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Daddies, Devotion, & Dollars: How Do They Matter for Youth?

Gary Painter and David I. Levine

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Berkeley
UNIVERSITY OF CALIFORNIA

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Daddies, Devotion, & Dollars:

How Do They Matter for Youth?

by

Gary Painter
School of Policy, Planning, and Development
University of Southern California
Los Angeles, CA 90089-0626
(213) 740-8754, gpainter@usc.edu

and

David I. Levine
Haas School of Business
University of California
Berkeley CA 94720-1900
(510)642-1697, levine@haas.berkeley.edu[1]

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[1] We appreciate useful comments from Timothy Biblarz and Dan Covitz. All programs used in this project are available from the first author. Data are available from the National Center for Education Statistics. This draft represents a substantial revision of a paper entitled "Family Structure and the Achievement of Youths: The Importance of Parental Involvement in Education" by the first author.

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Abstract

Growing up in a family that lacks a biological father is correlated with a number of poor outcomes for youths. This study uses the National Educational Longitudinal Survey of 1988 to examine the extent to which differences in income or in parental involvement can explain the effects of family structure on youth outcomes. We find that measurement error in income from single-parent homes affects the results in a large way because of the variability in income earned over a youth's teen years. Overall, we find that both lower income and lower parental involvement explain most of the disadvantages of youth in single-parent homes, but neither explains the disadvantages of families with stepfathers.

The non-traditional family is becoming the norm. For example, in 1988 approximately 35% of eighth graders lived in homes that were not headed by two biological parents (Table 1), up from 25% in 1970 (1996 Statistical Abstract of the United States). What is even more striking is that less than forty percent of African-American children have two biological parents in the household.

Children who do not grow up living with both biological parents are more likely to drop out of high school, have children out of wedlock, and be arrested. Such children are also less likely to attend college or hold a good job. The mechanisms underlying these disadvantages remain subject to research. An understanding of these mechanisms is critical in developing public policies which can help children with a higher risk of negative outcomes.

There are many theories that predict why, on average, children are disadvantaged in non-intact families. For example, children in single-parent homes live in families with lower average incomes, are more likely to suffer school and/or residential dislocation, and suffer more sexual abuse (Acock and Demo 1994; Amato, Loomis, and Booth 1995; Biblarz, Raftery, and Bucur 1997; Coleman 1994; Forehand, Long, and Brody 1988; Garasky 1995; McLanahan 1985; McLanahan and Sandefeur 1994; Simons 1996). The quality of parenting may also suffer, where quality of parenting is often defined as time spent with children, the level of involvement in their children's education, and the level of involvement in their children's other activities (Acock and Demo 1994; Simons 1996; Coleman 1994; Downey 1995). One can infer from these studies that one reason non-traditional families fail is due to a reduction in "quality time" spent with their children.

This study uses the NELS:88 to examine the importance of two possible causal channels by which children in non-traditional families are disadvantaged: low parental income and lack of time or resources to devote to helping children by activities such as volunteering in schools and participating in extra-curricular activities with their children (parental involvement). The NELS is advantageous because it contains rich measures of the characteristics of youth, their schools, parents, and neighborhoods. This allows us to control for many aspects of family background the hypotheses mentioned above suggest are important. Therefore, this research is subject to little of the biases due to omission of key variables that other studies have been forced to neglect due to

data constraints. We have multiple measures of several of the key constructs, which reduces problems of measurement error. We also examine multiple outcomes, which permits us to identify how income and parental involvement may affect education attainment differently than out-of-wedlock fertility.

Most past research has used statistical techniques that assume that predetermined variables such as race and maternal education do not affect youth in part due to their effects on family structure. This strong assumption can hide the true effects of income and parental involvement. Similarly, most past research has used statistical techniques that ignores how income can partly proxy for unobserved aspects of the family. This strong assumption can over-state the effects of income as a channel for why family structure matters. We examine how relaxing these assumptions changes the results.

The study of how family structure affects youth outcomes is complicated by the fact that family structure may be correlated with poor outcomes for youth, but not be causally related. This would occur if the parents of children living in single-family households had severe disadvantages, so that their marriage or continued marriage might do little to improve the lives of youth. In this case, children in single-parent households may do worse on average than those in intact families, but the family structure would be a result of parental disadvantage, and not an independent cause (Manski, *et al.* 1992; Painter and Levine 1999). Understanding causality is critical for policy purposes, because, for example, transferring income to a single parent family may have no influence on youth outcomes if the observed family disadvantage is non-causal.

Research is not conclusive as to the importance of the non-causal channels. Geronimus and Korenman (1991) and Hotz, Mullin, and Sanders (1997) find that most of the disadvantages of children born of teenaged parents are due to the pre-existing disadvantages of their mothers, not due to the early age of motherhood; Hoffman, Foster, and Furstenberg (1993) read the data somewhat differently. Moreover, Cherlin and others examined the lives of children at aged 7 (in the UK) or 7 to 11 (in the US), and resurveyed the same children roughly four years later, after their parents' divorced (1991). They found that the non-causal channel to be important in predicting behavior and achievement deficiencies in boys, but less important in girls. In contrast, a recent study found that little of the disadvantage of divorce during a teen's high school years

was due to pre-divorce disadvantages of the family (Painter and Levine 1999; also see Morrison and Cherlin 1995).

Although we examine only two of the many causal channels, they have important policy implications. If the disadvantages are largely due to the lower incomes of single-parent households, reducing welfare may be very expensive for the next generation. Conversely, if the disadvantages are largely due to different levels of parental involvement, finding ways to promote parental involvement becomes a target of policy.

We find that both income and parental involvement play an important role in explaining the disadvantages of youth who grew up with a single mother. This study finds a much larger role for income that previous studies because we partially control for measurement error in income, which is likely to be a problem in cross-sectional data. Income itself reduces the estimated impact of growing up in a female-headed household by more than half when predicting out-of-wedlock teen fertility and dropping out of high school. Further, it reduces all of the estimated disadvantage of growing up in a female-headed home for college attendance. Parental involvement is important for educational attainment, but not for out-of-wedlock teen fertility. On the other hand, neither income nor parental involvement can explain the observed disadvantage of youth who grow up in family with a stepfather.

Theory

The literature on the importance of income as a determinant of youth outcomes is vast. Many studies find that the reduction in income associated with a marital disruption is an important contributing factor to the observed disadvantaged outcome in the youth. For example, Sandefur, McLanahan, and Wojtkiewicz (1992) find that the reduction in income accounts for fifteen percent of the observed gap in high school graduation rates between children. Downey (1995) finds that most of the disadvantage of growing up in a stepfather household instead of an intact family is due to parental education, income, and race.

Susan Mayer (1995) and others have noted that income can improve outcomes through many channels, including higher consumption levels of a family, improved access to enrichment activities such as tutoring, after-school classes, or camp, improved parental well-being, and raising youths' perceptions that the family can afford college. Conversely, poverty may limit the ability

of the family to provide certain amenities such as visiting museums. While Mayer (1995) cautions that income alone cannot determine consumption choices, a higher income can also free up more time. A low income can also increase financial stress in the household. Financial stress, in turn, can change the parenting practices either by decreasing the time available to spend with children or creating an atmosphere of inferior discipline.

More recently research has focused on the impact of parenting practices on the outcomes of youth. Astone and McLanahan (1991) notes that parental aspirations and supervision are important predictors of youth high school graduation. In a sample of eighth graders, Downey (1995) finds that children whose parents attend the local PTA, and whose parents know their children's friends get higher grades and higher test scores. McLanahan and Sandefeur (1994) mention that one reason that children in step families seem to do nearly as poorly as do children in female-headed households is inferior parenting practices when compared to the intact family. They suggest that while the stepfather brings in additional income to the family, constructing a new, satisfying marital relationship commands a great deal of the mother's time and attention. This lack of time is also present with regard to female-headed households due to the financial demands and lack of the additional parent.

The "conventional reduced form": A general model of the determinants of youth outcomes posits that they depend on family structure, predetermined parental characteristics that predate the birth of the child, and contemporaneous characteristics of the family, parent, and youth ranging from parental occupation and employment status to whether the family has a library card:

$$\textit{Youth outcome} = ä_0 + ä_1\, \textit{Family structure} + ä_2\, \textit{Predetermined characteristics} + ä_3\, \textit{Income} + ä_4\, \textit{Contemporaneous characteristics} + u_1 \quad (1)$$

As Figure 1 illustrates, the estimation of such a model is not straightforward. Income can affect other contemporaneous characteristics; for example, higher income can enable more trips to museums. Causation can run from contemporaneous characteristics to income; for example, occupation is a good measure of permanent income, even when controlling for a single year's income. To understand the true role of income, we would like to be able to identify its effects on contemporaneous family characteristics. For some purposes, as noted below, we would also like

to subtract off how predetermined characteristics and omitted variables affect income. Further, if increasing income affects outcomes, then we want to increase income and ignore that parental characteristics that caused it. Given that no plausible instruments to distinguish the causation exist in the dataset, we have to estimate a reduced form.

A number of researchers have estimated what Susan Mayer (1995) referred to as the "conventional reduced form" to study the role of income or parental involvement in explaining how family structures affect youth outcomes (e.g., Astone and McLanahan 1991; Downey 1995). In these specifications, the authors typically divided variables into 3 groups: predetermined variables assumed to causally precede family structure; family structure; and a focal input such as income. They then ran:

$$\textit{Youth outcome} = \acute{A}_1\ \textit{predetermined characteristics} + \hat{A}_1\ \textit{family structure}, \qquad (2)$$

and

$$\textit{Youth outcome} = \acute{A}_2\ \textit{predetermined characteristics} + \hat{A}_2\ \textit{family structure} + \tilde{A}_2\ \textit{focal input such as income} \qquad (3).$$

These studies then focus on the decline in the estimated coefficient on family structure ($\hat{A}_1$-B_2) as income is added to the regression. Implicitly, this specification assumes that the predetermined variables do not operate by changing income. These studies typically find that income knocks out up to one third of the estimated negative effects of nontraditional family structure.

What if predetermined variables operate via income? The conventional reduced form may understate the true role of income because the predetermined variables such as race or maternal education probably affect your in part by affecting income. Consider a world (similar to our own) in which low-educated mothers are more likely to be single parents and also live in families that, on average, have lower incomes.

When we do not include maternal education in the regression, the coefficient on income is biased up because it picks up some of the non-income advantages of high maternal education such

as being raised in a home with more books. Moreover, the effect of income in reducing the coefficient on family structure will partly capture some of the true effect of higher maternal education. Thus, the effect of income in reducing the coefficient on family structure will be an upper bound.

Symbolically, if we run

Youth outcome = B_1'family structure, *(2')*

and

Youth outcome = $\hat{A}_2$' family structure + $\tilde{A}_2$' focal input such as income *(3')*

the difference *(B_1' - $\hat{A}_2$')* will be biased up and will be larger than *(B_1- $\hat{A}_2$)* estimated in the conventional reduced form.

Conversely, the conventional reduced form includes maternal education in the regression without income (as in equation 2). In this formulation, maternal education picks up some of the effect of the omitted variable income. Thus, the estimated effects of family structure already have "factored in" the disadvantage due to lower income that was, in turn, correlated with low maternal education. That is, some fraction of the disadvantage of lower-educated parents is due to their lower income. Thus, when income is added to the regression, its effect is lower than the true effect. Thus the conventional reduced form's estimate of how income accounts for the disadvantage of some family structures *(B_1- $\hat{A}_2$)* is biased down. (This result is shown formally in the Appendix.)

What if income proxies for unmeasured characteristics of the family? Conversely, income partly proxies for unmeasured characteristics of the parents and family that benefit the child (Mayer 1995). Consider the case where highly energetic parents earn more and also take their children to the library more. In this setting, the correlation between income and library use is not causal; instead, library use proxies for unobserved parental energy.

For concreteness, we can make the extreme assumption that all of the contemporaneous characteristics that are correlated with income causally affect youth due to common omitted factors that lead to both income and to these characteristics.

In this case, the correct method is to add income into the regression after all contemporaneous measures of the family's characteristics have already been entered. With accurate measures of income, this procedure leads to a lower bound on the role of income.

Measurement error on income: In fact, income is measured with error. Thus, the tests described above may understate the true impact of income. In addition, a single year's income is an imperfect measure of a family's permanent income, and it is permanent income that probably matters more for youth (Solon 1992; Zimmerman 1992). This is likely to be particularly true for single parent households, which in the NELS, have 44 percent more variability in income over the study period than do step-families, and 56 percent more variability that intact families. In a standard setting, random measurement error will reduce the estimated coefficient of income on youth outcomes. Moreover, random measurement error will also reduce the effect of income on knocking out the coefficients of family structure in predicting youth outcomes.

Fortunately, the dataset has a measure of income four years after the dataset began. A simple correction for possible measurement error is to include the second measure of income as another variable in equation (1). If both measures are reasonable estimates of permanent income, then the sum of the coefficients should be equal to the estimate on the single measure (I) in equation (1).

We also use a standard instrumental variable technique to correct for the inadequate single measure of income. We use the income during a youth's twelfth grade year (1992) as an instrument for income during the youth's eighth grade year (1988) to estimate the first-stage equation:[2]

$Income_{88} = è_0 + è_1\ Income_{92} + è_2\ Predetermined\ characteristics + è_3\ Contemporaneous$

[2] In regressions that do not include either predetermined characteristics or contemporaneous characteristics, those characteristics are dropped from the first stage equation (6).

characteristics + $u_{2.}$ (4).

We then substitute the predicted value $Income_{88}^{\wedge}$ into equation (1) for *Income*$_{88}$ and re-estimate equation (1). This yields the equation,

Youth outcome = $ä_{0a}$ + $ä_{1a}$ *Family structure* + $ä_{2a}$ *Predetermined characteristics*

+ $ä_{3a}$ *Income*$_{88}$^ + $ä_{4a}$ *Contemporaneous characteristics* + u_{1a} (1a)

The measurement error on *Income*$_{88}$ and on *Income*$_{92}$ are correlated; for example, neither pick up income from before 1988 and both are subject to bias from a family that systematically over- or under-reports income. If the measurement error is correlated in this fashion, the coefficient from the instrumental variable estimate remains biased down.

Not all dollars may be equal. The conventional reduced form assumes that the income earned by a stepfather has the same influence on a youth as the income earned by a biological father. This assumption may not always hold. Most obviously, children with stepfathers have spent some period with only one biological parent. Thus, they have typically spent a period with lower income. To the extent that the income experienced throughout childhood matters, income with a stepfather is an overestimate of permanent income of the youth's family. Second, stepfather families are more likely to divorce than intact families. For example, in the NELS sample, ten percent of families with a stepfather when the child was in eighth grade divorced within the next six years, but only five percent of families with two biological parents. To the extent that youth consider this possibility, they will treat their expected future income as lower. Stepfathers are also more likely to have children from previous relationships, which reduces their ability to support the youth. Finally, some stepfathers have weaker emotional bonds with their stepchildren; thus, they may be less willing (or youth may expect them to be less willing) to pay for college. Any of these forces leads to the hypothesis that income would have a smaller influence in stepfather families than in intact families.

A simple test of the differences in the importance of income can be accomplished by interacting income with family structure so that

Youth outcome = $ö_0$ + $ö_1$ *Predetermined variables* + $ö_2$ *Contemporaneous characteristics*

$$+ \ddot{o}_3 \, Income_{88}\hat{} + \ddot{o}_4 \, Family\ structure + \ddot{o}_5 \, Income_{88}\hat{} * stepfather\ family$$
$$+ \ddot{o}_6 \, Income_{88}\hat{} * female\text{-}headed\ family + u_3 \qquad (5)$$

A positive coefficient on the interactions ($\ddot{o}_5$ and $\ddot{o}_6$) implies that income matters more for that particular family structure.

Parental Involvement: We repeat the above procedures to study how parental involvement mediates the effects of family structure on youth outcomes. We do not create an instrumental variables approach for parental involvement. The data do not contain later measures of parental involvement, and other possible instruments are not likely to be uncorrelated with the error term in equation (1). Therefore, we are not willing to make the strong assumptions that method requires. Instead, we use the approach of adding additional, related measures of parental involvement. To the extent that results are similar when new measures are added, we are reassured that better measures will not greatly change the results.

Data

The National Education Longitudinal Study of 1988 (NELS) is sponsored by the National Center for Education Statistics and carried out by the Bureau of the Census. The NELS is designed to provide trend data about critical transitions experienced by young people as they develop, attend school, and embark on their careers. The base year (1988) survey was a multifaceted study with questionnaires for students, teachers, parents, and the school.[3]

Sampling was first conducted at the school level and then at the student level within schools. The data were drawn from a nationally representative sample of 1,000 schools (800 public schools and 200 private schools, including parochial institutions). Within this school sample, 25,000 eighth grade students were selected at random. The three follow-ups revisited (most of) the same sample of students in 1990, 1992, and 1994; that is, when the respondents were typically in the tenth grade, in the twelfth grade, and roughly two years after high school graduation. A randomized sample of approximately 14,000 students were interviewed in the 1994 survey. We restrict our sample (N = 9260) to the three family structures described below, and

[3] The parent questionnaire was filled out by the mother in 85% of the cases, and therefore may reflect the mother's characteristics rather than the father's. The school questionnaire was filled out by an administrator. Less than two percent of the sample was lost to attrition.

drop observations for which there was incomplete information available on the income of the family (N = 2391).[4]

Family Structure: Due to limited sample size, we focus on three family structures: intact families have both biological parents, families with a mother and a stepfather, and families with a mother alone.[5] We examined several other family structures – father and stepmother (N = 216), father alone (N = 178), mother and live-in companion (N = 123), and no biological parents (N = 254) – but the sample sizes were either small or in the case of children living without a biological parent, it is difficult to characterize the involvement of the parents, if any. These family structures are subsequently dropped from the main results. Respondents were also dropped if they lived with their parents less than fifty percent of the time (N = 40), if a spouse died while the youth was in high school (N=88), or if the parent and youth surveys had conflicting reports on family structure (N=27).

Finally, we drop those families that experience transitions during the high school years of the youth: divorce from an intact family (N = 468), (re)marriage by a single mother (N = 189), and divorce from a stepfather (N = 146). The inclusion of this group of families would preclude the use of the instrumental variable technique using both the measure of eighth grade and twelfth grade family income. Based on the results in Painter and Levine (1999), which suggested that these families are similar at the time of the youth's eighth grade year, the exclusion of these families will not bias the results. Our measures of family structure accurately describe intact families and the current status of non-intact families, but they do not indicate how many times a particular women may have been divorced or remarried. Garasky (1995) finds later transitions are more important than early ones, so the bias from not having data on these earlier transitions may be lessened.

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[4] The main results of the study are unchanged when the missing values are included. The disadvantage of living in a step-parent family is less, but the impact of parental involvement and income is the same.

[5] Additional stratification was explored, but did not significantly change the implications of the analysis. These include the various reasons for being a single parent such as being divorced, widowed, and having never been married.

Socioeconomic Status and Family Background: A missing ingredient in most analyses of the impact of family structure on the achievement of youths is adequate measures of family background and parental involvement in education. Studies have either used a socioeconomic status index provided by the data set (e.g. Lee *et al* 1994), created an *ad hoc* index of parent's characteristics (e.g. Herrnstein and Murray 1994), or used a limited set of family background measures that are intended to separate the effects of family structure on the achievement of youths from the effects of family background. This study employs much more detailed measures of family background and family involvement in education, which are intended to better isolate the effect of family structure on outcomes.

The measures of socioeconomic status are created from both the parent and student questionnaire. The set of variables include occupational status (using Duncan's index), parental education, and family income. Occupational status is converted into z-scores with mean zero and standard deviation equal to one. When mother's education is missing, it is set to a z-score of 0, and a categorical variable is included to note these important missing values. We are not able to do this in the case of father's education, because so many are missing values in female-headed homes. Thus, for father's education, we impute missing values based on the other predetermined characteristics of the family.[6]

Family income is comprised of income from all individuals and sources. Family income is presented in categories, and is top-coded at $200,000 (less than two percent of the sample). It is assumed that income is at the midpoint of each of the categories, and for those households above $200,000, an income of $300,000 is assumed. To adjust family income for its size, family income is divided by the poverty line adjusted for family size. This is an improvement over most studies, which simply include some measure of family income in their estimated models. The log of this income:needs ratio (hereafter referred to as income:needs or income) is available for both the student's 8th grade and 12th grade years.[7]

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[6] A total of 1245 values were imputed. For families with stepfathers, it is likely that most of the reports of father's education refer to the stepfather, not the biological father. Results are invariant to the inclusion of exclusion of the father's education variable.

[7] The square of family income was also entered to capture nonlinear effects; its inclusion did not affect the results on family structure.

To create a rich list of family characteristics, we included a wide range of measures that prior research suggests are indicators of advantages or disadvantages for youth. From the student questionnaire, we use standard demographic characteristics: region, rural vs. urban vs. suburban, race categorical variables, and a female categorical variable. A second set of variables are indirectly related to parental involvement in education, but are not exogenous to the outcome variable. These include whether a foreign language is spoken in the home, whether the mother or father is foreign born, the number of siblings, and whether the home has a library card, magazines, and many books.

From the parental questionnaire, indicators are obtained for whether the family was one of five religions, and any of four levels of religious observance. These variables may proxy for how closely a family is knit as well as proxy for the social capital (Coleman 1990) available to the children. Also, a categorical variable indicating if the mother was a teen when the youth was born is included. (Unfortunately, the dataset does not indicate whether the parents were married when the youth was born.)

The final two variables measure parents' involvement in the youth's life and education. (We refer to these variables as parental involvement throughout the paper.) The first variable is equal to one if the parent belonged to a parent-teacher association or related organization, or volunteered at school. Finally, a categorical variable for whether the child had participated in clubs such as Boy or Girl Scouts, or religious or community groups during elementary school is included to proxy for the quantity of time spent with the child outside of the home. While the data do not distinguish whether the parent directly participated in these groups, child participation would necessitate some parent role in most cases. (Recall that some currently female-headed households were married when the focal youth was in elementary school, the time period when the scouting question applied. Thus, that family may have higher levels of facilitating the participation of their children in extracurricular activities in the past than in the present.)

Outcomes: This study analyzes three outcomes that are observed when the youth was age 20. While the overall impact of family background and family structure is similar across the various outcome measures, there are subtle differences that may be important. The outcomes include permanently dropping out of high school (that is, dropouts who do not receive a GED),

attending college if one has received a high school diploma, and having a child out of wedlock.

Summary statistics for the analysis variables are presented in Table 3. The means for the outcome variables are taken from the estimation sample, while the means for the remainder of the variables are taken from the complete sample. For example, the estimation sample for having a child out of wedlock is made up of females, and the estimation sample for analyzing college attendance includes only high school graduates. Approximately five percent of the sample permanently drop out of high school, while seventy-five percent of high school graduates have attended some college. Nine and a half percent of the females have a child out of wedlock.

Results

For one of the causal channels to be important, the different family structures must differ on the causal channel that enters into the "youth production function" (Becker 1991). For example, only if families with two biological parents have higher levels of income or parental involvement can that input be a candidate for explaining the gap in outcomes by family structure. Table 2 demonstrates the required patterns exist for the sample in the NELS.

Intact families have higher incomes and a higher frequency of parental involvement in their children's lives (as measured by volunteering in school and by participating in extra-curricular activities with their children) than do female-headed households. The outcomes of the youth such as the rate of dropping out of high school, attending college, and having children out of wedlock are also much better for intact families.

The contrast between step-families and female-headed households is more complex. The rates of parental involvement and of youth outcomes are similar for both family types, and consistently worse than for intact families. In contrast, families with a stepfather and a biological mother have substantially higher incomes than those of mother-headed households. Because income and parental involvement differ by family structure they are candidates for explaining the gap in outcomes.

Since the outcomes we study are binary, we estimate a probit specification. The tables

present only the coefficients on family structure and the coefficients on the causal channels investigated. The coefficient estimates are converted into marginal changes in the probability of the outcome evaluated at the mean of the independent variables. We first present a detailed analysis of results for permanent dropouts from high school. We then present results on starting college and (for women) teen out-of-wedlock fertility more briefly. Tables present the pseudo-R^2, which is defined as $1 - L_1/L_0$, where L_1 is the log likelihood of the estimated model and L_0 = the log likelihood corresponding to the model with only a constant term.

The Effects of Income on Permanent Drop-Out

The results of the equations predicting dropouts are presented in Table 4. Model 1A demonstrates that female-headed households have dropout rates 6.3 percentage point higher and stepfather families have rates 5.0 percentage point than intact families. Controlling for the predetermined factors (maternal and paternal education, race and region of residence) cuts both the stepfather effect and the female-headed effect roughly by a third to a bit over 4 percentage points (model 1B). With a mean dropout rate in the population of five percent (Table 3), the remaining effects of being in a nontraditional family remain large.

Model 2B presents the typical measure of the effects of income found in past research. Specifically, income is added to model 1B, and we examine the decline in the coefficients on family structure. Youth in families with higher income in eighth grade had significantly lower odds of dropping out of high school. Consistent with past research, income "knocks out" about sixteen percent of the disadvantage of being from a female-headed household (although the decline from 4.4 to 3.7 percentage points is not statistically significant). In contrast, income plays very little role in closing the gap in dropout rates between stepfather and intact families.

What if predetermined variables operate via income? The conventional reduced form (comparing 1B and 2B) understates the true role of income to the extent the predetermined variables operate by raising income. If all of the effects of race, maternal education, and other predetermined variables that are correlated with income affect youth outcomes via their effects on income, the correct test is to compare the family effects with no additional controls. In Table 4, income has a larger impact on knocking out the importance of family structure when it was entered into the regression without predetermined variables than when it is entered after the

predetermined variables (models 1B vs. 2B). Specifically, controlling for income alone reduces the effect of residing in a female-headed family from a 6.3 percentage point higher dropout rate to 3.4 percentage points – a 46 percent reduction. The comparable impact of residing in a stepfather family falls by less (5.0 to 4.6 percentage points), and the difference is not statistically significant. This set of assumptions provides a rough upper bound on the role of income. (See the section on measurement error, below, for even larger bounds.)

What if income proxies for other characteristics of the family? Income is partly a proxy for measured and unmeasured characteristics of the parents and family that benefit the child. In an extreme case, all of contemporaneous (that is, eighth grade) variables that are correlated with income might causally affect youth directly or due to common omitted factors. The appropriate lower bound of the influence of income is estimated by entering income after all contemporaneous measures of the family's and youth's characteristics.

After these contemporaneous characteristics have been added, the estimated effects of family structure on dropout rates are much smaller (model 1C). Now female-headed families have a 3.1 percentage point higher dropout rate, and stepfather families have only a 2.1 percentage point higher dropout rate (model 1C). As expected, income has a smaller impact on knocking out the effects of family structure if it entered into the regression after an extensive set of contemporaneous measures of the family's characteristics than if it is entered after only the predetermined variables (models 1C and 2C); this attenuation is to be expected as income itself is no longer a statistically significant predictor of dropping out. After controlling for income the single-parent effect fell very little (from 3.1 to 2.9 percentage points, difference n.s.) and the stepfather effect did not change at all. Thus, the lower bound estimate of the role of income is quite small.

The role of measurement error. The tests of hypotheses 1, 2 and 3 may understate the true effect of income because income measured in a single year is only a rough measure of permanent income experienced by and expected by a youth. The evidence in Table 5 demonstrates that the effect of income on dropout status rises by fifty percent or more when correcting for measurement error. This result is obtained by comparing the coefficient on income

in model 2A, B, and C with the corresponding sum of coefficients of the two income measures in model 3, or with the estimated effect of income using the 2nd measure as an instrumental variable in model 4. For example, the coefficient on income rises from -.005 to -.017 when using the instrumental variables technique (comparing models 2B and 4B).

As expected, the impact of income in knocking out the estimated effects of family structure on dropping out also rises substantially when correcting for measurement error. If we consider the baseline specification with predetermined controls, adding income reduces the effect of single-parent status by about 16 percent, and of stepfather status by very little (comparing models 1B and 2B). When correcting for measurement error, income reduces the effect of single-parent status by over half, but continues to have no influence on the coefficient on stepfather status (comparing models 1B and 4B).

Because measurement error on income had such large effects, all future regressions use the instrumental variables technique to obtain a more accurate measure of permanent income.

Does income matter differently in different families? Income earned by a stepfather may play a different role than income earned by a biological father. Table 6 presents the results of an explicit test for an interaction using the probit specification. The coefficient on income*female-headed is small and not statistically significant in any model. The coefficient on income*stepfather families is statistically significant in the model with no controls, but is much smaller and not significant with either predetermined or contemporaneous characteristics. This result is similar whether or not we are correcting for measurement error using instrumental variables. These results provide suggestive evidence that income may be less important for stepfather families than for intact families, but the results are not very robust.

Preliminary summary. Adding income to the regression consistently reduces the estimated effects of being in a female-headed family on dropping out of high school. The magnitude of the effects of family structure on dropout rates is highly dependent on the other controls in the equation and on the correction for measurement error in income. After (partially) correcting for measurement error on income, we found that the estimated impact of being in a female headed household on dropping out of high school consistently fell by about half of the "total" effect when controlling for income. This is in stark contrast to the results in model 2,

which found no effect of income after including contemporaneous characteristics of the family. This difference is likely due to the inadequacy of using a single measure of income as a proxy for permanent income for female headed households.

Finally, we find that regardless of the controls included in the models, adding income to the equation has an insignificant impact on the coefficient on stepfather.

The Effects of Parental Involvement on Permanent Drop-Out

The effects of the parental involvement measures are different than income, which we would expect given the deficit in income for female-headed households observed in Table 2. Consider adding the parental involvement measures to the conventional reduced form (Model 1B). The parental involvement measures have a large influence on dropping out (model 6B); specifically, youth whose parents were involved in the educational system (e.g., PTA members) had 1.3 percentage point lower dropout rates, and children clubs had 2.5 percentage point lower dropout rates. In sum, their contribution to pseudo-R^2 is quite similar to that of income adjusted for measurement error.

Consistent with expectations, the addition of the parental involvement variables lowered the coefficient on female-headed household by 11 percent (n.s.) and the coefficient on the stepparent coefficient by 5 percent (n.s.). These changes were rather similar to the effects of income without the correction for measurement error.

At the same time, if the parental involvement variables are entered "before" the predetermined variables, their size of the estimated effect almost triples (compare models 6A and 1A). This is the appropriate model if the portion of the predetermined characteristics that are correlated with parental involvement operate by changing parental involvement. Even in this model, the changes in the effects of family structure due to including parental involvement are not statistically significant.

Conversely, when parental involvement measures were added into the model after contemporaneous characteristics, their effects are small (model 6C). Moreover, the coefficient on single mother or of stepfather changes little (Compare model 6C and

1C). These results are also similar to those of income.

The second column in Table 7 (Model 7) includes both income and parental involvement into the estimated equation. The inclusion of income has no impact on the coefficient on parental involvement once other controls are included in the models. Similarly, the inclusion of parental involvement has little influence on the estimated effect of income (compare Table 5 with Table 7). It appears that parental involvement and income act independently of each other.

Measurement error. As mentioned previously, we do not create an instrumental variables approach for parental involvement. Instead, we add additional measures that capture different dimensions of the construct "parental involvement." Based upon the literature (e.g., Acock and Demo 1994; Simons 1996; Coleman 1994; Downey 1995), we chose the number of friends and the number of friends' parents that the focal youth's parents knew, helping the student with homework, and having rules governing TV use and other behaviors as our supplementary measures of involvement. To the extent that results are similar when new measures are added, we are reassured that better measures will not greatly change the results. For example, adding income in 1992 as a control variable after already entering income in 1988 greatly changed the results in Table 4. These changes suggest that measurement error was a large issue for income in 1988.

In contrast, adding an additional measure of parental involvement has no impact on the coefficient on family structure (results not shown). This result suggests that measurement error for parental involvement – although surely present – is probably not driving the results.

College Attendance

The results for college attendance differ slightly from those for dropout status. Family structure powerfully predicts college attendance for high school graduates. Children from persistently single-parent families are 8.6 percentage point less likely to attend college than children from intact families, and children from stepfather families are 13.4 percentage point less likely (model 8A). Controlling for predetermined variables (model 8B), the gaps falls to 4.0 and 8.4 percentage points.

As many others have found, income has a large effect on college attendance. With the

predetermined controls, a one standard deviation rise in income (adjusted for measurement error) raised the odds of attending college by 5.6 percentage points, about 9 percent (second column of model 8B).

Single-parent families & income: Controlling for predetermined variables, income knocks out essentially all of the female-headed household disadvantage (model 9B). In the model without controls, the inclusion of income causes the coefficient on female-headed household to switch to a positive value, although the coefficient is not statistically significant (model 9A). As with the results for permanent dropout, income continues to be important in explaining the disadvantage of children from female-headed households in the model with contemporaneous characteristics (model 9C). In fact, income knocks out all of the remaining 3.4 percentage point female-headed household disadvantage.

Stepfathers and income: The coefficient on stepfather implies 8.4 percentage points less college attendance than exists in intact families with controls for predetermined variables, and 6.5 percentage points less with contemporaneous characteristics. In contrast to results on female-headed households and on permanent dropout status, neither income nor parental involvement had any impact on the coefficient on stepparent, regardless of the control variables.

The effect of income by family structure: In contrast to the results on permanent dropout, income is 40% more important for female heads (not shown) than for intact families in a model with predetermined characteristics ($P < .05$), but this interaction term is smaller and not statistically different in the model with contemporaneous characteristics. The interaction effect on stepfather income was also positive, but the coefficient on the interaction term was not statistically significant in any of the models.

The effect of parental involvement: Parental involvement continues to have an important effect independent of income (models 10 & 11) -- the contribution to pseudo-R^2 if the two measures of parental involvement are included is quite similar to that of

income adjusted for measurement error (comparing model 9B and model 10B). At the same time, adding measures of parental involvement has a much lower impact on lowering the estimated coefficient of residing in a female headed household on college attendance.

Child Out of Wedlock

Family structure also powerfully predicts fertility out of wedlock for young women. Young women from persistently female-headed (stepfather) families are 14.3 (11.3) percentage points more likely to have a child out of wedlock than are intact families (model 12A). Controlling for predetermined variables (model 12B) lowers the gap to 6.4 and 7.2 percentage points.

As others have found, income has a large effect on out-of-wedlock fertility. Controlling for predetermined variables, a one standard deviation rise in income lowers the probability of out-of-wedlock fertility by 3.5 percentage points (model 13B).

Much like the results for college attendance, income but not parental involvement affects the coefficient on female-headed household. The addition of income into the model lowers the coefficient on female-headed household by over half in all specifications (compare models 12 and 13). Similarly, the coefficient on stepfather is not affected by the inclusion of income (models 13B and 13C).

In contrast, parental involvement had no impact on the probability of a teen having a child out of wedlock. Thus, it had no meaningful effect on the coefficient on family structure (models 14B and 14C).

In results not shown, the effect of income was similar across family structures.

Conclusions and Policy Implications

Compared with those living with two biological parents, children growing up with a single mother have much higher rates of teen fertility out of wedlock and of dropping out of high school, and much lower rates of entering college (conditional on graduating high school). For predicting out-of-wedlock teen fertility and dropping out

of high school, the inclusion of income as a control lowers the coefficient on female-headed household by more than one half, and eliminates entirely the negative effect of residing in a female-headed home for starting college attendance.

The estimated effects of living in a nontraditional family structure are higher if one assumes predetermined variables such as maternal education and race act in part via their effects on family structure. Moreover, the effects of income in "knocking out" the gap are larger in absolute terms under these assumptions. Working in the other direction, if one includes contemporaneous controls for the family characteristics in eighth grade, the estimated effects of family structure are lower. For example, income closes the gap for permanent dropout status by 3.7 percentage points under the assumption of predetermined variables operating through family structure, and only 1.8 percentage points if one controls for a broad set of characteristics. Thus, while income closes a similar proportion of the gap, the absolute effect of income is smaller.

The results on income and stepfather families are simple to explain: regardless of specification, controlling for income never reduces the coefficient on residing in a stepfather family by a statistically significant amount. In results not shown, we stratified the sample by gender and were unable to find different effects by gender that might help explain this puzzle.

We find a larger role for income than do some past studies because we are able to control partially for measurement error in income. This result suggests than a single measure of income in cross-sectional data sets is a poor predictor of permanent income. These findings are consistent with other research on the inter-generational transmission of income inequality (Solon 1992; Zimmerman 1992). We also find that measurement error appears to be a less serious problem with regard to the parental involvement variables.

The estimated effects of parental involvement are almost independent of the

effects of income. Parental involvement is important for predicting permanent dropout status and attending college, but not for out-of-wedlock teen fertility. At the same time, parental involvement has little role as a mediating variable that explains the disadvantages of female-headed or stepfather families.

This analysis sheds some light on possible policies to address the disadvantages of youth in non-traditional families. Because the effects of income and parental involvement are almost independent of each other, if policy-makers can identify cost-effective policies to raise parental involvement, they do not need to worry that they will need to also raise incomes sufficiently to enable the higher involvement. Lareau (1989) has noted that the reason that many parents are not involved is that they feel unqualified to help. This is predominately the case for parents with only a high school education. A focus of policy may be to develop programs which teach parents how to assist their children and become more involved in their lives. At the same time, Lareau (1994) cautions that one needs to be careful in a widespread encouragement of parental involvement. Some forms of parental involvement in schooling, namely criticism and anger from parents toward teachers are likely to inhibit achievement of their students.

The findings in this study are consistent with a large body of research implying that raising the income of female-headed families will increase the educational attainment and lower the out-of-wedlock teen fertility rates of their children. This could be done by increasing child support vigilance or providing some other type of income support. Mayer (1995) cautions that the type of income transferred may matter. She finds that a dollar of child support income provides a greater benefit to children than does a dollar of labor income, and while welfare income provides a much smaller benefit than labor income. As she notes, her correlations may be picking up omitted variables such as above-average paternal involvement in families with child support, and below-average paternal involvement in families on welfare. In our regressions, the effects of income do not appear to largely be proxying for parental involvement,

but our measures are likely to under-report the involvement of the non-custodial father.

In short, nontraditional families predict less desirable outcomes for youth. It appears that the lower income of female-headed households accounts for a substantial portion of the disadvantage. Unfortunately, these results cast no light on why children living with stepfathers do so poorly on the outcomes we measure. Further research should explore the youth's lower expectations the stepfather will remain present in the long term (as families with stepfathers have higher divorce rates than families with two biological parents), the scarring effects of lower income when the family was female-headed, higher conflict levels within the family, and other possible causal channels.

Table 1

Family Structure by Ethnic Group

Family Structure of Children in the 8th grade	***Ethnic Heritage***				
	Asian	**Latino**	**African**	**Caucasian**	**Total**
Both biological parents	78.02%	62.43%	36.35%	68.55%	65.24%
Father, stepmother	0.99%	1.69%	0.72%	2.12%	1.84%
Mother, stepfather	3.56%	6.67%	8.48%	9.06%	8.30%
Single female	4.16%	13.67%	37.43%	11.63%	13.93%
Single male	2.38%	1.30%	0.93%	1.74%	1.65%
No biological parent	10.89%	14.24%	16.09%	6.90%	9.03%

Source: National Center for Education Statistics, National Education Longitudinal Study of 1988, Second Follow-Up: Student Component Data File User's Manual, Washington DC, June 1994

Table 2: Summary Statistics by Family Type

	Persistently intact	Persistently female-headed	Persistently Stepfather
	7137	1353	770
Family in 1988 (Youth in eighth grade)			
log Eighth grade income/ needs	1.192	0.235	1.011
Parental Involvement in Education	0.599	0.466	0.481
Parents and children were involved in clubs	0.897	0.847	0.896
Family in 1992 (Youth in 12th grade)			
log Twelfth grade income/needs	1.172	0.268	0.963
Youth Outcomes 1992-94 (Youth aged roughly 18 to 20)			
Permanent Dropout	0.034	0.097	0.084
College attender	0.831	0.745	0.698
Child out of wedlock	0.069	0.212	0.183

Notes: The sample for permanent dropouts includes only those who did not receive a GED. The sample for college attender includes only those with a high school diploma. The sample for having a child out of wedlock includes only females.

Figure 1

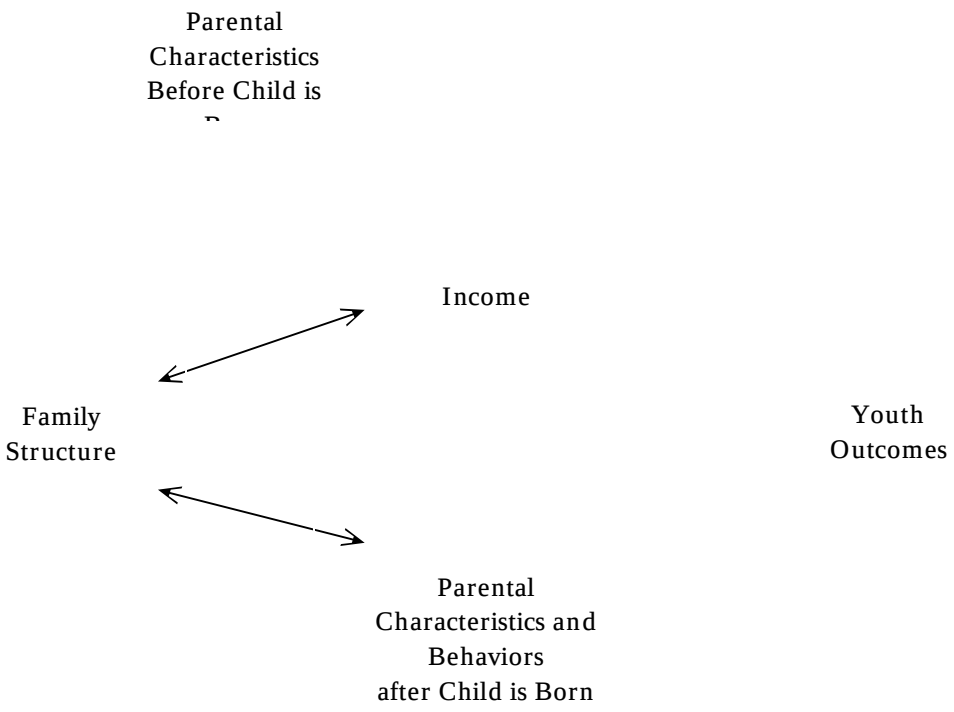
Parental
Characteristics
Before Child is
Income
Family
Structure
Youth
Outcomes
Parental
Characteristics and
Behaviors
after Child is Born

Table 3: Summary statistics
(N = 9260)

Analysis Variables	Means	Std Dev.
Family Structures		
Female-headed family throughout the sample	0.146	
Stepparent family throughout the sample	0.083	
Family Characteristics		
Log (Income/needs) in 8th grade	1.037	1.017
Log (Income/needs) in 12th grade	1.022	1.151
Parent involved in educational system (e.g, PTA member)	0.570	
Parent involved in children's clubs (e.g., Boy or Girl Scouts)	0.889	
Youth outcomes		
Permanent dropout (that is, no GED)	0.054	
College attender (among HS graduates)	0.747	
Had a child out of wedlock (among women)	0.100	
Included as predetermined characteristics:		
African-American (Omitted category is Caucasian)	0.094	
Asian	0.073	
Latino	0.107	
Female	0.520	
Native English Speaker	0.836	
Father foreign born	0.154	
Mother foreign born	0.154	
Live in the south (Omitted category is northeast)	0.347	
Live in the west	0.180	
Live in the central	0.296	
Live in urban area (Omitted category is suburb)	0.242	
Live in rural area	0.321	
Oldest child	0.323	
Mother was a teen parent	0.096	
Father's education {z}	0.031	0.962
Mother's education {z}	0.087	0.989
Included as contemporaneous characteristics (in addition to predetermined characteristics):		

Analysis Variables	Means	Std Dev.
Father's occupation {z}	0.055	0.904
Father unemployed	0.052	
Mother's occupation {z}	0.031	0.957
Mother unemployed	0.288	
Religious affiliation - Baptist (Missing is other Protestant)	0.190	
Religious affiliation - Catholic	0.328	
Religious affiliation - Other religion	0.116	
Religious affiliation - Missing religion	0.030	
Religious affiliation - No religion	0.026	
Religiosity - very religious	0.435	
Religiosity - religious	0.152	
Religiosity - somewhat religious	0.154	
Number of siblings	2.152	1.498
More than 50 books in home	0.902	
Has at least one magazine subscription	0.778	
Family has a public library card	0.823	

Note: Variables marked (z) are z-scored to have mean zero and s.d. 1 in the entire sample. Reported summary statistics differ from 0 and 1 due to exclusion of families with incomplete income reports {and those that divorced or remarried}. Variables with no standard deviation indicated are dummy variables.

Table 4: Influence of Income and Family Structure on Permanent Dropout Status

	Probit Estimation (N = 8923)	DF/DX	Std. Error
	Baseline		
Model 1A	*No controls: Pseudo-R^2 = 0.030*		
	Female headed	0.063 **	0.008
	Stepfather	0.050 **	0.008
Model 1B	Predetermined characteristics*: Pseudo-R^2 = 0.168*		
	Female headed	0.044 **	0.006
	Stepfather	0.039 **	0.007
Model 1C	*Contemporaneous characteristics: Pseudo-R^2 = 0.260*		
	Female headed	0.031 **	0.006
	Stepfather	0.021 **	0.007
	Baseline + Income:needs in 8th grade		
Model 2A	*No controls: Pseudo-R^2 = 0.071*		
	Income:needs in 8th grade	-0.018 **	0.002
	Female headed	0.034 **	0.008
	Stepfather	0.046 **	0.007
Model 2B	*Predetermined characteristics: Pseudo-R^2 = 0.172*		
	Income:needs in 8th grade	-0.005 **	0.002
	Female headed	0.037 **	0.006
	Stepfather	0.038 **	0.007
Model 2C	*Contemporaneous characteristics: Pseudo-R^2 = 0.260*		
	Income:needs in 8th grade	-0.001	0.001
	Female headed	0.029 **	0.006
	Stepfather	0.021 **	0.007

Notes: Omitted family type is persistently intact. Predetermined and contemporaneous characteristics are listed in Table 3. Standard errors are corrected for the presence of heteroskedasticity (White/Huber estimator) and relaxes the assumption of independence of observations within schools.

* and ** = test that coefficient is statistically significantly different from zero at the P < .05 and .01 levels.

Table 5: Does Measurement of Income Matter?
(Outcome = Permanent Dropout Status)

	Probit Estimation (N = 8923)	**DF/DX**	**Std. Error**
	Includes both 8th grade and 12th grade measure of income		
Model 3A	*No controls: Pseudo-R^2 = 0.099*		
	Income:needs in 8th grade	-0.011 **	0.002
	Income:needs in 12th grade	-0.014 **	0.002
	Female headed	0.024 **	0.006
	Stepfather	0.045 **	0.009
Model 3B	*Predetermined characteristics: Pseudo-R^2 = 0.183*		
	Income:needs in 8th grade	-0.002 *	0.001
	Income:needs in 12th grade	-0.006 **	0.001
	Female headed	0.023 **	0.006
	Stepfather	0.044 **	0.009
Model 3C	*Contemporaneous characteristics: Pseudo-R^2 =*		
	Income:needs in 8th grade	-0.000	0.001
	Income:needs in 12th grade	-0.004 **	0.001
	Female headed	0.024 **	0.006
	Stepfather	0.021 **	0.007
	Includes 12th grade income as an instrument for permanent income		
Model 4A	*No controls: Pseudo-R^2 = 0.085*		
	Income:needs in 8th grade	-0.034 **	0.003
	Female headed	0.013 **	0.006
	Stepfather	0.043 **	0.008
Model 4B	*Predetermined characteristics: Pseudo-R^2 = 0.182*		
	Income:needs in 8th grade	-0.017**	0.003
	Female headed	0.013 **	0.006
	Stepfather	0.040 **	0.008
Model 4C	*Contemporaneous characteristics: Pseudo-R^2 = 0.268*		
	Income:needs in 8th grade	-0.011 **	0.002
	Female headed	0.011	0.006
	Stepfather	0.021 **	0.008

Notes: Omitted family type is persistently intact. Predetermined and contemporaneous characteristics are listed in Table 3. Standard errors are corrected for the presence of heteroskedasticity (White/Huber estimator) and for correlated residuals within schools.

* and ** = test that coefficient is statistically significantly different from zero at the P < .05 and .01 levels.

Table 6: Does the Effect of Income Vary by Family Structure?
(Outcome = Permanent Dropout Status)

	Probit Estimation (N = 8923)	**DF/DX**	**Std. Error**
Model 5A	*No controls: Pseudo-R^2 = 0.0 72*		
	Income:needs in 8th grade	-0.033 **	0.003
	Female headed	0.014 *	0.006
	Stepfather	0.068 **	0.013
	Female headed*Income:needs	-0.004	0.003
	Stepfather*Income:needs	-0.017 *	0.007
Model 5B	*Predetermined characteristics: Pseudo-R^2 = 0.183*		
	Income:needs in 8th grade	-0.017 **	0.003
	Female headed	0.014 **	0.006
	Stepfather	0.044 **	0.010
	Female headed*Income:needs	0.001	0.002
	Stepfather*Income:needs	-0.004	0.004
Model 5C	*Contemporaneous characteristics: Pseudo-R^2 = 0.268*		
	Income:needs in 8th grade	-0.012 **	0.002
	Female headed	0.011	0.006
	Stepfather	0.023 **	0.009
	Female headed*Income:needs	0.002	0.002
	Stepfather*Income:needs	-0.001	0.003

Notes: Income:needs in 8th grade (entered in log(.) form) is the predicted variable from a first-stage model that included log(income:needs in 12th grade) as an instrument. Omitted family type is persistently intact. Predetermined and contemporaneous family characteristics are listed in Table 3. Standard errors are corrected for the presence of heteroskedasticity (White/Huber estimator) and relaxes the assumption of independence of observations within schools.

* and ** = test that coefficient is statistically significantly different from zero at the P < .05 and .01 levels.

Table 7: What is the Effect of Parental Involvement on Permanent Dropout Status?

	Model 6: Baseline		*Model 7: Adding Income*	
Probit Estimation (N = 8923)	**DF/DX**	**Std. Error**	**DF/DX**	**Std. Error**
A: No controls				
Income:needs in 8th grade			-0.027 **	0.003
Parent involved in educational system	-0.032 **	0.004	-0.026 **	0.004
Parent involved in children's clubs	-0.073 **	0.010	-0.054 **	0.009
Female headed	0.051 **	0.007	0.013 **	0.006
Stepfather	0.046 **	0.008	0.042 **	0.008
Pseudo-R^2	0.085		0.124	
B: Predetermined characteristics				
Income:needs in 8th grade			-0.016 **	0.003
Parent involved in educational system	-0.013 **	0.003	-0.013 **	0.003
Parent involved in children's clubs	-0.025 **	0.006	-0.023 **	0.006
Female headed	0.039 **	0.006	0.013 **	0.006
Stepfather	0.037 **	0.007	0.037 **	0.007
Pseudo-R^2	0.184		0.197	
C: Contemporaneous characteristics				
Income:needs in 8th grade			-0.011 **	0.002
Parent involved in educational system	-0.007 **	0.002	-0.007 **	0.002
Parent involved in children's clubs	-0.009 **	0.004	-0.008 **	0.004
Female headed	0.029 **	0.006	0.010	0.006
Stepfather	0.022 **	0.007	0.022 **	0.007
Pseudo-R^2	0.265		0.273	

Notes: Income:needs in 8th grade (entered in log(.) form) is the predicted variable from a first-stage model that included log(income:needs in 12th grade) as an instrument. Omitted family type is persistently intact. Predetermined and contemporaneous characteristics are listed in Table 3. Standard errors are corrected for the presence of heteroskedasticity (White/Huber estimator) and for correlated residuals within schools.

* and ** = test that coefficient is statistically significantly different from zero at the P < .05 and .01 levels.

Table 8: What are the Effects of Income and Parental Involvement on College Attendance?

Probit Estimation (N = 8336)	***Model 8: Baseline***		***Model 9: Adding Income***		***Model 10: Adding Parental Involvement***		***Model 11: Adding Parental Involvement Income***	
	DF/DX	Std. Error	DF/DX	Std. Error	**DF/DX**	**Std. Error**	**DF/DX**	**Std. Error**
A: No controls								
Income:needs in 8th grade			0.108 **	0.010			0.098 **	0.011
Parent involved in educational system					0.091 **	0.010	0.076 **	0.010
Parent involved in children's clubs					0.075 **	0.017	0.046 **	0.016
Female headed	-0.086 **	0.014	0.015	0.015	-0.070 **	0.013	0.015	0.013
Stepfather	-0.134 **	0.018	-0.114 **	0.018	-0.121 **	0.018	-0.106 **	0.018
Pseudo-R^2	0.012		0.043		0.030		0.054	
B: Predetermined characteristics								
Income:needs in 8th grade			0.056 **	0.010			0.053 **	0.011
Parent involved in educational system					0.038 **	0.009	0.036 **	0.009
Parent involved in children's clubs					0.054 **	0.017	0.051 **	0.017
Female headed	-0.040 **	0.013	-0.002	0.014	-0.034 **	0.013	0.001	0.013
Stepfather	-0.084 **	0.018	-0.083 **	0.018	-0.079 **	0.018	-0.079 **	0.018
Pseudo-R^2	0.121		0.125		0.125		0.129	
C: Contemporaneous characteristics								
Income:needs in 8th grade			0.052 **	0.011			0.047 **	0.011
Parent involved in educational system					0.027 **	0.009	0.022 **	0.009
Parent involved in children's clubs					0.027	0.016	0.019	0.016
Female headed	-0.034 **	0.014	0.003	0.015	-0.031 *	0.013	0.002	0.013
Stepfather	-0.065 **	0.018	-0.064 **	0.018	-0.063 **	0.016	-0.063 **	0.016
Pseudo-R^2	0.148		0.152		0.150		0.152	

See notes to Table 6.)

Table 9: What are the Effects of Income and Parental Involvement on Teen Fertility out of Wedlock?

Probit Estimation (N = 4816)	***Model 12: Baseline***		***Model 13: Adding Income***		***Model 14: Adding Parental Involvement***		***Model 15: Adding Parental Involvement and Income***	
A: No controls	DF/DX	Std. Error	DF/DX	Std. Error	**DF/DX**	**Std. Error**	**DF/DX**	**Std. Error**
Income:needs in 8th grade			-0.063 **	0.008			-0.057 **	0.007
Parent involved in educational system					-0.035 **	0.009	-0.026 **	0.009
Parent involved in children's clubs					-0.056 **	0.015	-0.038 **	0.013
Female headed	0.143 **	0.014	0.053 **	0.013	0.137 **	0.014	0.054 **	0.013
Stepfather	0.113 **	0.017	0.095 **	0.017	0.107 **	0.018	0.092 **	0.016
Pseudo-R^2	0.047		0.083		0.061		0.090	
B: Predetermined characteristics								
Income:needs in 8th grade			-0.035 **	0.009			-0.034 **	0.009
Parent involved in educational system					-0.011	0.009	-0.010	0.008
Parent involved in children's clubs					-0.003	0.011	-0.002	0.011
Female headed	0.064 **	0.012	0.031 *	0.012	0.063 **	0.012	0.029 *	0.012
Stepfather	0.072 **	0.016	0.068 **	0.016	0.071 **	0.016	0.066 **	0.016
Pseudo-R^2	0.168		0.174		0.169		0.174	
C: Contemporaneous characteristics								
Income:needs in 8th grade			-0.031 **	0.009			-0.033 **	0.009
Parent involved in educational system					-0.005	0.008	-0.002	0.008
Parent involved in children's clubs					0.007	0.010	0.011	0.009
Female headed	0.058 **	0.012	0.023	0.012	0.057 **	0.012	0.023	0.012
Stepfather	0.057 **	0.016	0.057 **	0.016	0.056 **	0.016	0.055 **	0.016
Pseudo-R^2	0.190				0.190		0.194	

See notes to Table 6.)

Appendix: What if predetermined variables operate via income?

This appendix presents a formal model of how the estimated effect of income on family structure can be different if predetermined variables such as race or parentnal education affect youth outcomes because they affect income.

For simplicity, suppose there are only three causal variables which affect the single outcome dropout (d): racial status (r), single-parent family status (s), and income (y). Then we can rewrite the conventional reduced form (Equation 3) as:

$$d = d(s, y, b) = ä_s \cdot s + ä_r \cdot r + ä_y \cdot y \qquad \text{(i)}$$

To simplify notation, we will make use of the coefficients from the following *noncausal* auxiliary regressions:

$$y = \tilde{a}_s \cdot s + \tilde{a}_r \cdot r \qquad \text{(ii)}$$

and

$$r = \tilde{n}_s \cdot s + \tilde{n}_y \cdot y \qquad \text{(iii)}$$

Substituting (iii) into (ii) yields:

$$y = \tilde{a}_s \cdot s + \tilde{a}_r[\tilde{n}_s \cdot s + \tilde{n}_y \cdot y] = [\tilde{a}_s + \tilde{a}_r \cdot \tilde{n}_s] \cdot s + \tilde{n}_y \cdot \tilde{a}_r \cdot y$$

$$= [(\tilde{a}_s + \tilde{a}_r \cdot \tilde{n}_s) / (1 - \tilde{a}_r \cdot \tilde{n}_y)] \cdot s \qquad \text{(iv)}$$

Substituting (iv) in (iii) yields:

$$r = \tilde{n}_s \cdot s + \tilde{n}_y \cdot [(\tilde{a}_s + \tilde{a}_r \cdot \tilde{n}_s) / (1 - \tilde{a}_r \cdot \tilde{n}_y)] \cdot s$$
$$= \{\tilde{n}_s \cdot (1 - \tilde{a}_r \cdot \tilde{n}_y) + \tilde{n}_y \cdot [\tilde{a}_s + \tilde{a}_r \cdot \tilde{n}_s] / (1 - \tilde{a}_r \cdot \tilde{n}_y)\} \cdot s$$
$$= (\tilde{n}_s + \tilde{n}_y \cdot \tilde{a}_s) \cdot s / (1 - \tilde{a}_r \cdot \tilde{n}_y) \qquad \text{(v)}$$

Now the conventional reduced form procedure is to first estimate the system including r but not y, as in our equation (2)

$$d = á_s \cdot s + á_r \cdot r \qquad \text{(vi)}$$

and then with all 3 variables as in our equation 3. The change ($á_s - ä_s$) is the difference in the single-parent effect attributed to lower income.

Then to find $á_s$, we plug (ii) into (i),

$$d = ä_s \cdot s + ä_r \cdot r + ä_y (\tilde{a}_s \cdot s + \tilde{a}_r \cdot r)$$
$$= (ä_s + ä_y \cdot \tilde{a}_s) \cdot s + (äb + ä_y \tilde{a}_r) \cdot r$$

so that $\acute{a}_s = \ddot{a}_s + \ddot{a}_y \cdot \tilde{a}_s$, and the difference $(\acute{a}_s - \ddot{a}_s) = \ddot{a}_y \cdot \tilde{a}_s$. (vii)

Alternatively, one can estimate the 2 equations without r.

$$d = æ_s \cdot s$$

and

$$d = è_s \cdot s + è_y \cdot y.$$

Equation (i) implies $d = \ddot{a}_s \cdot s + \ddot{a}_y \cdot y + \ddot{a}_r \cdot r$. We can substitute equation (iv) and (v) into (i) to yield the following:

$$d = \ddot{a}_s \cdot s + \ddot{a}_y \cdot [(\tilde{a}_s + \tilde{a}_r \cdot \tilde{n}_s) / (1 - \tilde{a}_r \cdot \tilde{n}_y)] \cdot s + \ddot{a}_r \cdot [(\tilde{n}_s + \tilde{n}_y \cdot \tilde{a}_s) / (1 - \tilde{a}_r \cdot \tilde{n}_y)] \cdot s$$
$$= s \cdot (\ddot{a}_s + [\ddot{a}_y \cdot \tilde{a}_s + \ddot{a}_y \cdot \tilde{a}_r \cdot \tilde{n}_s + \ddot{a}_r \cdot \tilde{n}_s + \ddot{a}_r \cdot \tilde{n}_y \cdot \tilde{a}_s] / (1 - \tilde{a}_r \cdot \tilde{n}_y))$$

so $æ_s = (\ddot{a}_s + [\ddot{a}_y \cdot \tilde{a}_s + \ddot{a}_y \cdot \tilde{a}_r \cdot \tilde{n}_s + \ddot{a}_r \cdot \tilde{n}_s + \ddot{a}_r \cdot \tilde{n}_y \cdot \tilde{a}_s] / (1 - \tilde{a}_r \cdot \tilde{n}_y))$.

Now estimating the system with s & y but not r

$$d = è_s \cdot s + è_y \cdot y.$$

As before, we substitute equation (iii) into (i):

$$d = \ddot{a}_s \cdot s + \ddot{a}_y \cdot y + \ddot{a}_r \cdot (\tilde{n}_s \cdot s + \tilde{n}_y \cdot y)$$
$$= (\ddot{a}_s + \ddot{a}_r \cdot \tilde{n}_s) \cdot s + (\ddot{a}_y + \ddot{a}_r \cdot \tilde{n}_y) \cdot y, \text{ so that}$$
$$è_s = \ddot{a}_s + \ddot{a}_r \cdot \tilde{n}_s.$$

The difference $(æ_s - è_s)$ is the difference in the single parent coefficient attributed to lower income in the absence of predetermined characteristics.

$$æ_s - è_s = [\ddot{a}_y \cdot \tilde{a}_s + \ddot{a}_y \cdot \tilde{a}_r \cdot \tilde{n}_s + \ddot{a}_r \cdot \tilde{n}_s + \ddot{a}_r \cdot {}_r y \cdot \tilde{a}_s] / (1 - \tilde{a}_r \cdot \tilde{n}_y) - \ddot{a}_r \cdot \tilde{n}_s$$
$$= [\ddot{a}_y \cdot \tilde{a}_s + \ddot{a}_y \cdot \tilde{a}_r \cdot \tilde{n}_s + \ddot{a}_r \cdot \tilde{n}_s + \ddot{a}_r \cdot {}_r y \cdot \tilde{a}_s - \ddot{a}_r \cdot \tilde{n}_s + \ddot{a}_r \cdot \tilde{n}_s \cdot \tilde{a}_r \cdot \tilde{n}_y] / (1 - \tilde{a}_r \cdot \tilde{n}_y)$$

$$= [\ddot{a}_y \cdot \tilde{a}_s + \ddot{a}_y \cdot \tilde{a}_r \cdot \tilde{n}_s + \ddot{a}_r \cdot {}_r y \cdot \tilde{a}_s + \ddot{a}_r \cdot \tilde{n}_s \cdot \tilde{a}_r \cdot \tilde{n}_y] / (1 - \tilde{a}_r \cdot \tilde{n}_y). \quad \text{(viii)}$$

We can rewrite the difference $(\acute{a}_s - \ddot{a}_s)$ as $[\ddot{a}_y \cdot \tilde{a}_s - \ddot{a}_y \cdot \tilde{a}_s \cdot \tilde{a}_r \cdot \tilde{n}_y] / (1 - \tilde{a}_r \cdot \tilde{n}_y)$. (ix)

Then we can notice the difference between the estimated change in the coefficient on family structure in the specification without predetermined variables as in the conventional reduced form. Both equations (viii) and (ix) have common terms, so that the difference in the importance of income in knocking out the effect of single parent when entered before predetermined variables $(æ_s - è_s)$ and when it is entered after $(\acute{a}_s - \ddot{a}_s)$ is

$$(æ_s - è_s) - (\acute{a}_s - \ddot{a}_s) = [\ddot{a}_y \cdot \tilde{a}_s + \ddot{a}_y \cdot \tilde{a}_r \cdot \tilde{n}_s + \ddot{a}_r \cdot r_y \cdot \tilde{a}_s + \ddot{a}_r \cdot \tilde{n}_s \cdot \tilde{a}_r \cdot \tilde{n}_y] / (1 - \tilde{a}_r \cdot \tilde{n}_y).$$

$- [ä_y \cdot ã_s - ä_y \cdot ã_s \cdot ã_r \cdot ñ_y]/(1-ã_r \cdot ñ_y)$.

$= [ä_y \cdot ã_r \cdot ñ_s + ä_r \cdot ñ_y \cdot ã_s + ä_r \cdot ñ_s \cdot ã_r \cdot ñ_y + ä_y \cdot ã_s \cdot ã_r \cdot ñ_y]/(1-ã_r \cdot ñ_y)$.

$= [ä_r \cdot ñ_y \cdot (ã_s + ñ_s \cdot ã_r) + ä_y \cdot ã_r \cdot (ñ_s + ã_s \cdot ñ_y)]/(1-ã_r \cdot ñ_y)$.

To simplify notation, note that $(ã_s + ñ_s \cdot ã_r)$ is just the coefficient $C_{ãs}$ we would estimate from the noncausal equation $Y = C_{ãs} \cdot s$, and $(ñ_s + ã_s \cdot ñ_y)$ is the coefficient $C_{ñs}$ from equation $R = Cñ_s \cdot s$. With this notation we can substitute and find:

$$(æ_s - è_s) - (á_s - ä_s) = [ä_r \cdot ñ_y \cdot Cã_s + ä_y \cdot ã_r \cdot Cñ_s]/(1-ã_r \cdot ñ_y) > 0.$$

In words, the importance of income in knocking out the apparent effect of single-parent status is higher when we do not control for predetermined variables (that is, $(æ_s - è_s)$) than when we do $(á_s - ä_s)$. The gap between the two estimated effects of income is particularly large when:

1) $ä_r$ is large, so predetermined variables are strong predictors of outcomes.

2) $Cã_s$ is large, so income is highly correlated with single-parent status (whether the correlation is due to both the direct effect ($ã_s$) and via its correlation with the predetermined variable ($ã_r$)).

3) $ä_y$ is large, so family structure matters a lot for income.

4) $Cñ_s$ is large, so predetermined variables correlate closely with family structure both directly ($ñ_s$) and indirectly via income {the $ã_s \cdot ã_r$ term's meaning here is unclear to me})

5) Finally, when income is strongly affected by the predetermined variables ($ñ_y$ is high), then $1/(1-ã_r \cdot ñ_y)$ is high and $ä_r \cdot ñ_y$ is high.

Thus, when income is strongly affected by the predetermined variables, the omission of predetermined variables matters more.

Channels (3) and (4): For policy purposes, if income matters a lot for outcomes ($ä_y$ is large), then we do not want to include predetermined variables that eliminate the possibility of this effect. This bias argues for dropping predetermined variables from the reduced form.

Channels (1) and (2): In the other direction, if predetermined variables matter a lot for the outcome (är is large), then NOT including predetermined variables will permit their effect to "load onto" our estimate (as long as income correlates with single-parent status and the predetermined variables). This bias argues for including predetermined variables.

If the two estimated effects of family structure conditional on income (that is, $è_s$ and $ä_s$) are similar, then we know $ä_s - è_s = ä_s - (ä_s + ä_r \cdot ñ_s) = ä_r \cdot ñ_s$ must be small. That is, the direct effect of predetermined variables on outcomes (other than operating via income) must be small.

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