



# My Sibling Is Adopted

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## NON-TECHNICAL SUMMARY

In the U.S. today approximately 2 percent of children under age 18 are adopted. About half of these are adopted into families that also have biological children.

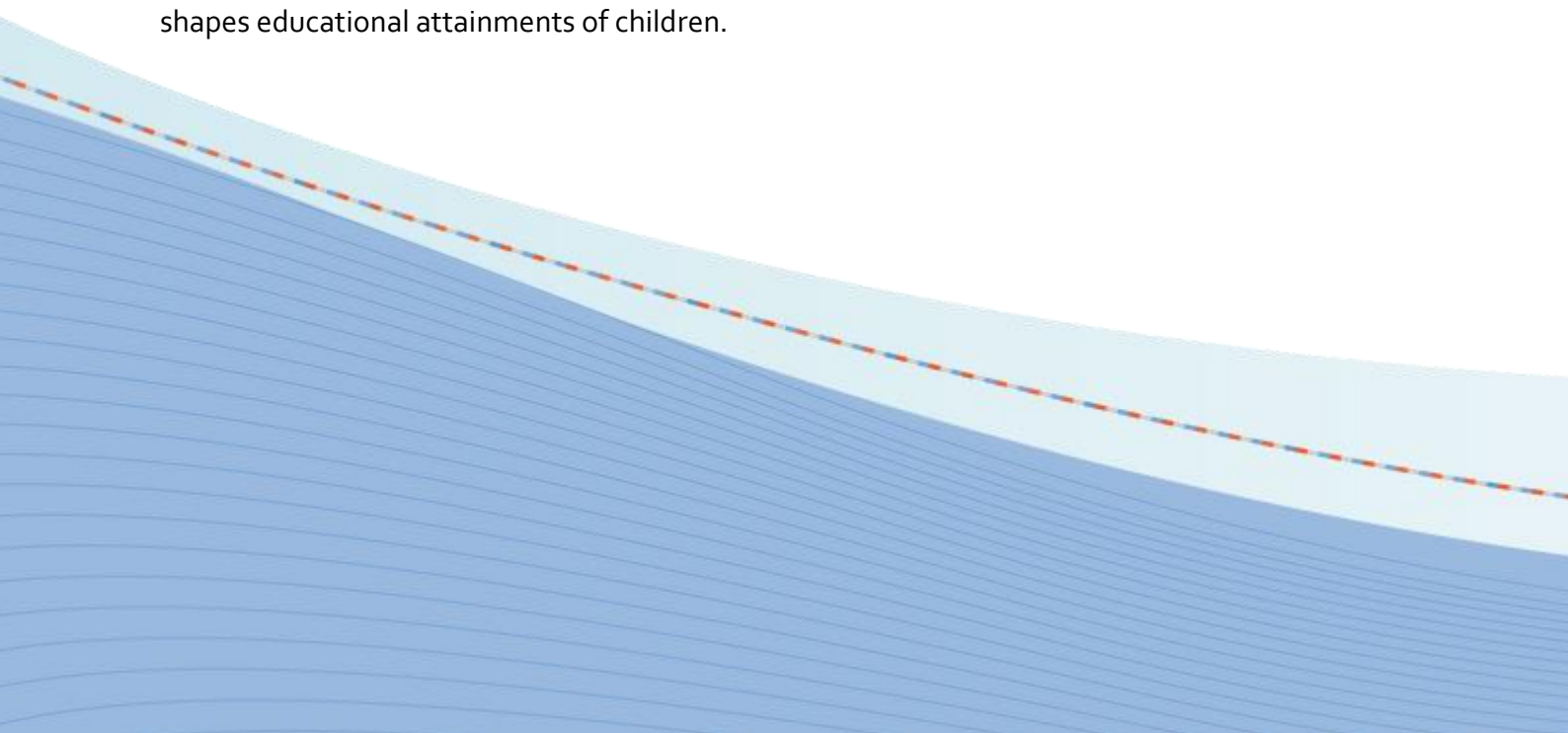
What does having an adopted sibling mean for biological children in the family? While the addition of another child to a family is expected to reduce parental time and resources for each child, is there anything special about having a sibling who was adopted that might influence a biological child's development and outcome? This is a question that has been little studied yet its answer could be relevant to a large number of children and may yield new insights about within-family influences on child development.

In this paper we explore this question focusing on years of education as our measure of outcome because educational attainment is a key determinant of other developmental outcomes in adulthood, most importantly health and mental health in adulthood.

We draw upon two sources of data. One includes the children of a single birth cohort and is relatively homogeneous in that parents are high school graduates of a single state in a single year. This reduces unobserved factors such as different cultural acceptance of adoption and different state laws governing adoption. The second source of data is nationally representative and draws from several birth cohorts, thus extending generalizability of the findings.

We find large heterogeneity (based on sex, family income, and age difference) in the effects of having an adopted sibling. In general, the effects on sisters' education levels are less pronounced than the effects on brothers'. For brothers, we find evidence that family income further moderates differential effects, where males from low-income families have lower education if they have an adopted sibling but males from higher income families do not. The effects are greater when the adopted sibling is close in age to the biological child.

Our results have implications for our understanding of family dynamics as well as how sex shapes educational attainments of children.



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## **Abstract**

Although adoption is a widespread phenomenon in the US, little research has examined the impacts on biological siblings. This paper uses two representative datasets to compare educational attainments of individuals who grew up with an adopted sibling and those that did not. We find large heterogeneity (based on sex, family income, and age difference) in the effects of having an adopted sibling. In general, the effects on sisters' education levels are less pronounced than the effects on brothers'. For brothers, we find evidence that family income further moderates differential effects, where males from low-income families have lower education if they have an adopted sibling but males from higher income families do not. The effects are greater when the adopted sibling is close in age to the biological child. Our results have implications for our understanding of family dynamics as well as how sex shapes educational attainments of children.

**Keywords:** sibling effects; adopted siblings; educational attainment; sex differences

## **Introduction**

In the U.S. today approximately 2 percent of children under age 18 are adopted. About half of these are adopted into families that also have biological children. What does having an adopted sibling mean for biological children in the family? While the addition of another child to a family is expected to reduce parental time and resources for each child, is there anything special about having a sibling who was adopted that might influence a biological child's development and outcome? This is a question that has been little studied yet its answer could be relevant to a large number of children and may yield new insights about within-family influences on child development.

In this paper we explore this question focusing on years of education as our measure of outcome because educational attainment is a key determinant of other developmental outcomes in adulthood, most importantly health and mental health in adulthood (Fletcher & Frisvold, 2009; Haveman & Wolfe, 1984; Lundborg, 2013; Oreopoulos & Salvanes, 2011). We draw upon two sources of data. One includes the children of a single birth cohort and is relatively homogeneous in that parents are high school graduates of a single state in a single year. Although this limits generalizability, it also reduces unobserved factors such as different cultural acceptance of adoption and different state laws governing adoption. The second source of data is nationally representative and draws from several birth cohorts, thus extending generalizability of the findings.

## **Adoption in the U.S.**

According to a U.S. government report in 2007, nearly 2 million children under 18 are adopted (Vandivere, Malm, Trends, & Radcl, 2009). Of these, the largest sub-group is private, domestic adoptions, including those by agencies, followed by adoptions through foster care and finally, international adoptions. More than three-quarters of adopted children are unrelated to the adoptive parents. There are differences in both the "types" of children who are adopted and the "types" of families who adopt children compared to the general population. The majority of adopted children are white/ non-Hispanic, though they are a smaller proportion of adopted children than all children. Family income tends to be higher among families with an adopted

child than families with children overall (Vandivere et al. 2009) A small percentage of children who are adopted have special needs. Because these children present an additional set of issues related to their special needs, we do not include these children or their siblings in our study (Forbes & Dziegielewski, 2003).

Fifty one percent of adopted children live in families who also have biological children, while about 30 percent have only other adopted children as siblings and 19 percent are only children. It is the first group on which this study is focused.

### **Existing literature**

We are not aware of any literature that has studied the influence of having an adopted sibling on a biological child using a national representative sample, but there is other related research that focuses on the development of adopted children. A comparison of degree of engagement in school and reading for pleasure suggests that most children, including adopted children, are engaged in these activities but the percentage is lower among adopted children. The same study showed that the difference is small until age 12 but becomes statistically different for 12–17 year old children. Further, the study indicated that, in contrast to school and reading, adopted children are more likely to be involved in other outside activities (such as sports, teams, lessons, and clubs), were more likely to have been read to every day as a young child and to attend religious activities. This difference in outside activities, being read to, and attending religious activities suggests additional time and resources spent on adopted children by the adopting parents—time potentially diverted from biological children in the household (Vandivere et al. 2009).

There are several theoretical reasons for expecting that having an adopted sibling may affect the educational attainment of biological children in the family. The broader economics literature that focuses on the “quantity-quality” trade-off of children (Becker & Lewis, 1973; Rosenzweig & Zhang, 2009) suggests that if parents have a large number of children, they will have less time and resources to spend on each individual child than if they have a smaller number of children. Models of the trade-off suggest that as family size increases, there are reductions in average child outcome (often measured as children’s educational attainments). When making choices about numbers of children, parents are thought to weigh having an increased number of children

(quantity) against the human capital (quality) of their children, where quality is likely to reflect time and other resources (inputs) they can devote to each child. Parents provide material goods and emotional support to their children, and siblings are then thought to vie for parents' time and attention. This literature typically assumes homogeneity of children within a household. If parents adopt a child, the quantity-quality trade-off and associated resource constraints could become more complex.

Bjorklund et al. (2006) add another important consideration to conceptualizing adoptive family dynamics. They suggest that children who are adopted might have been subject to less than standard pre- and post- birth care, which can negatively affect their development and thus affect their outcomes as young adults. Juffer and van IJzendoorn (2005), in their meta-analysis, conclude that international adoptees who experienced pre-adoption adversities have more behavioral problems (particularly externalizing problems) than international adoptees without deprivation before adoption. Indeed, among internationally adopted children who spent prolonged periods before adoption in institutionalized settings, testing after adoption showed a neuropsychological pattern suggesting that brain-behavior circuitry may be impaired on a lasting basis (Pollak et al., 2010). Thus, pre-adoption deprivation could motivate a differential resource allocation by the adoptive parents, which might favor the adopted child(ren) to compensate for this initial disparity. In one study that examined this question, Gibson (2009) found that parents invested more resources in their adopted child than their biological child in response to elevated needs on the part of the adopted child. Nevertheless, the adopted child had greater likelihood of arrest, reliance on public assistance, and treatment for drug, alcohol, and mental health difficulties. The conclusion was that the differential positive investment in adopted children than biological children is due to their greater need for help.

While examinations comparing adopted to non-adopted children are typically carried out with convenience samples and clinical samples, several studies have used the Add Health data set, which is one of the two sources of data we analyze for the present study. Since Add Health is a large nationally representative sample, the results are more generalizable than most studies of adoption. The Add Health and many other studies (Juffer & van Ijzendoorn, 2005; Speer, 2009; van Ijzendoorn, Juffer, & Poelhuis, 2005) concluded that adopted adolescents, on average, have more adjustment and behavior problems than their non-adopted peers, but that effects sizes are

small to moderate (Miller et al., 2000; Slap et al., 2001). In addition to the estimated average differences between the groups, many more adopted children are at the extreme of the lower end of the distribution than non-adopted children, which speaks to the potential severity of poor adolescent outcomes of some adopted children.

Our question is different, but grows out of this research. We examine the *biological* children in families who have adopted a child, and ask if they are affected with respect to educational attainment. This type of effect could emanate from both the quantity and the quality side of the quantity-quality trade-off (i.e., due to the addition of another child that spreads the resources of the parents more thinly as well as from the additional needs that adopted children have that draw on parental resources more than just in a quantitative sense). More generally, we are interested in studying the effects of siblings on one another and this study extends past research that found such effects when one sibling dies during the other's childhood (Fletcher et al., 2013) and when one sibling has developmental disabilities or mental health diagnoses (Wolfe et al., 2014). These studies found differential effects of sibling death on brothers versus sisters (but no differential effects by sex of having a sibling with a disability), and thus in the present study we examine the effects of adoption for brothers and sisters separately. Studying the effect of sibling adoption offers an additional opportunity to understand sibling effects, which have been viewed as “an untapped window” into understanding child development in a family context (McGuire & Shanahan, 2010).

## **Data**

In our research, we use two panel data sets—the Wisconsin Longitudinal Study and the National Longitudinal Study of Adolescent Health (Add Health) — in order to take advantage of differing strengths of each of these data sets and to offset limitations as well. Our overall approach is to examine whether the educational attainment of biological children (termed “target children”) is affected by having an adopted sibling.

The Wisconsin Longitudinal Study (WLS) is a random sample of 10,317 women and men who graduated from Wisconsin high schools in 1957 (Hauser and Roan 2006). Follow-up surveys were conducted in 1975 (9,138 [90.1 %] surviving members of the original sample), in 1992



(8,493 [87.2 %] of the surviving original respondents), and again in 2004 (7,265 [80.0 %] of the surviving respondents). Family background data in 1957 and high school IQ scores are available for the respondents. Data from three of the four surveys (1957, 1975, and 2004) were used in the present analyses. Most respondents are white, reflective of Wisconsin's population in the mid-twentieth century.

Respondents were asked questions whether any of their children were adopted. Separately, questions also were posed regarding whether any child had developmental disabilities or serious mental health problems. Specifically, developmental disability (DD) and mental illness (MI) of the children are identified through a series of 31 screener questions asked of all parents during the 2004 survey. We eliminated any child who had a brother or sister with an identified developmental disability (e.g., Down syndrome, autism spectrum disorder, cerebral palsy, and specific genetic conditions) or mental illness (e.g., schizophrenia, bipolar disorder, or major depression) based on evidence that having a sibling with a DD or MI condition influences educational attainment (Wolfe et al., 2014). Also, we excluded any biological child who had a DD or MI condition him/herself because these conditions affect educational attainment and only a small number who had an adopted sibling also had one of these conditions.

To examine the effects of having an adopted sibling on the educational attainment of biological children, we analyze data for WLS respondents' adult children who were aged 25 and older in 2004 for families who had two or more children. In particular, we study 431 biological adult children of WLS respondents (180 females and 251 males) who, before they reached 25 years of age, had at least one adopted sibling whose adoption was not tied to parents' remarriage and 14,356 biological adult children of WLS respondents (6,862 females and 7,063 males) who had only biological siblings. In Table 1 we present descriptive WLS data for the entire sample and separately for those who had an adopted sibling and those with only biological siblings, sisters and brothers separately. Descriptively, there were no differences in education between the biological children who had an adopted sibling and those who had only biological siblings. The average years of school was 14.41 years, reflecting attainment at age 38 on average.

The second data set we use, Add Health, was originally fielded as a school-based, longitudinal study of the health-related behaviors of adolescents and their outcomes in young adulthood. Beginning with an in-school questionnaire administered to a nationally representative sample of

students in grades 7–12 in 1994–1995 (Wave 1), the study follows up with a series of in-home interviews of respondents approximately 1 year (Wave 2; 1996), 6 years (Wave 3; 2001–2002), and 13 years (Wave 4; 2008) later. By design, the Add Health survey included a sample stratified by region, urbanicity, school type, ethnic mix, and size (see Udry, 2003 for a full description of the Add Health data set).

The original Wave 1 sample collected information on more than 20,000 respondents, and approximately 15,000 have been followed longitudinally to Wave 4, approximately 13,000 have non-missing outcome data and have at least one sibling. Adoption status is reported twice. First, at Wave 1, respondents were asked to complete a household roster; for each person in the household, respondents reported his/her relationship (i.e. adopted sibling and whether the relationship with the mother is “adopted mother”). Second, at Wave 3, each respondent is asked whether he/she has ever been adopted. Using this information, we construct indicator variables for each respondent of whether he/she reported having an adopted sibling. A limitation with this measure is that adopted siblings not present in the household at the time of either of these surveys are not included. We expect this limitation to be minor, as a supermajority of biological children in households are older than their adopted sibling; on the other hand, a concern is that some respondents will have an adopted sibling in the future (i.e. following survey data collection). As the respondents are in grades 7–12 at baseline, we expect this limitation to also be minor. Of the 13,000 individuals followed longitudinally, we also further limit our sample to those who are not adopted themselves (dropping 3% of the sample) and who do not have any of a set of health conditions (epilepsy, mental retardation, blindness, learning disorder, and/or receiving special education services (dropping ~10% of the sample), leaving us with nearly approximately 11,400 individuals for our analysis.

In addition to having our primary independent variable, education attainment, which is measured at Wave 4, Add Health also includes a large set of health and background characteristics of each individual, such as race, gender, age, parent education, marital status, and income. Table 2 presents summary descriptive statistics from the analysis sample and separately for respondents who have an adopted sibling and those who did not. Less than 1 percent (0.7%, 74 families) of this sample report having an adopted sibling in the household at Wave 1. In terms of outcomes as adults based on the Wave 4 data, average years of schooling were 14.46, similar to the WLS.

Of the Add Health families with an adopted child, the typical family has one adopted child, though a few families report up to five adopted children. Adopted children are slightly more likely to be female than male. Table 2 shows that children in families that adopted (who were selected for our study because they have one adoptive and one biological child) have higher educational attainments on average than children in families with no adopted siblings. The outcome measure of education reflects attainment at age 29 (on average), almost a decade earlier in the life course than in the WLS.

### **Research design: Defining the relevant population**

Our question of interest is the influence of having an adopted sibling on the human capital of biological children. In order to answer this question, we need to identify that subset of families who adopt who have both biological and adoptive children. Do these families differ from those families with two or more biological children and no adopted child?

Existing research on the predictors of adoption has mainly focused on the characteristics of adoptive mothers in nationally representative data such as the National Survey of Family Growth, and found consistent results: women who were older, more educated, ever married, had higher family income and fertility problems were more likely to adopt a child (Bonham, 1977; Braden, 1970; Chandra et al., 1999; Jones, 2009; Leahy, 1933; Poston & Cullen, 1989). In order to control for confounding factors that may be correlated with both adoption status and educational attainment, we conducted preliminary analyses examining whether families who adopt children (and have one or more biological children) are observably different than families who have only biological children. The WLS data set allows us to include in our analysis most of the factors found significant in previous research. The WLS includes variables measured at the time of parents' high school graduation (before they became parents), as well as measures obtained in midlife and in early old age, allowing us to build upon the findings of existing studies where we estimate whether families who adopt differ systemically from those who do not.

The results of regression models estimating predictors of adoption among WLS families who have either at least one biological and one adopted child or two or more biological children but no adopted child (table available from the authors) revealed that later age at marriage and longer

time between marriage and first child birth, which could be biological factors related to fecundity, predicted adoption. Both growing up in a rural area or an urban area appear positively associated with the probability of adoption, relative to a suburban area. Other characteristics found in prior research related to adoption (e.g., gender, socioeconomic status, marital status) were not associated with the probability of adoption

The results of the regression model estimating the predictors of adoption in Add Health among the subsample of households who had either one biological and one adopted child or two or more biological children but no adopted child (table available from authors) revealed no statistically significant differences in the likelihood of having an adopted child based on race/ethnicity and small differences based on father's education. We also find some small effects of the sex composition of children in the household, where having all-girls or having all-boys (vs. mixed sex composition) reduces the likelihood of having an adopted child. Couples who adopted a child have higher incomes, as found in the prior literature. Interestingly we find that if a parent is an alcoholic, there is a lower probability of adoption, perhaps because agencies find the couple less suitable for adopting a child. Our ability to control for these variables in our main analysis should reduce concerns that our analysis confounds the impacts of the presence of adopted children with other family observables that may also impact biological children's educational attainments. We include a further discussion and empirical results of this issue in the Appendix.

### **Empirical model**

Our focus is on whether having a sibling who is adopted influences the human capital of biological children. Since we wish to focus on the issue of adoption, ideally we want to examine families with the same number, age and sex composition of children, and hold the composition of the family constant (including parents' marital status and human capital). In addition, since one reason parents may adopt is if they have a child who has a significant chronic condition, and such a condition is likely to influence future prospects for a child, we exclude families in which a child has such a chronic condition, whether that child is biological or adopted, in order to focus solely on the influence of adoption rather than chronic health conditions.

Specifically, we estimate the following model

$$Y_{ijt} = \beta_o + \beta_1 S_{\alpha} + \beta_2 X_{it} + \varepsilon_{it}$$

where  $Y$  is the education outcome for an individual  $i$  who is of  $j$  sex (male or female) at time  $t$  or as a young adult who has completed their schooling. All individuals  $i$  here are biological children to at least one parent in their family.  $S$  indicates sibling and we denote whether or not the sibling is adopted ( $\alpha$ ).  $X_{it}$  is a vector of individual and family covariates including total number of siblings, education level of both parents, own age, grandparent's income, early household income, and respondent (one parent's) IQ, and age difference between the siblings

We also explore an extension of our baseline model. We expect that the reduction in available resources to a birth child due to adoption will be stronger in families with limited resources; i.e., limited income. Thus we add an interaction between the presence of an adopted sibling and income to capture this hypothesis.

## Results

We begin our analysis with the richer WLS data set. Table 3 presents our baseline and interaction analysis linking the presence of adopted siblings with later educational outcomes among biological children in the WLS data. Since schooling models are generally estimated separately by sex, we follow this convention. Also, we expected that daughters will face more of the added constraint when resources are devoted to an adopted sibling (see Fletcher et al. 2013). In all cases we control for the number of siblings in the family, as we are primarily interested in the issue of the differential influence of having an adopted sibling (compared to the impact of having an additional sibling).

For females, the results are suggestive of a reduction in educational attainment for those who have an adopted sibling. The impact is about a third to a half of a year of schooling and appears to affect daughters regardless of income of the family.

The results for males are different. For the full sample, we find a suggestion that males (like females) face a penalty if they have an adopted sibling (not statistically significant). The most

interesting results occur when we allow this relationship to differ based on family income. With this interaction, we find that males in poorer families completed less schooling if they have adopted siblings than males in poorer families but with no adopted sibling; in this case the reduction is approximately two thirds of a year. In contrast, there appears to be no reduction for males in higher income families who have adopted siblings—the negative coefficient on having an adopted sibling is canceled out with the positive coefficient on the interaction with family income greater than 200 percent of the FPL. Brothers and sisters who are further apart in age from their adopted siblings also experience a reduction in schooling but the effect is small (10 percent of a year for a 10 year age difference).

In terms of other findings, most of our estimates are consistent with expectations: children whose parents had higher IQ scores in high school and more highly educated parents are likely to themselves have more schooling; those with more siblings attain less schooling with a slightly greater reduction for daughters, consistent with the quantity – quality predictions of economic models. Children in families in which the parents had a longer interval between marriage and the first child also receive more schooling. This is likely an income effect as it suggests older parents who are likely to have saved more for their children’s schooling. Those children who grew up in Catholic families also achieve more schooling, with boys experiencing effects that are more than double that of girls (for boys the increase is approximately a quarter of a year.)

We test for the robustness of these findings using the more representative and diverse Add Health data. Table 4 reports our baseline and interaction analysis linking the presence of adopted siblings with later educational outcomes in biological children in the Add Health data. While our descriptive statistics suggested average differences in educational attainment, Table 4 shows the effects are concentrated entirely on male biological siblings, who have over 1/2 of a year of a schooling advantage in educational attainment compared with males with no adopted sibling. Our results that interact family income suggest that there are positive effects for males of having an adopted sibling, which are concentrated among higher income families, while those in lower income families may experience a slight reduction in schooling (a pattern that has similarities with the results in WLS). This pattern of heterogeneous effects on outcomes for brothers with an adopted sibling by family income are consistent with the WLS results but the positive influence on brothers is unique to the Add Health results. Consistent with the WLS results, we find

negative though statistically insignificant effects on schooling of females with adopted siblings compared with females with no adopted siblings.

## **Discussion and conclusion**

This paper uses two representative datasets to explore a novel question, namely what are the effects of having an adopted sibling on own-educational outcomes? While there are large literatures describing the outcomes of adopted children compared to non-adopted children (in the same or different households), no current research has asked whether there may be spillover effects of having an adopted sibling on biological children.

Our results suggest the effect of having an adopted sibling on a biological sibling depends on several sociodemographic factors, particularly the sex of the biological sibling. In general, brothers with adopted siblings are affected more in their educational attainment than are sisters, and the effects on brothers of having an adopted sibling appear to be dependent on family income. The WLS data suggest that brothers from lower income families are negatively affected in their educational attainment by having an adopted sibling as compared with brothers from similar SES families who have only biological siblings, and the Add Health data suggest that brothers from higher income families *benefit* from having an adopted sibling as compared with brothers from similar backgrounds who have only biological siblings. In both analyses, sisters' educational attainment is less affected by having an adopted sibling than brothers'. These findings were obtained from well-controlled models that held constant family background and family structural variables (e.g., number of children in the family) that might have affected the educational attainment of children. This study thus provides the first evidence of spillover effects of adoption on educational attainment of the biological siblings in the families.

Study of the effects of adoption is important, given the prevalence of adoption in the US (2 percent of children are adopted). The use of two complementary data sets with converging findings strengthens the conclusions about the effects, especially on brothers' educational attainment.

What might be the mechanisms underlying these effects? The quantity-quality perspective might explain why adoption negatively affects educational attainment for brothers in low-income families. Parents with limited resources must spread them more thinly when children are added to the family, especially given the cost of adoption. Thus, brothers in lower income families appear to be vulnerable. When family income is high, then the additional child may not strain

available resources. Note however that the measured influence of the adopted child is net of the number of children. In all estimates, consistent with the quantity-quality tradeoff, having more siblings is negatively tied to years of schooling.

The quantity-quality model does little to explain why brothers in higher-income families *benefit* from having an adopted sibling. Earlier work by Becker and Tomes (1976, 1986) postulates that parents may invest more heavily in their children who are more able academically, particularly in higher income families. Harkonen and Mayer (2008) report data that provide some support for the Becker and Tomes hypothesis for brothers but not for sisters. They found more within-family heterogeneity in educational attainment among brothers from higher-income families but not for sisters in such families. Thus, although parents might spend more time with their adopted child in activities such as clubs, sports, and religious activities, they might simultaneously encourage and reward academic achievement more strongly for their biological sons, particularly in higher-income families. These families may be particularly sensitive to the possible repercussions of adding a child through adoption on the opportunities afforded their birth children. This explanation warrants direct examination in future research.

Why are the effects of an adopted child less prominent among sisters than brothers? Much research has shown that the bonds between sisters are much closer than the bonds between brothers, with sister-brother bonds in the middle (e.g., Spitze & Trent, 2006). Thus, it is possible that closer bonds among a biological sister in a family and her adopted sibling might temper potential spillover effects of having an adopted sibling, whereas for brothers the weaker bonds may leave them more likely to experience spillover effects. This interpretation is in alignment with the empirical results of studies based on social bonding theory, which asserts that adolescents who feel a sense of closeness to their siblings are less vulnerable to negative spillover from these siblings because feelings of being loved and supported buffer negative spillover. Researchers have found that even in cases in which siblings engaged in problematic or deviant behaviors such as substance abuse or sexual risk behaviors, individuals who reported feeling close to these siblings were less likely to engage in similar deviant behaviors (East & Khoo, 2005; Samek & Rueter, 2011). In addition, evidence from studies based on social learning theory suggests that sibling similarity will be more salient when siblings are close in age (McGue & Iacono, 2009; McHale et al., 2009). In the current analytic sample, the age difference between the biological child and their adoptive sibling is smaller among brothers than among sisters (an average of 20.4 months among brothers vs. 32.3 months among sisters in the WLS sample); this



relatively smaller age difference between biological brothers and their adopted siblings was another potential factor underlying the spillover between these siblings.

An additional explanation as to why the effects are less prominent in sisters than in brothers comes from earlier analysis of WLS data by Kuo and Hauser (1997), who noted that “the effects of social background variables on the schooling of women are uniformly smaller than among men” and that the within-family differences in educational attainment among women are smaller than among men. Thus, the introduction of an adopted sibling who might have poorer prospects for educational attainment might have less of a spillover effect on sisters, as women’s prospects for educational attainment in earlier generations were more constrained. This explanation may have held true for earlier cohorts such as the children of the WLS and Add Health, but today the educational attainment of males is lagging behind females considerably, and thus these patterns may be different confirmation in younger cohorts.

In past research on siblings using the WLS and Add Health cohorts (Fletcher et al., 2013), the authors showed a different pattern of gender effects, namely that experiencing sibling death had substantially greater effects on sisters than brothers. This pattern of findings would argue against the explanation advanced above, and instead might suggest that sisters suffer more from losing a sibling while brothers (from higher-income families) may gain more from gaining a sibling. Clearly more research is needed that directly measuring the quality of sibling relationships among dyads where one is adopted and the other is a biological child of the parents.

There are limitations in our analysis to consider when interpreting the results. Although we show a very limited set of (non-biological) factors seem to predict the presence of adopted children in families who have at least one birth child, there could be unobserved factors that are related to both the likelihood of adopting and the educational outcomes of biological children that are not captured in our analysis. Each of our individual datasets also have limitations: the WLS is a single cohort of families from Wisconsin so that their experiences may not be representative of large populations and/or different time periods; the Add Health is a nationally representative sample but has a modest sample of adopted families (mirroring the prevalence in the US). Generally, we find similar effects for each sample, which bolsters the findings. The findings point to the possibility that post-adoption services would benefit low-income adoptive families, and might reduce the tendency to divert resources away from their biological children whose needs may not be met.

## References

- Becker, Gary S., and H. Gregg Lewis. (1973). "On the Interaction between the Quantity and Quality of Children." *Journal of Political Economy* 81(2, Part 2): S279–S288.
- Becker, Gary S., and Nigel Tomes. "Child endowments and the quantity and quality of children." *The Journal of Political Economy* 84, no. 4 (1976).
- Becker, Gary S., and Nigel Tomes. "Human capital and the rise and fall of families." *Journal of Labor Economics* 4, no. 3 (1986): S1-S39.
- Bjorklund, Anders, Mikael Lindahl, and Erik Plug. (2006). "The Origins of Intergenerational Associations: Lessons from Swedish Adoption Data." *Quarterly Journal of Economics* 121(3): 999–1028.
- Bonham, Gordon Scott. (1977). "Who Adopts: The Relationship of Adoption and Social-Demographic Characteristics of Women." *Journal of Marriage and the Family* 39(2): 295–306.
- Braden, Josephine A. (1970). "Adoption in a Changing World." *Social Casework* 51(8): 486–490.
- Chandra, Anjani, Joyce Abma, Penelope Maza, and Christine Bachrach. (1999). "Adoption, Adoption Seeking, and Relinquishment for Adoption in the United States." *Advance Data* No. 306. Vital and Health Statistics of the Centers for Disease Control and Prevention, National Center for Health Statistics.
- East, P.L., & Khoo, S.T. (2005). Longitudinal pathways linking family factors and sibling relationship qualities to adolescent substance use and sexual risk behaviors. *Journal of Family Psychology*, 19, 571-580.
- Fletcher, Jason M., and David E. Frisvold. "Higher education and health investments: does more schooling affect preventive health care use?." *Journal of human capital* 3.2 (2009): 144.
- Fletcher, Jason, Marsha Mailick, Jieun Song, and Barbara Wolfe. (2013). "A Sibling Death in the Family: Common and Consequential." *Demography* 50(3): 803–826.
- Forbes, Heather, and Sophia F. Dziegielewski. (2003). "Issues Facing Adoptive Mothers of Children with Special Needs." *Journal of Social Work* 3(3): 301–320.
- Gibson, Kyle. (2009). "Differential Parental Investment in Families with Both Adopted and Genetic Children." *Evolution and Human Behavior* 30(3): 184–189.
- Gunnar, Megan, and Seth D. Pollak. (2007). "Supporting Parents So That They Can Support Their Internationally Adopted Children: The Larger Challenge Lurking Behind the Fatality Statistics." *Child Maltreatment* 12(4): 381–382.
- Härkönen, Juho, and Karl Ulrich Mayer. (2008). "Paternal Social Class and Sibling Resemblance and Difference in Educational Attainment in West Germany." Paper presented at the meeting of The Transfer of Resources across Generations: Family Income, Human Capital, and Children's Wellbeing, Vadstena, Sweden, June 9–13.
- Hauser, Robert M., and Carol L. Roan, eds. (2006). "The Class of 1957 in their Mid-60s: A First Look." CDE Working Paper No. 2006-03. University of Wisconsin-Madison, Center for Demography and Ecology: Madison, WI.

- Haveman, Robert H., and Barbara L. Wolfe. "Schooling and economic well-being: The role of nonmarket effects." *Journal of human Resources* (1984): 377-407.
- Jones, Jo. (2009). "Who Adopts? Characteristics of Women and Men Who Have Adopted Children." *NCHS Data Brief*, No. 12. Hyattsville, MD: National Center for Health Statistics.
- Juffer, Femmie, and Marinus H. van Ijzendoorn. (2005). "Behavior Problems and Mental Health Referrals of International Adoptees." *Journal of the American Medical Association* 293(20): 2501–2515.
- Kuo, Hsiang-Hui Daphne, and Robert M. Hauser. (1997). "How Does Size of Sibship Matter? Family Configuration and Family Effects on Educational Attainment." *Social Science Research* 26(1): 69–94.
- Leahy, Alice M. (1933). Some characteristics of adoptive parents. *American Journal of Sociology*, 38(4), 548-563.
- McCormick, Adam. (2010). "Siblings in Foster Care: An Overview of Research, Policy, and Practice." *Journal of Public Child Welfare* 4(2): 198–218.
- Lundborg, Petter. "The health returns to schooling—what can we learn from twins?." *Journal of population economics* 26.2 (2013): 673-701
- McGue, M., & Iacono, W.G. (2009). Siblings and the socialization of adolescent deviance: An adoption study approach. In K. McCartney & R. Weinberg (Eds), *Experience and development: A festschrift to honor Sandra W. Scarr* (pp. 179-201). London, England: Taylor & Francis.
- cGuire, Shirley, and Lilly Shanahan. (2010). "Sibling Experiences in Diverse Family Contexts." *Child Development Perspectives* 4(2): 72–79.
- McHale, S.M., Bissell, J., & Kim, J. (2009). Sibling relationship, family, and genetic factors in sibling similarity in sexual risk. *Journal of Family Psychology*, 23, 562-572.
- Miller, Brent C., Xitao Fan, Mathew Christensen, Harold D. Grotevant, and Manfred van Dulmen. (2000). "Comparisons of Adopted and Nonadopted Adolescents in a Large, Nationally Representative Sample." *Child Development* 71(5): 1458–1473.
- Oreopoulos, Philip, and Kjell G. Salvanes. "Priceless: The nonpecuniary benefits of schooling." *The journal of economic perspectives* (2011): 159-184.
- Pollak, Seth D., Charles A. Nelson, Mary F. Schlaak, Barbara J. Roeber, Sandi S. Wewerka, Kristen L. Wiik, Kristin A. Frenn, Michelle M. Loman, and Megan R. Gunnar (2010). "Neurodevelopmental Effects of Early Deprivation in Post-Institutionalized Children." *Child Development* 81(1): 224–236.
- Poston, Dudley L., Jr., and Ruth M. Cullen. (1989). "Propensity of White Women in the United States to Adopt Children." *Biodemography and Social Biology* 36(3–4): 167–185.
- Rosenzweig, Mark R., and Junsen Zhang. (2009). "Do Population Control Policies Induce More Human Capital Investment? Twins, Birth Weight and China's One-Child Policy." *Review of Economic Studies* 76(3): 1149–1174.
- Samek, D.R., & Rueter, M.A. (2011). Considerations of elder sibling closeness in predicting younger sibling substance use: Social learning versus social bonding explanations. *Journal of Family Psychology*, 25(6), 931-941.

- Slap, Gail, Elizabeth Goodman, and Bin Huang. (2001). "Adoption as a Risk Factor for Attempted Suicide During Adolescence." *Pediatrics* 108(2): e30.
- Spear, Nicole. (2009). "Adopted Children's Outcomes as Young Adults in Regards to Educational Attainment and Income." *The Park Place Economist* XVII: 68–75. Available at: <http://digitalcommons.iwu.edu/parkplace/vol17/iss1/16>
- Spitze, Glenna, and Katherine Trent. (2006). "Gender Differences in Adult Sibling Relations in Two-Child Families." *Journal of Marriage and Family* 68(4): 977–992.
- Udry, J. Richard. (2003). The National Longitudinal Study of Adolescent Health (Add Health), Waves I & II, 1994–1996; Wave III, 2001–2002 [machine-readable data file and documentation]. Chapel Hill, NC: Carolina Population Center, University of North Carolina at Chapel Hill.
- van Ijzendoorn, Marinus H., Femmie Juffer, and Caroline W. Klein Poelhuis. (2005). "Adoption and Cognitive Development: A Meta-Analytic Comparison of Adopted and Nonadopted Children's IQ and School Performance." *Psychological Bulletin* 131(2): 301–316.
- Vandivere, S., Malm, K., Trends, C., & Radcliff, L. (2009). Adoption USA: A chartbook based on the 2007 national survey of adoptive parents. U.S. Department of Health and Human Services.
- Wolfe, Barbara, Jieun Song, Jan S. Greenberg, and Marsha R. Mailick. (2014). "Ripple Effects of Developmental Disabilities and Mental Illness on Nondisabled Adult Siblings." *Journal of Social Science and Medicine* 108: 1-9.

## Tables

**Table 1: WLS Descriptive Statistics**

	Males		Males with Adopted Sibling		Males without Adopted Sibling	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Education (2004)	14.33	2.35	14.46	2.52	14.33	2.34
Adopted sibling	.03	.18	1.00	0.00	0.00	0.00
Number of adopted siblings	.04	.26	1.29	.64	0.00	0.00
Number of adopted brothers	.02	.16	.61	.66	0.00	0.00
Number of adopted sisters	.02	.17	.68	.63	0.00	0.00
Age	37.78	4.49	36.60	4.87	37.82	4.47
Male	1.00	0.00	1.00	0.00	1.00	0.00
Grandparent's Income(1957)	6,125	6,338	6,602	8,661	6,108	6,240
Catholic (1957)	.46	.50	.39	.49	.46	.50
Parent's IQ (1957)	100.78	14.40	103.19	16.32	100.69	14.32
Paternal Education	13.43	2.61	13.93	2.59	13.41	2.60
Maternal Education	12.80	1.62	12.97	2.01	12.79	1.61
Number of Siblings	2.68	1.51	2.91	1.35	2.67	1.51
Family income (10K) (1975)	1.65	1.14	1.70	.90	1.65	1.16
Income ≥ 200% FPL (1975)	.63	.48	.80	.40	.63	.48
Income ≥ 150% FPL (1975)	.78	.41	.92	.28	.78	.42
Income ≥ 250% FPL (1975)	.45	.50	.67	.47	.44	.50
Birth order	2.34	1.31	2.54	1.36	2.33	1.31
All Sisters	0.00	0.00	0.00	0.00	0.00	0.00
All Brothers	.23	.42	.13	.34	.24	.43
Age difference with Adopted/ selected Sibling (months)	3.87	62.10	20.40	96.50	3.28	60.46
Same Gender adopted/selected Sibling	.51	.50	.52	.50	.51	.50
Any Deceased Sibling	.08	.27	.08	.27	.08	.27
Observations	7,314		251		7,063	

	Females		Females with Adopted Sibling		Females without Adopted Sibling	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Education (2004)	14.50	2.23	14.58	2.26	14.49	2.23
Adopted sibling	.03	.16	1.00	0.00	0.00	0.00
Number of adopted siblings	.03	.23	1.32	.64	0.00	0.00
Number of adopted brothers	.02	.16	.81	.63	0.00	0.00
Number of adopted sisters	.01	.13	.51	.62	0.00	0.00
Age	37.96	4.48	36.47	5.20	37.99	4.45
Male	0.00	0.00	0.00	0.00	0.00	0.00

Grandparent's Income (1957)	6,143	6,624	6,461	7,525	6,135	6,599
Catholic (1957)	.46	.50	.34	.48	.46	.50
Parent's IQ (1957)	101.09	14.08	104.12	15.96	101.00	14.02
Paternal Education	13.43	2.60	13.84	2.53	13.41	2.60
Maternal Education	12.78	1.61	13.00	1.92	12.78	1.60
Number of Siblings	2.68	1.46	3.02	1.60	2.67	1.45
Family income (10K) (1975)	1.65	1.13	1.74	.77	1.65	1.14
Income $\geq$ 200% FPL (1975)	.63	.48	.81	.39	.63	.48
Income $\geq$ 150% FPL (1975)	.79	.41	.93	.26	.79	.41
Income $\geq$ 250% FPL (1975)	.44	.50	.72	.45	.43	.50
Birth order	2.31	1.30	2.55	1.36	2.30	1.30
All Sisters	.21	.40	.09	.29	.21	.41
All Brothers	0.00	0.00	0.00	0.00	0.00	0.00
Age difference with Adopted/ selected Sibling (months)	1.25	62.90	32.26	113.70	.46	60.88
Same Gender adopted/selected Sibling	.48	.50	.45	.50	.48	.50
Any Deceased Sibling	.07	.26	.10	.31	.07	.26
Observations		7,042		180		6,862

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**Table 2:** Add Health Descriptive Statistics

Sample	Males with Adopted Sibling		Males without Adopted Sibling	
	Mean	Std Dev	Mean	Std Dev
Variable				
Education	15.00	1.91	14.25	2.02
Adopted Sibling	1.00	0.00	0.00	0.00
Number of Adopted Siblings	1.14	0.35	0.00	0.00
Number of Adopted Brothers	0.39	0.49	0.00	0.00
Number of Adopted Sisters	0.75	0.50	0.00	0.00
Age	16.14	1.96	16.17	1.74
Age	28.97	2.01	29.09	1.76
Male	1.00	0.00	1.00	0.00
Black	0.19	0.40	0.20	0.40
Hispanic	0.19	0.40	0.17	0.38
Other Race	0.06	0.23	0.09	0.28
Birth Order	1.28	0.61	1.84	1.14
Parental Adoption Report Missing	0.28	0.45	0.27	0.45
Respondent Adopted Report Missing	0.17	0.38	0.19	0.39
Catholic	0.29	0.45	0.27	0.44
Paternal Education	14.10	2.17	13.37	2.37
Maternal Education	13.40	2.33	13.32	2.31
Rural Indicator	0.36	0.49	0.24	0.43
Urban Indicator	0.17	0.38	0.34	0.47
Missing Family Information Indicator	0.11	0.32	0.25	0.43
Number of Siblings	2.72	1.75	2.71	2.05
Paternal Age (W1)	44.21	5.42	44.25	5.58
Parental Poor Health Indicator	0.17	0.38	0.09	0.29

Family Income (W1)	57.29	32.53	46.86	37.41
Income > 200% FPL	0.67	0.48	0.72	0.45
Income > 150% FPL	0.81	0.40	0.81	0.39
Income > 250% FPL	0.58	0.50	0.59	0.49
Observations	N=36		N=5144	
Sample	Females with Adopted Sibling		Females without Adopted Sibling	
Variable	Mean	Std.	Mean	Std.
Education	14.47	1.97	14.72	2.04
Adopted Sibling	1.00	0.00	0.00	0.00
Number of Adopted Siblings	1.26	0.64	0.00	0.00
Number of Adopted Brothers	0.66	0.75	0.00	0.00
Number of Adopted Sisters	0.61	0.55	0.00	0.00
Age	15.82	1.47	16.01	1.72
Age	28.60	1.40	28.87	1.74
Male	0.00	0.00	0.00	0.00
Black	0.21	0.41	0.23	0.42
Hispanic	0.05	0.23	0.16	0.37
Other Race	0.05	0.23	0.07	0.26
Birth Order	1.55	0.72	1.80	1.11
Parental Adoption Report Missing	0.32	0.47	0.25	0.43
Respondent Adopted Report Missing	0.11	0.31	0.16	0.36
Catholic	0.24	0.43	0.27	0.44
Paternal Education	13.81	2.36	13.28	2.35
Maternal Education	13.50	2.01	13.22	2.27
Rural Indicator	0.32	0.47	0.25	0.43
Urban Indicator	0.40	0.49	0.35	0.48



Missing Family Information Indicator	0.18	0.39	0.25	0.43
Number of Siblings	3.66	2.75	2.73	2.06
Paternal Age (W1)	45.81	6.28	44.09	5.40
Parental Poor Health Indicator	0.13	0.34	0.12	0.32
Family Income (W1)	63.34	46.20	46.80	42.77
Income > 200% FPL	0.71	0.46	0.71	0.46
Income > 150% FPL	0.89	0.31	0.79	0.40
Income > 250% FPL	0.61	0.50	0.56	0.50
Observations	N=38		N=6196	

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**Table 3:** WLS: Regression Analysis of Predictors of Education (by Gender)

Outcome Sample	Education			Education		
		Male			Female	
Age	-0.021*	-0.022*	-0.021*	-0.058***	-0.058***	-0.058***
	(0.011)	(0.011)	(0.011)	(0.010)	(0.010)	(0.010)
Grandparents' income (1957)	-0.062	-0.063	-0.063	0.019	0.019	0.018
	(0.050)	(0.050)	(0.050)	(0.047)	(0.047)	(0.047)
Family religion (1=Catholic) (1957)	0.276***	0.278***	0.277***	0.130*	0.130*	0.127*
	(0.060)	(0.060)	(0.060)	(0.057)	(0.057)	(0.057)
R grew up area: rural (1957)	-.128+	-.128+	-.128+	.031	.032	.034
	(.068)	(.068)	(.068)	(.064)	(.064)	(.066)
R grew up area: urban (1957)	.062	.060	.060	.073	.073	.074
	(.076)	(.076)	(.076)	(.072)	(.072)	(.072)
R IQ (1957)	0.016***	0.016***	0.016***	0.015***	0.015***	0.015***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Mother's education (1975)	0.217***	0.217***	0.217***	0.222***	0.222***	0.221***
	(0.021)	(0.021)	(0.021)	(0.020)	(0.020)	(0.020)
Father's education (1975)	0.250***	0.250***	0.250***	0.214***	0.213***	0.213***
	(0.016)	(0.016)	(0.016)	(0.013)	(0.013)	(0.013)
R age at 1 <sup>st</sup> marriage	.033*	.032*	.032*	.056***	.056***	.057***

	(.015)	(.015)	(.015)	(.014)	(.014)	(.014)
Time lag between marriage and child birth	.005**	.004**	.004**	.004*	.004*	.004*
	(.002)	(.002)	(.002)	(.002)	(.002)	(.002)
Income $\geq$ 200% FPL (1975)	0.182**	0.167*	0.167*	0.169**	0.166**	0.168**
	(0.068)	(0.069)	(0.069)	(0.064)	(0.064)	(0.064)
Adopted sibling (1=yes)	-0.226	-0.691*	-0.692**	-0.333*	-0.484	-0.500
	(0.160)	(0.272)	(0.272)	(0.166)	(0.317)	(0.316)
Number of siblings	-0.084***	-0.084***	-0.084***	-0.104***	-0.104***	-0.099***
	(0.024)	(0.024)	(0.024)	(0.022)	(0.022)	(0.023)
Age differences with adopted sibling	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Adopted sibling x income $\geq$ 200 FPL		0.654*	0.655*		0.197	0.204
		(0.325)	(0.326)		(0.363)	(0.363)
Deceased sibling (1=yes)			0.003			-0.130
			(0.116)			(0.106)
Same gender with adopted sibling (1=yes)			0.010			-0.072
			(0.054)			(0.053)
Observations	7,237	7,237	7,235	6,958	6,958	6,956
R-squared	0.231	0.232	0.232	0.258	.258	.262

**Note:** R = WLS respondents (i.e., children's parents). FPL = Family Poverty Level. +  $p < .10$ . \*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

**Table 4:** Add Health: Regression Analysis of Predictors of Education (by Gender)

Outcome	Education	Education	Education	Education
Sample	Male	Male	Female	Female
Adopted Sibling	0.602*** (0.193)	-0.127 (0.317)	-0.315 (0.308)	-0.660 (0.553)
Income > 200% FPL	0.440*** (0.070)	0.432*** (0.071)	0.513*** (0.062)	0.510*** (0.063)
Income X Adopted Sibling		1.093** (0.487)		0.486 (0.675)
Age (W4)	-0.021 (0.020)	-0.021 (0.021)	0.015 (0.018)	0.015 (0.018)
Black	-0.248*** (0.090)	-0.246*** (0.090)	-0.002 (0.098)	-0.002 (0.098)
Hispanic	-0.087 (0.094)	-0.086 (0.094)	0.193** (0.093)	0.193** (0.093)
Other Race	0.262 (0.278)	0.264 (0.277)	0.178 (0.214)	0.179 (0.214)
Birth Order	-0.024 (0.024)	-0.025 (0.024)	-0.013 (0.027)	-0.013 (0.027)
Catholic	0.174**	0.174**	0.146*	0.146*

	(0.080)	(0.080)	(0.079)	(0.079)
Paternal Education	0.178***	0.178***	0.165***	0.165***
	(0.016)	(0.016)	(0.015)	(0.015)
Maternal Education	0.137***	0.137***	0.181***	0.181***
	(0.023)	(0.023)	(0.022)	(0.022)
Rural Indicator	-0.139**	-0.141**	-0.141*	-0.141*
	(0.067)	(0.067)	(0.078)	(0.078)
Urban Indicator	-0.094	-0.096	-0.125	-0.126
	(0.109)	(0.109)	(0.084)	(0.084)
Number of Siblings (W4)	-0.070***	-0.070***	-0.100***	-0.100***
	(0.014)	(0.014)	(0.015)	(0.015)
Paternal Age	0.047***	0.046***	0.035***	0.035***
	(0.006)	(0.006)	(0.005)	(0.005)
Observations	5,174	5,174	6,222	6,222
R-squared	0.208	0.208	0.214	0.214

**Notes:** Constant, missing family information indicator not shown.

## **Appendix: Additional Discussion and Analysis of Predictors of Adopted Status**

Our results that point to a relatively limited role for a number of family-level factors that predict having an adopted child is at odds with some of the literature related to adoption. In order to attempt to partially explain this surprising result, we include an expanded set of tables in the that analyze the predictors of adoption in alternative samples in our data. In particular, we note that, since our main analysis focuses on estimating the effects of having an adopted sibling on the biological child's outcomes, it was necessary for us to select an analysis sample *including only families that have at least one biological and one adopted child or two or more biological children and no adopted children*. Our appendix tables (AX, AX2) show greater evidence of relationships between family factors and adoptive status using the full sample of the data rather than our selected sample. For example, table AX shows that in the Add Health sample, family income is three times as predictive of adoptive status in the full sample of families than we find in our select sample of families. Likewise, table AX2 shows that in the WLS data, family income is a strong predictor of adoption status in the full sample but not a predictor in the results of our selected sample. We conclude from these analyses that, while it is intuitive to expect many family factors (such as socioeconomic status) to predict whether a family has an adopted child, these factors do not typically explain adoptive status in the sub-set of families who have at least one biological child (i.e. the samples we use in our main analysis). Therefore, standard concerns of the potential for confounding from family characteristics may indeed be less important in our analysis that focuses on a selected sample of families.

**Table AX1:** Family Factors Related to Presence of Adopted Sibling: Add Health Data

Outcome Sample	Adopted Sibling	Adopted Sibling
	Full	Analysis Sample
Maternal Age at First Birth	0.000 (0.000)	0.000 (0.000)
Maternal Teen Birth Indicator	0.007* (0.004)	0.006** (0.003)
Paternal Age (W1)	0.001*** (0.000)	0.000 (0.000)
Black	-0.000 (0.003)	-0.001 (0.002)
Hispanic	-0.001 (0.003)	-0.001 (0.003)
Other Race	0.004 (0.007)	-0.002 (0.004)
Catholic Indicator (W1)	0.004 (0.003)	0.000 (0.002)
Paternal Education (W1)	0.001 (0.000)	0.001** (0.000)
Maternal Education (W1)	0.001 (0.001)	-0.000 (0.000)
Equivalence Income (W1)	0.003** (0.001)	0.001*** (0.001)
Maternal Poor Health Indicator (W1)	0.003 (0.004)	0.003 (0.004)
Either Parent Alcoholic (W1)	-0.005 (0.003)	-0.005** (0.002)
Rural Indicator (W1)	-0.000 (0.002)	0.004* (0.002)

Urban Indicator (W1)	-0.001 (0.003)	0.001 (0.002)
Sibling Death Indicator	0.003 (0.004)	
Number of Siblings (W4)	0.002*** (0.001)	0.001* (0.001)
All Female Children Indicator	-0.005* (0.003)	0.000 (0.003)
All Male Children Indicator	-0.004* (0.003)	-0.003 (0.002)
NN Indicator	0.003 (0.003)	
Sibling NN Indicator	0.021** (0.011)	
Focal Child Adopted Indicator	0.177*** (0.019)	
Observations	14,815	10,879
R-squared	0.100	0.005

Notes: Missing Family/Mom Teen Birth Indicators and Constant Not Shown.



**Table AX2: Family Factors Related to Presence of Adopted Child: WLS**

	Model 1	Model 2
Age	0.111	0.139
	0.085	0.121
Spouse's age	--	--
	--	--
Gender (1=Mothers)	-0.269*	-0.319+
	0.132	0.195
Family Religion (1=Catholic) (1957)	0.129	0.044
	0.121	0.177
Paternal SEI (1957)	0.003	-0.001
	0.003	0.005
Paternal Education (1957)	-0.020	0.007
	0.020	0.029
Family Income (1957)	0.003	0.094
	0.106	0.152
R grew up with problem drinker	0.051	0.250
	0.153	0.210
R IQ (1957)	0.004	0.001
	0.005	0.007
R grew up area: Rural	0.191	0.217
	0.145	0.205
R grew up area: Urban	0.324*	0.270
	0.148	0.215
R plan for college (1957)	0.045	0.298
	0.171	0.250
R marriage plan influencing future (1957)	-0.373	-0.031

	0.247	0.339
R Occupational aspirational SEI (1957)	-0.001	-0.001
	0.004	0.005
R Education	0.028	-0.001
	0.032	0.047
R family income (1975)	0.100*	0.155*
	0.051	0.078
R age at 1 <sup>st</sup> marriage	0.028*	0.053+
	0.013	0.029
Time between marriage and 1 <sup>st</sup> child birth	.018***	.030***
	.002	.002
Extraversion	-0.024+	-0.019
	0.013	0.019
Agreeableness	0.016	-0.009
	0.017	0.025
Conscientiousness	0.039*	0.039
	0.018	0.025
Neuroticism	-0.012	-0.013
	0.016	0.023
Openness	-0.001	-0.002
	0.016	0.022
Non-adoptive child had NN	-0.099	--
	0.299	--
Non-adoptive child deceased	-0.306	--
	0.253	--
Observations	6,199	4,304
R-squared	0.083	0.151