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ABSTRACT

How Distance to a Non-Residential Parent Relates to Child Outcomes*

A substantial and growing fraction of children across Europe and the US live in single parent households. Law practices are evolving to encourage both parents to maintain contact with their children following parental separation/divorce, driven by the belief that such contact is in the best interest of the child. We test this assumption by using information on the distance between non-residential parents and their children to proxy for contact, and measuring educational, behavioral, and health outcomes for a population sample of children from nonnuclear families in Denmark. Instrumental variables techniques are employed to control for the endogeneity of residence. The results indicate that educational and behavioral outcomes are better for children who live farther away from their non-residential parent, but that distance is not related to health outcomes. Failing to control for endogeneity biases the results in favor of more proximate parents. These findings suggest that policy efforts to keep separated parents geographically closer together for the sake of the children may, in fact, not be advantageous.

JEL Classification: D13, I12, I21, J12, J13

Keywords: child outcomes, parental separation, distance

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1. Introduction

Falling marriage rates and high divorce rates throughout the US and Europe are causing a substantial and growing fraction of children to live in households with only one parent. At the same time there has been a growing tendency to grant joint custody or otherwise ensure that children of divorced parents spend time with each of their parents. This shift away from maternal custody is based on the belief that having contact with each parent is in the child's best interest. In this paper we use detailed data on children in Denmark who live with only one biological parent to examine the relation between parental contact and child educational, behavioral, and health outcomes. Information on the geographical distance between the household where the child resides and the child's non-residential parent's household is employed to proxy for contact. As this distance is likely endogenous, we expand upon the extant literature by presenting instrumental variable results.

Marriage rates in the US have fallen from 10.6 per 1000 population in 1970 to 6.8 in 2009. In the EU-27, marriage rates have declined from 7.9 to 4.5 over the same time period. The ratio of divorces to marriages has been hovering around 50% in the US since 1980. The rate of marital dissolution is at least as high in Germany, France, and the UK and only slightly lower (at about 42%) in the Netherlands, Sweden, and Denmark (U.S. Bureau of Labor Statistics, 2009). Although an increasing fraction of couples are opting to live together without marriage, the dissolution rate of cohabiting relationships is higher still than that of marriages (Bumpass and Sweet 1989). Stable couple relationships are on the decline.

As a result, many children are growing up in divided households. In 2004 about 61% of children in the US were living with both their biological parents, 6.3% were living with their biological mother and a step or adoptive father, 1.6% were living with their

biological father and a step or adoptive mother, and fully 25.7% were living with a single parent (the mother 90% of the time). Though single parents comprise a higher share of all households with children in the US than elsewhere, the fraction of children living with single parents is substantial in many developed countries. In 2001 in households with children, the fraction of single parents was 20.7% in the UK and 18.4% in Denmark (Martin and Kats 2003). Thus, the incidence of children living in divided households is high across Europe and North America.

Furthermore, as the fraction of children living in divided households increases with the age of the children, the probability with which any child will experience a parental divorce or separation is higher than the point estimates suggest. Some evidence indicates that up to 40% of children in the US will experience a parental divorce, 50% will for some period of time reside with a single parent, and 33% will for some period of time live with a step-parent (Amato 2000).

Some of the most important and difficult decisions made during a divorce, during any parental separation, are those concerning child custody. Prior to the 1970's, US courts generally awarded mothers custody of their children. This marked preference for maternal custody was known as the "tender years" standard. A more gender neutral approach known as "the child's best interests" standard became dominant in the 1970's and 1980's (Fox and Kelly 1995). While the most prevalent custody arrangement in the US remains maternal custody and it is difficult to measure the degree of joint custody, there is some evidence that the prevalence of joint or shared custody is on the rise (Cancian and Meyer 1998). Denmark has taken this a step further as legislation effective October 2007 establishes co-parenting as the norm. One purpose of this law was to increase the custody rights of fathers. In 2002-2004, before the legislation was passed, 80% of contested custody cases were resolved by giving custody to the mother (Udvalget om

Forældremyndighed og Samvær, 2006). A critical research question for a policy change such as this is how increased contact with the non-residential parent affects child outcomes. As degree of contact is a choice variable that may itself be related to child outcomes, it is necessary to control for possible endogeneity when addressing this research question. We do so using instrumental variable techniques.

2. Literature Review

There exists a substantial literature in psychology, sociology, and demography, and to a smaller degree in economics, addressing the impact of divorce on children's outcomes (Amato 2000 provides a review of the US-based literature). These studies generally suggest a negative relation between non-nuclear family structure and child outcomes. Much of this literature focuses on the mechanisms driving this negative relation.[1] Our interest, however, is not in comparing nuclear and non-nuclear families but rather in comparing non-nuclear families in which the child has more versus less contact with the non-residential parent. Research addressing this question is considerably less prevalent. Amato (2000) in his review reports that in the US there was little evidence that contact with the non-custodial parent had any impact on child outcomes in the 1970's or 1980's, but that evidence from the 1990's supports a positive relation between contact and child outcomes, such as higher education. He also reports that child outcomes appear better in the case of joint versus sole custody arrangements, but notes that selection could be a

[1] Specifically a common research question is whether divorce mainly happens in negatively selected families (based on child outcomes) or whether there is a negative causal effect of divorce. Some studies conclude that selection is key in determining educational outcomes (for example Bjorklund and Sundstrom 2006; and Bjorklund, Ginther, and Sundstrom 2007). Other studies present evidence more suggestive of causality (Ermisch and Francesconi 2001, Antecol and Bedard 2007). Still others report that both selection and causality play a role (Steele, Sigle-Rushton, and Kravdal 2009, Rasmussen 2009).

serious problem here as divorced parents with joint custody may get along better than other divorced parents.

One issue in the literature is the definition of 'contact'. Some studies use child-reported closeness to the non-residential parent (typically the father). Such studies often find that perceived closeness to step-parents has a greater impact on child outcomes than perceived closeness to non-residential parents (for example White and Gilbreth 2001; King 2006; Yuan and Hamilton 2006). Another metric for 'contact' is shared activities or time. King (2006) reports that children who had contact with their non-residential parent were more likely to feel close to them. Yuan and Hamilton (2006), however, find no significant relation between activities with the non-residential parent and child outcomes. Feelings of closeness are, of course, subject to a number of measurement problems. First, such feelings are typically measured at only one point in time and hence subject to the "window problem" (Wolfe et. al. 1996) that can lead to imprecise results. Second, feelings are also difficult to measure and compare across individuals.

Another strand of the literature distinguishes between children of divorced or separated parents and children experiencing parental death. Contact beyond the grave is clearly not possible. Corak (2001) compares outcomes for children who have experienced a parental death with outcomes for children whose parents divorce. Corak finds that when controls for parental income and labor force attachment are included, the differences between the economic outcomes of children from different family backgrounds (divorced, bereaved, and even nuclear) are not statistically significant. Children with divorced parents are, however, more likely to delay marriage and more likely to experience separation/divorce themselves than are children with deceased parents – suggesting some behavioral differences. What is not clear from this literature is whether the death of a parent should be expected to have a greater impact on children because it means that all

contact with the non-residential parent ceases and such lack of contact is more disruptive or whether parental death should have a lesser impact either because there is less conflict involved or because the extended family continues to play a role in the children's lives.

Physical distance is a more concrete metric. When a relationship ends, at least one partner must typically physically move. Moving further away increases the cost of maintaining physical contact. Cooksey and Craig (1998) confirm a negative relation between physical distance and physical contact, but also report a negative relation between physical distance and telephone contact. As physical distance is a choice, there may be a selection problem with these results; however Cheadle, Amato, and King (2010) find a similar negative relation between changes in distance and changes in the frequency of contact. In the analysis that follows, we use distance from non-residential parent to proxy for contact, controlling for selection concerns with instrumental variables estimation.

The extant literature employs a variety of child outcome measures. Educational outcomes are one of the most common. Much of the literature addressing non-residential parents includes such measures (Amato and Gilbreth 1999; Hofferth 2006; King 2006). Most sociological studies also include a measure of behavior (Amato and Gilbreth 1999; White and Gilbreth 2001; Hofferth 2006; King 2006; Yuan and Hamilton 2006). A few model criminal behavior (Cobb-Clark and Tekin 2011) and health outcomes (Hofferth and Pinzon 2011). We examine educational, behavioral (criminal), and health outcomes.

Theoretically, there are arguments both for and against a relation between child outcomes and distance to a non-residential biological parent. For example, one can argue that a greater distance is likely to be associated with a lower time investment from the non-residential parent and thus worse child outcomes (Becker and Tomes, 1986). On the other hand, longer distance can reduce parental conflicts and minimize stress for children. Children who experience more stability in their daily routines and activities may fare

better (Lamb et al., 1997). Distance to the non-residential parent may also have no association with child outcomes. If the parental relationship dissolves because the match is of poor quality or due to one of the parents having poor parenting abilities then contact with/distance to the non-residential parent may be of no importance (Becker et al., 1977). Finally, the last option is that distance to a non-residential parent has heterogeneous effects depending on the child's and potentially also the parents' characteristics. For example, contact with a non-residential father is potentially more important for boys than for girls if the father acts as a role model for the child. These four hypotheses are discussed in more detail by Kalil et al. (2011).

The most similar work in this field is that by Kalil et al. (2011) who use Norwegian registry data on a five year cohort of children whose parents were married at the time of their birth, but divorced before their thirteenth birthday to compare outcomes for children whose fathers were either always proximate or always distant.[2] They find that children with distant fathers have significantly better educational outcomes, particularly when their fathers are well educated. The effect of paternal distance on employment status, earnings, welfare receipt, and young parental status is not statistically significant, though there does appear to be some positive effect of paternal distance on marital status. Supplemental survey data indicate that highly educated proximate fathers both spend more time with their children and report a higher level of post-divorce conflict. Taken together the authors suggest that children with more educated fathers may experience more stress when their fathers remain close by than when they relocate at a distance and this stress negatively effects their educational outcomes.

[2] Proximate fathers live in the same economic region as their child for more than 90 percent of the years. In Norway, there are 46 economic regions, each with an average population of about 86,000 people.

Our work will extend this literature in a number of ways. First, Kalil et al.'s (2011) results were based on Norwegian data. By using similar data from a neighboring Scandinavian country we test the robustness of these published findings. Second, we do not restrict our analysis to married couples. Kalil et al. (2011) themselves state that it is not clear if their results hold for unmarried couples. This extension is particularly important now in the Scandinavian context because of the high prevalence of cohabitation and premarital childbirth. Third, with our focus on municipalities with an average population of about 20,000 people in 2006 we use smaller geographical units than Kalil et al. (2011). Fourth, we analyze educational outcomes, but we also have information on criminal and health outcomes that were not available to Kalil et al. (2011). Results may differ across measures (Fomby and Cherlin, 2007), so it is important to analyze a variety of child outcome measures to assess the impact of distance to a non-residential parent.

Most importantly, we address the issue of endogeneity. Kalil et al. (2011) recognized the possibility that omitted variables could bias their estimated distance coefficient and addressed this by estimating models with a varying number of covariates in order to assess the robustness of their results. They also recognized the possibility that the non-residential parent may choose his place of residence based on expected child outcome, but they were not able to address this problem empirically. If parents are more likely to move farther away when they believe their child is going to do well, then estimates that do not take into account such endogeneity are likely to find that children whose parents are more distant have better outcomes. If parents move further away when they believe their child is doing poorly in order, perhaps, to distance themselves, then estimates that do not take endogeneity into account are likely to find that children whose parents are more distant have worse outcomes. In order to control for such endogeneity bias, we provide instrumental variables estimates. Our instrumental variable is based on the non-residential

parents' connectivity to the geographic area. A thorough discussion of the strength and validity of the proposed instrument is provided in Section 5.

3. Data

Our empirical estimates are based on an administrative register dataset consisting of the entire population of Danish children born from January to August 1985. About 50,000 children were born per year in Denmark in the mid 1980's. Our initial sample includes 36,495 children born in Denmark of a known biological mother. This sample constitutes about 73% of 50,000 and so closely corresponds to the 75% of the year for which we have data. These individuals are observed annually in the Danish tax and income registers maintained by Statistics Denmark provided they are alive and reside in Denmark. We have these data from 1985 until 2007, when the children turn 22. Each annual record provides detailed information regarding the composition of the family with whom the child resides. Information on the biological parents is also available. We then exclude children who leave the sample prior to age 20, who are not in the sample for at least 14 of their first 18 years, or who do not live with at least one biological parent between the ages of 15 and 17. Some of these exclusions are attributable to childhood or parental deaths, but most are likely attributable to movement abroad. These restrictions yield a sample of 34,511 children.

Throughout this study, family structure changes are defined as *any change in the biological or social parents with whom the child is residing up till age 18.* After this age, the individual is registered as an adult whether or not he/she still lives with a parent. The term '*social parent'* is used to describe any partner of the biological parent with whom the child resides, be he/she the other biological parent or not. Every individual has a unique identifier so all changes in family composition are observed. Married partners are clearly

coded as such, but we do not restrict our analysis of family structure changes to legal changes only.[3] Any observed change in the number or identity of the 'parents' in the household where the child resides from one year to the next is considered a family structure change. Thus, if one partner leaves and a new one appears from one year to the next, that would be recorded as one family structure change. Likewise, if the child moves from one biological parent's household to the other's, a family structure change would be recorded. If one parent moves abroad, possibly for employment reasons, for over a year and then returns, that would constitute two family structure changes, a departure and a return. Note, however, that family structure changes within the household of the non-residential biological parent (a biological parent with whom the child does not live) are not captured. We expect the impact of such changes to be smaller than the impact of changes within the child's own residence. Short term changes in household composition that are not evident as of the dates of the annual registry are also not recorded. Separations of only one year are visible in the data but ignored. In at least some cases, these short term separations appear to be capturing households in the process of moving. Overall our tally of changes is likely to represent a lower bound of the actual number of household changes children experience.

The precise breakdown of family structure changes is reported in Table 1. Using this measure, 61.5% of our cohort grew up in a nuclear family. Roughly 12.5% experience one family structure change, 10.4% two, and 15.6% more than two. In this study, the focus is on the 38.5% of children in the 1985-cohort who experience at least one family structure change. Dropping those children who experience no family structure changes, those who experience a family structure change while abroad (since we do not

[3] Cohabiting persons who share biological children are clearly identified by Statistics Denmark. Other adults are classified as cohabiting couples using standard rules. Under these rules, two adults who reside in the same household, are no more than fifteen years apart in age, and are not in any way related are classified as cohabiting.

know how many they may have experienced), those who ever reside with legally united gay parents, those whose biological father is not identified, those who themselves die prior to 2010 or experience a parental death before they turn 18, and those for whom key covariates (particularly mother's education and distance to the non-residential parent) are missing, yields a sample of 11,059 children. Following Kalil et al. (2011), we also restrict our analysis to children who experience an initial family structure change before the age of 13 and whose parents remain separated for the child's teenage years.[4] This leaves a final estimation sample of 8,182 children.

In recognition that the impact of family structure changes on child outcomes may differ depending upon the type of outcome measure employed, we examine three distinct outcomes measures: one based on education, one on behavior (specifically criminal activity), and one on health. All of these measures derive from register data.

The registers provide information on each child's completed education as of the last year observed. As it is very popular among Danish youth to take a sabbatical year(s) between high school and college, higher educational goals may not be clear when the children are 22 years old. When investigating educational outcomes, we therefore focus on completion of an academically focused high school (referred to as high school completion).

The age of criminal responsibility is 15 in Denmark in the time period we analyze, so we cannot investigate this behavioral outcome before age 15. As criminal behavior likely relates more to one's peers as one ages rather than to one's household characteristics, our measure of criminal activity focuses on behavior prior to age 18.

[4] Parents in our sample reunite in 8% of the cases. This number is in line with the 10% rate at which formal divorces are annulled in Norway (Steele, Sigle-Rushton and Kravdal, 2009).

Health outcomes, specifically hospitalizations, are recorded beginning in 1991 when the children were age 6. To capture health outcomes we construct an indicator for hospitalization. This information is assumed to be zero during periods out of the country. One possible problem with this measure is that many young women are hospitalized for childbirth. Our health outcome measure, therefore, incorporates some behavioral outcomes as well. While childbirth amongst young teens may be of concern, it is less so as women age. Thus we focus on a specification that identifies children who were hospitalized prior to age 18.

The first three rows of Table 2 show mean values for the outcome measures. According to the sample statistics, about 40% of the children have completed academically focused high school by the time they were last observed. This number is lower than that for children in nuclear families (Rasmussen, 2009) but clearly higher than the comparable rate for their parents. Ten percent have been convicted, while 39% have been hospitalized before the age of 18. Both of these numbers are slightly higher than what is observed for children in nuclear families (Rasmussen 2009).

The remainder of Table 2 provides sample statistics for our rich set of control variables. As the data come from the Danish registers, they are substantially complete, however some values are missing and others are imperfectly measured. The sample was restricted to children whose mothers' education was recorded. However, birth weight, father's education, and each parent's labor market income were missing for a small number of cases. In these cases, dummy indicator variables were constructed while data values were set equal to zero for discrete variables and to the remaining sample mean for continuous variables. No variable was missing for more than five percent of the sample. Some of the other variables are imperfectly measured. Annual register data are available to construct the control variables only for those years when the child resided in Denmark.

The sample is restricted to children who lived in Denmark for at least 14 years, so relatively few years of information are missing. Values are averaged over the years observed, rather than over the lifetime.

The key variable of interest is the child's *Average Distance to Non-Residential Parent*. This is measured in kilometers between the child's and the non-residential parent's municipality of residence. Denmark is a relatively small country and in no case can this distance measure exceed 481 kilometers when both parties are living in Denmark. For those years when the non-residential parent is abroad, we set the value to 500. Only about 0.5% of the mothers and 7% of the fathers are ever abroad. Just over 25% of non-residential parents always reside in the same municipality, in which case the average distance is zero. For the sample as a whole, the average distance is just over 40 kilometers.

Our substantial set of covariates includes information specific to the child, specific to the biological parents, and specific to the household in which the child resides. Child-specific variables include indicators for the county of birth, the gender, and the nationality, as well as his/her birth weight and age when last observed. County of birth is included as a common demographic in order to ensure that the distance measure is not driven by outlying geographical areas (means available upon request). Nationality is included to control for family background. This is certainly a rough measure as 99% of the sample is Danish. Gender is an important covariate as child outcomes generally vary by gender – for example boys are more likely to engage in criminal behavior than girls (Cobb-Clark and Tekin 2011) and girls are more likely to obtain higher education than boys (Jacob 2002). Boys make up half our sample. Children who are older when last observed are necessarily more likely to have completed more schooling. While some children in the sample are only observed until age 20, most are observed till age 22. As we use health

and behavioral measures observed at the age of 18, age last observed is not included as a covariate in these models. Finally, average birth weight is 3.35 kilograms or about 7.4 pounds and is included as a rough control for the initial health of the child.

Information on each biological parent includes age, marital status, education, income, and criminal record. Age and education were obtained from the registers in 1983, i.e. 1 to 1.5 years before the child's birth. Marital status was obtained from the 1985 records, and criminal records were obtained from the 1980 to 1984 records, i.e. the 5 year period before the child's birth. Income is calculated as the average of the 1983 and 1984 values or, if one such measure is missing, the non-missing value.[5] Mothers are on average age 26 while fathers average age 30. About 47% were married in 1984 when the child was age zero, reflecting the high rate of cohabitation in Denmark and highlighting the importance of capturing non-marital relationships in the data. Educational attainment is captured using a dummy to identify parents who completed high school. Thirty percent of mothers and 25% of fathers had done so. While the sample is restricted to children whose mother's educational attainment is recorded, approximately five percent of the children are missing information on their father's education. Mothers may be more educated, but fathers have higher pre-birth annual incomes (221K 2011 DKK versus 140K 2011 DKK). This information is missing for only one percent of mothers and four percent of fathers. We hope these pre-birth income measures will control for the potential resources available from the biological parents. Measures of actual household resources are incorporated as information about the household in which the child resides. Information on the criminal record of each biological parent is incorporated as well. This variable may be particularly pertinent as a predictor of child criminal behavior. Six percent of mothers and 30% of fathers had a criminal record in 1980 to 1984, i.e. before the child was born.

[5] All income measures are deflated to 2011-values.

A wide array of variables is available to control for the characteristics of the household in which the child resides. Following Kalil et al. (2011) we distinguish between those characteristics that are determined at or before the first family separation and those determined after. Parental decisions post separation regarding household composition may be driven in part by unobserved factors related to child outcomes, making post-separation measures potentially endogenous. The same argument also holds for location decisions and hence the distance measure. We address these concerns using IV in the next section of the paper. Here we estimate specifications excluding as well as including post-separation measures of family composition.

Two household-related variables that are determined at or before the time of separation are the age of the child at the time of separation and the household characteristics at the time of birth. If having both biological parents present in the household improves child outcomes, we expect age at first separation to have a positive coefficient. There exists a substantial literature (see Price 2008 for a review) indicating that first born children have better outcomes than those who follow. To control for first born children, we include a dummy variable to identify children who are born into households with no older children. This is the case for 54% of our sample.

All our remaining household-related covariates are constructed using annual observations from birth till the child leaves the parental household or age 17. To control for the degree to which household resources must be shared, we include a measure of the fraction of time the focal child is observed to be the only child in the household and the average number of other children in the household. If resources are important, then the more time a child spends without siblings and the fewer siblings he/she has, the better should be that child's outcome. The focal child is the only child on average 37% percent

of the time observed and households are on average rather small with less than one other child present.

We also create measures of the household structure. As more disruptions may be more stressful for the child, we control for the number of family structure changes. Twenty-six percent of these children experience only one family structure change, 26% two, 19% three, and 29% more. We take advantage of the annual nature of our data to construct measures of the fraction of years a child lives with both biological parents, a single mother, a single father, a mother and her partner, a father and his partner, or neither biological parent. The latter case is by construction extremely rare, occurring on average less than 0.3% of the time. On average children are living with both biological parents for 26% of their childhood years. This figure reflects the fact that on average the children are age 4.3 when they experience their first family structure change. On average the children live with their single mother for 41% of their childhood years and with their mother and her partner for 26% of their childhood years. Less than 10% of the time is spent, on average, with their biological father. As these measures are highly correlated with age at first separation, age at first separation is excluded from specifications including these detailed measures.

While the educational values and income of the biological parents are likely to remain important even after a parental breakup, the educational values and income of resident household adults will also play a role (see Yuan and Hamilton 2006 for evidence). Thus, we also construct measures that reflect the education and income of the household's social parents. The social parent is the biological parent when he/she is present and the biological parent's partner when such a partner is present. Conditional upon the presence of such an individual, the probability with which the social mother/father has completed high school is 26%/23%, about four percentage points lower than the comparable values

for the biological parents. In the case of average income for the social parent, the absence of such an individual implies the absence of some resources and so a value of zero is employed when no such individual is in residence. Even though father figures are present less often than mother figures, the average annual income of social fathers remains larger (179K 2011 DKK) than the average annual income of social mothers (170K 2011 DKK). These measures are missing for less than four percent of the sample.

4. Multivariate Analyses

We begin by estimating simple probit models with our three dependent variables. Coefficient estimates for the average distance measure are reported in Table 3 for several specifications. Specification (1) includes controls only for average distance and, in the case of the education measure, a measure of age last observed. Specification (2) adds controls for the child-specific variables, the biological parents' characteristics, the age at first separation, and the indicator for first born children. These constitute all the variables that are determined at or before the parental separation. Specification (3) adds all the remaining controls for household composition as well as the information regarding the social parents' characteristics. The results for education are reported first, followed by the results for criminal behavior, and finally the results for health. Analytic marginal effects are reported in brackets below the standard errors for a child with sample mean characteristics for all continuous measures and sample modal characteristics for the remaining characteristics. It is particularly important to note that this child is a boy who is the first born in his household, lives in Copenhagen, and has parents who did not complete high school, had no criminal convictions between 1980 and 1984, and were not married at the time of his birth. In the case of specification (3) marginal effects are calculated assuming the father moves out and the child thereafter lives with his single mother.

The results from specification (1) indicate that there is a significant positive correlation between average distance from non-residential parent and high school completion. As our comparison group is children whose non-residential parents have always lived in the same municipality, this result matches that found in Kalil et al. (2011). Children whose parents live farther apart are more likely to complete high school, thus more distance is associated with better educational outcomes. The marginal effect is calculated for a one standard deviation or 75 kilometer increase in the distance to the non-residential parent. In the case of specification (1), children whose non-residential parents are on average 75 kilometers away have about a 1.5 percentage point higher probability of completing high school than children whose non-residential parent lives in the same municipality. This significant positive association between distance and education persists in specification (2), though the marginal effect diminishes to about 1 percentage point. While the association remains positive in specification (3), it is not statistically significant. Kalil et al. (2011) in using this same dependent variable with a much larger sample reported significance only at the 10% level, suggesting that our results may be quite similar. As was the case with Kalil et al. (2011), our distance measure has the same marginal effect when we add controls for household structure and social parents, suggesting that our average distance measure is not proxying for other post-separation family characteristics.

Conversely, average distance has a positive association with both criminal behavior and health outcomes in all specifications. Thus, greater distance from a non-residential parent is associated with worse behavioral and health outcomes. Children whose non-residential parent lives on average 75 kilometers away have a 0.4 percentage point higher probability of engaging in criminal activity than children whose non-residential parents live in the same municipality across all specifications. The association with

hospitalizations displays much more variability, but in fact there is little relation between any of the available covariates and hospitalization. The Pseudo-R-squared measure for the health outcome model only reaches about 0.01, as compared to 0.13 in the behavioral and 0.18 in the education models. While the association between distance and behavior/health is consistently positive, it is not statistically significant in any specification.

5. IV Analyses

However, as discussed earlier, if non-residential parents choose a distance in part based on expected child outcomes, these results will be biased. We employ instrumental variables estimates in order to correct for this possible bias. The instrumental variable we employ is information on the distance between the child and the municipality where the non-residential parent last completed education. Distance to the school where the non-residential parent last completed education is likely linked to residential location in a number of ways. For example, individuals are likely to have fairly close ties to the area where they obtained their education. Absent family ties, individuals leaving a relationship may be more likely to seek a job and other opportunities where they have some prior experience, where they feel more comfortable. Alternatively, individuals whose family residence is usually far from their place of schooling may be individuals who are more likely to move on average than others. In neither case is distance to school last completed likely to be correlated with child outcomes directly. Thus, this instrument is likely to itself be exogenous. We assume such in the analysis that follows.

To be a good instrument, distance to school must also be partially correlated with average distance to non-residential parent. A regression of average distance to non-residential parent against all the covariates and distance to school indicates that this

instrument has substantial power. T-statistics for the coefficient to distance to non-residential parent always exceed 15 in value.

MLE IV estimates of the effect of distance to non-residential parent on child outcomes are presented in Table 4. As the additional covariates in specification (3) are likely to also be endogenous, we focus on specification (2). The results are substantially different by outcome. In the case of education, IV estimates yield positive marginal effects about seven times as large as those reported in Table 3. A child whose absent parent resides on average 75 kilometers away has a seven percentage point higher predicted probability of completing high school as compared with a child whose non-residential parent lives in the same municipality. This effect is furthermore statistically significant at the 1% level. Failing to take into account the possible endogeneity of distance understates the positive relation between distance to non-residential parent and child educational outcomes. A standard Wald test for exogeneity of the distance to non-residential parent variable soundly rejects the null, indicating that the IV approach is warranted.

In the case of our behavioral outcome, having been convicted of a crime before the age of 18, the IV estimates for distance to non-residential parent reverse in sign and become statistically significant. These results indicate that having a more distant non-residential parent reduces criminal convictions. Children whose absent parent lives on average 75 kilometers away are about eight percentage points less likely to have a criminal conviction before the age of 18 than children whose absent parent lives in the same municipality. The test for exogeneity on this model also soundly rejects the null. Failing to control for endogeneity leads to a substantial positive bias in the impact of distance upon criminal convictions.

In the case of our health outcome, having been hospitalized before the age of 18, the IV estimates also change sign, becoming negative. Again this suggests that failing to control for endogeneity leads to a positive bias in the impact of distance upon health outcomes, however the coefficient to distance is not statistically significant and one cannot reject the hypothesis that distance is exogenous to health outcomes. As before, health outcomes do not appear to be related to distance to non-residential parent.

Parameter results for the other covariates are reported in Table 5. Child-specific characteristics reveal results not dissimilar from those reported elsewhere. Boys are significantly and substantially (almost 20 percentage points) less likely to complete high school, more likely to be convicted of a crime (six percentage points), and more likely to be hospitalized (six percentage points) than are girls. Being Danish has no statistically significant association with any outcome. Children who weigh more at birth have better education and health outcomes.

An analysis of the relation between parental characteristics and child outcomes also supports previous literature. Children with older mothers have significantly better education and behavioral outcomes, but no significant difference in health outcomes. Children with older fathers have at least marginally significantly better education outcomes. Children whose mothers are more educated are substantially and significantly more likely to have better educational (18 percentage points) and behavioral outcomes (four percentage points). More educated fathers are associated with better education outcomes, as well, having a marginal effect of about 14 percentage points. Children whose parents earn more likewise have better educational outcomes, while those with higher earning fathers are also less likely to be convicted. Having parents with criminal records is associated with worse outcomes, significant particularly for behavioral outcomes.

As has been observed elsewhere, first born children have significantly better education and behavioral outcomes. Adding a dummy variable to identify multiple births (twins/triplets) does not improve the fit. Children whose parents separate later also appear to have significantly better outcomes in all dimensions, supporting the positive association between nuclear families and child outcomes.

One measure not incorporated in the study by Kalil et al. (2011) is an indicator of parental marital status. Only children whose parents were married at the time of the child's birth were included in the Kalil et al. study. As they focus on Norwegian children born between 1975 and 1979 inclusive, this restriction excludes only ten percent of births and allows use of the legal divorce date to identify the time of separation. Such a restriction is not advised for more recent cohorts. For this sample of Danish children born about a decade later in 1985, only 47% of the biological parents were married at the time the child was born and only 57% were ever married during the child's lifetime. Excluding non-marital births would impose a serious constraint upon the sample. Including non-marital births allows us to observe the relation between parental marital status and child outcomes. In all cases, children with married parents have better outcomes, significantly better in terms of education. These results are robust to alternative measures of parental marital status such as ever married or married at age two. Those whose parents were married at age two also have a significantly lower probability of being convicted as a child.

6. Sensitivity analyses

A number of sensitivity tests were performed on the IV specification. First, we constructed an alternative measure of the education outcome using years of education completed or begun. Results were substantially similar to those using our binary measure

of high school completion. Second, we added a quadratic measure of distance to each specification. The linear measures of distance in the educational and behavioral outcome models keep the same sign, while the quadratic terms indicate a diminishing effect. However, the quadratic terms were in no case statistically significant at even the 15% level. Our results are also robust to use of a dummy variable to identify non-residential parents with an average distance of over 30 kilometers (just over 30% of the sample) rather than our linear measure.

We also re-estimated the model with a variety of subsamples in order to check the robustness of our results. Coefficients to the average distance measure from these alternative models are presented in Table 6.

Out of concern that our results might be driven primarily by parents who move abroad, we re-estimated our models excluding the sample of non-Danish children. Over 25% of children who are not Danish had a father living abroad at some point, compared to just over 6% of Danish children. Very few mothers ever live abroad, but again, the probability is more than five times as great for non-Danish children. The first estimates in Table 6 show that our results are robust to this sample selection criterion. Even the marginal effects of distance (not reported here) are comparable. From this we conclude that movement abroad alone does not explain our results.

We also estimate our models separately by child gender. This analysis is important for two reasons. First, it is clear from our results that gender has a highly significant association with child outcomes. It would be important to know if this association varies by distance to the non-residential parent. Second, as the majority of children live with their mother, it is possible that distance may matter differently for boys and girls. Fathers may provide a stronger role model for boys than for girls, hence enhancing the importance of distance for boys as compared to girls. The results indicate that the direction of the

effect is the same by gender for educational and behavioral outcomes, but in these smaller samples, the effect of distance is only significant in the case of education for boys and in the case of criminal behavior for girls. Further testing (not reported here) indicates that there is no significant difference in the coefficient to distance by gender in the education model, but that the difference is significant at conventional levels in the case of criminal behavior. It would appear that for boys having a father who lives closer is not as negatively associated with behavioral outcomes as is the case for girls. The effect of distance on health outcomes is not statistically significant for either boys or girls.

Kalil et al. (2011) find evidence that the positive association between child outcomes and distance to non-residential parent is strongest for children with more educated fathers. We split our sample by father's education to see if we could replicate these results. We could not. Our results indicate that the association is most significant for the sample of children with less not more educated fathers. Having noted this, however, it is also true that we find no statistically significant difference in the effect of distance between these two samples. This difference may constitute a difference between Norway and Denmark.

Finally, as noted above, Kalil et al.'s (2011) results were restricted to married couples. When we split our sample between married and cohabiting couples we find the association between educational outcomes and distance to the non-residential parent is not statistically significant for children whose parents were cohabiting in their first year. The association between criminal convictions and distance to the non-residential parent is, however, statistically significant for both samples and in no case is it possible to say there is a significant difference between the married and the cohabiting samples in the associations.

Overall, therefore, we find some evidence of a differential effect by child gender as well as weak evidence that the association is strongest for children with less educated fathers and children with married parents. Our instrument has substantial power in all these subsamples and tests of the exogeneity of distance generally reject the null in those cases where the coefficient estimates are statistically significant.

7. Conclusion

There is an increasing trend to encourage both parents to maintain contact with their children following parental separation and divorce. The driving force behind this trend is the belief that such contact is in the best interest of the child. We use information on the distance between the child and the non-residential parent in order to proxy for contact as we analyze educational, health, and behavioral outcomes for a cohort of children from nonnuclear families in Denmark.

Similar to Kalil et. al. (2011), but contrary to popular belief, we find no evidence that children who live a greater distance from their non-residential parent experience worse outcomes. Indeed our simple results, like Kalil et al.'s, suggest that educational outcomes are better for children who live farther away from their non-residential parent. After replicating the basic results found by Kalil et al. (2011), we take the analysis one step further by recognizing distance to the non-residential parent is a decision variable that may be related and hence is endogenous to child outcomes. Our instrument consists of a measure of the average distance between the child and the municipality where the absent parent last completed some education. This instrument is predicated on the belief that people tend to gravitate towards localities where they have more roots, but may also distinguish between individuals who tend to move and those who do not. We find this instrument has substantial power and that we can reject the hypothesis that distance is

exogenously determined for both educational and behavioral child outcomes. Our IV results indicate that failure to control for endogeneity leads to a downward bias in estimates of the relation between distance and outcomes. IV increases the magnitude of the positive association between distance and child educational outcomes more than sevenfold and changes the sign of the association between distance and both our behavioral and health outcome measures. While greater distance appeared to yield worse behavioral and health outcomes (though not significantly worse) in non-IV estimates, correcting for endogeneity reverses this relation, significantly so in the case of criminal behavior. Children with more distant non-residential parents have better outcomes.

Sensitivity analysis indicates that our results are quite robust. We find weak evidence that having a more distant parent is more strongly associated with better educational outcomes for boys rather than girls, while the association with behavioral outcomes is stronger for girls than for boys. Kalil et al. (2011) find evidence that this relation may be restricted to children with more educated fathers and may be a consequence of greater conflict between the parents that is mitigated by greater distance. Our results differ modestly as we find that the positive association between distance and outcomes is more significant for children with less educated fathers. This difference is not, however, statistically significant. Our results also suggest that the association between distance and child outcomes may be strongest for married parents. In summary, our results show that policy efforts to keep separated parents geographically closer together for the sake of the children may, in fact, not be advantageous.

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Table 1
Distribution of Family Structure Changes

Number of Changes	Number of Children	Frequency
0	21,235	61.53
1	4,304	12.47
2	3,597	10.42
3	2,181	6.32
4	1,516	4.39
5	828	2.40
6	442	1.28
7	223	0.65
8+	185	0.52

Based on a sample of 34,511 Danish children born January-August 1985.

Table 2
Sample Statistics

Variable	Mean	Std. Dev.
Dependent Variables		
Completed High School	0.40	0.49
Ever Convicted before age 18	0.10	0.30
Ever Hospitalized before age 18	0.39	0.49
Distance Measures		
Average Distance to Non-Residential Parent (km)	40.62	74.98
Always lives in same municipality	0.26	0.44
Mother ever lived abroad	0.01	0.07
Father ever lived abroad	0.07	0.25
Child-Specific Measures		
Male	0.50	0.50
Danish Origin	0.99	0.11
Weight at Birth (kilograms)	3.35	0.56
Missing Birth Weight	0.01	0.08

Age Last Observed	21.96	0.24
Biological Parent's Characteristics		
Mother's Age at Birth	26.47	4.76
Father's Age at Birth	29.62	5.77
Parents Married When Child is Age 0	0.47	0.50
Mother Completed High School	0.30	0.46
Father Completed High School	0.25	0.43
Missing Father's Education	0.05	0.22
Mother's Average Income 1983 & 84 (/1000 DKK)[a]	139.52	101.04
Father's Average Income 1983 & 84 (/1000 DKK)[a]	221.12	137.21
Mother's Income Missing	0.01	0.09
Father's Income Missing	0.04	0.20
Mother has a Criminal Record in 1980 to 1984	0.06	0.24
Father has a Criminal Record in 1980 to 1984	0.30	0.46
Household Characteristics		
Only Child at Birth	0.54	0.50
Age at First Separation	4.33	3.57
Fraction of Time is Only Child	0.37	0.32
Average Number of Siblings	0.88	0.62
One Family Structure Change	0.26	0.44
Two Family Structure Changes	0.26	0.44
Three Family Structure Changes	0.19	0.39
Four+ Family Structure Changes	0.29	0.45
Percent of Time Living with Both Parents	0.26	0.20
Percent of Time Living with Single Mother	0.41	0.29
Percent of Time Living with Mother & Partner	0.26	0.27
Percent of Time Living with Single Father	0.05	0.14
Percent of Time Living with Father & Partner	0.03	0.11
Percent of Time Living with Neither Biological Parent	0.00	0.02
Parents Reunited after First Separation	0.08	0.28
Social Parents' Characteristics		
Social Mother Completed High School	0.26	0.42
Social Father Completed High School	0.23	0.38
Average Income of Female Partner (/1,000 DKK)[a]	170.20	110.90
Average Income of Male Partner (/1,000 DKK)[a]	178.63	128.92
Missing Mother’s Labor Market Information	0.00	0.02
Missing Father’s Labor Market Information	0.04	0.19
Number of Observations	8182	

a: All income measures are deflated to 2011-values.

Table 3
Probit Models of Child Outcomes
Distance to Non-Residential Parent

	Specification (1)		Specification (2)		Specification (3)
Completed High School	Coefficient Estimate		Coefficient Estimate		Coefficient Estimate
Average Distance (1000 km)	0.5057	***	0.4238	*	0.3587
	(0.1862)		(0.2490)		(0.2530)
	[0.0146]		[0.0094]		[0.0096]
Pseudo R2	0.0010		0.1581		0.1822
Log pseudolikelihood	-5492.65		-4629.07		-4494.98
Ever Convicted before age 18	Coefficient Estimate		Coefficient Estimate		Coefficient Estimate
Average Distance (1000 km)	0.2980		0.2116		0.2424
	(0.2444)		(0.3281)		(0.3296)
	[0.0040]		[0.0041]		[0.0042]
Pseudo R2	0.0003		0.1201		0.1332
Log pseudolikelihood	-2715.31		-2389.87		-2354.36

Ever Hospitalized before age 18	Coefficient Estimate	Coefficient Estimate	Coefficient Estimate
Average Distance (1000 km)	0.0865	0.2316	0.1993
	(0.1864)	(0.2316)	(0.2329)
	[0.0025]	[0.0069]	[0.0059]
Pseudo R2	0.0000	0.0093	0.0128
Log pseudolikelihood	-5477.37	-5426.34	-5407.27

Standard errors are reported in parenthesis.
Marginal effects for a one standard deviation increase in average distance are reported in brackets.
Asterisks indicate the level of statistical significance for a two-sided test: *** 1%, ** 5%, * 10%.

Table 4
IV Probit Models of Child Outcomes
Distance to Non-Residential Parent

	Coefficient Estimate	
Completed High School		
Average Distance (1000 km)	2.9828	***
	(1.0890)	
	[0.0688]	
P-Value for Wald Test of Exogeneity	0.0174	
Ever Convicted before age 18		
Average Distance (1000 km)	-4.1739	***
	(1.4347)	
	[-0.0781]	
P-Value for Wald Test of Exogeneity	0.0032	
Ever Hospitalized before age 18		
Average Distance (1000 km)	-0.2163	
	(1.0482)	
	[-0.0064]	
P-Value for Wald Test of Exogeneity	0.6610	

Results are for specification (2).
Standard errors are reported in parenthesis below the coefficient estimates. Marginal effects for a one standard deviation increase in average distance are reported in brackets.
Asterisks indicate the level of statistical significance for a two-sided test: *** 1%, ** 5%, * 10%.

Table 5
IV Probit Models of Child Outcomes
Specification (2)

	Completed High School		Ever Convicted Before Age 18		Ever Hospitalized Before Age 18	
Male	-0.5112	***	0.9165	***	0.1674	***
	(0.0307)		(0.0511)		(0.0285)	
	[-0.1995]		[0.0618]		[0.0638]	
Danish Origin	-0.2458		-0.0605		-0.2109	
	(0.1535)		(0.1892)		(0.1371)	
	[-0.0876]		[-0.0160]		[-0.0839]	
Weight at Birth (kilograms)	0.0860	***	0.0534		-0.0827	***
	(0.0276)		(0.0353)		(0.0260)	
	[0.0264]		[0.0133]		[-0.0327]	
Mother's Age at Birth	0.0222	***	-0.0183	***	-0.0051	
	(0.0046)		(0.0065)		(0.0044)	
	[0.0068]		[-0.0046]		[-0.0020]	
Father's Age at Birth	0.0064	*	0.0046		-0.0015	
	(0.0035)		(0.0044)		(0.0032)	
	[0.0020]		[0.0011]		[-0.0006]	
Parents Married When Child is Age 0	0.0855	**	-0.0692		-0.0261	
	(0.0334)		(0.0446)		(0.0316)	
	[0.0263]		[-0.0173]		[-0.0103]	
Mother Completed High School	0.6000	***	-0.1419	***	0.0124	
	(0.0358)		(0.0502)		(0.0341)	
	[0.1845]		[-0.0354]		[0.0049]	
Father Completed High School	0.4531	***	-0.0120		0.0287	
	(0.0379)		(0.0522)		(0.0362)	
	[0.1394]		[-0.0030]		[0.0114]	
Mother's Income pre-birth (/1,000 2011 DKK)	0.0010	***	0.0000		0.0001	
	(0.0002)		(0.0002)		(0.0002)	
	[0.0316]		[0.0012]		[0.0028]	
Father's Income pre-birth (/1,000 2011 DKK)	0.0007	***	-0.0003	**	0.0002	
	(0.0001)		(0.0002)		(0.0001)	
	[0.0291]		[-0.0113]		[0.0083]	
Mother has a Criminal Record (1980-84)	-0.1004		0.1439	*	0.0506	
	(0.0653)		(0.0764)		(0.0590)	
	[-0.0309]		[0.0359]		[0.0200]	
Father has a Criminal Record (1980-84)	-0.2116	***	0.2482	***	0.0437	
	(0.0350)		(0.0435)		(0.0326)	
	[-0.0651]		[0.0619]		[0.0173]	

Only Child at Birth	0.2670	***	-0.1570	***	0.0179		
	(0.0354)		(0.0461)		(0.0329)		
	[0.0654]		[-0.0450]		[0.0071]		
Age at First Separation	0.0163	***	-0.0229	***	-0.0091	*	
	(0.0052)		(0.0070)		(0.0050)		
	[0.0050]		[-0.0057]		[-0.0036]		
Number of Observations	8182		8182		8182		

Standard errors are reported in parenthesis.
Marginal effects are reported in brackets. In the case of the income variables the calculations are for a one standard deviation increase in value. In all other cases, the calculations are for a one unit increase.
Asterisks indicate the level of statistical significance for a two-sided test: *** 1%, ** 5%, * 10%.
Also included in the specification are 13 region dummies; dummy variables to identify those missing birth weight, missing information on biological fathers, and missing information on parental income; a constant term; and the average distance to non-residential parent. The coefficients to the missing information dummies are not statistically significant.
The education model also includes a measure of age last observed.

Table 6

Additional IV Probit Models of Child Outcomes
Sensitivity Testing of Effect of Distance to Non-Residential Parent

	Completed High School		Ever Convicted		Ever Hospitalized
	Coefficient Estimate		Coefficient Estimate		Coefficient Estimate
Danes Only					
(N = 8085)	0.0030	***	-0.0042	***	-0.0003
	(0.0011)		(0.0014)		(0.0011)
Boys					
(N = 4126)	0.0041	***	-0.0023		0.0014
	(0.0014)		(0.0017)		(0.0014)
Girls					
(N = 4056)	0.0017		-0.0103	***	-0.0022
	(0.0017)		(0.0021)		(0.0016)
Fathers have High School Education					
(N = 2072)	0.0028		-0.0032		-0.0023
	(0.0022)		(0.0031)		(0.0021)
Fathers do Not have High School Education					
(N = 5682)	0.0029	**	-0.0046	***	0.0005
	(0.0014)		(0.0017)		(0.0013)
Parents Married					
(N = 3813)	0.0043	***	-0.0039	*	-0.0009
	(0.0016)		(0.0023)		(0.0017)
Parents Cohabiting					
(N = 4369)	0.0018		-0.0043	**	0.0003
	(0.0015)		(0.0018)		(0.0014)

Results are for specification (2).
Standard errors are reported in parenthesis below the coefficient estimates.
Asterisks indicate the level of statistical significance for a two-sided test: *** 1%, ** 5%, * 10%.