
Child is male	0.511
Year born	1962
Indicator: SEO sample	0.469
Indicator: birth mother	0.954
Indicator: adoptive mother	0.015
Indicator: stepmother	0.023
Indicator: foster mother	0.008
Mother's education	11.80
Indicator: birth father	0.648
Indicator: adoptive father	0.021
Indicator: stepfather	0.067
Indicator: foster father	0.015
Indicator: "unclear" father relationship	0.248
Father's education	11.41
Indicator: oldest child	0.381
Indicator: youngest child	0.283
Difference in age to next oldest child	1.64
Number of children raised by mother	4.27

Number of observations = 6199. The sample is restricted to individuals greater than or equal to age 23 in 1997, whose relationships with a mother figure and father figure was recorded up to a maximum age of 20 during the period 1968–1985 (the period during which the PSID reported relationships between all dyads in the household). To be included in the analysis, a child must have a mother figure and a father figure, and the relationship between mother and all children in the child's household must be clear.

predictor of educational attainment and if it is correlated with family structure (i.e., whether a child has birth parents, stepparents, and so on). In addition, the ability of families to provide for children may depend on birth spacing, which may also be correlated with family structure. For this reason, we add information on birth spacing between this child and the next-oldest child in the household. (That is, we have coded the age difference for the oldest child to be zero. The age difference between the oldest and second oldest child is attached to the latter, and so on.) We also control for the number of children a woman has raised. The number of children in a family is a strong predictor of educational attainment and, again, may be correlated with family structure. The means for these four variables appear at the bottom of Table 1. Thirty-eight percent of our sample are first-born children, and 28% are last-born. On average, the differences in children's ages in the family is 1.64 years. (This mean includes the zeros associated with the first born children.) On average, there are 4.3 children associated with each mother. In most of the regression results that follow, being a first-born child is a

positive and significant predictor — and the number of siblings is a negative and significant predictor — of educational attainment. Birth spacing and being the last-born child generally have no significant effects on the results, and their coefficients are not displayed in the tables.

We have removed families containing children whose relationship to his or her mother is "unclear" (i.e., it could be a biological, adoptive, step, or foster relationship). Most "unclear" relationships are coded as such because the individuals were living in a household that was not interviewed in 1985. The 1985 interview collected complete marital, fertility, and adoption histories of all men and women in the PSID, which makes it possible to determine the exact relationship (birth, step, adoptive, foster) between each child and parent. If the household was not interviewed in 1985, we have to rely on information collected from the yearly surveys to link children with parents, and this information is not as complete as the marital, adoption, and fertility histories. Before 1983, the PSID did not distinguish between biological, adoptive, and step relationships in the yearly survey; between 1983 and 1985, the PSID separated the step relationship from biological and adoptive relationships but did not distinguish between the latter two categories. The results presented below are robust to the inclusion of all children with "unclear" mother status.

3. Educational attainment

We compare the educational attainment of children raised by different types of mothers in Table 2. Each row presents means of educational attainment for households with more than one child, in which the mother figure raised birth children and stepchildren (row 1); birth children and adopted children (row 2); birth children and foster children (row 3); or birth children only (row 4). The educational attainment of birth children, in each type of household, is presented in the first column. There is, on average, no difference in the educational attainment of children raised by their birth mothers, regardless of whether these woman also raised stepchildren (12.70 years of education for birth children), adopted children (12.78), foster children (12.76), or only birth children (12.81). However, there are significant differences between the educational attainment of birth children and stepchildren in households where women raised both. On average, stepchildren obtained 0.75 years less schooling than birth children (column 3). In households with adopted and birth children, the adopted children obtained, on average, 0.62 years less schooling and, in households with foster and birth children, the foster children obtained 1.33 years less schooling, on average, than the birth children. In all three cases, the difference between the birth and nonbirth children's educational attainment is significant at the 10% level, and the difference is significant for stepchildren and foster children at a 5% level. We cannot reject that the step, adopted, and foster children all complete 1 year less schooling, on average.

Table 2 presents prima facie evidence that the birth children of a woman who also raises nonbirth children face no risk of lower educational attainment. If a stepmother were a less able mother, or if her family were more chaotic, we would expect the birth children in these families to suffer along with the stepchildren. In all of the family structures presented in

Table 2
A comparison of educational outcomes by household type

Households containing the following	Mean education of the birth children in households of this type (standard error of mean)	Mean education of the step (adopted, foster) children in households of this type (standard error of mean)	Difference between the birth and step (adopted, foster) childrens' educ [Col 1 – Col 2] (standard error)
Step and birth children of the mother	12.70 (0.16)	11.95 (0.14)	0.75* (0.21)
Adopted and birth children of the mother	12.78 (0.23)	12.16 (0.27)	0.62 (0.35)
Foster and birth children of the mother	12.76 (0.18)	11.43 (0.24)	1.33* (0.30)
Only birth children of the mother present	12.81 (0.02)		

Each row presents means of educational attainment for households with more than one child, in which the mother figure raised birth children and stepchildren (row 1); birth children and adopted children (row 2); birth children and foster children (row 3); or birth children only (row 4).

A child's educational attainment is the maximum education observed for that child between 1968 and 1997. The sample is restricted to individuals greater than or equal to age 23 in 1997, whose relationships with his or her mother figure was recorded up to a maximum age of 20 during the period 1968–1985 (the period during which the PSID reported relationships between all dyads in the household).

* Significant at the 95% confidence interval.

Table 2, the significant differences are between birth and nonbirth children, as opposed to birth children in different types of families.

There may be other determinants of children's education that are correlated with family structure, and in Table 3, we present regressions results in which, in addition to indicators for the type of mother who raised the child, we control for many family and child characteristics that we think may influence educational attainment. These include mother's and father's education, the number of children raised by the mother, indicators for whether the child is the oldest child or the youngest child raised by the mother figure, the difference in age between the child and the child's next older sibling, the child's sex, and an indicator that the child's family is part of the PSID's poorer (SEO) sample. We also include an indicator for whether the child's birth father lived in the household while the child was growing up. Results in column 1 show that parents' education and the presence of the child's birth father in the household have large and significant effects on educational attainment. In addition, children raised in larger sibships complete fewer years of schooling on average. The results in column 1 suggest that, on average, children raised by stepmothers, or by foster mothers, complete roughly a year less schooling than do children raised by birth mothers.

The regression in column 1 compares outcomes for all stepchildren with outcomes for all birth children: The coefficients are calculated using the differences in education by type of

Table 3
Educational attainment and relationship to mother with and without mothers' fixed effects

Explanatory variables	Dependent variable: years of completed education	
Mother-specific indicators included?	No	Yes
Indicator: adopted child of mother	− 0.173	− 0.783*
	(0.193)	(0.336)
Indicator: stepchild of mother	− 1.249*	− 0.847*
	(0.155)	(0.235)
Indicator: foster child of mother	− 0.870*	− 0.879*
	(0.259)	(0.346)
F test: joint significance of mother variables (P value)	25.41	9.31
	(0.0000)	(0.0000)
F test: adopted = step = foster mother (P value)	9.52	0.02
	(0.0000)	(0.9778)
Mother's educational attainment	0.145*	–
	(0.002)	
Father's educational attainment	0.101*	− 0.003
	(0.001)	(0.046)
Indicator: child's father figure is birth father	0.577*	0.440*
	(0.050)	(0.143)
Indicator: child is oldest child raised by this mother figure	0.096	0.161*
	(0.067)	(0.062)
Difference in age between child and next-older child	0.016	0.002
	(0.014)	(0.014)
Number of children raised by mother figure	− 0.057*	–
	(0.011)	

Standard errors in parentheses. The omitted category is birth child of the mother figure. These children may have birth, step, adoptive, foster, or "unclear" father figures. Also included in both regressions are an indicator that the child is the youngest in the sibship, an indicator that the child is male, and an indicator that the family is drawn from the SEO sample of the PSID. The sample is restricted to persons who were at least 23 years old in 1997, whose relationships with parent figures were measured between 1968 and 1985 (the period during which the PSID reported relationships between every dyad in the household), and whose relationship to the mother figure was clear for every child in the household. Average number of children per mother figure = 2.6. Number of observations = 6199.

* Significant at the 95% confidence interval.

mother across all households. These coefficients, then, do not answer the question of whether children raised by the same woman receive differential treatment based on their relationship to their mother. For the latter, we turn to the regression results in column 2. Here, we have added to the regression a complete set of indicator variables (fixed effects) identifying each mother. Adding these variables forces all of the regression coefficients to be based solely on differences observed between children raised by the same mother. The regression no longer calculates coefficients for mother's educational attainment, the household's SEO status, and the number of children this woman has raised: There are no differences between children raised by the same woman in these variables, and the effects of these variables are absorbed

by the mother's indicator variable. The coefficient on father's education is small and insignificant when we add mother indicator variables, suggesting that there may be little difference in the educational attainment of the fathers of children raised by the same woman, which we would expect if there was assortative mating.

Table 3 makes clear that, relative to a woman's birth children, her step, adopted, and foster children receive significantly less education. Consistent with the comparison of means in Table 2, the estimates in column 2 show that nonbirth children receive roughly one year less education than birth children. An F test (row 4) shows that the indicators for types of mother are jointly highly significant ($F = 9.31$, P value = .0000). The coefficients on mother type are very similar in size for adopted (-0.8), step (-0.8), and foster (-0.9) children, and an F test (row 5) cannot reject that they are equal.

The coefficients on types of mother in column 2 are generated by the differences in educational attainment between stepchildren, for example, and the birth children of mothers who are raising both types of children. If a mother has only stepchildren, her stepchildren do not contribute information to the stepchild coefficient. There must be variation within the group of children raised by a woman if they are to contribute to the calculation. The observations that contribute information to the coefficients on step, adopted, and foster children are from women who raise more than one type of child.

Allowing for mother-specific intercepts has the largest effect on the coefficient for adopted children, among the family structure variables. In the OLS regression, all adopted children contribute to the coefficient while, in the regressions that include mother indicator variables, only adopted children in households where there is at least one other type of mother–child relationship contribute to the coefficient. Adopted children observed in the PSID, on average, received 12.81 years of completed schooling, which is not significantly different from that received by birth children. However, this mean masks an important difference between households with and without birth children: When a woman raises adopted children but no birth children of her own, on average, her adopted children obtain 13.29 years of schooling. On the other hand, if a woman is raising birth children and adopted children, on average, the adopted children receive 12.16 years of schooling (as reported in Table 2).

This difference — between the unconditional mean of educational attainment of adopted children and the mean conditional on the presence of a woman's birth children — helps us to reconcile our results with those on adopted children in Case and Paxson (2001). Case and Paxson could follow only one child per household in the NHIS-CH. They observed and reported the unconditional mean of health investments for adopted children, which was generally insignificantly different from that for birth children. It is not possible to know whether the means of health investments, conditional on types of children present, would show the pattern we find here for educational investments.

Birth father's presence is a significant determinant of children's education, even when we include mother indicators. However, the coefficient for birth father's presence (.44) is only half as large as that for birth mother's absence, a point we return to below.

We explore the point at which nonbirth children fall behind in their education in Table 4, where we examine whether children complete at least 12 years (column one), 14 years (column two), and 16 years of schooling (column three). All three regressions include mother

Table 4
Determinants of high school graduation and college achievement

Explanatory variables	Dependent variable		
	= 1 if child has at least 12 years of schooling	= 1 if child has at least 14 years of schooling	= 1 if child has at least 16 years of schooling
Mother indicators included?	Yes	Yes	Yes
Indicator: adopted child of mother	− 0.052	− 0.240*	− 0.094
	(0.068)	(0.085)	(0.066)
Indicator: stepchild of mother	− 0.082	− 0.192*	− 0.076
	(0.048)	(0.060)	(0.046)
Indicator: foster child of mother	− 0.052	− 0.265*	− 0.042
	(0.070)	(0.088)	(0.068)
F test: joint significance of mother variables	1.52	10.15	1.99
	(0.2081)	(0.0000)	(0.1134)
F test: adopted = step = foster mother (P value)	0.08	0.24	0.18
	(0.9255)	(0.7856)	(0.8392)
Father's educational attainment	0.013	0.002	− 0.009
	(0.009)	(0.012)	(0.009)
Indicator: child's father figure is birth father	0.080*	0.070	0.042
	(0.029)	(0.036)	(0.028)
Indicator: child is oldest child raised by this mother figure	0.024	0.025	0.015
	(0.013)	(0.016)	(0.012)
Difference in age between child and next-older child	0.004	− 0.003	− 0.004
	(0.003)	(0.004)	(0.003)

Standard errors in parentheses. The omitted category is birth child of the mother figure. These children may have birth, step, adoptive, foster, or "unclear" father figures. Also included in all regressions are an indicator that the child is the youngest in the sibship, and an indicator that the child is male. The sample is restricted to persons who were at least 23 years old in 1997, whose relationships with parent figures were measured between 1968 and 1985 (the period during which the PSID reported relationships between every dyad in the household), and whose relationship to the mother figure was clear for every child in the household. Average number of children per mother figure = 2.6. Number of observations = 6199.

* Significant at the 95% confidence interval.

indicator variables. Being raised by an adoptive, step, or foster mother has no significant effect on the probability of finishing high school. The coefficients on all three indicators are negative, but insignificant (both individually, and tested jointly using an *F* test). In contrast, family structure plays a significant role in determining whether children go on to college. The type of mother indicators are significant predictors of the probability that a child receives at least 14 years of schooling, reducing that probability by 20–30%. Again, the coefficients on types of mothers are highly significant (*F* test = 10.15, *P* value = .0000), and we cannot reject that the coefficients on adopted, step, and foster children are identical. It is the transition from high school to college where having been raised by a nonbirth mother is most important. We find no significant effect for parent types beyond 14 years of schooling.

Taken together, the results in Table 4 suggest that living with a birth mother is protective of college attendance. This may be for several reasons. Completion of high school may not be a

very strong indicator of a child's skills or knowledge in the United States, where most children are graduated if they stay in school. College attendance is apt to be a better measure of academic strength. Children raised with birth mothers may be better students, having received more scholastic help from their mothers during primary and secondary schooling. A complementary explanation for nonbirth children being less likely to attend college is that college education can be expensive, while generally high school education is not. Our results are consistent with a model in which women are more willing to invest in their birth children's college education. (Alternatively, all nonbirth children may be scarred by events earlier in their lives, and that scarring may lead children to obtain less schooling. The merits of this alternative hypothesis are discussed in Section 4.) It is possible that college scholarship rules discriminate against stepfamilies, by counting the incomes of absent parents in determining student need. However, if this were the most important determinant of stepchildren's educational attainment, we would expect the effect of living with stepfathers to be as large as the effect of living with stepmothers, which is not the case (see discussion below). This explanation also does not explain why we find significant effects for adopted children, who would not have an absent parent's income that could be added to a formula when determining student need.

3.1. Distinctions among nonbirth fathers

In the regressions presented in Tables 3 and 4, the omitted category was that of birth child of the mother. Such a child may have a birth, step, adoptive, or foster relationship with the father figure in the household. In Table 5, we allow the relationship between mother and child to depend upon the type of father figure present. Biblarz and Raftery discuss reasons why the presence of a stepfather may affect the investments a woman makes in her children, noting in particular that a stepfather's "concern with his own reproductive fitness is in competition with the stepchildren for the mother's resources, increasing the risk of abuse to children in families with a stepparent" (p. 326).

In the regressions that follow, we restrict the sample to the family types that are most common in the PSID. Specifically, we compare outcomes for children who are raised by six types of parents: a birth mother and birth father (3790 children), a birth mother and stepfather (379), a birth mother and adoptive father (55), a stepmother and birth father (95), an adoptive mother and adoptive father (73), and a foster mother and foster father (36). In order to be included, all children in a household must fall into one of these groups. (Results are very similar when the sample is not restricted to these types.)

In Table 5, we allow for differences in the investments made by these six different mother–father pairs, by including indicators for five of these parental types, taking as the omitted category being raised by a birth mother and birth father. As in Tables 3 and 4, we also include mother indicator variables, and, thus, observations contribute to the different parental types only if the mother who raised a child of a particular type also raised at least one other child of a different mother–father type.

The results in Tables 5 show that father types do not have a significant effect on educational attainment, when measured individually, or jointly using an F test (row 3). In

Table 5
Educational attainment and parental relationships, with mother indicator variables and indicators for relationships with parents

Explanatory variables	Dependent variable			
	Years of completed education	Indicator: high school degree	Indicator: 14 or more years of schooling	Indicator: 16 or more years of schooling
Mother indicators included?	Yes	Yes	Yes	Yes
Indicator: birth mother, stepfather	− 0.321	− 0.049	− 0.071	− 0.025
	(0.225)	(0.042)	(0.058)	(0.047)
Indicator: birth mother, adoptive father	0.516	0.095	− 0.008	0.080
	(0.442)	(0.083)	(0.114)	(0.093)
F test: joint significance of birth mother–stepfather and birth mother–adoptive father (P value)	1.80	1.41	0.76	0.54
	(0.1653)	(0.2446)	(0.4692)	(0.5831)
Indicator: stepmother, birth father	− 0.875*	− 0.131*	− 0.195*	− 0.010
	(0.349)	(0.066)	(0.090)	(0.074)
Indicator: adoptive mother, adoptive father	− 1.171*	− 0.204*	− 0.231*	− 0.108
	(0.390)	(0.073)	(0.100)	(0.082)
Indicator: foster mother, foster father	− 1.669*	− 0.171*	− 0.427*	− 0.141
	(0.408)	(0.077)	(0.105)	(0.086)
F test: joint significance of stepmother, adoptive mother, foster mother variables (P value)	10.30	5.37	8.49	1.44
	(0.0000)	(0.0011)	(0.0000)	(0.2291)
Indicator: child is the oldest of all children raised by this mother	0.243*	0.028*	0.034	0.023
	(0.074)	(0.014)	(0.019)	(0.016)
Number of observations	4423	4423	4423	4423

Standard errors in parentheses. The omitted category is birth child of both the mother figure and father figure in the household. Sample restricted to persons who were at least 23 years old in 1997, whose relationships with parent figures were measured between 1968 and 1985 (the period during which the PSID reported relationships between every dyad in the household), who report having a father figure and a mother figure. All children raised in the household would have to have had one of six types of parents: birth mother and birth father; birth mother and adoptive father; birth mother and stepfather; stepmother and birth father; adoptive mother and adoptive father; foster mother and foster father. Also included in the regressions are an indicator that the child belongs to the SEO sample of the PSID, an indicator that the child is male, an indicator that the child is the last born of a mother's children, and controls for father's education and for the difference in age between this child and the next-older child raised by this woman. Average number of children per mother figure = 2.6.

* Significant at the 95% confidence interval.

contrast, a child raised by a step, adoptive, or foster mother is at risk for lower educational attainment as compared with a child raised by a birth mother. The mother-type indicators are significant for years of completed schooling, and for the probability that the child completes 12 and 14 years of education. We find that the negative effect on educational attainment of being raised by a birth mother and stepfather is roughly one-third the size of the effect of being raised by a stepmother and birth father. All else held equal, when compared to outcomes for children raised by two birth parents, the probability that a child completes at least 14 years of schooling is 7% lower if the child is raised by a birth mother and stepfather,

but 20% lower if the child is raised by a birth father and stepmother. These results are largely consistent with Wojtkiewicz (2000) who, using the National Educational Longitudinal Survey (NELS), found that the negative effect on college attendance of being raised by a birth father and stepmother was twice as large as the effect of being raised by a birth mother and stepfather.

The small effect for stepfathers is due to the fact that the coefficient is calculated using differences between children raised by the same woman. If we compare children raised in different households, we find that children raised by birth mothers and stepfathers receive significantly less education. If we compare children raised by the same woman, we find that children raised by birth mothers and stepfathers receive almost the same amount of education as children raised by birth mothers and birth fathers. This can be seen most clearly in Table 6, where we focus on stepfamilies. Here, we include only children in households in which all children are either birth children of both parents, birth children of the mother and stepchildren of the father, or birth children of the father and stepchildren of the mother. Column 1 does not include mother indicator variables, and the coefficients in column 1 are calculated using differences between children of a given mother–father type and all other types of children in all the households in the sample. We see that, relative to children raised by two birth parents,

Table 6
Educational attainment in blended families

Explanatory variables	Years of completed education	
Mother indicators included?	No	Yes
Indicator: stepmother, birth father	− 1.38*	− 0.745*
	(0.193)	(0.370)
Indicator: birth mother, stepfather	− 0.798*	− 0.271
	(0.099)	(0.231)
Mother's education	0.135*	–
	(0.015)	
Father's education	0.147*	1.175
	(0.011)	(0.789)
Number of children raised by mother	− 0.043	–
	(0.015)	
Number of observations	4147	4147

Standard errors in parentheses. To be included in these regressions, all children raised in the household would have to have had one of three types of parents: birth mother and birth father; birth mother and stepfather; or stepmother and birth father. Sample restricted to persons who were at least 23 years old in 1997, whose relationships with parent figures were measured between 1968 and 1985 (the period during which the PSID reported relationships between every dyad in the household), who report having a father figure and a mother figure. Also included in the regressions are an indicator that the child belongs to the SEO sample of the PSID, an indicator that the child is male, an indicator that the child is the first born of the mother's children, that the child is the last born of a mother's children, and the difference in age between this child and the next-older child raised by this woman. The omitted parental category is birth child of both the mother figure and father figure in the household. Average number of children per mother figure = 2.6.

* Significant at the 95% confidence interval.

children raised by a birth mother and stepfather receive, on average, 0.8 years less schooling and children raised by a stepmother and birth father receive, on average, 1.4 years less schooling. These coefficients are significant, and are significantly different from one another (the effect of a stepmother being significantly larger than the effect of a stepfather). However, when we include mother indicators, we find that children raised by their birth mother and stepfather receive only slightly less schooling than do their siblings who are birth children of the father figure (the coefficient is -0.27, and is not significantly different from zero). In contrast, children raised by stepmothers and birth fathers do receive less schooling than do their siblings who are the birth children of the mother figure (the coefficient is -0.75 and is significantly different than zero).

4. Discussion

Past studies have focused primarily on father absence, which is the more common type of parental absence. Generally, these studies have categorized "stepparent" households to be those with either a stepmother or a stepfather, and have not sought to distinguish between stepmother households and stepfather households. In addition, previous research has not provided an adequate explanation for why remarriage does not appear to improve children's outcomes.

This paper, along with the other papers by Case et al., shows that mother absence is more important than father absence, both in terms of investments made in children and in terms of child outcomes. In previous work, we have shown that parental investments are lower in stepmother families than in birth mother families, which has identified a potential mechanism for explaining the differences in child well being. Since these past studies follow only one child in a family, or measure investments at the level of the household, they do not tell us whether the lower investment in stepparent households is generalized to all children or whether it is a specific to nonbirth children. In this paper, we provide evidence that nonbirth children have poorer outcomes than their siblings who are raised by both birth parents. This suggests that investments are child specific. In what follows, we explore several explanations for these results.

4.1. An explanation based on evolutionary psychology

The results presented here are consistent with those of evolutionary psychologists Daly and Wilson (1985, 1987), who have carefully documented the greater risk faced by stepchildren for child abuse and child homicide. This risk is not due to economic insecurity or family size, both of which are predictors of abuse, but which do not vary between step and birth parent households. Daly and Wilson (1985) collected data on roughly 1300 households in Hamilton, Ontario, obtaining information on the living arrangements of the population at large. They then compared these living arrangements with those of abused children, using information obtained from the two children's aid societies of Hamilton-Wentworth. They found stepparent households significantly overrepresented in the abuse sample, relative to the population at

large. Consistent with the results presented above on outcomes within families, Daly and Wilson found that stepparents were selective in their abuse, abusing their stepchildren but not their birth children. In the sample of abused children in Hamilton, there were 10 households that contained both stepchildren and children of the "present marriage." In nine of those 10 households, only the stepchild was abused.

Daly and Wilson (1998) explained their findings in terms of *discriminative parental solicitude*. They note:

> Because parental love carries with it an onerous commitment, it would be strange if merely pairing up with someone who already had a dependent child were sufficient to fully engage the evolved psychology of parental feeling. And it is not sufficient. Step-parents do not, on average, feel the same child-specific love and commitment as genetic parents, and therefore do not reap the same emotional rewards from unreciprocated 'parental' investment ... Successful discrimination of one's own offspring from unrelated young is not the only allocation problem facing parental investors, but it can be a crucial one. Indiscriminate allocation of parental benefits without regard to cues of actual parentage would be an evolutionary anomaly (pp. 38–39).

This may help to explain the difference in educational attainment between adopted children raised with a woman's birth children and those raised with only other adopted children. The "child-specific love and commitment" toward adopted children may be greater on the part of parents who have had no birth children of their own.

4.2. An alternative hypothesis: have nonbirth children been scarred?

By showing that outcomes are child specific, the present research allows us to rule out two major competing hypotheses for the lower attainment of children in stepmother families: namely that stepmothers are less able parents (which implies that all their children do poorly) or that the environment in second families is less conducive to effective parenting. The empirical evidence presented in this paper is not consistent with either of these arguments since the birth children in mixed (birth and nonbirth children) families appear to do as well as the birth children raised by two birth parents.

The major competing hypothesis that we cannot rule out with this research is that children who live apart from their birth mothers are scarred in some way through early experiences, and these scars account for the fact that they do less well in school. We cannot rule out the scarring hypothesis, but we offer some evidence that makes it seem less likely. First, children who are adopted into families with only adopted children would have to be less scarred than children adopted into families where there are birth children of the mother present, since the former obtain more education than birth children raised alone, while the latter obtain less education. (It is possible that adults who have birth children may be more likely to adopt a child who is physically or emotionally challenged. We do not have enough information about the adopted children in our sample to sort out whether this is a plausible explanation, but this is the sort of story one would have to tell to square our findings with a scarring explanation for adopted children.)

In addition, the scarring caused by divorce, in the case of stepchildren, or parent absence or death, in the case of adoption or foster parenting, would have to be equally large: the coefficients on the probability of achieving 14 years of schooling are of very similar size for step, adopted, and foster children, and we cannot reject that they are equal to one another (Table 4, F statistic $= 0.24$, with a P value $= .79$).

4.3. The role of mothers

Children raised by adoptive fathers or stepfathers are not at risk for lower educational attainment, provided that they are raised by their birth mothers, while children raised by stepmothers are at risk — even when their birth fathers are present. That mothers play a more important role than fathers in the rearing of children is consistent with the fact that a woman must make a larger commitment in bearing a child. A woman is more limited in the number of children she can parent, both because of she must carry each child and because women have a shorter reproductive span, which may affect the relative intensity with which she raises the children that she does bear.

Corroborating evidence on the relative importance of mothers and fathers in the rearing of children comes from several sources. Judge (1995) analyzed a sample of wills probated in Sacramento County, CA between 1890 and 1984 and found that men left significantly larger fractions of their estates to their wives than wives did to their husbands. The text of the husbands' wills "included such phrases as 'knowing her [wife] to be trustworthy and that she will provide for my boys . . . their education and a start in life.'"(p. 306) Women, on the other hand, preferred to have resources handed directly over to their children upon their own demise, which Judge argued may well be because widowers were significantly more likely to remarry than were widows, and to father additional children, who would compete with the woman's own children for resources later in life.

Hrdy (1999) presented evidence on the differences in the physiological responses of men and women to the sound of a hungry baby crying. That women respond more immediately to the sound of a hungry baby, she writes, "does *not* mean that fathers are not able to do so . . . or that baby primates cannot form primary attachments to a male. Rather, a seemingly insignificant difference in thresholds for responding to infant cues gradually, insidiously, step by step, without invoking a single other cause, produces a marked division of labor by sex" (p. 213).

Whether it is due to some combination of the limitations women face in the number of offspring they can successfully bear, or to differences in the physiological responses of women and men to young children's needs, it appears that investments in children are more likely to be made by women, and that birth mothers protect investments in birth children above those in nonbirth children.

Finally, the relative importance of the mother's role in raising children has long been recognized in the major psychological theories of child development, including the Bowlby (1988) "attachment theory," which focuses on the importance of the mother–child dyad in the internal development of the child, and the Bronfenbrenner (1979) ecological theory, which focuses on the mother-as-primary-caregiver and the systems of support in which she

and the child are embedded. Fathers are virtually absent from these theories, except insofar as they support mothers (financially and emotionally). Until recently, fathers have been absent from most of the empirical studies. Although researchers are now beginning to ask what fathers do to promote child development, the shift in orientation is very new, and the empirical evidence that "fathers matter" is mixed at best.

Acknowledgments

Appendix A. Description of data used in the analysis

The analysis is based on a data set supplemental to the PSID, the 1968–1985 Relationship File. This file contains information on dyadic relationships (including biological, adoptive, step, and foster relationships) of all individuals who were ever part of or derived from the same original 1968 household. In total, the file comprises 426,608 pairs of the relationships over the 18 years. We use the following steps to identify the analytic sample.

First, we identify all individuals who were ever biological, adopted, step, or foster children in the PSID families and their parents. The 1968–1985 Relationship File consists of two sources of information. One is information on the marriage and childbirth that was retrospectively collected in 1985 (HIS). The second source of information is taken from the yearly survey, from 1968 to 1985 (RTH). The HIS file allows us to identify the relationships among all household members. In the RTH file, only household member's relationship to the head of the household is identified. We took information on the parent–child pairs from the HIS file. If the information is missing in the HIS file, we used the information from the RTH file. We also included children whose relationship to their parents is unclear (i.e., could be biological, adoptive, or step relationships). Most of the relationships are unclear because these individuals were living in a nonresponding household in the 1985 survey and we have to rely on information collected in the yearly surveys. Before 1983, the PSID did not distinguish among biological, adoptive, and step relationships in the yearly survey; between 1983 and 1985, the PSID separated the step relationship from biological and adoptive relationships but still combined the latter two categories. In the end, we identified 19,057 "children" of all ages in the PSID.

Second, there are a handful of children who had more than one parent with the same type of status (i.e., step, foster, birth, adoptive) in the same year or various years. We assigned these children to only one parent with any given status based on whom the child lived with for the longest time between 1968 and 1985. In addition, some children had more than one woman with the status of "unclear" mother figure, or multiple "unclear" father figures. We assigned these children to a unique "unclear" parent using the same rule described above (i.e., based on the parent figure that the child lived with for the longest time). If there is a tie,

we assigned these children to the parent with unclear status whom children lived with during their teenage years. At the end of this step, all children have at most one parent of each status (i.e., biological, adoptive, step, foster, or unclear) but children may have more than one type of mother or father. For example, a child may have lived with a biological mother from 1968 to 1980 and with a stepmother from 1981 to 1985. Then this child has two mothers, one biological and one step.

In order to estimate models that control for mother's effects, we have to assign children to a unique mother whom they lived with during the period 1968 and 1985. We use the following rule to make the assignment: (1) Children are defined as living with their birth mother when

Table 7
Assignment of a mother figure

Living arrangement (1968 to 1985)	Mother assigned
B (birth mother) only	B
A (adoptive mother) only	A
S (step mother) only	S
F (foster mother) only	F
U (mother with ''unclear'' status) only	U
BA	A
BS	S
BF	F
BU	U
AS	A
AF	A
AU	A
SF	S
SU	S
FU	F
BAS	A
BAF	A
BAU	A
BSF	S
BSU	S
BFU	F
ASF	A
ASU	A
AFU	A
SFU	S
BASF	A
BASU	A
BAFU	A
BSFU	S
ASFU	A
BASFU	A

In column 1, ''BA'' refers to a child who lived with both his or her birth mother and an adoptive mother at some point in the period 1968 to 1985. In column 2, the assignment of ''A'' means that this child was assigned his or her adoptive mother as mother figure for the analysis.

they lived with a birth mother and with no other type of mother before age 20. (2) Children are defined as living with their adoptive mother when they ever lived with an adoptive mother before age 20, regardless of whether these children ever lived with other parents with different status. (3) Children are defined as living with their stepmother when they never lived with an adoptive mother but ever lived with a stepmother before age 20. (4) Children are defined as living with their foster mother when they never lived with an adoptive mother or a stepmother but ever lived with a foster mother before age 20. (5) Finally, children are defined as living with a parent with unclear status if they were only observed living with a parent whose status was unclear, or if they lived with a biological parent for some period of time and with a parent with unclear status for some period of time. Table 7 shows the assignment rule followed.

We dropped three children for whom we do not have age information. We also dropped the following children from the analysis: 1123 children who reached age 20 before 1968; 4966 children who had not reached age 23 by 1997; 3216 children who were age eligible, but who left the PSID before their final educational attainment was recorded; 1229 children whose mother figures were unclear (and an additional 430 children who lived with those whose mother figures were unclear); 1979 children for whom a father figure is not identified; 76 children for whom a mother figure is not identified; 7 children whose educational attainment is coded as "missing"; and 1 child whose father figure's education is missing. In summary, we keep 6199 children in the analysis.

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