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**DOES PLACING CHILDREN IN FOSTER CARE INCREASE THEIR  
ADULT CRIMINALITY?**

**by**

**Matthew J. Lindquist and Torsten Santavirta**

# Does Placing Children in Foster Care Increase Their Adult Criminality?<sup>†</sup>

Matthew J. Lindquist\*  
SOFI, Stockholm University

Torsten Santavirta\*\*  
SOFI, Stockholm University

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## *Abstract*

We evaluate the association between foster care placement during childhood and adult criminality. In contrast to previous studies, we allow associations to vary by gender and age at initial placement. We find that foster care is negatively associated with adult criminality of males first placed during adolescence (age 13-18). Under relatively lax assumptions concerning selection on unobservables, the causal effect of foster care on adult crime for this subgroup can be bounded away from zero. We find no effect for boys who were placed in foster care before age 13 and no effect on the adult criminality of girls. These zero findings stand in stark contrast to the poor outcomes reported in earlier work concerning the long-run effects of foster care.

JEL: H75, I38, J13, K42

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\* Swedish Institute for Social Research, Stockholm University, 106 91 Stockholm, Sweden, +46-(0)8-163831, Matthew.Lindquist@sofi.su.se.

\*\* Swedish Institute for Social Research, Stockholm University, 106 91 Stockholm, Sweden, +46-(0)8-162647, Torsten.Santavirta@sofi.su.se.

## **Introduction**

Does how we raise our children affect their wellbeing? Do home environments and parental fostering have *causal* impacts on the outcomes of children later in life? Social scientists all over the world work with these questions every day in hopes of increasing our understanding of the mechanisms underlying important social issues such as poverty, crime and social mobility. Rapid changes in the structure of families and in parental work patterns continue to fuel our interest in these questions, since they have fundamentally changed the home environments and parenting strategies experienced by many children.

At the same time, public awareness and concern with issues of child abuse and neglect has risen dramatically. In the U.S., for example, the number of reports made to the child protection authorities (CPAs) tripled between 1976 and 1992 (Albert and Barth 1996). Today, over 2 million children in the U.S. are the subject of CPA investigations each year and approximately 800,000 children spend some time in foster care in any given year (Doyle 2008). In Sweden, nearly 1 percent of all boys and 0.8 percent of all girls aged 13 to 17 spent some time in government care during 2009 (Socialstyrelsen 2010).

Thus, in many Western countries, the state has taken on a new role as a provider of child protection and child fostering services; a role that is quite different in nature to its role as a provider of public education or other services aimed directly at children. Unfortunately, the empirical evaluation literature has not kept pace with this new development and in many instances does not provide us with credible empirical evidence concerning the causal impact of placement in out-of-home care on children's wellbeing and future outcomes. Important exceptions include studies by Doyle (2007, 2008) and Warburton et al. (forthcoming).

The aim of our paper is to evaluate the association between foster care and adult criminality and to explore differences in this association across subgroups of children using data from the Stockholm Birth Cohort Study (SBC). The SBC data include information on all

individuals born in 1953 who were residing in the greater Stockholm metropolitan area in 1963. The SBC contains a rich set of variables concerning individual, family, social and neighborhood characteristics for more than 15,000 individuals. Furthermore, the case files kept by the local social welfare authorities and child welfare committees for each cohort member were manually coded and that information is included in the SBC data. Thus, all cohort members who came in contact with the child welfare committees are identified and much of the information concerning their cases is known. Administrative crime records from the official police registry are also linked to the SBC data.

Many of the existing evaluations of placing children in foster care have looked at effects on juvenile delinquency or adult criminality (Vinnerljung et al. 2006; Doyle 2007, 2008; Vinnerljung and Sallnäs 2008, Frederiksen 2012; Warburton et al., forthcoming). This choice of outcome variable is motivated by the fact that out-of-home care is especially common among children with high risks for future criminal activity. For the U.S., Doyle (2008) reports that nearly 20 percent of the prison population under age 30, and 25 percent of these prisoners with prior convictions, spent part of their youth in foster care. Doyle (2007) also finds higher rates of juvenile delinquency among foster children. For Canada, Warburton et al. (forthcoming) report that the average incarceration rate (at age 19) is more than twice as high for those placed in foster care than for those who were not placed in foster care. For Sweden, Vinnerljung et al. (2006) and Vinnerljung and Sallnäs (2008) report that children placed in out-of-home care were more likely to be convicted of at least one crime between the ages of 21 and 25 than comparable groups that had not been placed in care and in comparison to the population as a whole.

Doyle (2008) is the most convincing study of the effects of foster care on adult criminality. He studies the effects of placing abused or neglected children in foster care in the U.S. (Illinois) on adult crime (until age 31). He takes advantage of the random assignment of

case workers (investigators) to cases and constructs an investigator fixed effect (similar to Kling's (2006) judge fixed effect), which is used as instrument for placement in foster care. This instrument allows him to estimate the treatment effect for the children at the margin of being placed and to give a causal interpretation to the obtained estimate. He finds that "children on the margin of placement are found to be two to three times more likely to enter the criminal justice system as adults if they were placed in foster care" (Doyle, 2008, p. 746). He also describes the type of children that were on the margin of placement in order to say something about what types of cases these results are most likely to apply to. These cases turn out to be those involving African Americans, girls and young adolescents.<sup>1</sup>

Our empirical strategy does not make use of exogenous variation in the placement decision and thus does not lend itself to estimating marginal treatment effects of the kind that Doyle (2007, 2008) is able to identify using an instrumental variable approach. Instead, we are confined to conditional means comparison of adult criminality between children who were placed in foster care and the children who were never removed from their families conditioning on a rich set of family background covariates after first defining a credible control group (those investigated during the same period but not placed). Under strong assumptions, our OLS estimate identify the average treatment effect on the treated (ATT). But rather than claiming that we are identifying a causal effect, we present a range of point estimates that plausibly bound this effect.

We contribute in at least two ways to the existing literature evaluating long-term consequences of foster care. First, unlike previous studies, our data comprises placements made over the whole age range, ages 0-18, making it particularly suited for comparing associations across different age groups. Second, distinction is made between those who are

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<sup>1</sup> In a companion study, Doyle (2007) uses the randomization of families to child protection investigators to estimate the causal effects of foster care on child outcomes such as juvenile delinquency, teenage motherhood, employment and earnings. His results suggest that children on the margin of placement, especially those who are above age 9 by the time of the removal investigation, tend to have better outcomes when they remain at home.

placed due to parental behavior (e.g., death, neglect, mental illness or abuse) and those who are placed on the grounds of their own behavior (e.g., delinquency, substance abuse or mental illness). Earlier descriptive work (e.g., Vinnerljung and Sallnäs 2008) has shown this to be an important distinction.

We find that men who were placed in foster care as children are 10 percentage points (23 percent) more likely to be convicted of a crime as adults than their investigated, but never-placed, counterparts. For females the point estimates are not statistically different from zero. Our subsample regressions clearly show that it is boys who are placed in foster care during adolescence (age 13-18) that account for the negative association between placement in foster care and adult criminality. For this subgroup, the placed children are on average 25 percentage points (55 percent) more likely to commit at least one crime as an adult. Under relatively lax assumptions concerning selection on unobservables, the causal effect of foster care on adult crime for this subgroup can be bounded away from zero. A null relationship is found for boys placed at earlier ages and for girls placed at any age, which is good news given the generally poor outcomes one reads about in the literature on foster care.

When analyzing subgroups by reason for placement, we find a large and statistically significant negative association for adolescent boys placed due to *own* anti-social behavior, whereas those adolescent boys placed due to parental behavior had substantially *lower* likelihoods of being convicted of crime as compared to their investigated, but not removed, counterparts.

The remainder of this paper proceeds as follows. In the next section, we present the SBC data and provide descriptive statistics. Our baseline regression results are reported in Section 3. Section 4 addresses the issue of omitted variable bias and performs a sensitivity analysis based on the approach outlined in Altonji et al. (2005). This approach is designed to gauge the degree to which estimates based on non-experimental data are sensitive to selection

on unobservables. As an additional strategy to detect omitted variable bias we, run a falsification test where adult height is used as a placebo outcome. We conclude with a brief summary of our main findings and a discussion of the limitations of our study in Section 5. We also discuss possible mechanisms through which placement in foster care might affect adult criminality.

## 2. Data

We use the Stockholm Birth Cohort Study (SBC) as a sampling frame for the dataset used in this study. The SBC consists of all 15,117 children (7,719 men and 7,398 women) born in 1953 who were living in the Stockholm metropolitan area as of November 1, 1963. It contains a rich set of variables concerning individual, family, social and neighborhood characteristics.<sup>2</sup>

All 3,290 children belonging to the SBC that have come in contact with one of the child welfare committees (CWC) are identified by comparing the CWC files stored in the social registry of the local social welfare office within the Stockholm greater metropolitan area.<sup>3</sup> The CWCs are responsible for the placement of children in foster homes and residential care. To be included in our CWC sample, a child's family must have received a formal decision from the CWC concerning the child. That is, the family must have been the focus of an investigation by the CWC which resulted in a formal decision.<sup>4</sup>

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<sup>2</sup> For a complete description of the SBC data see Stenberg and Vågerö (2006) and Stenberg et al. (2007). These data are well documented and are freely available to all researchers. Application forms and codebooks can be found at <http://www.stockholmbirthcohort.su.se/>.

<sup>3</sup> Each municipality in Sweden maintains its own social registry which is comprised of dossiers for individuals that have for some reason or another received help from the local social services. Reasons for receiving help vary greatly and include aide to disabled persons, adoption records, receipt of widows' pensions, social assistance, etc. These dossiers also include information concerning CWC cases. Registries outside of the Stockholm metropolitan area were not searched. This means that cohort members cannot appear in the register until they have moved into the area and that they disappear from this register once they leave the municipality. Of the 15,117 cohort members, 1,373 boys and 1,353 girls (i.e., 18 percent of the birth cohort) were not born in the area, but rather moved into the area some time before November 1, 1963. Also, by November 1, 1970, 503 boys and 444 girls (i.e., 6 percent of the birth cohort) had left the area. For these individuals, data from the social register are (potentially) censored.

<sup>4</sup> Many investigations were initiated by the CWC in response to suspected maltreatment or to the child's own delinquent behavior. Others were initiated on a routine basis after one of the parents died, was incarcerated, suffered from a severe mental illness, or if the family was placed on welfare. As such, not all children who were

The CWC cases identified from the social registry include information concerning all cohort members from birth up until age 19 for whom a decision was taken. The data tell us if a cohort member has spent time in a foster home or in residential care and also how much time they have spent in these out-of-home placements. The data include information on multiple placements over the life-course. They also include the types and number of decisions made concerning each child. Types of decisions include: (i) no warning or action, (ii) warnings to the parents, (iii) in-home assistance to the family, (iv) further supervision/monitoring of the family situation, and (v) out-of-home placement.

Placement in foster care may be due to the fact that the child's parents were deemed unfit, the child was orphaned or abandoned, or the child was found to be in need of special care. From age 7 to 19, these decisions are also categorized as to whether or not they were made in direct response to the parental behavior or to the child's own behavior. Those placed in foster homes due to their own behavior suffered many times from substance abuse or severe delinquency. The children who received the other type of out-of-home treatment, i.e., residential care, are excluded from the sample, with the exception of those children who were placed in both forms of out-of-home care during their childhood.<sup>5</sup> Their inclusion among the treated is motivated by the fact that the children, before ending up in foster care, in many cases were first placed in residential care due to emergency situations, for assessment, or for shortage of available foster families.<sup>6</sup>

Crime data for each individual in the SBC come from the national police registry. This registry contains records of offenses that lead to an official report to the CWC or to a

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investigated were under serious threat of being removed from their parents custody. Imagine, for example, that a child has two fantastic parents and one of these parents dies. The CWC would then routinely check on the child's wellbeing and would decide that the surviving parent was more than capable of raising his or her own child.

<sup>5</sup> Of the 1,166 children removed from their families during their childhood 174 spent time in both types of OHC.

<sup>6</sup> Since we do not observe the exact time of removal within each period it is hard to form a definite picture about the sequence of events based on the data. We observe that of the 174 removed children spending time in both types of OHC during their childhood only 28 children spent time in foster care prior to the period of the removal decision and placement into residential care whereas in 53 cases a removal decision and placement in foster care followed after a spell of residential care in the previous period. Thus, based on the data, it is more likely that residential care worked as a channel into foster care than vice versa.



conviction. These crime data are divided into seven crime categories, including: violent crime or crimes against persons, stealing, fraud, vandalism, traffic crimes (that lead to a court conviction, e.g., driving without a license or under the influence of alcohol), narcotic crimes, and other crimes. For each year from 1966 to the first half of 1984 (i.e. when the respondents are age 13 through 31), there is information on the number of offenses in each of these crime categories as well as the sentence that was received; the 1966 data is actually a summary of all known crimes reported up to and including 1966. Data on juvenile delinquency is collected from the social registry that includes information concerning delinquent acts that resulted in an intervention by the CWC. The general category of delinquent behavior was also recorded. These include: stealing, violent crimes, alcohol abuse or narcotics, and other offenses. We use most, but not all, of the crime and delinquency data mentioned above. Our data on juvenile delinquency are taken *only* from the files held by the CWC and cover ages 7 to 18. Our data on adult criminality (ages 19-31) are taken *only* from the police register data on convictions.

### *Summary statistics*

Table 1 displays descriptive statistics for the treated group in column (1) and the comparison group in column (2). To document how much selection is mitigated by the choice of comparison group we also display the descriptive statistics for *all* nontreated individuals in the entire census sample of Stockholm Birth Cohort Study (SBC) in column (4). Panel A summarizes the outcome measures, panel B the demographic and placement characteristics, and panel C the family background characteristics.

The outcome variables in this study are crime (prison) measured by a binary variable equal to 1 if the individual has been convicted of at least one crime (prison sentence) between the years 1973 and 1984, i.e., between ages 19-31, and 0 if not. Panel A in Table 1 shows that

the treatment group does not significantly differ from the comparison group with respect to crime and prison.

Panel B in Table 1 shows that the 573 children who were placed in foster care spent on average 20.6 months in foster care. The stays in foster care are broken down by age periods; early childhood (ages 0-6), elementary school years (ages 7-12), and adolescence (ages 13-18). For simplicity we will refer to these three periods as Period 1, 2, and 3, respectively. The 2,124 non-treated are the children that at some point during childhood came in contact with the CWC but were never removed from their family. When looking separately at subsamples by period of placement the treated are defined as those investigated and initially removed from their family to foster care in that period and the non-treated were investigated in the same period by the CWC but not removed. Roughly 63 percent of investigations concerning children in their early childhood (Period 1) result in removal and placement in foster care whereas only about 10 percent of the investigations concerning adolescents (ages 13-18) result in removal. There are more women (44 percent) in the treatment group than in the comparison group (28 percent), which should be kept in mind when considering our results since treated men and women may not be on the same margin of treatment.

Panel C of Table 1 looks at how well the family background characteristics balance across the treatment group and comparison group. All background characteristics reported in C1 are measured over all three age periods. For example, the dummy variable indicating alcoholism among the parents takes on value 1 if there is a note on parental misuse of alcohol in the CWC file in any of the three periods. All variables reported in C2, e.g., grades in grade 6, IQ at age 11, father's income in 1963, and delinquent behavior during elementary school years, only apply as background characteristics for the subgroup of children removed during their adolescence. It is clear from the *t*-test of means comparison in column (3) that the treatment group is a selected group with respect to most of the observed background

characteristics and thus controlling for them will be crucial. However, the selection problem is significantly smaller when defining the control group as all never-treated children among the families that have been under the magnifying glass of case workers from CWC than when defining it as all never-treated individuals from the census sample of SBC as is seen when comparing the two different  $t$ -tests for mean difference in columns (3) and (5) of Table 1.

### 3. Baseline OLS results

In order to estimate the association between foster care,  $FC_i$ , on adult criminal behavior,  $Adult\ Crime_i$ , we estimate equation (1) using OLS:<sup>7</sup>

$$(1) \quad Adult\ Crime_i = \beta_1 + \gamma_1 FC_i + \beta_2 Female_i + \gamma_2 Female_i * FC_i + \mathbf{X}_i \boldsymbol{\beta}_2 + \varepsilon_i.$$

In Table 2,  $Adult\ Crime_i$ , is a binary variable equal to one if individual  $i$  has at least one criminal conviction during adulthood and zero otherwise. In Table 3,  $Adult\ Crime_i$ , is a binary variable equal to one if individual  $i$  has at least one prison sentence during adulthood and zero otherwise. Here, adulthood refers to ages 19-31 while foster care during childhood refers to ages 0-18. The estimating equation also includes a female dummy and its interaction with  $FC_i$ . Thus, the parameters of interest are  $\gamma_1$  for men and  $\gamma_1 + \gamma_2$  for women. We condition on a set of pre-intervention variables,  $\mathbf{X}$ , including various family background and individual characteristics (see Panel C in Table 1).

To interpret the estimated coefficient of  $FC$  as the causal effect of foster care on adult criminality the Conditional Independence Assumption (CIA) needs to hold. This requires that placement in foster care is as good as randomly assigned conditioned on all pre-intervention variables. We acknowledge that CIA in the fostering context is a strong assumption and will, henceforth, refer to the associations between foster care and crime instead of claiming

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<sup>7</sup> In Table 5, we report results from a probit model.

causality. In Section 5, we examine whether a causal estimate can be bounded away from zero with reasonable assumptions concerning unobservable heterogeneity.

Column (1) in Table 2 reports the OLS results for the whole SBC sample without controlling for background characteristics. The first row reports a coefficient of 0.305 suggesting that boys who were placed in foster care have higher crime rates. The mean crime rate for males in this sample is 21 percent. For girls in this sample, the mean crime rate is roughly 4 percent and those girls placed in foster care have crime rates that are roughly 11 percentage points higher.

In columns (2) and (3), the comparison group is narrowed down to the CWC sample, i.e., the children who underwent an investigation during their childhood but were never removed from their families. The coefficient on foster care falls to 0.10 for boys and zero for girls. Defining the comparison group this way should substantially mitigate the usual omitted variable bias in means comparison – that children who are removed come from worse backgrounds and would have worse outcomes regardless of removal. The negative association for boys between foster care and crime still remains both statistically significant and quantitatively important. The mean crime rate for boys in this sample is roughly 43 percent with those placed in foster care having a roughly 10 percentage points higher rate.

In column (3), the family background characteristics controlled for are based only on the CWC records from Period 1 (see variable list in Panel C1 of Table 1). We include also 419 neighborhood dummies based on district of residence in 1953.<sup>8</sup> Even though the exact time of removal during Period 1 is unknown, we assume that the background characteristics recorded in each period have been collected by the CWC's case worker upon investigating the family and making a placement decision. In this sense, background characteristics derived

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<sup>8</sup> For a detailed description of the construction of neighborhood codes, see Codebook II on the SBC project's webpage: <http://www.stockholmbirthcohort.su.se>

from records referring to a particular age period are as good as pre-intervention variables for placement decisions made in that age period.

In columns (4)-(7), we split the sample by age period within which the investigation leading to the initial removal took place. The children whose case investigation within a particular age period resulted in foster care placement are contrasted with those children who were investigated by case workers within the same age period but for whom the investigation did *not* give rise to removal and consequently no out-of-home-care in that period (or in any other period for that matter). We condition foster care in a particular period on *not* having been placed in earlier periods but *allow* each placement spell to stretch over age periods in the sense that a child placed, for example, at age 11 (Period 2) and who spent all her adolescence until age 18 in foster care will be considered in the subgroup of treated within Period 2.<sup>9</sup> This way we can compare the effect of treatment across different ages at *initial* placement since all individuals in the sample belong to the same cohort.

In column (4), those who were placed in foster care during early childhood (ages 0 to 6) are contrasted to the never-placed within the CWC sample who received a negative placement decision by a case worker in the same age period. In this regression the background variables included remain the same as in column (3) except for that number of neighborhood dummies in the sample is 168. In column (5), the placed children are those who were initially placed in foster care during Period 2 and the comparisons are the never-placed within the CWC sample who were investigated in the same age period. In columns (6) and (7), the foster care variable takes on value one if the child was initially removed as a result of an investigation during Period 3 and zero if not removed. In column (6), additional family background variables are included, e.g., father's income in 1963, number of siblings in 1964, and parent's marital status, recorded in 1964 (see variable list in Panel C2 of Table 1). Also

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<sup>9</sup> The non-treated individuals who received a negative placement decision in the same period as the treated individuals they are contrasted against were also not placed in any prior or later periods, and are thus essentially never-treated.

important child specific pre-intervention characteristics are included such as IQ test scores and grades in 6<sup>th</sup> grade.

Following the same reasoning as for the pooled sample, for each age group considered only the background characteristics recorded in the particular age period, or earlier, are considered.<sup>10</sup> As for the region controls, we include 47 neighborhood dummies based on the 1960 parish codes in column (5) and 213 neighborhood dummies based on district of residence in 1963 in columns (6)-(7). In column (7), an additional background covariate is included, i.e., pre-intervention juvenile delinquency. With respect to juvenile delinquency we are particularly cautious not to confuse it with post-intervention crime and include only juvenile delinquency recorded during the previous age period, i.e. elementary school years prior to start of high school. Our concern with juvenile delinquency recorded in the same period as removal, namely during Period 3, is that it was not only recorded for removal investigation purposes but also after placement in foster care.

The results in columns (4) and (5) show that the association between foster care placements early on in childhood and adult criminal behavior is not statistically different from zero for either males or females. Columns (6)-(7) show that boys who are placed at ages 13-18 (Period 3) had roughly 25 percentage points (55 percent) higher adult criminality than their never-placed counterparts. This is a striking contrast to the associations found for the children removed earlier on in childhood. The association for girls who were placed at these ages is not statistically different from zero (p-value: 0.48). Including preintervention juvenile delinquency in column (7) shrinks the negative association somewhat in comparison to column (6) but does not qualitatively change the results.<sup>11,12</sup>

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<sup>10</sup> For example, in column (5) where treatment is defined as placement in Period 2, we control for background characteristics recorded in periods 1 and 2. As a robustness check, we also ran all regressions using the same set of background variables, i.e., those listed in Panel C1 of Table 1. The results did not change qualitatively.

<sup>11</sup> We also ran a version of the model in column (7) including both juvenile delinquency recorded in Period 2 and in Period 3. In this regression the coefficient (*standard error*) of foster care fell to 0.242 (0.051).

Overall, the results in Table 2 suggest that a negative association between placement into foster care and adult criminality exists *but* that only the boys placed during adolescence account for this association. Children placed in foster care at earlier stages of childhood do not fare any worse than their non-placed counterparts in terms of adult criminal behavior.

In Table 3 we examine the effect of foster care on whether the individual has ever been sentenced to prison up until age 31. The results are by and large in line with the results in Table 2 and show that the overall positive association between foster care and prison is driven by the subsample of adolescent males. The association for adolescent males is 0.18, which is equivalent to a 120 percent increased probability of being sentenced to prison at least once as an adult.

### *Reason for Placement*

As discussed earlier, children are investigated by the CWC either because of their own anti-social behavior or because of their parents' behavior (e.g., parental illness, death, criminality, alcoholism, abuse, neglect, financial difficulties, etc.) Even though it may be hard to single out the origin of the problems leading to an investigation it is likely that children with different social problems also differ in the way they respond to treatment. While the CWC files lack information on the specific cause of a particular investigation, they do contain a crude categorization on whether the investigation by the case worker was initiated due to the child's own anti-social behavior or due to some parental behavior or circumstance.

In Table 4, we split the sample into these two categories and replicate column (6) of Table 2 for each subsample.<sup>13</sup> A limitation to this subsample analysis is that most of the investigations concerning adolescents are conducted due to own behavior (in Period 3 only

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<sup>12</sup> For robustness we ran regressions excluding the 174 observations from the CWC sample who had spent time in both foster care and residential care (see footnote 6) during their childhood. The foster care coefficient (*standard error*) was 0.221 (0.062) in a regression identical to column (7) in Table 2.

<sup>13</sup> The reason for not including pre-intervention delinquency is that only very few among those placed due to parental behavior had a record of youth delinquency.

145 investigations were made due to parental behavior).<sup>14</sup> In order not to further decrease the number of observations by restricting the analysis to those initially placed in Period 3, we allow for both the treated and comparisons to have a placement history prior to Period 3. Crucially, both the treated and comparisons must have undergone a CWC investigation in Period 3 leading to a placement decision.

Column (1) reports the estimates of the sample pooling both categories of investigations. The point estimate of foster care is smaller in magnitude than the equivalent estimate in column (6) of Table 3, the reason being that this time the comparison group also includes children placed in foster care in earlier periods. Column (2) reports the results for those children investigated due to own delinquent behavior and column (3) reports the results for those investigated due to parental behavior. The point estimates differ dramatically between the two subsamples. Boys who were placed in foster family during adolescence due to own behavior were roughly 22 percentage points more likely to commit crime during adulthood than their counterparts, whereas the probability to commit crime for boys who were placed due to parental behavior was 20 percentage points *lower* than for their counterparts.

An important caveat that warrants mention is that by including previously placed children in the comparison group the results across subsamples may be driven by differential shares of previously treated among the comparisons. In the parental behavior subsample, only 9 individuals of the 110 comparisons had been removed and placed in OHC prior to Period 3 whereas only 3.5 percent of the 1,700 comparisons in the own behavior sample had spent time in foster care prior to Period 3 (none of the comparisons in either group had been placed in residential care prior to Period 3). Furthermore, as we have shown in the previous subsections, placement at earlier stages of life does not have a significant effect on criminality. We therefore conclude that the difference in the shares of comparisons removed

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<sup>14</sup> Of all 1,436 children investigated due to parental behavior 1,049 are investigated the first time at ages 0-6.



in earlier periods does not account for the huge difference in the effects between the subsamples.

### *Statistical power*

A concern that arises when dealing with as small sample sizes and when failing to detect a significant association between foster care and adult crime, as is the case in the subsample analysis in columns (5)-(6) of Table 2, is that low statistical power prevents any potential association of reasonable size to be statistically significant. A power calculation is in this case useful in order to determine whether our findings of a null association for the younger age groups are informative regarding the absence of a causal effect.

Our estimates using a two-sided test of size  $\alpha=0.05$  show that our analysis of the association between foster care and crime in the two pre-adolescent age period subsamples is under-powered in the sense that our sample sizes are too small to detect significant true effect size of say 0.10.<sup>15</sup> In the subsample of preschoolers ( $n=494$ ), the size of the association would have to be 0.17 to be detected at one percent significance level. In the subsample of elementary school pupils, it would require a sample of roughly 6,000 observations to detect an even marginally significant association of 0.05, i.e., the magnitude of the association found in column (6) of Table 2 (and turning the question around, given the 507 observations, a marginally significant association of 0.17 can be detected). The power calculations thus show that we cannot exclude a quite large negative association in any of the age subsamples with reasonable confidence. However, it is also clear that associations of the same magnitude as in the adolescent subsample ( $\approx 0.25$ ) could be detected at 1 percent significance level in the

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<sup>15</sup> Our sampel power calculations are performed using the Stata module called `sampsi_reg`.

younger subsamples. In this sense, our results convincingly show, that the negative association is at least smaller in the younger age groups as compared to adolescents.<sup>16</sup>

#### **4. Identifying a causal relationship**

In order to be able to evaluate the foster care policy we need to be able to identify its causal effect on crime. The fundamental difficulty in carrying out a causal analysis of a question like ours using only observational data is that foster care placements are by no means random: kids from worse backgrounds are more likely to be removed from their families. Thus, in order to take the analysis further than simple associations between foster care and crime we examine in what follows how sensitive the baseline OLS results are to omitted variable bias (OVB). This sensitivity analysis is based on the approach outlined in Altonji et al. (2005). As an additional strategy to detect OVB we run a falsification test where adult height is used as a placebo outcome.

Before moving to the sensitivity analyses it is worth pointing out that OVB is already substantially mitigated in the baseline analysis for three particular reasons. First, the choice of control group is *not* be the population at large, but rather the group of children whose families had for some reason come in contact with their local child welfare committee (CWC, the agency that determines out-of-home placement). Second, many of the family background variables controlled for in the analysis are derived from the actual file kept by the CWC concerning each child's case and represent key criteria considered by the CWC's investigator when making her placement decision.<sup>17</sup> Third, the path dependent nature of crime makes

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<sup>16</sup> As for the prison results reported in Table 3, smaller associations can be detected with reasonable confidence: for preschoolers a marginally significant 0.07 association can be detected and for elementary school kids a marginally significant 0.12 association can be detected.

<sup>17</sup> As Angrist (1998) argues in his paper comparing the earnings and employment status of military service veterans to non-enlisting applicants, knowledge of the screening process and complete information on the characteristics used when screening applicants can eliminate the selection bias induced by the screening when using regression analysis or matching estimators.

juvenile crime a strong predictor of adult crime and hence, a particularly strong control for unobservable characteristics.

*Selection on observables vs. selection on unobservables*

As mentioned above, the main threat to identification is omitted variable bias, i.e., selection in unobserved variables strongly affecting placement in foster care. We address this potential confounding problem using the approach outlined in Altonji et al. (2005). The analysis is carried out in two steps. The first step tests how sensitive our estimates of  $\gamma_1$  and  $\gamma_2$  are to different assumptions concerning the strength of potential correlations between unobservable factors that affect both placement in foster care and adult criminality. The second step produces new estimates of  $\gamma_1$  and  $\gamma_{1+\gamma_2}$  under the assumption that selection on unobservables is as strong as the measured degree of selection on observables. Altonji et al. (2005) argue that this later estimate will, in fact, be a conservative lower bound on the true causal impact, while our original estimate acts as an upper bound. Using this approach, we can bound the true causal effect of foster care on adult criminality. For ease of exposition, we run the analysis separately for males and females and denote the coefficient of foster care by  $\gamma$  for both sexes.

The Altonji et al. (2005) approach is based on the following bivariate probit model:

$$(2) \quad FC_i = 1(X_i'\alpha + u_i > 0),$$

$$(3) \quad Adult\ crime_i = 1(\gamma FC_i + X_i'\beta + e_i > 1),$$

$$(4) \quad \begin{bmatrix} u \\ e \end{bmatrix} \sim N\left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 & \rho \\ \rho & 1 \end{bmatrix}\right)$$

Unobservables that affect placement,  $u$ , and adult criminality,  $e$ , are assumed to be correlated by a factor,  $\rho$ , where  $0 < \rho < 1$ . As it stands, the bivariate probit model is under-identified. In order to obtain an estimate of  $\gamma$ , the causal impact of foster care on adult criminality, we set a

fixed value for  $\rho$  before estimating the model. Then we allow the value of  $\rho$  to range from 0.0 to 0.4 and record the observed changes in the estimated value of  $\gamma$ . These results are reported in Table 5.

Recall that we reported an OLS estimate of placing adolescent males in foster care on the probability of committing crime of 0.25 in column (7) of Table 2. The equivalent probit estimate (under the assumption that  $\rho$  is equal to zero) is reported in column (1) of Table 5. This new estimate of the marginal effect (30 percentage points or 67%) should be viewed as an upper bound on the true causal effect of foster care, as the CIA implies that  $\rho$  is equal to zero.

When  $\rho$  is set equal to 0.2, the marginal effect of foster care decreases to 0.17 but remains significant at the 1 percent level. At  $\rho = 0.3$ , the effect is 0.11, but only significant at the 10 percent level. When  $\rho$  increases to 0.4, the marginal effect is reduced to 0.03 and is no longer statistically significant. If we set  $\rho$  (the degree of selection on unobservables) equal to the degree of selection on observables ( $\rho = 0.15$ ), then the marginal effect of foster care is still significant and large (21 percentage points or 47%). See column (6) in Table 5. Under a set of plausible assumptions (set out in Altonji et al. 2005), this estimate can be viewed as a lower bound on the causal effect of foster care on adult criminality.

In column (7) of Table 3, we reported a strong association for adolescent males between foster care and having at least one prison sentence (18 percentage points or 120%). In panel B of Table 5, we see that this estimate is not robust to the choice of functional form. The estimated marginal effect in a probit model (i.e., the bivariate probit model with  $\rho$  set equal to zero) is 6 percentage points (40%). We also see that this result appears to be sensitive to selection on unobservables and is no longer statistically significant nor quantitatively meaningful if we set  $\rho$  such that selection on unobservables is equal to selection on observables. See column (6) of Table 5.

Lastly, Panel C of Table 5 reconfirms our zero finding for adolescent females. It also shows us that selection on unobservables does not appear to be masking a significant protective effect.

*Placebo test of the effect of foster care on adult height*

Our second test to analyze omitted variable bias is a placebo regression where men's adult height is used as outcome variable.<sup>18</sup> The arguments for why height is a good placebo outcome in studies on early life interventions and later life outcomes have been discussed in Havnes and Mogstad (2011). The first argument is that in developed countries height has already for at least half a century been determined mainly by genetic factors and should thus be unaffected by foster care, especially when the placement takes place during adolescence.<sup>19</sup> Second, height and labor market outcomes tend to be positively correlated. The mechanisms providing a rationale for this correlation are somewhat unclear but one possible channel provided by Case and Paxson (2008) is a significant correlation between height and cognitive ability during childhood. Thus, height and crime should also be negatively correlated, which is exactly the case in our sample: a one standard deviation increase in height decreases the probability of committing crime by 2 percentage points. With these arguments in mind, if we were to find a significant association between foster care and height, that would suggest that there is a third factor driving the results instead of the fostering policy having an impact. Our descriptive results in Table 1 and placebo regressions using adult height as outcome in Equation (1) for the male subsample show a null relationship between foster care and adult height.<sup>20</sup>

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<sup>18</sup> Adult height is derived from the military enlistment records 1971-1973, which includes roughly 90 percent of all male cohort members.

<sup>19</sup> See for example Silventoinen et al. (2003), who show that genes account for 90 percent of the variation in adult height using data for Sweden, among other countries.

<sup>20</sup> The coefficient (standard error) of foster home is 0.78 (0.79) in an adult height regression that looks otherwise identical to column (7) in Table 2.

## 5. Discussion and conclusions

We use data from the Stockholm Birth Cohort Study in order to estimate the association between placement of children in foster care and their adult criminality. We further attempt to bound the magnitude of the average treatment effect on the treated of placing children in foster care, that is the causal effect, on their adult criminality. We find a statistically significant negative association between foster care and adult criminality for boys first placed during adolescence (age 13-18). This effect can be bounded between 0.21 (47 percent) and 0.30 (67 percent). We find no relationship for boys who were placed before age 13. Further, we find no association between foster care and adult criminality for girls. Similar patterns are seen for the effects of foster care on being sentenced to prison.

Interestingly, adolescent boys who are placed in foster care for their own protection (from their parents' behavior) appear to have lower average crime rates than their counterparts. The negative association that we find for foster care on adolescent boys is only accounted for by those boys who are placed in foster care due to their own anti-social behavior.

An important question that warrants discussion is through which mechanisms being placed in foster care might affect the incentives facing adults. Developmental psychologists typically predict that the impact of separation would be greater for younger children.<sup>21</sup> But we see no evidence of this in our data. We also find no effect for women. But it is not clear that men and women are on the same margin of treatment, since the share of investigated women who are placed after an investigation is much higher (i.e., there appears to be a lower threshold of removal for girls than boys in our data).

We see large effects for boys placed in foster care. But it is only boys who are already acting out that are affected – not those seeking immediate protection from poor parental

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<sup>21</sup> See Shaw and Bell (1993) for a review of the literature concerning child developmental theories and the contributions of parents to the anti-social behavior of their offspring.

behavior. It could be that trauma from separation and/or parental rejection interacts with delinquency and increases adult criminality. Also, the foster family's expectations were presumably in many cases not met and they may have lacked the appropriate educational tool kit for dealing with an adolescent who had already developed a strongly deviant behavior. Vinnerljung (1996) reports that breakdowns in foster family placements were not uncommon.

Another question that arises is whether a switch from an urban environment to a rural one reinforced the trauma of parental separation or was it beneficial since it may have offered children a fresh start in terms of school and peers. We are also concerned with the educational outcomes of these children more generally. Replacing *Adult Crime<sub>i</sub>* with *Years of Schooling<sub>i</sub>* in our model, results in an estimated 0.7 years of less schooling. Although this is an important difference, it is not large enough to explain an adverse effect size of 0.21 to 0.30.<sup>22</sup>

At this point, and with these data, we can only speculate about the mechanisms underlying the adverse effects that we find. We can also stress (once again) the importance of our zero findings, given that most previous, non-causal studies of foster care find that treated children do so poorly when looking at their adult outcomes. We argue that these earlier findings are mainly due to the fact that many of these studies lacked proper control groups and had access to only a limited set of control variables.

The main limitation of our approach is that the control group, even after narrowing it down to those who underwent a removal investigation at the same age but were not removed, differs from the treatment group along most observable background covariates. We argue, however, that the confounding bias is substantially mitigated by adjusting the means comparison for background characteristics that qualified as key removal criteria in the investigation process. Further, we address the sensitivity of our results to selection on unobservables using the method proposed by Altonji et al. (2005).

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<sup>22</sup> Assuming that the coefficient -0.7 is the true causal impact of foster care on years of schooling and based on the result that the causal impact of one more year of schooling on crime is -0.022 (Hjalmarsson et al., 2013), then  $-0.7 * -0.022 = 0.0154$  percentage points, which is a rather small number in this context.

A second limitation of our study is the low statistical power in our subsample regressions for preschoolers and elementary school aged children. Our results are admittedly not highly informative regarding the absence of a causal effect. We can, however, convincingly show that association of the order of magnitude found for the adolescents would be detected for the younger subgroups given the statistical power at hand.

Taken together, our results suggest that foster care is a more effective policy tool (less counter-effective) when it is directed to children in their early stages of life and towards girls. The behavioral problems of adolescent boys, on the other hand, appear to be exacerbated by placement in foster care, resulting in more adult criminality. Enhanced awareness of potentially differential consequences of foster care depending on gender, age at first placement, and reason for placement may motivate policy makers to develop and test more targeted interventions and will hopefully encourage future researchers to delve into the underlying mechanisms.



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Table 1. Summary Statistics

	Treatment group in registry Child Welfare Committee (CWC)	Comparison group in registry Child Welfare Committee (CWC)	<i>t</i> -test of mean difference <i>t</i> (p-value)	All nontreated cohort (1953) members in Stockholm Birth Cohort Study (SBC)	<i>t</i> -test of mean difference <i>t</i> (p-value)
	Mean (SD) or N	Mean (SD) or N		Mean (SD) or N	
Panel A: Cohort member outcomes					
Crime conviction (1973-1984), Prison sentence (1973-1984)	0.34 (0.47) 0.12 (0.32)	0.34 (0.47) 0.10 (0.30)	0.29 (0.77) -1.25 (0.21)	0.11 (0.32) 0.03 (0.16)	-19.93 (0.000) -15.36 (0.000)
Panel B: Cohort member demographic and placement characteristics					
Female	0.46 (0.50)	0.28 (0.45)	-8.22 (0.000)	0.49 (0.50)	3.50 (0.001)
Adult height (males only)	178.65 (6.93)	178.69 (6.34)	0.21 (0.831)	179.72 (6.63)	2.36 (0.018)
Removal investigation (foster care), N	573	2,124			
< Age 7 (P1)	191*	303			
7 <= Age<13 (P2)	99*	408			
13 <= Age<19 (P3)	182*	1,741			
Total time spent in foster care (P1+P2+P3) in months, N=573	20.61 (31.84)				
Adopted	0.026 (0.007)	0.014 (0.003)	-2.10 (0.04)	0.008 (0.001)	-4.68 (0.000)
Panel C: Family background characteristics					
Part C1: Prenintervention wrt removal in any period					
Alcoholism	0.19 (0.39)	0.12 (0.32)	-4.31 (0.000)	0.03 (0.18)	-24.88 (0.000)
Drunkenness	0.11 (0.31)	0.06 (0.23)	-4.63 (0.000)	0.03 (0.16)	-10.19 (0.000)
Total received welfare	99.66 (211.75)	64.88 (188.77)	-3.81 (0.000)	22.52 (115.80)	-19.96 (0.000)
Years on welfare	4.12 (4.97)	2.26 (4.11)	-9.16 (0.000)	0.76 (2.39)	-38.84 (0.000)
Welfare (yes=1)	0.64 (0.48)	0.42 (0.49)	-9.79 (0.000)	0.18 (0.38)	-36.66 (0.000)
Father's Mental health disorders (MHD)	0.09 (0.29)	0.06 (0.24)	-2.98 (0.003)	0.02 (0.15)	-14.50 (0.000)
Mother's MHD	0.25 (0.43)	0.09 (0.29)	-9.84 (0.000)	0.03 (0.16)	
Death of father	0.06 (0.24)	0.04 (0.19)	-2.76 (0.006)	0.01 (0.11)	-11.33 (0.000)
Death of mother	0.04 (0.20)	0.02 (0.13)	-3.92 (0.000)	0.00 (0.07)	-13.44 (0.000)
Father in prison	0.05 (0.23)	0.02 (0.15)	-3.65 (0.000)	0.01 (0.10)	-10.31 (0.000)
Finnish origin	0.03 (0.17)	0.02 (0.13)	-1.94 (0.052)	0.01 (0.12)	-3.02 (0.004)

Table 1. Continued

	Treatment group in CWC	Comparison group in CWC	<i>t</i> -test of mean difference	All nontreated in SBC	<i>t</i> -test of mean difference
	Mean (SD) or N	Mean (SD) or N	<i>t</i> (p-value)	Mean (SD) or N	<i>t</i> (p-value)
Panel C: Family background characteristics (continued)					
Part C1: Prenintervention wrt removal in any period					
SES in 1953 (0-6)	3.78 (1.39)	3.51 (1.40)	- 4.07 (0.000)	3.03 (1.48)	-14.54 (0.000)
Maternal age at birth	26.05 (6.34)	27.84 (5.95)	6.30 (0.000)	28.51 (5.62)	9.51 (0.000)
Crime record by father	0.30 (0.46)	0.21 (0.41)	-4.49 (0.000)	0.11 (0.31)	-15.53 (0.000)
Birth length	41.14 (19.41)	41.27 (19.82)	0.14 (0.887)	40.22 (20.65)	4.29 (0.000)
Birth weight	28.02 (13.61)	28.53 (14.49)	0.75 (0.450)	27.91 (14.99)	2.67 (0.008)
Father's education	0.07 (0.29)	0.15 (0.44)	4.26 (0.000)	0.34 (0.63)	12.62 (0.000)
Mother's education	0.01 (0.12)	0.03 (0.20)	2.73 (0.006)	0.09 (0.34)	6.94 (0.000)
Part C2: Preintervention wrt removal in Period 3					
Number of siblings in 1964	1.40 (1.27)	1.51 (1.21)	1.81 (0.069)	1.36 (1.06)	-4.17 (0.000)
Parents married in 1964	0.66 (0.47)	0.84 (0.36)	9.91 (0.000)	0.91 (0.29)	20.47 (0.000)
Father's income in 1963	3.04 (0.38)	3.10 (0.47)	2.64 (0.008)	3.24 (0.50)	12.26 (0.000)
Delinquent in P2	0.18 (0.39)	0.11 (0.32)	- 4.66 (0.000)	0.02 (0.13)	...
Grades in 6th grade	279.90 (61.19)	284.97 (63.38)	1.71 (0.087)	323.46 (68.22)	18.01 (0.000)
Verbal test (IQ)	21.52 (6.09)	22.31 (6.20)	2.73 (0.006)	24.85 (6.65)	16.25 (0.000)
Spatial test (IQ)	20.32 (6.64)	21.27 (6.83)	2.97 (0.003)	22.85 (7.01)	11.06 (0.000)
Numerical test (IQ)	16.92 (6.89)	18.49 (7.61)	4.46 (0.000)	20.93 (8.01)	15.19 (0.000)
Observations	573	2,124		13,919	

In Panel B, the numbers of investigations ending up with the child being placed in the age groups (marked with an asterisk) do not add up to the total number of placed (all age groups together) because some children have incoherent records for the period where the decision leading to the initial placement took place. For example, 239 children were initially placed in foster care in Period 1 but for only 199 of these we see a positive placement decision recorded in that same period. There are two reasons for this incoherency of which the first being lags between placement and the eventual filing of the decision (e.g., Period 1 decision filed in Period 2) and the second being that some children did not receive a removal decision in the observed period of placement but did instead switch from foster care (residential care) to residential care (foster care) between periods. These ambiguous cases are excluded from the subsample analyses by age period of initial placement.

Table 2. Foster Care and Adult Crime (OLS)

Dependent variable: Any crime during years 1973-1984	SBC (1)	CWC (2)	CWC (3)	CWC (4)	CWC (5)	CWC (6)	CWC (7)
Foster Care (FC)	0.305*** (0.028)	0.101*** (0.031)	0.105*** (0.035)				
Foster Care in P1				-0.003 (0.089)			
Foster Care in P2					-0.054 (0.077)		
Foster Care in P3						0.273*** (0.051)	0.252*** (0.052)
Female	-0.156*** (0.005)	-0.267*** (0.019)	-0.282*** (0.023)	-0.295*** (0.062)	-0.411*** (0.047)	-0.260*** (0.027)	-0.252*** (0.027)
Female*FC	-0.193*** (0.035)	-0.103** (0.040)	-0.103** (0.046)				
Female*FC_P1				0.023 (0.103)			
Female*FC_P2					0.041 (0.106)		
Female*FC_P3						-0.242*** (0.077)	-0.226*** (0.077)
Mean dep.var.:							
Females	0.04	0.14	0.14	0.09	0.11	0.19	0.19
Males	0.21	0.43	0.43	0.37	0.48	0.45	0.45
Control for:							
Family background			X	X	X	X	X
Preintervention delinquency							X
Neighborhood			X	X	X	X	X
s.e. for $\gamma_1+\gamma_2$	0.021	0.026	0.027	0.057	0.080	0.057	0.058
Observations	14,523	2,696	2,696	494	507	1,922	1,922
R-squared	0.083	0.083	0.240	0.469	0.254	0.200	0.204

The models are estimated by OLS and robust standard errors are reported in parentheses. SBC=whole census sample from Stockholm Birth Cohort 1953; CWC=sample only including removal investigations from SBC. The first three columns define the treated group as the children placed in foster care during their childhood. The last four columns define the treatment group as the children placed for the first time in foster care during a particular age period (P1, P2, or P3) of their childhood. The control group is in each regression the never-placed children who underwent a removal investigation (in columns (4)-(7) they must have been subject to an investigation during the same age period as the treated). Those, who were placed in both foster care and residential care are included as treated whereas those who were only placed in residential care (in columns (4)-(7) within the same age period), are excluded from the analysis. The family background covariates included in columns (3)-(4) are those that are preintervention variables for all periods (See Panel C1 in Table 1 for the list of variables and definitions), and the 404 neighborhood dummies included are based on the 1953 neighborhood of residence (NOR) codes in SBC. In column (5) preintervention is defined as having occurred before period P2 (in P2 the list of preintervention variables remains the same as in Panel C1 of Table 1 but is updated in P2) and the 73 neighborhood dummies are based on the 1960 parish codes. In columns (6)-(7) preintervention is defined as having occurred before P3 (See Panel C1 in Table 1 for variables updated in P3 and Panel C2 for variables only available for P3) and the 231 neighborhood dummies are based on the 1963 neighborhood of residence.

Table 3. Foster Care and Prison Sentence (OLS)

Dependent variable: Prison sentence during years 1973-1984	SBC (1)	CWC (2)	CWC (3)	CWC (4)	CWC (5)	CWC (6)	CWC (7)
Foster Care (FC)	0.147*** (0.022)	0.077*** (0.024)	0.075*** (0.028)				
Foster Care in P1				0.056 (0.054)			
Foster Care in P2					-0.043 (0.063)		
Foster Care in P3						0.208*** (0.052)	0.183*** (0.051)
Female	-0.046*** (0.003)	-0.100*** (0.011)	-0.113*** (0.013)	-0.050 (0.036)	-0.182*** (0.032)	-0.101*** (0.016)	-0.092*** (0.016)
Female*FC	-0.140*** (0.023)	-0.091*** (0.026)	-0.075** (0.031)				
Female*FC_P1				-0.095 (0.059)			
Female*FC_P2					0.044 (0.070)		
Female*FC_P3						-0.238*** (0.056)	-0.219*** (0.055)
Mean of dep.var.:							
Female	0.003	0.02		0.02	0.01	0.03	
Male	0.06	0.14		0.10	0.17	0.15	
Control for:							
Family background			X	X	X	X	X
Preintervention delinquency							X
s.e. for $\gamma_1 + \gamma_2$	0.006	0.009	0.014	0.034	0.038	0.024	0.024
Observations	14,523	2,696	2,696	494	507	1,922	1,922
R-squared	0.040	0.039	0.194	0.401	0.146	0.152	0.167

See notes in Table 2.

Table 4. Foster Care and Adult Crime at the Extensive Margin – Regression Results for Subsample Regressions by Reason for CWC Investigation at Age 13-18 (P3)

Dependent variable: Any crime during years 1973-1984	(1)	(2)	(3)
Foster Care in P3 (FC)	0.194*** (0.044)		
Foster Care (due to own behavior)		0.223*** (0.044)	
Foster Care (due to family behavior)			-0.203 (0.136)
Female	-0.252*** (0.024)	-0.240*** (0.026)	-0.215** (0.089)
Female*FC	-0.173*** (0.062)		
Female*FC_own		-0.196*** (0.068)	
Female*FC_fam			0.186 (0.148)
Mean dep. var.:			
Female	0.19	0.22	0.06
Male	0.45	0.46	0.22
s.e. for $\gamma_1+\gamma_2$	0.045	0.053	0.074
Observations	2,048	1,903	145
R-squared	0.101	0.105	0.224

The models are estimated by OLS and robust standard errors are reported in parentheses. Given that only 35 children were placed in foster homes as a consequence of family behavior in P3 (vs. 110 nontreated comparisons), we allow both treated and comparisons to have a placement history prior to P3. The treatment variable takes on value one if being placed in foster care and zero if not placed in either form of out-of-home care in P3 as a consequence of a decision taken in that particular period unconditional on having been placed in out-of-home care prior to P3. Column (2) includes only those who were investigated due to own behavior in P3. Column (3) includes only those who were investigated due to parental behavior in P3. The control variables are the same as in column (6) of Tables 3 and 4 in each regression except for neighborhood dummies that are excluded from all three regressions due to the small number of observations that are placed due to family behavior in relation to the number of neighborhood dummies.

Table 5: Estimates of the Effects of Foster Care Given Different Assumptions on the Correlation of Disturbances in Bivariate Probit Models.

	(1) $\rho = 0$	(2) $\rho = 0.10$	(3) $\rho = 0.20$	(4) $\rho = 0.30$	(5) $\rho = 0.40$	(6) $\rho = \text{Selection on observables}$
<i>A: Males age 13-18</i>						
Dep. var.: Crime7384	0.778 <sup>***</sup> (0.169)	N.A.	0.441 <sup>***</sup> (0.165)	0.265 <sup>*</sup> (0.162)	0.085 (0.158)	$\rho = 0.15$ 0.527 <sup>***</sup> (0.167)
Marginal effect	[0.300]		[0.174]	[0.105]	[0.034]	[0.208]
<i>B: Males age 13-18</i>						
Dep. var.: Prison	0.673 <sup>***</sup> (0.171)	N.A.	N.A.	0.157 (0.165)	-0.019 (0.161)	$\rho = 0.31$ 0.139 (0.165)
Marginal effect	[0.062]			[0.008]	[-0.001]	[0.007]
<i>C: Females age 13-18</i>						
Dep. var.: Crime7384	0.445 <sup>*</sup> (0.259)	N.A.	0.118 (0.255)	-0.047 (0.251)	-0.212 (0.245)	$\rho = 0.21$ 0.101 (0.255)
Marginal effect	[0.007]		[0.001]	[-0.000]	[-0.002]	[0.001]

The background covariates included in the bivariate probit model are the same as in column (7) of Tables 2 and 3. Robust standard errors are shown in parentheses and average marginal effects in square brackets; \*\*\* indicates significance at 1%; \*\* indicates significance at 5%; \* indicates significance at 10%. N.A. indicates that the bivariate probit model did not converge to a solution.



**Swedish Institute for Social Research (SOFI)**

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**Stockholm University**

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**DOES PLACING CHILDREN IN FOSTER CARE INCREASE THEIR  
ADULT CRIMINALITY?**

**by**

**Matthew J. Lindquist and Torsten Santavirta**