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**DOES PLACING CHILDREN IN OUT-OF-HOME CARE INCREASE  
THEIR ADULT CRIMINALITY?**

**by**

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# Does Placing Children in Out-of-Home Care Increase Their Adult Criminality?<sup>†</sup>

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## *Abstract*

We estimate the average treatment effect on the treated of out-of-home care during childhood on adult criminality. In contrast to previous studies on out-of-home care, we look separately at the effects of foster care and residential care and allow these effects to vary by gender and by age at initial placement. We find that foster care has an adverse effect on the adult criminality of boys first placed during adolescence (age 13-18), but no effect for boys who were placed before age 13. Foster care has no effect on the adult criminality of girls. Both boys and girls who were first placed in residential care during their adolescence have higher adult criminality than their never-placed counterparts. We find no such effects for those placed before age 13.

Keywords: crime, delinquency, foster care, out-of-home care, residential care.

JEL: H75, I38, J13, K42

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## 1. 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, social class 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 Canada, over 72,000 children (about 1% of the Canadian population) were in some form of government care in 2004 (Warburton et al. 2011). 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. (2011).

Many of the existing evaluations of placing children in foster care have looked at effects on juvenile delinquency or adult criminality (Doyle 2007, 2008; Warburton et al. 2011; Vinnerljung et al. 2006; Vinnerljung at Sallnäs 2008). 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. (2011) 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.

The current paper contributes to the existing literature by estimating the average treatment effect on the treated (ATT) of out-of-home care (OHC) on adult criminality using data from the Stockholm Birth Cohort Study (SBC). The SBC follows up more than 15,000 individuals all born in 1953 and residing in Stockholm in 1963 until age 31. The SBC contains a rich set of variables concerning individual, family, social and neighborhood characteristics. 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 children who were investigated by the child welfare committees are identified and much of the information concerning their cases is known. Administrative crime records from the official policy registry are also linked to the SBC data.

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 estimate the ATT by means comparison that conditions on a rich set of family background covariates after first defining an appropriate control group (those investigated at the same time but not placed).<sup>1</sup>

When evaluating a policy such as out-of-home care, marginal treatment effects that apply to children at the margin of placement are of particular policy relevance since they provide direct implications for case workers facing the dilemma of keeping families intact versus protecting the children (oftentimes from their own family members). As we show in what follows, important lessons

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<sup>1</sup> The ATT is the weighted average of effects on always-takers and compliers. Doyle (2007, 2008) estimates the local average treatment effect (LATE) on the population of compliers only. The compliers, in this case, being those induced into foster care on the basis of the intensity of an instrumental variable.

can still be drawn from our ATT estimates. In particular, our data is well suited to analyze treatment effects of OHC placement across different types of placement (foster care and residential care) and different types of children.

We contribute in three ways to the existing literature evaluating long-term consequences of out-of-home care. First, we look both at the impact of placement in foster care (a foster family) and that of placement in residential care (nursery, orphanage, mental hospital, youth home, or reform school) whereas the previous studies, especially the causal studies, have focused mainly on the effects of foster care. Second, unlike previous studies, our data comprises placements made over the whole age range, ages 0-18, making it particularly suited for comparing the effect of placement between different age groups. Finally, distinction is made between those who are 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. Doyle (2007) documents the important distinction between investigations initiated due to abuse and those initiated due to neglect. In our data, both types of allegations go under the class called parental behavior and cannot be separated.

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 effect that placement in foster care has on the adult criminality of males. The adverse effect is an increase of 26 percentage points (58 percent) of committing at least one crime as an adult. A null effect 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.

Placement in residential care as an adolescent has adverse effects on the adult criminality of both males and females. For men the effect is 30 percentage points (67 percent) and for women the effect is 15 percentage points (71 percent). Once again, we find no effect of placement in residential care on adult criminality in those children who were first placed before age 13.

Our results for OHC effects on crime at the intensive margin (number of crimes) follow the same pattern as the extensive margin results. Further, when using the likelihood of ever being sentenced to prison (or, at the intensive margin, the total number of days sentenced to prison) we find an adverse effect only for adolescent boys. When analyzing subgroups by reason for placement, we find that foster care has an adverse effect on 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 a crime as compared to their investigated, but not removed, counterparts.

The outline of the remainder of our paper is as follows. In the next Section, we discuss several key studies on out-of-home care and adult criminality in more detail. In Section 3, we give a brief description of the institutional setting. We then go on to outline our empirical strategy. The data and descriptive statistics are presented in Section 5 and our results are presented in Section 6.

In Section 7, we address the issue of selective placement and we run a sensitivity analysis based on the approach outlined in Altonji et al. (2005), which is designed to gauge the degree to which estimates based on non-experimental data are sensitive to selection on unobservables. We show that our results are, in fact, robust to relatively large amounts of selection on unobservables and that all of our baseline effects concerning the causal impact of OHC on adult criminality can be bounded away from zero.

We conclude with a summary of our findings and discuss several limitations of our study. We briefly discuss several potential mechanisms that might explain our results and highlight our most policy relevant findings.

## **2. Previous Studies on Out-of-Home Care and Criminality**

The few studies that have been able to link data on out-of-home care with measures of adult criminality (Doyle, 2008; Vinnerljung et al., 2006; Vinnerljung and Sallnäs, 2008; and Warburton et al., 2011), all agree that there is a strong correlation between foster care, residential care and adult criminality.<sup>2</sup> The question remains, however, as to what share of this

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<sup>2</sup> See also Levin (1998) and Vinnerljung (1996) for reviews of the Sweden-specific evaluation literature.

correlation, if any, is due to the causal impact of out-of-home care on adult criminality? The causal evidence, is limited, but growing, and is somewhat mixed.

Vinnerljung and Sallnäs' (2008) study uses Swedish register data and is, perhaps, the first study examining long-term outcomes that exploits a large nationally representative sample. They looked at a wide spectrum of outcomes including convictions and prison sentences between the ages of 21 and 25. However, their study does not help us in distinguishing between correlations and causality, since they have no well defined control group – a drawback that they are acutely aware of.

Using a much smaller sample, Vinnerljung et al. (2006) compare outcomes of young adults aged 21-25 who were born and raised in Stockholm, Sweden and who had been placed in foster care or residential care as a child with those who had been investigated by their local child welfare committees but were not placed.<sup>3</sup> In general, placement in foster and/or residential care was associated with worse outcomes. For adult crime, however, they found a small, but statistically significant, *negative* relationship between out-of-home care and the number of criminal offences registered. Their means comparison was, however, conditioned on a quite limited set of controls (gender, born to teenage mother, immigrant and type of problem). As such, we cannot say if this result is causal or if it is simply driven by unobserved confounders. Also, the sample was too small for them to analyze the effect of service separately by gender or type of placement.<sup>4</sup>

Doyle (2008) is one of the more convincing studies 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

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<sup>3</sup> The sample consisted of 161 treated and 110 untreated born between 1968 and 1975.

<sup>4</sup> In our study, we find that treatment effects differ by gender, type of placement, and reason for placement.

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>5</sup>

Using data from the Canadian province of British Columbia, Warburton et al. (2011) study the impact of placing 16 to 18 year old adolescent males in foster care on high school graduation, the receipt of income assistance before age 20 and incarceration at age 19. They follow Doyle (2007, 2008) in using investigator fixed effects as an instrument for placement in foster care. But they also have access to a second instrument that was generated by a judicial inquiry that created an abrupt increase in placement rates that was followed by an abrupt decrease several years later. With two instruments at hand, they can potentially identify different treatment parameters (across two different margins) given that the treatment effect is heterogeneous. This is, in fact, what they find. In contrast to Doyle's (2008) results, the use of their investigator fixed effect instrument produces a *negative* impact of placement in foster care on incarceration rates at age 19. Their across-the-board policy change that resulted in higher placement rates *increased* incarceration rates at age 19. They argue that the desirable outcomes of foster care placement during normal times may have been swamped by problems with lower average program quality during the phase of rapid expansion in foster care that took place directly after their policy change.

### **3. The Swedish Institutional Context**

Since all children in the Stockholm Birth Cohort Study were born in 1953, the placements in foster families and residential care studied in this paper all took place between 1953 and 1972. In this Section, we give a brief description of the different types of placements in out-of-home care that existed at that time.

Foster care in Sweden is quite similar to that found in other countries. There are few, if any, time-specific or Sweden-specific attributes.

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<sup>5</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.



There were two ways to end up in a foster home (Vinnerljung 1996). The first was that the social authorities took legal custody of the child and then placed the child in a foster home as opposed to placing the child in residential care. The second was that the parents of the child could in agreement with a foster family hand the guardianship of the child over to the foster parents. These were called “private” placements. But the social authorities were still involved and were legally required to approve the new family.

According to Vinnerljung (1996), the six most common reasons for placing a child in a foster home at this time were: (1) parental substance abuse, (2) parents “unfit”, which was used as a broad, catchall category that included, for example, cases where the parents were mentally handicapped, (3) parental mental illness, (4) child abandonment, (5) physical or sexual abuse, and (6) the child’s own anti-social behavior.

There were two ways of becoming foster parents (Vinnerljung 1996). The first was that the foster family already knew the child in need of care. They could be family members, neighbors, friends of the family, the local school teacher, etc. Nearly one-third of the foster parents in Wåhlander’s (1990) study of foster children from Stockholm had some prior connection to their foster child. The second way of becoming a foster family was to be recruited by the social services. Some foster parents replied to advertisements in the local newspaper, some were recommended by other foster families and some called the social services to offer their help.

Most foster families were working class or lower middle class. Many were farmers. In fact, there was a strong tradition to send foster children from the big city to stay with foster families in the country side. Vinnerljung (1996) characterizes the primary motivations for becoming a foster parent as; (1) a previous relationship with the child, (2) economic motives and the desire to “work” at home, (3) childless couples and their desire to raise and, perhaps, adopt children, (4) altruistic motives, and (5) complicated personal psychological issues.

On December 31, 1950, there were 28,000 children (1.4 percent of all children) enrolled in some form of foster care in Sweden (Vinnerljung 1996). This fell to 1.3 percent in on December 31, 1960 and to 0.8 percent on December 31, 1970. Vinnerljung (1996) estimates that 3 to 4 percent of the adult Swedish population has experienced foster care at some point during their childhood.

Residential care was a common alternative to placing children in foster homes. Residential care refers to the placement in an organized institutional form and includes primarily nurseries, orphanages, mental hospitals, youth homes and reform schools. The dominant form of institutional placement when aged zero to six was in state run nurseries or orphanages. Many of these children went on to become adopted – which we can see in our data. The most prevalent forms of institutional placements available in the city of Stockholm for kids aged 7 to 12 were orphanages, youth homes and school homes (*barnhem, ungdomshem, skolhem*).<sup>6</sup> The dominant form of institutional placement for teenagers who were placed due to their parent’s behavior and/or death were called youth homes (*ungdomshem*). For older teenagers these were often separated by gender, some offered job training, while others were more like public housing projects that gave older teenagers a place to stay in a room of their own. The dominant form of institutional placement for teenagers who were placed due to their own anti-social behavior was in reform schools (*ungdomsvårdsskolor*).

Reform schools, we believe, are the main form of residential care responsible for the adverse effects we find for children placed in residential care as teenagers.<sup>7</sup> Hence, we focus the remainder of this Section describing them in more detail.<sup>8</sup>

Youths who committed crimes were not normally sentenced to prison. Instead, they were turned over to the social services for care and/or custody. This was done under the condition that the social services places the teenager in a locked (or at least supervised) facility, a reform school. The social services also had the authority to ask for a court order to place teenagers against their (and their family’s) will in such a reform school if they deemed that the child was in grave risk of developing into a severe criminal or had substance abuse problems.

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<sup>6</sup> We searched the Stockholm city archive for all types of residential care that were active during this time period (and that catered to the appropriate age group). We found 56 such institutions along with brief descriptions of each institution, it’s stated purpose and the age and gender of the children it serviced. See <http://www2.ssa.stockholm.se/Bestand/Barnhemsarkiv.aspx>. Unfortunately, this archive does not cover the entire Stockholm metropolitan area, only the city of Stockholm. Also, many teenagers were placed in reform schools outside of the greater Stockholm metropolitan area.

<sup>7</sup> One drawback with our data is that we do not actually know what type of residential care the child is placed in. However, we do believe that those placed as babies or as young children and were later adopted, spent time in a nursery or orphanage. We also believe that those who were placed as teenagers via a court order (due to their criminality and/or alcohol and drug abuse) were, in fact, placed in reform schools. This was oftentimes a requirement made by the court before turning the child over to the social services.

<sup>8</sup> Youth homes are harder to characterize, since they were often smaller and had more heterogeneous characters to them. We learned this from our search of the Stockholm city archive for all relevant forms of residential care operating in the city at this time. See <http://www2.ssa.stockholm.se/Bestand/Barnhemsarkiv.aspx>.

During the 1950's, there were roughly 700 places in these reform schools; this grew to 1000 in the 1960's and then was lowered to 500 places in the 1970's (Levin, 1998). During this time, youths could be placed in locked facilities for an indeterminate amount of time. But had to be released at age 21 (Levin 1998). A stay in one of these reform schools could vary between several months and several years *regardless* of the reason for being placed and without any judicial control or rights from the child (Levin 1998). Levin (1998) argues that reform schools operated in a grey zone between the legal punishment and incarceration system and the open, voluntary treatment system.

Levin (1998) characterizes the actual placement process as being quite similar to an arrest and arraignment process in the court. The majority (65 percent) of all placements were acute, 30 percent were planned, and 5 percent were voluntary. The most common reasons for placement for boys at this time were; (1) property crimes, (2) drug and/or alcohol abuse, and (3) violent crimes. For girls they were; (1) drug and/or alcohol abuse, (2) running away – living on the street, and (3) property crimes.

Levin (1998) describes the reform schools in operation at this time as hierarchical, pacifying, lacking any form of treatment, and without rehabilitant effects. In many case, placements involved rather poor living conditions and physical labor (on a farm for example). Physical punishment was also commonplace. In response to the criticism of these early reform schools the child welfare committee in Stockholm city opened its own reform school in 1947 (*Barnbyn Skå*), which became well known in the 1960's and '70's for its work in developing treatment strategies for delinquent children aged 7 to 15.

Vinnerljung (1996) estimates that 4-5 percent of Sweden's adult population has spent at least some time in residential care or in foster care. In response to a strong wave of media attention and criticism of the old system of foster care and residential care in Sweden, the Swedish Parliament recently passed a law that allows those who were subject to abuse while in state custody (either foster care or residential care) between 1920 and 1980 to sue the Swedish State for damages. The Swedish Government has also offered an apology for its neglect and for not providing children in state care with proper protection and a sound living environment. Thus, our priors when starting this project were, admittedly, bleak, which makes our findings of no effects for some groups – younger children and girls – all the more interesting.

#### 4. Empirical strategy

In order to identify the effect of out-of-home care,  $OHC_i$ , on adult criminal behavior,

$Adult\ crime_i$ , we estimate equation (1) using OLS:

$$(1) \quad Adult\ crime_i = \beta_1 + \gamma_1 OHC_i + \beta_2 Female_i + \gamma_2 Female_i * OHC_i + X_i \beta_3 + \varepsilon_i.$$

In our benchmark results,  $Adult\ crime_i$ , is a binary variable equal to one if individual  $i$  has at least one criminal conviction during adulthood and zero otherwise. Here adulthood refers to ages 19-31 while  $OHC_i$  during childhood refers to ages 0-18. The estimating equation also includes a female dummy and its interaction with  $OHC_i$ . Thus, the parameters of interest are  $\gamma_1$  for men and  $\gamma_1 + \gamma_2$  for women.

In order for us to interpret these estimated parameters as the causal impact of out-of-home care on adult criminality, we need to be convinced that the Conditional Independence Assumption (CIA) holds, i.e., that placement in out-of-home care is as good as randomly assigned after conditioning on a set of preintervention variables,  $X_i$ , including family background characteristics (see Panel C in Table 1). A dummy for preintervention juvenile delinquency by the individual also enters as a background covariate in subsample regressions that look at children being investigated during adolescence (age 13-18). Controlling for juvenile delinquency is motivated by the strong path dependent nature of criminal careers and by the fact that most criminals engage in criminal activity before age 19.<sup>9</sup>

We also examine the effect of  $OHC_i$  on the total number of crimes the individual is convicted of up until (and including) age 31, whether the individual has ever been sentenced to prison, and the total number of days the individual has been sentenced to prison.

We acknowledge the strength of the CIA assumption, but argue that selection bias is at least substantially mitigated in this particular application for three reasons. First, the choice of control group will *not* be the population at large, but rather the group of children whose families (either due to abuse, neglect, or the child's own deviant behavior) came into contact with their local child welfare committee (CWC, the agency that determines out-of-home placement) and for whom the CWC has taken a decision concerning placement in OHC (more on this below). 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

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<sup>9</sup> We do include period 3 delinquency in one of our sensitivity analyses.

making her placement decision.<sup>10</sup> Third, the path dependent nature of crime makes juvenile crime a strong predictor of adult crime and hence, a particularly strong control for unobservable characteristics. To address whether and how severely our results could be biased by potential confounding factors, we examine in Section 7 how sensitive the baseline results are to selection on unobservable characteristics. This sensitivity analysis is based on the approach outlined in Altonji et al. (2005). We also briefly address the possibility of selective placement.

## 5. 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>11</sup>

All families with children belonging to the SBC that have been investigated by 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>12</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. The CWC cases identified from the social registry

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<sup>10</sup> As Angrist (1998) argues in his paper comparing the earnings and employment status of military service veterans to nonenlisting 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.

<sup>11</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>12</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.

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) warnings to the parents, (ii) in-home assistance to the family, (iii) further supervision/monitoring of the family situation, and (iv) out-of-home placement. Out-of-home placement can 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.

Other variables that have been taken from the social registry include; whether or not the cohort member was adopted, if one or both parents have died, the amounts and number of years of social assistance received by the cohort member's parents, incident's of drunkenness, alcoholism, drug abuse and mental problems of the mother and father, and family structure. The registry also has information on the cohort member's own delinquent behavior and adjustment problems. All information taken from the social registry has been aggregated into three time periods; Period 1 representing early childhood (ages 0-6), Period 2 representing elementary school years before starting high school (ages 7-12), and Period 3 representing adolescence (ages 13-18).<sup>13</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 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.

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<sup>13</sup> The exact date of investigation (and thus age at placement for those placed) is not recorded, only in which of the three periods it occurred. Also, the data were aggregated into these three periods by the original research team that collected the data. We cannot disaggregate them.

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) at the extensive and intensive margins. The extensive margin is 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. We also look at the intensive margin measured as the sum of all crimes (days sentenced to prison) a person has been convicted of between 1973 and 1984. Panel A in Table 1 shows that the treatment group does not significantly differ from the comparison group with respect to crime and prison at the extensive margin. The treated had however significantly higher crime rates and spent more days in prison at the intensive margin.

The treatment in this study is out-of-home care, of which there are two different types: placement in a foster home and placement in residential care. We construct two separate treatment variables: (1) a binary variable equal to one if the child has spent time in foster care and zero if the child was never placed in OHC and; (2) a binary variable equal to one if the child has spent time in residential care and zero if the child was never placed in out-of-home care. As discussed earlier in this

section, the stays in OHC are broken down by age periods; early childhood (ages 0-6), elementary school years (ages 7-12), and adolescence (ages 13-18). 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, while the 767 children (out of 3,290) who were placed in residential care spent 9.9 months on average in residential care. In total 1,166 children were removed, of which 174 were placed in both types of OHC (foster and residential) during their childhood. The 2,124 non-treated are the children that at some point during childhood were investigated by 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 the particular type of OHC in that period and the non-treated were investigated in the same period by the CWC but not removed.<sup>14</sup> Roughly 69 percent of investigations concerning children in their early childhood (ages 0-6) result in removal and placement in either type of OHC whereas only about 15 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).

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. Numbers of siblings in 1964, father's income in 1963, and delinquent behavior during elementary school years, reported in C2, 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. The selection problem is however

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<sup>14</sup> The numbers of investigations ending up with the child being placed in the age groups 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.



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.

## 6. Results

### *Foster Care*

Table 3 reports the regression results for equation (1) where  $Crime_i$  is defined as adult crime at the extensive margin and  $OHC_i$  is defined as placement in foster care during childhood. The children who received the other type of treatment, i.e., residential care, are not included in the sample. The exception is the children who were placed in both forms of out-of-home care during their childhood.<sup>15</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>16</sup>

In column (1), the comparison group is defined as *all* the never-removed individuals from the census sample of SBC as in column (4) of Table 1. Never-removed refers to both types of OHC. In columns (2)-(7), the comparison group refers to the never-removed individuals in the CWC sample, i.e., the sample of families that underwent a removal investigation. 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 to 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 OHC in that period (or in any other period for that matter).

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<sup>15</sup> Of the 1,166 children removed from their families during their childhood 174 spent time in both types of OHC.

<sup>16</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.

We condition treatment 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, e.g., 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>17</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. An additional advantage when defining the counterfactual contrast to placement in foster care within a certain age period of childhood against no treatment in the same age period is that preintervention delinquency can be controlled for, albeit only for those placed in age Period 3, using juvenile delinquency in Period 2.<sup>18</sup>

The outcome, crime at the extensive margin, is binary and the results are shown using a linear probability model to estimate differences in means between the treatment group and the comparison group.<sup>19</sup>

Column (1) in Table 3 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 a removal investigation during their childhood. The coefficient on foster care falls to 0.10 for boys and zero for girls. Defining the comparison group this way should at least 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 adverse effect of foster care for boys however still remains both statistically significant and quantitatively important. The mean crime rate in this sample is roughly 34 percent with those placed in foster care having a roughly 10 percentage points higher rate.

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<sup>17</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.

<sup>18</sup> Juvenile delinquency is not recorded for children aged 0-6 (Period 1) for obvious reasons.

<sup>19</sup> Our results are similar when a probit model is used (see Table 12).

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). 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 from records referring to a particular age period are as good as preintervention variables for placement decisions made in that age period.

In columns (4)-(7), the foster care variable defines treatment as having been placed in foster care for the first time within a particular age period. 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 column (5), the treated children are those who were initially placed in foster care during elementary school years (ages 7-12) 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 treatment variable takes on value one if the child was initially removed as a result of an investigation during adolescence (ages 13-18) and zero if not removed. In column (6), two additional preintervention variables are included, namely father's income and number of siblings, recorded in 1963 and 1964 respectively. Thus, 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>20</sup> In column (7), an additional background covariate is included, i.e., preintervention juvenile delinquency. With respect to juvenile delinquency we are particularly cautious not to confuse it with postintervention 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 adolescence, is that it was not only recorded for removal decision purposes but also after placement in OHC.

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<sup>20</sup> For example, in column (5) where treatment is defined as placement in period II, we control for background characteristics recorded in periods I and II. As a robustness check, we also ran all of the regressions using the same set of background variables, i.e. those listed in Panel C1 of Table 1. The results did not change qualitatively.

The results in columns (4) and (5) show that the average treatment effect on the treated of foster care placements early on in childhood on 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 26 percentage points higher adult criminality than their never-placed counterparts. This is a striking contrast to the effects found for the children removed earlier on in childhood. The effect for girls who were placed at these ages is not statistically different from zero (p-value: 0.55). Including preintervention juvenile delinquency in column (7) shrinks the adverse effect of fostering somewhat in comparison to column (6) but does not qualitatively change the results.<sup>21</sup>

Taken overall, the results in Table 3 suggest that placement into foster care has an adverse average effect on adult criminality for the placed children *but* that only the boys placed during adolescence account for this effect. 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. This pattern tends to repeat itself throughout the rest of the paper.

### *Residential Care*

Table 4 displays results from a series of OLS regressions that relate adult criminality (extensive margin) to placement in residential care during childhood. We define treatment similarly as in the case of foster care, i.e., we first look at an average effect of placement in residential care for the pooled sample and then re-define treatment by age period within which initial placement in residential care took place.

The results for the pooled sample reported in columns (1)-(3) suggest that when compared to their counterparts in the full SBC sample the children placed in residential care have an elevated probability of committing crime as adults. However, in contrast to the results on foster care, no such effect is found when defining the comparison group as the never-treated within the CWC sample. Columns (4)-(7) reveal that residential care has a null effect on those placed in residential care during their first years of childhood (ages 0-6) and the effect on those placed before starting high-school (ages

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<sup>21</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 0.247 (0.047).

7-12) is also not statistically different from zero. The boys initially placed in residential care during adolescence (ages 13-18) did clearly worse than their counterparts who were never-placed similarly to the foster care results in Table 3. However in this case, placement in residential care during adolescence also has an adverse effect for females as well. The effect being roughly half the size of that for boys (0.154 vs. 0.302). This difference is statistically significant at the 5 percent level.

When comparing the results of foster care to the results of residential care two things stand out. First, the effects of both forms of treatment are not statistically different from zero for whether boys or girls initially placed before adolescence in out-of-home care. Second, placement in foster care during adolescence only affects boys adversely, whereas placement in residential care during adolescence has an adverse effect on both boys and girls.

Together, the results in Tables 3 and 4 suggest that out-of-home care is a more effective policy tool (or less counter-effective) when directed to children in their early stages of life. Adolescent boys is the subgroup driving the main results of an adverse effect for both types of OHC. Also, foster care should be preferred to residential care for girls who are initially placed during adolescence.

#### *Crime at the Intensive Margin*

Tables 5 and 6 show estimates of the effect of foster care and residential care, respectively, on the sum of crimes committed between age 19 and 31, i.e., crime at the intensive margin. A similar pattern to the one found in Tables 3 and 4 appears, out-of-home care during adolescence has a statistically significant adverse effect for boys whereas it has a null effect for adolescent girls. Most other treated subgroups are unaffected, the exception being boys placed in foster care during ages 0-6. A marginally significant (at 10 percent level) adverse effect is found for this subgroup.

#### *Prison*

Table 7 looks at the effect of placing children in foster care on the probability of being sentenced to prison at least once during adulthood. The results follow the same pattern as in Table 3. For the pooled sample, we find an adverse average effect of placing children in foster care. But the subsample regressions show us once again that this effect is entirely due to boys placed during adolescence. In

Table 8, when examining the effect of residential care on the probability of being sentenced to prison at least once as an adult, the same pattern is repeated. Boys placed during adolescence account for the overall adverse effect on adult imprisonment at the extensive margin.

Tables 9 and 10 present results for effects of OHC on the total number of days sentenced to prison. The results follow those reported in Tables 7 and 8 with the exception that foster care also has an adverse effect on number of days in prison for boys initially placed at ages 0-6.

### *Reason for Placement*

As discussed in Section 4, the reasons for becoming subject to an investigation by the CWC are either parental death, illness, neglect/abuse or own anti-social behavior. 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. Furthermore, as we are interested in the effects of OHC on criminal behavior it may be particularly important to separate the cases where the child's own anti-social behavior has been the primary cause for an investigation from other cases.

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 parental behavior. In Table 11, we split the sample into these two categories and replicate column (6) of Table 3 for each subsample.<sup>22</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 145 investigations were made due to parental behavior).<sup>23</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

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<sup>22</sup> The reason for not including preintervention delinquency is that only very few among those placed due to parental behavior had a record of youth delinquency.

<sup>23</sup> Of all 1,436 children investigated due to parental behavior 1,049 are investigated the first time at ages 0-6.

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 25 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 18 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, 8 percent 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). However, 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 in earlier periods does not account for the huge difference in the effects between the subsamples.

#### *Dose response model*

The lumpiness of our length of stay variable (and the relatively small sample size) prevents us from analyzing the dose response in detail.<sup>24</sup> However, a simple linear model regressing adult crime at the extensive margin against the length of stay in the particular type of OHC (foster care or residential care) and the complete set of background covariates shows that for those who were placed in foster care during childhood, an additional month of care decreases the likelihood of committing crime by 0.2 percentage points (the estimate being significant at 10 percent level) whereas residential care increases the likelihood of crime by 0.4 percentage points (1 percent level).

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<sup>24</sup> The length of stay variable heaps by quarterly intervals for both types of OHC.

## 7. Sensitivity analyses

In order for us to interpret  $\gamma_1$  (for males) and  $\gamma_1 + \gamma_2$  (for females) as the causal impact of out-of-home care on adult criminality we must believe that placement in out-of-home care is as good as randomly assigned after conditioning on  $X_i$ . Although there are a number of good arguments (presented above) as to why we think this should be the case, the model certainly does not guarantee identification of a causal effect. There may still exist unobservables that are correlated with both placement in out-of-home care and adult criminality. If these unobservable factors are important, then we risk over exaggerating the adverse effect of placement in OHC. Alternatively, social workers may be successful in placing and treating those who can (and do) benefit the most from OHC. This would mean that we are underestimating the true adverse effects of placement in OHC.

Following Doyle (2007), we look for evidence of selective placement by estimating the ATT for different types of youths placed in OHC between the ages of 13 and 18, where types are defined based on their propensity to be placed in OHC. That is, we first estimate the propensity score for placement in OHC based on  $X_i$ . We then estimate the ATT separately for individuals within each quartile of the distribution of propensity scores. We do not find any evidence in favor of selective placement. Youths with higher propensities for placement (as predicted by their  $X_i$ ) do not tend to have less adverse ATTs. In general, placement in OHC seems to be an option that social workers prefer not to use. They do not necessarily use it as a form of treatment *per se*. Hence, our evaluation of the effect of OHC is less susceptible to bias from selective placement.

The main threat to identification is, instead, unobservable heterogeneity. We address this potential 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 out-of-home care and adult criminality. The second step produces new estimates of  $\gamma_1$  and  $\gamma_2$  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.<sup>25</sup> We are thus able to bound the true causal effect. For ease of exposition, we run the analysis separately for males and females and denote the coefficient of OHC by  $\gamma$  for both sexes.

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

$$(2) \quad OHC_i = 1(\mathbf{X}_i' \boldsymbol{\alpha} + u_i > 0),$$

$$(3) \quad Crime_i = 1(\gamma_1 OHC_i + \mathbf{X}_i' \boldsymbol{\beta} + e_i > 1),$$

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

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 OHC 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 to 0.4 and record the observed changes in the estimated value of  $\gamma$ . These results are reported in Table 12. We restrict our sensitivity analysis to our preferred estimates from column (7) in Tables 3, 4, 7 and 8, and to those results which are statistically different from zero.<sup>26</sup>

In column (7) of Table 3, we report a causal effect of placing males in foster care when they are adolescents of 0.26. This estimate should be viewed as an upper bound on the true causal effect. It is replicated in column (1) of Table 12 by setting  $\rho = 0$  before estimating the bivariate probit model.

This effect remains positive and statistically significant for values of  $\rho$  equal to 0.1 and 0.2. Thus for moderately large degrees of selection on unobservables, we still find meaningful adverse effects of placement in foster care as adolescents on the adult criminality of males. These effects range from 0.11 to 0.26.

If we make the assumption that selection on unobservables is just as large as that on observables, then the marginal effect is still positive, 0.05, but not statistically significant. This, however, should be viewed as a conservative lower bound on the causal impact of foster care, since

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<sup>25</sup> If control variables are chosen at random from a large set of potential controls, then selection on unobservables should not be larger than selection on observables. However, if the researcher strategically picks variables the are believed to carry a lot of information concerning selection (as in our case), then selection on unobservables should be much smaller than selection on observables. Thus, assuming that two types of selection are equal will produce a conservative lower bound on the causal (selection-corrected) estimate of the effect.

<sup>26</sup> We focus on our main, extensive margin results in these four tables only, since the Altonji et al. (2005) methodology requires that both the treatment and the outcome are dichotomous variables.

our control variables were not picked at random. They were picked specifically due to the large amount of information they carry about the child's behavior and family circumstances and are based on information collected as part of the investigation on whether or not to place the child. In essence, we are using much of the same information that social workers were required to present to the child welfare committees before the committees could make informed decisions about placement in OHC.

We then go on to investigate the sensitivity of the adverse effects reported in column (7) of Table 4, which refer to the adverse impact of placement in residential care as an adolescent on adult criminality. An adverse effect was found for both males and females. The baseline effect for males ( $\rho = 0$ ) is 0.32 (see column (1) in Table 12). Once again, the result for males is robust to even moderately large values of  $\rho$ . The causal effect of placement in residential care is bounded between 0.04 and 0.32 with the lower bound again being quite conservative.

The estimated effect for females appears to be more sensitive to selection on unobservables. It "only" requires that selection on unobservables be half as large as selection on observables for the effect to go to zero. The causal effect is bounded between 0.03 and 0.16.

Lastly, we address the sensitivity of our estimates of OHC on being sent to prison at least once as an adult. For males, the causal impact of being placed in foster care as an adolescent is bounded between 0.04 and 0.15 (see row *D* in Table 12). The causal impact of being placed in residential care is bounded between 0.04 and 0.20 (see row *E* in Table 12). Recall that we estimated a zero effect for females.

In summary, our one adverse female effect appears to be more sensitive to selection on unobservables than are our male effects, which, in turn, are quite robust to moderately large degrees of selection on unobservables. Selection on unobservables needs to be as large as 66 to 75 percent of selection on observables (depending on the specific effect in question) for our statistically significant adverse effects to become statistically insignificant. We find this unlikely given the large amount of relevant information we control for.

## 8. Summary and Discussion

We use data from the Stockholm Birth Cohort Study in order to estimate the average treatment effect on the treated of the impact of placing children in out-of-home care (OHC) on their adult criminality. In contrast to previous studies on OHC, we look separately at the effects of foster care and residential care and allowed these effects to vary by gender and by age at initial placement.

We find that foster care has an adverse effect on adult criminality at the extensive margin for boys first placed during adolescence (age 13-18), but no effect on boys who were placed before age 13. Foster care has no effect on the adult criminality of girls.

We find that residential care has an adverse effect on adult criminality at the extensive margin for both boys and girls who were first placed during their adolescence (age 13-18). However, the effect on girls is about half the size of the effect on boys. We find no effects of placement in residential care for children placed before age 13.

Similar patterns are seen for the effects of OHC on being sentenced to prison and for crime at the intensive margin. Interestingly, adolescent boys who are placed in foster care for their own protection (from their parents' behavior) appear to experience a protective effect of foster care. The adverse effect that we find for foster care on adolescent boys is only experienced by those boys who are placed in foster care due to their own behavior.

Taken together, our results suggest that OHC is a more effective policy tool (or less counter-effective) when it is directed to children in their early stages of life. Adolescent boys is the subgroup driving the main results of an adverse effect for both types of OHC. Also, foster care should generally be preferred to residential care for girls who are initially placed during adolescence and for boys needing protection from their parents' behavior.

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). Our results for adolescent boys do not seem to be sensitive to such selection, whereas our single, non-zero result for girls is more sensitive to selection on unobservables. Selective placement into OHC of those children who could potentially benefit the most from placement does not appear to bias our results.

A second limitation of our study is that instead of being able to observe the exact date of removal we can only observe in which 6-year age interval between 0-18 the removal took place. Even though the age periods are ad hoc from a developmental perspective, they coincide with the preschool years, elementary school years and high school years. We also do not know exactly what type of residential care each adolescent was placed in. We do know what facilities were in operation at the time, but not which facility the child was placed in.

Finally, since the children were placed in Swedish OHC between 1953 and 1973, the results may not hold for modern residential care or residential care in other countries. Residential care in Sweden has become more homogeneous than it was during the 1960s. However, the main type of residential care that delinquent teenagers are placed in today, i.e. reform schools, looks quite similar to those in operation during the 1960s. Some are actually the same reform schools. But even if they are the same institutions and buildings, the content of these schools has changed over time to include, among other things, more adults per child and, perhaps, even a more well-thought-out treatment plan (see Lindqvist 2011 for a more skeptical take on this last point). Also, reform schools no longer practice corporal punishment and use isolation and other forms of physical restraint sparingly. Foster care, on the other hand, remains largely unchanged. Although it may be the case that foster care has become somewhat professionalized with somewhat more control over who becomes a foster family.

Not knowing the name or type of the facility that a specific child was placed in, makes it difficult for us to address the potential mechanisms underlying the negative effects of residential care that we find. As previously mentioned in Section 3, Levin (1998) describes the reform schools operating during the 1960s and 1970s as hierarchical, pacifying, lacking any form of treatment, and without rehabilitant effects. In many cases, placements involved rather poor living conditions and physical labor (on a farm for example). Physical punishment was also commonplace. Each of these

elements could contribute to the adverse effect on children's well-being and adult criminality that we find.

Another potentially important mechanism could be that adolescents placed in OHC do not have the same possibilities to complete their high school education (Hjalmarsson 2008). They may not receive the same amount, type, or quality of education as their non-placed counterparts who stay in the regular education system. Adults with lower human capital tend to commit more crimes (Hjalmarsson, Holmlund, and Lindquist 2011).

Lindqvist (2010) studies residential care in Sweden and argues that public facilities have strong incentives to undertreat particularly difficult cases. In a companion paper Lindqvist (2011) argues that the lack of official treatment plans affects the success of treatment negatively. Recall that children could be held in residential care for an arbitrarily long period of time regardless of why they were placed. The only rule was that they had to be released at age 21. Much of this arbitrariness still exists today. Children do not always know their expected release date once they are placed. This uncertainty appears to lower the effectiveness of treatment (Lindqvist 2011).

Peer effects may also play a role. They typically worsen the criminal outcomes of teenagers placed in OHC, regardless of whether they are placed in residential or non-residential care (Bayer, Hjalmarsson, & Pozen, 2009). Bondeson (1974) studied a large number of residential care facilities in Sweden. She concluded that pre-existing anti-social behaviors displayed by many youths were magnified by their stay in such institutions. Youths created subcultures that had a negative influence on them and encouraged drug use and crime. Many used alcohol and drugs during their stay in residential care. Levin (1998) paints a similar picture of residential care as training grounds for future criminal behavior.

But we also see large effects for boys placed in foster care. For these boys, peer effects are most likely not driving the adverse effects that we see in the data. Furthermore, it is only boys who are already acting out that are affected – not those seeking immediate protection from poor parental behavior. It could be that trauma from separation and/or parental rejection interacts with delinquency and increases adult criminality. The foster families' 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. It is not uncommon for foster family-child matches to breakdown (Vinnerljung 1996). Another question that arises is whether a switch from an urban environment to a rural one reinforces the trauma of parental separation or does it, instead, offer children the chance for a clean start in a new town and a new school.

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 OHC 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.

New data has recently been added to the Stockholm Birth Cohort Study (see Stenberg and Vågerö, 2006; Stenberg et al., 2007), which means that we can now follow these individuals up to age 59. In future research, we plan to see how our children placed in OHC fare in terms of income, employment, education, health and early mortality. As far as we know, this is the only data set of OHC clients that can be followed for such a long period of time. As such, a follow up of these individuals may be of great interest to an international audience of researchers and practitioners alike. It will help us to gain a much better picture of the true, long-term effect of placing children in OHC on adult outcomes. Such information is necessary for a correct evaluation of the state's role as a provider of child protection and child fostering services.

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## Tables

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	All nontreated cohort (1953) members in Stockholm Birth Cohort Study (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 A: Cohort member outcomes					
Crime (Extensive margin), 1973 <=Year<=1984	0.32 (0.47)	0.34 (0.47)	1.12 (0.26)	0.11 (0.32)	-19.93 (0.000)
Crime (Intensive margin), 1973 <=Year<=1984	5.05 (16.70)	3.06 (10.93)	-4.12 (0.000)	0.68 (4.79)	-21.91 (0.000)
Prison (Extensive margin)	0.11 (0.31)	0.10 (0.30)	-1.04 (0.30)	0.03 (0.16)	-15.36 (0.000)
Prison (Intensive margin), days	60.85 (288.25)	42.30 (235.17)	-1.99 (0.05)	8.39 (102.50)	-13.55 (0.000)
Panel B: Cohort member demographic and placement characteristics					
Female	0.44 (0.50)	0.28 (0.45)	-9.46 (0.000)	0.49 (0.50)	3.50 (0.001)
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)				
Removal investigation (residential care), N	767	2,124			
< Age 7 (P1)	499*	303			
7 <= Age<13 (P2)	59*	408			
13 <= Age<19 (P3)	146*	1,741			

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)
Total time spent in institution (P1+P2+P3) in months, N=767	9.86 (14.53)				
Adopted	0.023 (0.15)	0.014 (0.12)	-2.02 (0.04)	.008 (0.09)	-5.32 (0.000)
Panel C: Family background characteristics					
Part C1: Prenintervention wrt removal in any period					
Alcoholism	0.19 (0.39)	0.12 (0.32)	-5.16 (0.000)	0.03 (0.18)	-24.88 (0.000)
Drunkness	0.08 (0.27)	0.06 (0.23)	-2.62 (0.01)	0.03 (0.16)	-10.19 (0.000)
Total received welfare	99.83 (220.88)	64.88 (188.77)	-4.77 (0.000)	22.52 (115.80)	-19.96 (0.000)
Years on welfare	3.96 (5.09)	2.26 (4.11)	-10.38 (0.000)	0.76 (2.39)	-38.84 (0.000)
Welfare (yes=1)	0.62 (0.49)	0.42 (0.49)	-11.05 (0.000)	0.18 (0.38)	-36.66 (0.000)
Mother's Mental health disorders (MHD)	0.10 (0.29)	0.06 (0.24)	-3.81 (0.000)	0.02 (0.15)	-14.50 (0.000)
Father's MHD	0.23 (0.42)	0.09 (0.29)	-11.09 (0.000)	0.03 (0.16)	-34.80 (0.000)
Death of father	0.05 (0.22)	0.04 (0.19)	-2.12 (0.03)	0.01 (0.11)	-11.33 (0.000)
Death of mother	0.04 (0.20)	0.02 (0.13)	-4.20 (0.000)	0.00 (0.07)	-13.44 (0.000)
Father in prison	0.05 (0.21)	0.02 (0.15)	-3.39 (0.000)	0.01 (0.10)	-10.31 (0.000)
Finnish origin	0.03 (0.16)	0.02 (0.13)	-1.71 (0.09)	0.01 (0.12)	-3.02 (0.004)
SES in 1953 (0-6)	3.68 (1.35)	3.50 (1.40)	-3.42 (0.000)	3.03 (1.48)	-14.54 (0.000)
Maternal age at birth	26.87 (6.28)	27.84 (5.95)	4.42 (0.000)	28.51 (5.62)	9.51 (0.000)
Crime record by father	0.27 (0.44)	0.21 (0.41)	-3.55 (0.000)	0.11 (0.31)	-15.53 (0.000)
Part C2: Preintervention wrt removal in Period 3					
Number of siblings in 1964	1.49 (1.21)	1.51 (1.21)	0.36 (0.71)	1.36 (1.06)	-4.17 (0.000)
Father's income in 1963	3.05 (0.41)	3.10 (0.47)	2.85 (0.004)	3.24 (0.50)	12.26 (0.000)
Delinquent in P2	0.14 ()	0.11 ()		0.02 ()	
Observations	1,166	2,124		13,919	

Notes: 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. Adult Crime by Gender and Out-of-Home Placement Status

		Not in CWC sample	CWC sample				
			Never placed	Placed	Foster home	Residential care	Both FH&RC
Crime, 1973- 1984 (% and N)	Male	13.1 (5,535)	41.0 (1,531)	45.3 (653)	50.2 (203)	40.1 (342)	52.7 (108)
	Female	2.6 (6,292)	14.3 (593)	14.2 (513)	11.7 (196)	14.3 (251)	21.2 (66)
Prison (% and N)	Male	2.8 (5,535)	12.5 (1,531)	17.9 (653)	19.7 (203)	15.8 (342)	21.3 (108)
	Female	0.1 (6,292)	2.5 (593)	1.9 (513)	1.5 (196)	2.8 (251)	0 (66)

Table 3: Foster Care and Adult Crime (Any crimes yrs 7384) at the Extensive Margin (OLS)

Dependent variable: Any crime during years 1973-1984							
VARIABLES	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)	0.092*** (0.032)				
Foster Care in P1				0.015 (0.065)			
Foster Care in P2					-0.065 (0.073)		
Foster Care in P3						0.285*** (0.048)	0.256*** (0.048)
Female	-0.156*** (0.005)	-0.267*** (0.019)	-0.268*** (0.019)	-0.263*** (0.047)	-0.390*** (0.042)	-0.257*** (0.024)	-0.249*** (0.024)
Female*FC	-0.193*** (0.035)	-0.103** (0.040)	-0.098** (0.041)				
Female*FC_P1				-0.042 (0.074)			
Female*FC_P2					0.054 (0.092)		
Female*FC_P3						-0.247*** (0.068)	-0.227*** (0.068)
Mean dep.var.:							
Females	0.04	0.14		0.09	0.11	0.19	
Males	0.21	0.43		0.37	0.48	0.45	
Control for:							
Family background			X	X	X	X	X
Preintervention delinquency							X
s.e. for $\gamma_1 + \gamma_2$	0.021	0.026	0.026	0.038	0.062	0.049	0.050
Observations	14,523	2,697	2,697	494	507	1,923	1,923
R-squared	0.083	0.083	0.089	0.138	0.161	0.084	0.091

Notes: 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 and Appendix X for the list of variables and definitions). 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 in columns (6)-(7) 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).

Table 4: Residential Care and Adult Crime (Any crimes yrs 7384) at the Extensive Margin

	Dependent variable: Any crime during years 1973-1984						
	SBC (1)	CWC (2)	CWC (3)	CWC (4)	CWC (5)	CWC (6)	CWC (7)
Residential Care (RC)	0.240*** (0.024)	0.021 (0.027)	0.015 (0.027)				
Residential Care in P1				-0.050 (0.049)			
Residential Care in P2					-0.001 (0.080)		
Residential Care in P3						0.334*** (0.047)	0.302*** (0.048)
Female	-0.156*** (0.005)	-0.267*** (0.019)	-0.268*** (0.019)	-0.260*** (0.047)	-0.392*** (0.042)	-0.256*** (0.024)	-0.248*** (0.024)
Female*RC	-0.118*** (0.031)	-0.007 (0.036)	-0.005 (0.036)				
Female*RC_P1				0.044 (0.058)			
Female*RC_P2					0.059 (0.131)		
Female*RC_P3						-0.170** (0.078)	-0.148* (0.080)
Mean of dep. var.:							
Female	0.04	0.15		0.10	0.12	0.21	
Male	0.21	0.41		0.33	0.49	0.45	
Control for:							
Family background			X	X	X	X	X
Preintervention delinquency							X
s.e. for $\gamma_1 + \gamma_2$	0.021	0.025	0.025	0.032	0.105	0.063	0.064
Observations	14,687	2,891	2,891	802	467	1,887	1,887
R-squared	0.080	0.070	0.080	0.110	0.164	0.085	0.091

Notes: The models are estimated by OLS and robust standard errors are reported in parentheses. SBC=whole census sample ; CWC=sample only including removal investigations. The first three columns define the treatment group as the children placed in residential care during their childhood. The last four columns define the treatment group as the children placed for the first time in residential 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 residential care and foster care are included as treated whereas those who were only placed in foster 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 and Appendix X for the list of variables and definitions). 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 in columns (6)-(7) 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).

Table 5: Foster Care and Adult Crime (sum of crimes yrs 7384) at the Intensive Margin

Dependent variable: Sum of crimes during years 1973-1984							
VARIABLES	SBC (1)	CWC (2)	CWC (3)	CWC (4)	CWC (5)	CWC (6)	CWC (7)
Foster Care (FC)	8.199*** (1.239)	6.114*** (1.326)	6.009*** (1.368)				
Foster Care in P1				4.640* (2.365)			
Foster Care in P2					1.137 (2.479)		
Foster Care in P3						11.954*** (2.970)	10.938*** (2.787)
Female	-0.924*** (0.080)	-2.014*** (0.472)	-2.175*** (0.498)	-1.964** (0.859)	-4.405*** (1.007)	-1.995*** (0.661)	-1.661** (0.665)
Female*FC	-6.931*** (1.335)	-6.174*** (1.473)	-6.031*** (1.485)				
Female*FC_P1				-4.618** (2.110)			
Female*FC_P2					-1.809 (2.691)		
Female*FC_P3						-11.092*** (3.357)	-10.406*** (3.233)
Mean of dep. var.:							
Female	0.26	1.59		0.68	1.20	2.44	
Male	1.50	4.65		4.51	5.56	4.79	
Control for:							
Family background			X	X	X	X	X
Preintervention delinquency							X
s.e. for $\gamma_1 + \gamma_2$	0.497	0.641	0.630	0.701	0.953	1.585	1.615
Observations	14,523	2,697	2,697	494	507	1,923	1,923
R-squared	0.051	0.034	0.039	0.079	0.061	0.053	0.064

Notes: The models are estimated by OLS and robust standard errors are reported in parentheses. SBC=whole census sample; CWC=sample only including removal investigations. 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 and Appendix X for the list of variables and definitions). 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 in columns (6)-(7) 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).

Table 6: Residential Care and Adult Crime (sum of crimes yrs 7384) at the Intensive Margin

Dependent variable: Sum of crimes during years 1973-1984							
VARIABLES	SBC (1)	CWC (2)	CWC (3)	CWC (4)	CWC (5)	CWC (6)	CWC (7)
Residential Care (RC)	6.475*** (0.940)	3.994*** (0.983)	3.909*** (1.018)				
Residential Care in P1				0.565 (1.073)			
Residential Care in P2					6.306 (4.771)		
Residential Care in P3						15.959*** (3.215)	14.902*** (3.070)
Female	-0.924*** (0.080)	-2.014*** (0.472)	-2.097*** (0.497)	-1.601* (0.829)	-4.278*** (1.027)	-1.912*** (0.660)	-1.631** (0.660)
Female*RC	-5.265*** (1.065)	-4.171*** (1.163)	-4.099*** (1.163)				
Female*RC_P1				-0.582 (1.254)			
Female*RC_P2					-7.204 (4.624)		
Female*RC_P3						-15.762*** (3.399)	-15.030*** (3.298)
Mean of dep. var.:							
Female	0.27	1.54		0.95	1.39	2.29	
Male	1.53	2.53		2.90	6.19	4.94	
Control for:							
Family background			X	X	X	X	X
Preintervention delinquency							X
s.e. for $\gamma_1 + \gamma_2$	0.500	0.621	0.637	0.781	1.273	1.100	1.132
Observations	14,687	2,891	2,891	802	467	1,887	1,887
R-squared	0.044	0.024	0.031	0.028	0.065	0.083	0.092

Notes: The models are estimated by OLS and robust standard errors are reported in parentheses. SBC=whole census sample; CWC=sample only including removal investigations. The first three columns define the treatment group as the children placed in residential care during their childhood. The last four columns define the treatment group as the children placed for the first time in residential 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 residential care and foster care are included as treated whereas those who were only placed in foster 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 and Appendix X for the list of variables and definitions). 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 in columns (6)-(7) 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).

Table 7: Foster Care and Prison Sentence (prison yrs 7384) at the Extensive Margin

	Dependent variable: Prison sentence during years 1973-1984						
	SBC	CWC	CWC	CWC	CWC	CWC	CWC
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Foster Care (FC)	0.147*** (0.022)	0.077*** (0.024)	0.077*** (0.025)				
Foster Care in P1				0.039 (0.041)			
Foster Care in P2					-0.029 (0.054)		
Foster Care in P3						0.194*** (0.050)	0.168*** (0.048)
Female	-0.046*** (0.003)	-0.100*** (0.011)	-0.100*** (0.011)	-0.046* (0.027)	-0.169*** (0.027)	-0.107*** (0.013)	-0.099*** (0.013)
Female*FC	-0.140*** (0.023)	-0.091*** (0.026)	-0.092*** (0.026)				
Female*FC_P1				-0.061 (0.044)			
Female*FC_P2					0.023 (0.055)		
Female*FC_P3						-0.211*** (0.053)	-0.192*** (0.052)
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	0.010	0.020	0.022	0.020	0.020
Observations	14,523	2,697	2,697	494	507	1,923	1,923
R-squared	0.040	0.039	0.044	0.043	0.075	0.060	0.073

Notes: The models are estimated by OLS and robust standard errors are reported in parentheses. SBC=whole census sample; CWC=sample only including removal investigations. 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 and Appendix X for the list of variables and definitions). 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 in columns (6)-(7) 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).



Table8: Residential Care and Prison Sentence (prison yrs 7384) at the Extensive Margin

	Dependent variable: Prison sentence during years 1973-1984						
	SBC	CWC	CWC	CWC	CWC	CWC	CWC
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Residential Care (RC)	0.122*** (0.018)	0.046** (0.020)	0.044** (0.020)				
Residential Care in P1				0.023 (0.030)			
Residential Care in P2					-0.006 (0.062)		
Residential Care in P3						0.245*** (0.055)	0.219*** (0.055)
Female	-0.046*** (0.003)	-0.100*** (0.011)	-0.101*** (0.011)	-0.049* (0.027)	-0.170*** (0.027)	-0.108*** (0.013)	-0.101*** (0.013)
Female*RC	-0.103*** (0.020)	-0.049** (0.022)	-0.049** (0.022)				
Female*RC_P1				-0.042 (0.034)			
Female*RC_P2					-0.020 (0.067)		
Female*RC_P3						-0.200*** (0.065)	-0.182*** (0.065)
Mean dep. var.:							
Female	0.004	0.02		0.02	0.02	0.04	
Male	0.06	0.14		0.09	0.18	0.15	
Control for:							
Family background			X	X	X	X	X
Preintervention delinquency							X
s.e. for $\gamma_1+\gamma_2$	0.008	0.010	0.011	0.017	0.025	0.035	0.035
Observations	14,687	2,891	2,891	802	467	1,887	1,887
R-squared	0.038	0.032	0.041	0.057	0.081	0.064	0.073

Notes: The models are estimated by OLS and robust standard errors are reported in parentheses. SBC=whole census sample; CWC=sample including only removal investigations. The first three columns define the treatment group as the children placed in residential care during their childhood. The last four columns define the treatment group as the children placed for the first time in residential 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 residential care and foster care are included as treated whereas those who were only placed in foster 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 and Appendix X for the list of variables and definitions). 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 in columns (6)-(7) 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).

Table 9: Foster Care and Prison Sentence (days in prison yrs 7384) at the Intensive Margin

Dependent variable: Number of days in prison during years 1973-1984

	SBC (1)	CWC (2)	CWC (3)	CWC (4)	CWC (5)	CWC (6)	CWC (7)
Foster Care (FC)	91.534*** (19.754)	57.495*** (21.733)	62.040*** (21.773)				
Foster Care in P1				78.021** (36.061)			
Foster Care in P2					-36.637 (29.610)		
Foster Care in P3						154.151*** (54.156)	133.981*** (51.255)
Female	-13.532*** (1.714)	-42.459*** (7.804)	-43.121*** (8.167)	-9.395 (12.576)	-82.288*** (19.991)	-46.579*** (10.002)	-40.442*** (10.068)
Female*FC	-85.716*** (20.404)	-61.385*** (22.684)	-63.495*** (22.754)				
Female*FC_P1				-81.301** (32.182)			
Female*FC_P2					31.826 (32.087)		
Female*FC_P3						-147.320*** (55.748)	-133.370** (53.584)
Mean dep.var.:							
Female	1.76	10.50		9.21	6.11	15.22	
Male	19.12	63.86		50.80	75.02	60.32	
Control for:							
Family background			X	X	X	X	X
Preintervention delinquency							X
s.e. for $\gamma_1 + \gamma_2$	5.111	6.500	7.158	12.535	13.279	16.911	17.503
Observations	14,523	2,697	2,697	494	507	1,923	1,923
R-squared	0.019	0.016	0.021	0.070	0.051	0.029	0.040

Notes: The models are estimated by OLS and robust standard errors are reported in parentheses. SBC=whole census sample; CWC=sample only including removal investigations. 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 and Appendix X for the list of variables and definitions). 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 in columns (6)-(7) 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).

Table 10: Residential Care and Prison Sentence (days in prison yrs 7384) at the Intensive Margin

Dependent variable: Number of days in prison during years 1973-1984

	SBC (1)	CWC (2)	CWC (3)	CWC (4)	CWC (5)	CWC (6)	CWC (7)
Residential Care (RC)	91.263*** (19.034)	52.179*** (20.194)	55.905*** (20.957)				
Residential Care in P1				17.852 (19.046)			
Residential Care in P2					19.274 (57.749)		
Residential Care in P3						296.290*** (78.990)	274.567*** (76.640)
Female	-13.532*** (1.714)	-42.459*** (7.803)	-41.011*** (8.252)	-3.682 (12.534)	-84.767*** (20.223)	-45.683*** (10.105)	-39.910*** (10.250)
Female*RC	-81.198*** (19.907)	-52.234** (21.328)	-53.529** (21.858)				
Female*RC_P1				-29.921 (22.113)			
Female*RC_P2					-31.577 (57.343)		
Female*RC_P3						-273.466*** (83.798)	-258.403*** (82.001)
Mean dep.var.:							
Female	1.98	10.50		8.99	17.19	18.73	
Male	20.55	63.86		20.01	84.65	77.95	
Control for:							
Family background			X	X	X	X	X
Preintervention delinquency							X
s.e. for $\gamma_1 + \gamma_2$	5.831	6.863	7.960	9.981	16.210	26.255	27.054
Observations	14,687	2,891	2,891	802	467	1,887	1,887
R-squared	0.021	0.014	0.023	0.059	0.046	0.056	0.064

Notes: The models are estimated by OLS and robust standard errors are reported in parentheses. SBC=whole census sample; CWC=sample including only removal investigations. The first three columns define the treatment group as the children placed in residential care during their childhood. The last four columns define the treatment group as the children placed for the first time in residential 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 residential care and foster care are included as treated whereas those who were only placed in foster 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 and Appendix X for the list of variables and definitions). 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 in columns (6)-(7) 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).

Table 11: Foster Care and Adult Crime (Any crimes yrs 7384) 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)	0.219*** (0.044)		
Foster Care (due to own behavior)		0.249*** (0.044)	
Foster Care (due to family behavior)			-0.181 (0.122)
Female	-0.257*** (0.023)	-0.243*** (0.025)	-0.195** (0.078)
Female*FC_P3	-0.185*** (0.062)		
Female*FC_P3_own		-0.202*** (0.067)	
Female*FC_P3_fam			0.149 (0.135)
Mean dep. var.:			
Female	0.19	0.22	0.06
Male	0.47	0.46	0.22
s.e. for $\gamma_1+\gamma_2$	0.044	0.052	0.067
Observations	2,048	1,903	145
R-squared	0.082	0.084	0.167

Notes: The models are estimated by OLS and robust standard errors are reported in parentheses. Given that only 34 children were placed in foster homes as a consequence of a decision taken in P3 (vs. 108 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 3-10 in each regression.

Table 12: Estimates of the Effects of Out-of-Home Care Given Different Assumptions on the Correlation of Disturbances in Bivariate Probit Models.

	(1)	(2)	(3)	(4)	(5)	(6)
	$\rho = 0$	$\rho = 0.1$	$\rho = 0.2$	$\rho = 0.3$	$\rho = 0.4$	$\rho =$ Selection on unobservables
<i>A: Males age 13-18</i>						$\rho = 0.272$
Foster care	0.684*** (0.146)	0.481*** (0.145)	0.273* (0.144)	0.061 (0.141)	-0.156 (0.137)	0.121 (0.142)
Marginal effects on crime_7384	[0.264]	[0.189]	[0.109]	[0.024]	[-0.061]	[0.048]
<i>B: Males age 13-18</i>						$\rho = 0.344$
Residential care	0.846*** (0.162)	0.637*** (0.161)	0.422*** (0.159)	0.200 (0.155)	-0.027 (0.150)	0.101 (0.153)
Marginal effects on crime_7384	[0.318]	[0.247]	[0.167]	[0.080]	[-0.011]	[0.040]
<i>C: Females age 13-18</i>						$\rho = 0.220$
Residential care	0.498*** (0.189)	0.314* (0.188)	0.130 (0.186)	-0.054 (0.182)	-0.237 (0.177)	0.093 (0.185)
Marginal effects on crime_7384	[0.157]	[0.095]	[0.037]	[-0.015]	[-0.062]	[0.027]
<i>D: Males age 13-18</i>						$\rho = 0.197$
Foster care	0.551*** (0.147)	0.353** (0.146)	0.156 (0.144)	-0.040 (0.140)	-0.235* (0.136)	0.162 (0.144)
Marginal effects on prison_7384	[0.154]	[0.092]	[0.038]	[-0.009]	[-0.048]	[0.039]
<i>E: Males age 13-18</i>						$\rho = 0.261$
Residential care	0.694*** (0.156)	0.490*** (0.154)	0.286 (0.152)	0.082 (0.149)	-0.122 (0.144)	0.161 (0.151)
Marginal effects on prison_7384	[0.204]	[0.135]	[0.073]	[0.019]	[-0.026]	[0.039]

Notes: Each entry represents a bivariate probit model described by equations (2), (3), and (4). Robust standard errors in parentheses and average marginal effects in square brackets.