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Signe Frederiksen
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Empirical Essays on Placements in Outside Home Care

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Empirical Essays on Placements in Outside Home Care

By Signe Frederiksen

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PREFACE

This thesis was written in the period May 2009 to May 2012 and is a result of my PhD study at the department of Economics and Business, Aarhus University (AU) and at Danish Institute of Governmental Research (AKF). I have benefitted greatly from the support from both institutions for data for my project and from them being inspiring workplaces. I am grateful for financial support from both institutions and the Danish Agency for Science, Technology and Innovation through a grant to the Graduate School for Integration, Production and Welfare which made it possible to participate in courses, conferences and workshops both in Denmark, Spain, Switzerland, Italy and Germany.

I would like to thank a number of persons for making this thesis possible and giving me advice and comments along the way. First and foremost I would like to thank my ever attentive supervisor Nabanita Datta Gupta for great advisory work throughout the three years and always being prepared to comment and discuss my work, and nonetheless for providing encouragement. I would also like to thank my secondary advisor at AKF Research Program Director Jill Mehlbye and Christophe Kolodziejczyk for helping me with data management. Furthermore, I am very thankful to all my colleges at AU and AKF for the continuous comments and discussions which have improved my work greatly and my professional development.

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I thank all my great colleagues who made the life of a PhD student lighter and contributed to the everyday entertaining. A special thanks goes to my officemates Karl Krassel and Lene Kjærsgaard who shared all my triumphs and defeats. Also big thanks to my family and friends for supporting me and cheering me on through the three years, especially Nikolaj who listened patiently and believed in me even in the darkest hours.

Signe Frederiksen, Copenhagen, May 2012.

SUMMARY

This thesis consists of three independent chapters all concerning placements of children in outside home care. Interventions such as placements of children are targeted at a very selected group of disadvantaged children but also a very diverse group of children which leads to many empirical challenges. The main challenge is to disentangle the effects of the placement itself. This is a challenge which has been taken up in economic literature within the last decade seeking to understand the complexity of the issues involved. Cunha & Heckman (2007) talks of the inability of a child to choose its parents in relation to skill formation, which is an essential point also in relation to children in placement, and intergenerational transmission mechanisms where an accumulation of social problems are passed one from one generation to the next, suggesting intervention not only for the child but also at different levels with respect to the parents and family and maybe even neighborhood interventions. The empirical evidence in the field shows in most cases a negative correlation between placement and adult outcomes (see e.g. Doyle 2007, 2008; Warburton et al. 2011; Ejrnæs 2011) and that placement instability also is associated with poorer outcomes in later life (Newton et al. 2000; Smith et al. 2001). All studies emphasize different and important aspects of placements in outside home care sketching out a fragmented but not too encouraging picture.

As mentioned, the group of children in placement is a diverse group. Children are placed for very different reasons. Younger children tend to placed due to parental problems and adverse family situations (Bebbington & Miles 1989; Franzén et al. 2008), while as children get older, their own personal behavior, challenges from school, friends, authorities etc. play a bigger and bigger role. In the first chapter the focus is only on children placed at a young age as an attempt to control for age diversity. If placement even in early childhood has an effect on adulthood, it indicates how extensive the consequences of an intervention are. The second chapter concentrates on age at placement, comparing outcomes of siblings who get placed at the exact same time but at different stages of development. Positioning it in the debate of timing of intervening adds a corner of evidential basis to the scattered knowledge of whether early intervention is preferred over later intervention. The last chapter focuses on types of care looking at delinquent behavior of children placed in foster compared respectively to children placed in residential institutions. This chapter locates itself in another current debate, namely whether some types of placements tends to produce children with better adult outcomes. Once again the diversity among children who get placed is present. Disadvantaged children have very different needs, making it impossible to say whether one type of care is ultimately better than the other. However it is crucial for caseworkers to have the

best possible evidence foundation when making the decision to place a child in outside home care and where.

Overall this thesis adds the field of placement in outside home care by producing empirical evidence and causal insight of probably the most far reaching interventions one can make in Denmark, aiding caseworkers in their daily work and policy makers when attempting to improve the conditions for disadvantaged children in outside home care.

Chapter 1 is entitled *Placements in outside home care on children's adult outcomes* and attempts at estimating the effects of placements in outside home care on adult outcomes in a Danish setting, the outcomes being education, labor market status, income, teenage motherhood and delinquency. A very rich panel dataset including demographics, socioeconomics and health information of the whole Danish population is used as well as data on placement in outside home care. Using these unique data it is possible to study the rare event of being placed in outside home care. The chapter focuses on the adult outcomes of all children who were born in Denmark in the period 1981-1986 and who have been placed for the first time in outside home care. Linking children to their parents enhances the model by incorporating intergenerational transmission mechanisms. Children placed in outside home care are a highly selected group and therefore it is difficult to find a suitable control group. Propensity score matching is used to overcome the selection bias embedded in the study population when estimating the counterfactual outcomes of placed children had they not been placed in outside home care. Results of the chapter show that placement in outside home care is associated with *negative* likelihood on children's long-run outcomes of education completion, labor market status, including unemployment, disability pension, social assistance receipt and crime rate.

Chapter 2 is called *Placements of siblings in outside home care: Does age at placement matter?* In child development stage theory, social, cognitive and language skills develop in children at specific ages. In relation to placements in outside home care, it is relevant to analyze whether placements at particular ages are more stressful for children than at others, and, hence, whether age at placement influences the long term outcomes for children placed in outside home care. Using family fixed effects, this chapter investigates siblings who are placed in outside home care at the exact same date for the first time, but at different ages. Thus, I analyze outcomes for a child at a specific age compared to its younger/older sibling who experiences their first placement in outside home care at the exact same time. The same date of first placement indicates that the placement is not due to the child's own characteristics, e.g. behavior, but is more likely due to

circumstances within the family that are difficult to identify otherwise. This set-up makes it possible to study long term outcomes of children who come from the same family environment but whom, due to variation in age, are at different stages of development. Using rich Danish register data results shows differences in employment, basic education and crime at age 20. It is clear that age at placement matters but the results are ambiguous and do not draw a clear picture of how age plays a role in placement.

The last chapter is written together with my supervisor Nabanita Datta Gupta and is entitled *Juvenile delinquency among children in outside home care – does type of care matter?* This chapter studies juvenile delinquency of children who have experienced placement in outside home care and contributes to the literature in investigating whether the type of care (foster care vs. residential institutions) matters for juvenile delinquency. Placements can have both positive and negative effects on criminal behavior. On the positive side, placements of both types (residential institutions or foster homes) by removing children from a disrupted home improve "social bonding" and by reinstating both social control and self-control, placement of either type should reduce delinquency. On the other hand, institutional care exposes children to a number of other low-quality peers from the same type of disrupted background and can therefore have a reinforcing effect on risky behaviors such as crime. We expect this peer effect to be less pronounced in the case of foster home care. In this paper we identify children who only have experienced foster care or placement in residential care. Then, we use an IV approach by exploiting municipalities' tendency to use different types of placement (foster care and residential institutions) to instrument mode of care. The result of this study reveals that relative to boys placed in foster care boys placed in residential institutions are more likely to commit crime, have more verdicts, have more severe verdicts and sentences and are more likely to engage in criminal recidivism. The study also finds that while girls placed in residential institutions are no more likely to commit crime than girls in foster homes, they have more verdicts, are more likely to have more severe verdicts and sentences and are also more likely to engage in criminal recidivism. Taken together, these results suggest that both boys and girls placed in residential institutions show substantially greater criminal activity across various measures of crime than their counterparts placed in foster homes.

SUMMARY IN DANISH (DANSK RESUME)

SUMMARY IN DANISH

Denne afhandling består af tre selvstændige kapitler der alle omhandler anbringelser af børn og unge. Foranstaltninger som anbringelse af børn og unge er henvendt til en særligt – og meget selekteret gruppe af udsatte børn og unge, men også en meget blandet gruppe af børn og unge, hvilket giver mange empiriske udfordringer. Den primære udfordring værende udledning af effekten af selve anbringelsen i forhold til andre forhold i opvæksten som kan bidrage til negative resultater i voksenlivet. Denne udfordring er blevet taget op i den økonomiske litteratur i løbet af det seneste årti i søgen efter at forstå kompleksiteten på området. I forbindelse med udvikling af evner taler Chuna & Heckman (2007) om børns manglende mulighed for at kunne vælge deres forældre, og dermed hvilken mængde af ressourcer der investeres i børnene mulighed for at opnå udnyttelse af deres fulde potentiale, hvilket måske især for udsatte børn og unge er en central pointe. Forældrenes akkumulering af sociale problemer bidrager til børnene egen risikoadfærd, hvilke ikke kun giver anledning til indsatser over for barnet, men også i forhold til forældrene, familien og endda i nogle tilfælde i forhold til nærmiljøet.

Empiriske studier på området viser at, i langt de fleste tilfælde er anbringelse forbundet med negative udfald og sociale problemer i voksenlivet. (se fx Doyle 2007, 2008; warburton et al. 2001; Ejrnæs ikke udgivet) samt, at manglende stabilitet i anbringelsesforløbet er associeret ned negative resultater i voksenlivet. Alle disse studier er med til at belyse området fra forskellige vinkler og tegne et billede af området – om end et ikke særlig opløftende billede.

Som nævnt er gruppen af anbragte børn og unge en blandet gruppe og børn og unge er anbragte er maget forskellige årsager. Små børn er overvejende anbragt på baggrunde at forældrenes problemer, manglende evne til at tager vare på børnene og sikre deres udvikling (Bebbington & Miles 1989; Franzén er al. 2008), mens ældre børn og unge i højere og højere grad anbringes på grund af egne problemer, adfærdsproblemer, problemer i skolen og problemer i forhold til kammerater og autoriteter.

I første kapitel af afhandlingen fokuseres der udelukkende på børn som er anbragt som små i et forsøg på netop at kontrollere for aldersdiversiteten blandt anbragte børn og unge. Hvis der selv blandt børn som er anbragt som små ses en effekt i voksenlivet siger det noget om hvor omfattende konsekvenserne af anbringelse er. I kapitlet sammenlignes børn der har været anbragt som 0-6-årige med jævnaldrende børn der ikke har været anbragt uden for hjemmet, men ligner de anbragte børn

på en række områder. Analysen viser, at anbringelse har en negativ effekt med hensyn til færdiggørelse af uddannelse tilknytning til arbejdsmarkedet og kriminalitet.
Andet kapitel fokuserer på alder ved anbringelse ved at sammenligne søskende der anbringes på præcis samme tidspunkt første gang de anbringes, men er forskellig i alder. I og med, at de har forskellig alder befinder de sig på forskellige udviklingstrin, hvilket kan sige noget om hvorvidt børn er mere sårbare i nogle udviklingsfaser, end i andre. Resultatet af undersøgelsen indikerer tydeligt, at alder ved anbringelse har afgørende betydning, dog er billedet flertydigt. Således bidrager andet kapitel til debatten om "timingen" af anbringelse med en smule faktuel viden om hvorvidt tidlig anbringelse er at foretrække frem for sen anbringelse. Dog uden at efterlade nogen klar retning med hensyn til anvisninger.
Sidste kapitel omhandler type af anbringelse i relation til kriminalitet og er skrevet i samarbejde med Nabanita Datta Gupta. Børn og unge anbragt hhv. i plejefamilie og på institution sammenlignes men hensyn til sandsynlighed for at begå kriminalitet, antal af overtrædelser, type af overtrædelse, type af afgørelse og med hensyn til gentagelse af samme type kriminalitet. Dette kapitel bidrager til en anden aktuel debat – nemlig om hvorvidt en type af anbringelse er at foretrække frem for en anden. Resultaterne viser, at børn anbragt på institution oftere har begået kriminalitet, har flere overtrædelser af loven, i højere grad har begået alvorligere typer af kriminalitet og har alvorligere typer af afgørelser. Igen er det dog vigtigt at pointere diversiteten blandt anbragte børn og unge. Udsatte børn og unge har vidt forskellige problemer og vidt forskellige behov, hvilket betyder, at man ikke kan sige, at én type af anbringelse er ultimativt bedre end en anden. Det er dog afgørende at socialrådgivere der har med anbringelsesager at gøre, har den bedst mulige faktuelle viden om hvilke effekter selve anbringelsen har når man anbringer et barn – og hvor man anbringer barnet.

Sammenfattende bidrager denne afhandling med kausal indsigt og empirisk viden om sandsynligvis den mest indgribende sociale foranstaltninger vi har i Danmark og kan forhåbentlig være en hjælp til sagsbehandlere i deres daglige arbejde og til ansvarshavende embedsfolk og politikere i arbejdet med at forbedre forholdene for udsatte børn og unge.

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Placements in Outside Home Care on Children's Adult Outcomes

Signe Frederiksen*

Abstract

This paper attempts at estimating the effects of placements in outside home care on adult outcomes in a Danish setting, the outcomes being education, labor market status, teenage motherhood and delinquency. A very rich panel dataset including demographics, socioeconomics and health information of the whole Danish population is used as well as data on placement in outside home care. Using these unique data it is possible to study the rare event of being placed in outside home care. The chapter focuses on the adult outcomes of all children who were born in Denmark in the period 1981-1986 and who have been placed for the first time in outside home care. Linking children to their parents enhances the model by incorporating intergenerational transmission mechanisms. Children placed in outside home care are a highly selected group and therefore it is difficult to find a suitable control group. Propensity score matching is used to overcome the selection bias embedded in the study population when estimating the counterfactual outcomes of placed children had they not been placed in outside home care. Results of the chapter show that placement in outside home care is *negatively* associated with children's long-run outcomes of educational completion, labor market status, including unemployment, disability pension, social assistance receipt and crime rate.

Keywords: outside home care, evaluation, children's adult outcomes, matching

JEL Codes: J13, J08

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*Department of Economics and Business, Aarhus University. Address: Hermodsvej 22, 8230 Aabyhoej, Denmark. E-mail: sifr@asb.dk

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1. INTRODUCTION

At the end of 2006, 12,235 children and adolescents (aged 0-17) were registered as being placed outside home in Denmark and DDK 11.3 billion[1] were being spent annually (Statistics Denmark); yet little is known about the consequences of outside home placements in Denmark. In this paper the aim is to estimate the long-run consequences of placements outside home of children aged 0-6 on educational outcomes, labor market status, income, teenage crime and teenage motherhood.

As early as the sixties, Denmark began to register information about the population. This consistent registration of all inhabitants in the country in the central population registers gives very rich data material and the opportunity to construct a plausible counterfactual situation. Information on placements outside home has been registered since 1977, which makes it possible to exploit the panel aspect and examine child placements over a very long period.

The welfare systems set up to deal with vulnerable children are organized differently across countries. In Denmark it is the role of the tax-funded welfare state model implemented in the country to ensure universal education, health care, unemployment benefits, old-age pensions, child care etc. Municipalities are authorized by law to identify and investigate vulnerable children and assess whether or not a placement is required. The municipalities have all the responsibility in this area and take all decisions regarding a placement *outside home, which can be in foster care, municipality owned residential institutions,* privately owned socio-educational housing[2], boarding schools, independent boarding schools for lower secondary students, continuation schools or in lodgings. In the observation period all expenses up until a fixed limit are paid by the municipality. Expenses above this limit are shared with the counties. Disputes or complaints regarding the placement can be directed to the regional state authorities who primarily deal with issues concerning family law.

The object of the special support for children and young people described in the act on social services is to

> *"…assist children and young persons with special needs and to secure the best possible conditions for the upbringing of such children and young persons, thereby providing them with the same opportunities for self-expression, personal development, maturity and health as their contemporaries, despite their individual problems. (…) The support must be provided at an early stage and on a continuing basis, so that any initial*

[1] UDS 1.99billion / EURO 1.52 billion

[2] Socio-educational housing is privately placed outside home care slots, which can vary from small professional families to institution-like places. From the 90s and on the use of these privately owned placed have risen and replaced some of the use of municipality owned residential institutions.

problems affecting the child or the young person may as far as possible be remedied in the home or the immediate environment. On the basis of a case-by-case assessment the support must be adapted to the specific situation of the individual child or young person and his/her family" (Consolidation act on social services §46:1, 2).

Thus, it is clear that the Danish act on social services both target neglect and abuse but also emphasizes prevention and early continuous support heavily. Both the current conditions of the child and expected future conditions when growing up are considered before a placement is made in outside home care, therefore it can be expected that more children on the margin of placement are placed in Denmark. Unfortunately, it is neither possibly in the current data to identify the reason for a placement nor the caseworker's evaluation of the cases.

Denmark is a particularly interesting case concerning child placements, partly due to the uniform policy[3]; partly due to the rich data material and partly because Denmark has a high frequency of placements outside home care. In 2007 1 pct of all children and young adults between 0-20 years were placed outside home. Denmark has about the same level of placement outside home as the other Scandinavian countries[4] (NOSOSCO 2009). Compared with the UK, all the Scandinavian countries have higher rates of placements. The placement rate for 0-20-year-olds in the UK is 0.6 pct in 2007 (DCSF 2008). In the age group 0-6 years, which is the group of interest in this study, the Danish placement frequency was 1.2 pct in 2007. Denmark has a range of different types of placements directed to tackle different kinds of problems and different categories of children, but the majority of placements outside home in Denmark for the age group 0-6 are made to foster care; hence 77.3 pct of placements aged 0-6 in 2007 were made in foster care while 13.8 pct were in residential institutions.

The paper is structured as follows: Section 2 reviews the literature in this area, Section 3 describes the data and Section 4 presents descriptive statistics. In Section 5 we go through the empirical approach, Section 6 shows the results and finally, Section 7 concludes and considers further analysis.

[3]Although the policy is uniform for the whole country, the actual implementation of it varies from one municipality to another.
[4] Between 2000 and 2007, however, the Danish rate dropped by 1.1pct. In the same period the rate increased 2.9 pct in Sweden and 2.9 pct in Norway (NOSOSCO 2009).

2. LITERATURE

One obstacle in analyzing placements outside home is selection on unobservables. Children who are placed outside home are typically disadvantaged compared to other children and it is, thus, difficult to find an adequate comparison group. The ideal control group would be disadvantaged children who for some reason do not get placed in outside home care. The challenge is to identify this group. I propose to solve the sample selection problem using propensity score matching, which is intended to remove the systematic differences in the outcome between the treated and non-treated (Rosenbaum & Rubin 1983).

One strategy is to follow Doyle (2007, 2008). Doyle uses the removal tendency of investigators as an instrument to identify causal effects of foster care placement on a range of outcomes for school-age children and youth who are roughly between the ages of 5 and 15 at the time of the abuse investigation. The results should therefore be regarded as the effects of foster care placement for older children exposed to abuse on delinquency, teen motherhood, employment and earnings. He finds that children on the margin of placements tend to have better outcomes when they remained at home, especially for older children, but he urges caution in the interpretation due to large marginal treatment effects. However, the results show higher delinquency rates, teen birth rates and lower earnings for children who have been in foster care. In Denmark children undergo an investigation by the authorities before a placement is effectuated. Information of the investigator caring out the investigation is however not available for the time period of interest in this paper.

Another strategy is used by Lindquist and Santavirta (2012). They explore the separate effects of foster care and residential care on adult crime but in a Swedish setting. The data consist of the Stockholm Birth Cohort Study (SBC), including all individuals born in Stockholm in 1953 who were living in the Stockholm metropolitan area a decade later. They have full case information on each child in the SBC subject to a removal investigation from the Child Welfare Committee (CWC) files. Thus, they have essentially the same information on children and parents as the caseworkers do. Conducting careful analysis, they estimate the average treatment effect on the treated of out-of-home care by using children who were subject to a removal investigation but not placed as a control group. This strategy is, however, not feasible in a Danish setting for the period of interest in this paper given that I lack information on the population of children who have been subject to an investigation. I only have information on the effectuated placements.

A third strategy is used in a Danish study by Egelund and Lausten (2009). They use a

for their treatment group survey data on all children born in Denmark in 1995 who are or formerly have been placed in outside home care to analyze the prevalence of mental health problems among children in outside home care. Their comparison group is vulnerable children of the same age, subjected to child protection interventions but living at home (in home care children), and all contemporaries who are not child protection clients. Egelund & Lausten find no significant differences between children in outside home care and in-home-care children when looking at psychiatric diagnoses except for pervasive developmental disorders (incl. childhood autism and Asperger's syndrome), disorders of social functioning with onset specific to childhood and adolescence (incl. attachment disorders) and problems concerning the social environment. Furthermore when analyzing strength and difficulties using the Strengths and Difficulties Questionnaire (SDQ) that screens for emotional and behavioral problems, hyperactivity, peer relations, and pro-social behavior, they find no differences between children in placement and in-home-care children regarding emotional symptoms and peer problems. This indicates that the latter could be a suitable comparison group also in the present paper. However two drawbacks are to be mentioned. One is that even when no significant differences occur in the above mentioned, the two groups are significantly different in terms of parental characteristics indicating that the parents of in-home-care children have superior characteristics than the parents of children in outside home care. Also, when looking at the characteristics of the child itself, e.g. child's conduct problems, hyperactivity and pro-social problems, there are significant differences between children in outside home care and in-home-care children showing in-home children in a better position than children in outside home care. The second drawback is that most of the in-home interventions are implemented during the 90s as an attempt to prevent placements of children. In the early 80s which is the time period of interest in this paper, most in-home interventions were targeted at older children e.g. allocation of internship offers at a public or private employer.

Thus, using this comparison group has disadvantages and is thus not chosen is this paper. The strategy proposed to overcome the challenges in finding a suitable control group is propensity score matching. This method is also used in a Danish report released by The Danish National Centre for Social Research (Fuglsang Olsen et al, 2011) measuring outcomes at age 24 of three cohorts of placed children, born 1980-1982. The matching is done on the basis of parental characteristics of the children and the factors included in the matching procedure are single parenthood, no higher education over and above compulsory school, labor market exclusion and marginalization, receipt of welfare benefits, teenage parenthood and psychic illness. In terms of

being employed or in education the children in placement have 26-29 pct. point (pp) less likelihood of participation. Children placed in care in preschool age have 30 pp higher likelihood of having basic education as their highest education. Children placed in preschool age have 19 pp higher likelihood of receiving disability pension at age 24 and 11-14 pp higher likelihood of receiving social assistance than the control group. In terms of health children who have been in placement are 5-7 pp more likely to have been in contact with the somatic health care system and 8-10 pp more likely to have a psychiatric diagnosis. In terms of crime, placed children are found to be 4-6 pct point more likely to have a verdict for violent crime and 8-9 pct point more likely to have a verdict for property crime at age 24 than non-placed children. The findings for convictions, drug related crimes or weapons related crimes are inconclusive because of the generally low frequency of occurrence of these crimes by age 24. No heterogeneous effects are found according to either age of placement or duration of placement. While the authors cannot conclude on the basis of their analysis that the placement itself *causes* increased crime, they conclude that the act of placement does not appear to reduce criminal tendencies in any case. As the authors point out, propensity score matching reduces but does not eliminate selection bias.

In this paper I have more observations at hand given that I analyze children from the 1981-1986 birth cohorts looking at outcomes at age 20. At this stage in their lives it is fair to assume that the children under observation would be enrolled in education or even have finished an education, or are employed, or receive public assistance. Furthermore, it will be relevant to investigate whether these formerly outside home care children are more or less likely to have become teenage mothers or juvenile delinquents. Some of these outcomes would be expected to be realized by the age of 24 as in the Fuglsang Olsen et al, report. Similar to the Fuglsang Olsen et al. report I will face the drawback of not being able to conclude if placement itself causes the results of the analyses due to unobserved characteristics influencing both the placement decision and the outcome. However using propensity score matching is a qualified attempt at closing in on the effect of placements in outside home care on adult outcomes.

Very few econometric studies have been conducted on the topic of children placed outside home. The best examples are the aforementioned studies by Doyle (2007, 2008). Another example is a Danish study by Ejrnæs (2011). She uses a difference-in-difference approach to investigate the outcomes of children who during their childhood have experienced child protection measures. The study identifies the effect of institutional care and care in foster families. Using information on siblings who have never experienced child protection measures, Ejrnæs controls for

family-specific factors and thus estimates the relative impact. As a robustness measure, Ejrnæs uses an instrumental variables approach by exploiting municipalities' intensities of use of different types of placement to instrument mode of care. Since Ejrnæs compares siblings within the same family, she argues for instrument validity by way of the fact that other characteristics of the municipality are held constant when comparing the differences between siblings residing in the same municipality. The study finds strong evidence that foster families are better than institutions at preventing children from engaging in criminal behavior, and for sending them on in the education system. Even though sibling-differenced models can control for shared unobserved family-specific effects that are time-invariant such as common facets of upbringing or genes, they cannot account for time-varying family characteristics and to the extent that these are correlated with placement type, their omission may impart bias to the estimates. Another issue is if the child being placed away from home is significantly different from the sibling who remains at home e.g. due to disability or behavior. Thus, this approach does not allow for child-specific reasons for removal from the home that could be correlated with sibling differences in outcome. Finally, by definition, the sample consists only of multiple-children families where one child was placed outside the home while the other was not.

A third paper Berger & Waldfogel (2004) also needs to be mentioned. They used both linear probability models and discrete-time event history models to explore the effects of family resources and family structure on (1) the probability that a child is living outside home in a given year, (2) the probability that a child is removed from home in a given year, conditional on the child living at home in the previous year, (3) the probability that a child is removed from home for the first time and, (4) the probability that a child is reunified with its biological parent(s) given that the child was living in outside home care in the previous year. The study shows that 1) lower-income, single-mother, and mother–partner families are considerably more likely both to be living out-of-home and to be removed from home, 2) a change in family structure also tends to place a child at a higher risk of an out-of-home living arrangement, unless this transition functions to bring a child's father back into the household. 3) there is no relationship between income and the probability of a family reunification, 4) single-mother and mother-partner families are less likely to reunify, 5) maternal work appears to increase the probability that a child lives at home, and finally 6) welfare benefit levels are negatively related to out-of-home placements. They conclude that their results provide some indication that policies matter and higher welfare benefits appear to be

associated with increases in children remaining at home, particularly as opposed to being placed in a service setting.

Finally in Sweden, Vinnerljung et al. (2005) have conducted several studies of children who formerly have been in outside home care. These papers do not talk about causality but contribute with an enormous amount of information on placement of children in outside home care. One paper is about educational attainment of former child welfare clients. In this national cohort study Vinnerljung et al. find that children and young people who have been in outside home care do worse in terms of education than children who have not been in outside home care. Educational attainment is especially poor if the placement takes place later than at the age of 13 or if the course of outside home care has been unstable.

All these results underscore the fact that the group of children in outside home care is very disadvantaged and their problems remain throughout and after a placement in outside home care. The question is, to what extent is this due to a lack of effect of the intervention or are these children so disadvantaged to begin with that they never catch up despite the intervention? This paper contributes to the literature by using propensity score matching on the basis of a rich set of covariates in assessing if placement in outside home care has an effect on adult outcomes such as education, labor market status, income, teenage crime and teenage motherhood. For this purpose administrative register data of all Danish children born 1981-1986 and their parents are used. The children are followed until the age of 20.

3. DATA

In this paper, I take advantage of the continuous administrative registration of information maintained by Statistics Denmark. The data used are extracted from several registers and linked by a personal identification number which is allocated to all Danish residents at birth by the Civil Registration System and to all immigrants when they get their residence permits. Due to the existence of a personal identification number, an administrative registration has been carried out since 1968, and today this identifier is used in all national registries as a secure linkage between registers.

The advantage of register data is that they contain a long range of precise and detailed information on for example demographics, tax, income, labor market, education, crime, family status, health etc. Due to the way the registration of information is carried out, there is no retrospective information and only natural attrition because of death or migration. With regard to

several of the above-mentioned variables, the Danish registers make it possible to observe the entire population every year from 1980 and to date. For others, the registration began later. It is also possible to make a link between generations by means of the personal identification number. In this way, we can link a child to its biological parents,[5] identify and monitor the biological parents – both of them – even if they have no contact with the child.

The shortcoming of the data is that no information is given about the reason for which the child is placed in outside home care, for example if the child was placed because of behavioral problems, social problems or disabilities. Hence, disabled children who lived in outside home care are included in the population. The number of disabled children in the register is estimated to make up about 15% of all children in outside home care in 2007 by the National Social Appeals Board[6] (Ankestyrelsen 2008). Thus, a share of the children in placement does not have the same abilities and therefore the same opportunities for self-expression, personal development, maturity and health as their able contemporaries as the Consolidation Act suggests which can lead to an underestimation of the results. It is difficult for a layperson to identify which diagnosis can inhibit development, and therefore the population extracted at the current time includes these children. However, I control for number of diagnoses and congenital deformities.

3.1 Population, treatment and controls

In this paper, I access the population of children who were born between 1981 and 1986 and who are Danish citizens. The only restriction is that the children had to be alive and living in Denmark in 2006. Children born 1981-1986 and experiencing their first placement outside home at the age of 0-6 are considered "treated". These children can possibly have had several placements outside home through their life. This is not taken into account in this paper since the crucial issue is whether the cumulated problems in the home have exceeded the threshold above which the authorities find a need to intervene. Similarly, the children could have either short (less than 6 months) or longer durations in placement. Short placements may on the one hand represent short-lived occurrences with no lasting effects. On the other hand, children in this group experiencing short placements may be more representative of those "on the margin" of placement than those experiencing longer placements. Therefore, we include children with short placements in the sample also. This gives a

[5] In fact, it is the child's legal parents. This means that we have information about the persons stated on the child's birth certificate – in most cases the biological parents, but not always.

[6] Physical and mental disabilities can be registered as the only reason or as one explanation out of many for the placement. The Local Authority Social Services categorize the children as either physically or mentally handicapped or as neither when they annually report to the National Social Appeals Board.

sample size of 312,118 children, of those 5,166 have experienced a placement in outside home care age 0-6[7]. The population of the control group is drawn from children born 1981-1986 who have not been placed outside home at the age of 0-6. Thus, this population contains both children never placed outside home and children placed outside home at ages older than 6. As a robustness check I tried to draw controls first from the group of never placed children and second from the group of children who were placed for the first time after the age of 6.

Children born during the period 1981-1986 are followed to age 20. At this stage in life it is fair to assume that the children under observation would be enrolled in education or even have finished an education, or are employed, or receive public aid. Furthermore, it will be relevant to investigate whether these formerly outside home care children are more or less likely to have become teenage mothers or juvenile delinquents. Thus, the data I have access to are more comprehensive than those used by any previous study of children in out of home care, and therefore they are not expected to suffer from attrition (except due to migration or death).

3.2 Outcome

The outcomes for children in outside home care are labor market status, income, education, teenage motherhood and juvenile delinquency. Labor market status is measured as a categorical variable including the states of employment, disability pension, social assistance or unemployment. Education is measured as ongoing or highest completed education. Income includes only wages. Teenage motherhood is measured as whether or not a female has given birth before the age of 20, and juvenile delinquency is measured as criminal offenses committed before the age of 20. It is not *a priori* clear whether placement would have positive or negative effects on children's adult outcomes. Previous studies comparing placed children to children who remained at home have found both positive and negative effects as described earlier. Berger et al. (2009) is an example of a study that finds no appreciable effects of placement. This paper carefully outlines reasons why results have differed so much in the previous literature and cite differences in the analytical method employed, the precise type of treatment given, the choice of comparison group and the timing of measurement of outcome as some of the deciding factors. Certainly, for a group of children who would have been removed under any circumstances, benefits should outweigh costs and effects on outcomes should be overwhelmingly positive. However, at the other end of the spectrum, for children who should have never been removed costs would exceed benefits and effects could be

[7] 13,030 children experience their first placement after the age of 6.

negative. This suggests that effects could be heterogeneous depending on the extent of negative family circumstances. I only estimate effects at the mean of family characteristics; however, identifying the effects occurring at the extremes of this distribution is an important topic that I leave for future work.

Several indicators are used for matching placed children in outside home care with controls. The ideal situation when using propensity score matching would be to observe all variables that are relevant. Unfortunately, all relevant parameters are not observable. This means that in practice, in order to estimate the propensity score, some modeling will be required (Rosenbaum & Rubin 1983). Only few parameters concerning the child itself are available, e.g. birth weight, parity, geography and diagnoses. Personal and behavioral characteristics of the child are not registered, for instance.

Characteristics of parents are considered compelling reasons for decisions regarding placements in outside home care especially where small children are concerned. Small children are primarily placed in outside home care due to problems of the parent(s). Older children are more often placed because of own problems, e.g. behavioral problems, problems with authorities, in school, with friends or with parents or in combination with parent(s) problems (Bebbington & Miles 1989; Franzén et al. 2008). Thus, it is essential to include information about the parents while analyzing placements in outside home care using propensity score matching. The factors used are based on results from a range of previous studies, showing that these factors increase the probability of being placed in outside home care.

Education of the parents is a very important parameter to include. Several studies have shown that children of mothers with low education have a far greater probability of being placed in outside home care than children with mothers who have more than primary education (Ejrnæs et al. 2010; Franzén et al. 2008; Vinnerljung et al. 2005). This paper uses both whether a person is enrolled in education and the highest completed education.

Labor market status of the parents is important as an indicator of household income, stability, inclusion-exclusion on the labor market and hence many aspects of participation in society in general. People outside the labor market have far more problems than employed people. In Denmark the dominating reason for disability pension in general is health issues, especially mental illnesses and muscular skeletal disorder (Ankestyrelsen 2009). Further, the study by Berger & Waldfogel (2004) shows that maternal work appears to increase the probability that a child lives at home. Information on primary employment is used to assess attachment to the labor market including social assistance. The family situation is a very important risk factor for being placed in

outside home care. Studies show a difference in the magnitude of the family situation for the child, but in all studies the family situation is a significant factor. Both children of single mothers and mothers living with another man than the father of the child have a higher probability of being placed in home care than children of mothers living with the father of the child (Berger & Waldfogel 2004; Bebbington & Miles 1989; Franzén 2008; Ejrnæs et al. 2010). It is possible to follow whether a child is living with both parents, only mother or father and whether a parent is living with a new partner from 1980-2006. Studies show that mother's age is related to an elevated risk of a child being placed in outside home care (Ejrnæs et al. 2011; Franzén et al. 2008; Bebbington & Miles 1989). This study uses information on mother's age and family type to assess family patterns.

Crime committed by a parent – even though a rare event – is a strong indicator for placement of children in outside home care. This means that children of parents who have a verdict are more likely to be placed in outside home care than children of parents without a verdict (Ejrnæs et al. 2010).

Health and social problems have a strong connection. Several studies show relations between parental poor mental health and general health and placement in outside home care (Christoffersen 1999; Franzén et al. 2008; Sidebotham & Heron 2006; Vinnerljung & Ribe 2001). This paper uses ICD8 codes to identify diagnoses of the parents.

The area the family/child lives in has shown to be of significance as well. This is shown in a study by Franzén et al. (2008). Information of the municipality and county the child lives in at the time of birth is used to examine geographical importance. Besides these well documented parameters several others are included to obtain the most comparable control group. Whether the child is an only child of have siblings is included. Further information on the municipality level is included in the propensity score to control for the structural setting the child is in. I control for the average size of the municipality in 1980-2006, the average size of the municipality in 1980-2006, the average share of youths 0-17 years in 1980-2006, the average share of employed in 1981-2006, the average share of single parents in 1980-2006, the average share of disability pensioners in 1984-2006 and per capita average public expenditures in 1995-2006. These shares move very little over time hence averaging over a long period does not present a problem.

4. DESCRIPTIVE STATISTICS

Table 1 shows mean differences between parents of children in outside home placement and parents of children who are not in outside home placement. The data in the table is lagged. In this way the information of the parents is used the year before a child is born. Thus, children observed 1981-1986 are linked with data of parents 1980-1985. The table shows that 85.1 pct of the mothers and 64.3 pct of the fathers of children in placement have a basic education as highest achieved educational level compared to 50.9 pct of the mothers and 35.5 pct of the fathers of not placed children. 34.8 pct of the mother of children in placement are employed compared to 76.2 pct of the mothers of not placed children. For the fathers the employment rate is 59.3 pct and 88.9 pct. respectively. Turning to disability pension 4.0 pct of the mothers and 3.4 pct of the fathers of placed children receive disability pension compares to only 0.3 pct of the mothers and 0.2 of the fathers of not placed children. Furthermore, 8.2 pct of the mothers and 13.0 pct of the fathers of children in outside home placement have a verdict compared to 0.9 pct of the mothers and 3.9 pct of the fathers of children not in outside home care. Respectively 0.4 pct of the mothers and 0.4 pct of the fathers of placed children have a psychiatric diagnosis compared to 0.0 pct of the mothers and 0.1 of the fathers of not placed children. Also 47.8 pct of the mothers of placed children are single compared to 14.6 pct of the mothers of not placed children. For the fathers 36.6 pct of father of children in outside home care are single compared to 11.9 pct of father of not placed children. Finally mothers and fathers of children in placement have a lower income than mothers and fathers of children not in outside home placement.

A clear pattern appears when comparing parents of children in outside home care to parents of children not in outside home care showing the group of parents of placed children as less educated, have a weaker attachment to the labor market with lower income, more verdicts and a higher number of psychiatric diagnoses then parents of not placed children.

Table 2 shows the descriptive statistics at age 20 for children born 1981-1986 who have been placed outside home before age 6 and children who have not been placed outside home. The table shows great differences between the two groups. 33.6 pct of children in outside home care are an only child compared to 30.8 pct of not placed children. Looking at congenital deformities the table shows that 4.3 pct of the placed children and 1.4 pct of the not placed children have congenital deformities. Further children in outside home care have a significantly lower birth weight and significantly more diagnoses than not placed children. Moreover children who have been in outside home care at age 0-6 are geographically different from not placed children. Children who lived on

the isle of Zealand have a higher frequency of placements than children who come from the peninsula Jutland which is consistent with earlier findings (Jørgensen et al. 1989; Ejrnæs & Frederiksen 2010).

To sum up, children in outside home care have lower birth weight, more diagnoses and congenital deformities than not placed children. Thus, tables 1 and 2 show significant differences in the background characteristics both between children in outside home care aged 0-6 and children not in outside home care and between their parents.

Regarding the outcome at age 20 between the two groups, children not placed in care are more often in employment than children with an intervention age 0-6, hence, 46.1 pct of placed children are in employment at age 20 compared to 75.9 pct of the not placed children. Furthermore, children in outside home care have a higher frequency of unemployment (5.8 pct) compared to not placed children (2.3 pct), 8.2 pct of placed children receives social benefits at age 20 compared to 1.6 pct of not placed children, 9.3 pct of placed children is recipient of disability pension compared to 0.6 pct of not placed children and 22.0 pct of placed children are outside the labor market for other reasons compared to 10.0 pct of the not placed children. Moreover 44.3 pct of children not placed in outside home care are enrolled in education at age 20 compared to 30.3 pct of the placed children. There is however no significant differences between children in outside home care and children not in outside home care when looking at completed education. This is probably due to the fact that outcome is measured at age 20 and many are still enrolled in education. Furthermore, there is no significant difference in income between the two groups. Most likely for the same reason, that outcome is measured at age 20. Another interesting result is that of family status. At age 20 the group of children who have been in outside home care have a slightly lower frequency (82.8 pct) of being single than children who have not experienced a placement in outside home care at ages 0-6 and (84.1 pct). Females who have been in outside home care have a higher frequency of teenage motherhood (0.9 pct) than females who have not been placed in outside home care (0.3 pct). Lastly, table 3 shows that children placed in outside home care have a higher frequency of teenage crime (32.8 pct) compared to not placed children (17.6 pct) and have a greater number of convictions than children who have not been placed in outside home care. Also the type of verdict and type of sentence differs between the two groups. Children not in placement have a higher frequency of verdicts for drunk driving and other types of verdicts which predominantly consists of traffic violations such as speeding, parking tickets, driving without a license etc. They also have a higher frequency of fines than children in outside home care. This might have to do with accessibility to a

car (their own or their parents) being greater for not placed children than for children in outside home care.

Children on the other hand who have been in outside home care have a higher frequency of verdicts for violence, sexual offences and theft and they more often have more severe sentences such as unconditional and conditional convictions.

Not surprisingly tables 1-3 shows great differences between the group of children who have been in outside home care and the group of children who have not been in outside home care as well as between parents of children in placement and parents of children not in placement. This supports the need for finding an adequate control group.

In the following it is shown how use of propensity score matching is proposed to tackle the problem of lacking an ideal control group.

5. TREATMENT EFFECTS

The aim of this paper is to analyze consequences of placement in outside home care on a child's adult outcome. Since treatment (placed in outside home care) is not randomly assigned - in fact, the treatment is only given in highly selected cases and thereby differs systematically from other children – independence cannot be assumed and alternative evaluation methods have to be considered. Children receiving the treatment are a highly selected group whom the authorities for various reasons assess as being unable to remain in the home and for whom therefore an outside home placement is implemented. In this study propensity score matching is used to group treated and controls so that comparisons are meaningful (Rosenbaum & Rubin 1983). Propensity score matching or 'matching on observables' tries to re-establish random experimental conditions in a non-experimental setting by selecting a control group of non-treated who are as similar as possible to the treated with respect to observable characteristics. When the set of observable characteristics is informative enough to capture differences between individuals in terms of potential outcomes, the method of matching can produce unbiased estimates of treatment effects (Dehejia & Wahba 2002).

The average treatment effect may be identified by introducing the conditional independence assumption (CIA) (Rubin 1977):

$$Y \perp\!\!\!\perp D \mid X$$

where ⫫ denotes independence. This assumption ensures that conditional on the observed X's, potential non-treatment (and treatment) outcomes are independent of treatment status. For the average treatment effect on the treated, a weaker version of the CIA is sufficient:

$$E(Y \mid D=1, X) = E(Y \mid D=0, X)$$

In this case the assumption implies that conditioning on the observables X, the expected potential adult outcome in case of non-placement in outside home care is the same for the two groups of placed and non-placed children and youth, respectively. So if CIA holds, I can use observed adult outcomes of non-placed children to measure potential adult outcomes for placed children, conditional on the characteristics X.

To ensure common support, i.e. that there are both treated and non-treated individuals for each X that are compared, I assume

$$0 < P(X) < 1$$

where $P(X) = \Pr(D = 1 \mid X)$, the propensity score denotes the treatment probability given the vector of observed characteristics, X. A problem is that the propensity score is not known, but has to be estimated, introducing parametric assumptions into the otherwise non-parametric matching method. For matching on an estimated propensity score to be reliable, it is essential to check the balancing properties of the estimated score carefully (Rosenbaum & Rubin 1985).

In this paper nearest neighbor matching within caliper without replacement is used to estimate the propensity score functions. I use the 5 nearest neighbors and a caliper set to a maximum difference at 0.01 between neighbors. Several other ranges of the caliper and numbers of neighbors have been tried as well as kernel matching, both Gaussian and Epanechnikov, with different bandwidths. All gave results close to the chosen method.

6. RESULTS

The probability of being in outside home care for the first time when controlling for a wide range of X's is estimated by a probit model. Marginal effects are shown in Table 4 and are reported in the following. When controlling for other factors, we discover that boys have 3 percentage points (pp) higher probability of being placed in outside home care at age 0-6 than girls. Health of the child is

very important. The table shows first that children with congenital deformities have 26 pp higher probability of placement, second that the higher the number of diagnoses of the child, the greater the probability of placement and third, the higher the birth weight the lower the likelihood of placement. Hence, health issues play a very important role in placements of children in Denmark. Because it is not possible to identify children with only mental or physical health problems as reason for placement in this sample and because health issues are very closely associated with social problems, it is essential to control for health.

The table shows further, that children of mothers and fathers outside the labor market have a higher probability of placement outside home. Especially children of recipients of disability pension, thus children of mothers on disability pension have a 107 pp higher probability than mothers not on disability pension and children of fathers on disability pension are associated with 81 pp higher probability of placement. These are the highest probabilities estimated of all. Parental health also plays an important role in relation to placements of children. Children of mothers who have been hospitalized for a mental illness have a 76 pp higher likelihood of placement and for children of fathers who have been hospitalized for a mental illness the likelihood is 55 pp higher. Also parental crime is associated with higher probability of placement. For children of mothers who have a verdict it is 57 pp and for children of fathers who have a verdict the probability is 36 pp higher. Thus, it is clear that parental social problems are highly associated with placements of children in outside home care. Parents' level of education is also significantly associated with placements. Compared to parents who have a secondary education children of both mothers and fathers with basic education are respectively 12 pp and 29 pp more likely to be in placement. On the other hand parents' enrollment in education is negatively associated with placement of the child. Parental post-secondary educational attainment has asymmetric effects on child placement. Children of mothers who have a post-secondary education have a 23 pp lower probability of placement, while for children of fathers with post-secondary education the probability is 22 pp higher than for children of fathers with secondary education.

In Table 5 the first column shows the OLS results without any controls included and the standard errors in the second column. The third column shows OLS results with controls followed by the standard errors in column in column 4. The estimated results for the propensity score matching is shown in column 5 followed by the standard errors in column 6. Column 5 reports the average treatment effect of the treated (ATT) along with approximated standard errors.

When looking at basic education the OLS without controls shows no significant difference between children in outside home care age 0-6 and children who have not been in care, but when including controls the estimation turns significant however the association is very small (0.9 pp). Turning to the ATT in column 5 the estimate is even smaller (0.6 pp) and remains significant. The picture is the same for secondary education but the sign changes from positive to negative. For the post-secondary education, the association is significant when looking at OLS with controls but turns insignificant and drops to 0 when estimating the ATT. This might have to do with age at outcome being 20 years old. At this point several of the children probably still enrolled in the educational system and therefore have not finished an education to be categorized as being at another educational level. Thus, when looking at enrollment in education, the OLS with controls shows that children who have been in placement are associated with a 10 pp higher likelihood of being enrolled in education than children who have not been in placement. But when children who have been in outside home placement are compared to the matched control group, the placed children are associated with 8 pp less likelihood of being enrolled in education.

When looking at labor market status the OLS shows that children who have been in placement are associated with 18 pp lower likelihood of being in employment than children who have not been in care. For the children who have been in care the association drops when looking at the AAT to 17 pp when compared to the matched control group. On the other hand the OLS shows that children who have experienced a placement in outside home care age 0-6 are associated with higher likelihood of unemployment (12 pp), of being recipient of disability pension (8 pp), of receiving social assistance (4 pp) and otherwise being outside the labor market (6 pp). The same is true when looking at children who have been placed in care compared to the matched control group. Table 5 shows that children who have experienced care are associated with a higher likelihood of unemployment (13 pp), of being recipient of disability pension (7 pp), of receiving social assistance (4 pp) and otherwise being outside the labor market (6 pp).Both the OLS and the ATT shows that children who have been placed in outside home care at the age of 0-6 are associated with a weak connection to the labor market.

Looking at family status of the treated compared to all children (OLS) or the controls (ATT), there is no significant difference when looking at the likelihood of being single. This result might also have to do with the age the outcome is measured. At age 20 family ties may still be very loose for both children who have experienced placement in care early in life and children who have not. When it comes to teenage motherhood the OLS shows 0.4 pp higher likelihood of having given

birth as a teenager for children who have been in care then for children not in care. For the placed children the association is 0.3 pp compared to the matched control group. Teenage motherhood is very rare even in Denmark. The rarity of the event will naturally influence the result in the model, however both the descriptive statistics and the result from the model shows higher likelihood of teenage motherhood among children who have been placed in care early in life suggesting a heightened focus on prevention in this area.

Finally, I have estimated the likelihood of having a verdict at age 20. Children who have been in outside home care are associated with 6 pp higher likelihood of having a verdict than children not in care. When the group of children who have experienced placement early in life (age 0-6) are compared with the matched control group, the ATT is also 6 pp higher. The higher likelihood compared to not placed children are expected, but compared to the matched control group I would expect an association closer to 0.

6.1. Balancing score and common support

To check the balancing properties for the estimation, a two-sample t-test statistic and standardized differences in means were calculated for the propensity score function for the explanatory variables. The balancing properties are in most cases very good and the differences between the group of treated and the group of controls are reduced to a minimum.

Table 6 shows the statistics for the whole sample. The means for the control groups are very close to the means for the placed group. The t statistics for the test of equality of means are in most cases insignificant except for mothers' post-secondary education and fathers' mental disorder. For these two explanatory variables a significant difference is still remaining between treatment group and control group after matching. One approach that could be tried is to estimate matching models *within* each education group as a robustness check. This will be implemented in future work. Also, the variable for congenital deformities is on the margin of being significant (P>t 0.104). A separate estimation for this group will also be included in the robustness check in future work. Otherwise the t values are very small for almost all variables even though the large sample size implies very small standard errors for the means.

To examine the common support a histogram is graphed in Figure 1. The figure graphs the propensity score by both placed children and non-placed children. Both placed children and non-placed children have their probability mass concentrated around the very lowest values of the propensity score, however, non-placed children to a greater extent than placed children. This

might pose a threat to the common support and could mean that it would be difficult to draw enough control observations to secure an appropriate matching. To explore further if there is a common support problem, I plot a histogram of both treated and control cases with propensity score greater than 0.05. Figure 2 shows overlapping values in the lower part of the spectra, but the treated observations with propensity scores above 0.5 do not all have 5 neighbors within the range of 0.01 indicating common support is not present throughout the whole spectra. However, when imposing common support in the model only 13 treated observations are dropped.

7. CONCLUSIONS

This paper adds to the scant knowledge in the literature of the long-run consequences of placements in outside home care during childhood by bringing reliable large-scale evidence based on the population of children in placement in Denmark. Denmark is an interesting case for several reasons: first, a rather high frequency of children are in outside placement relative to other countries; second, very rich panel data exist on the whole population on a range of variables: demographics, socioeconomics, health etc., therefore, the population of placed children can be followed over time in the registers; third, a uniform welfare-state financed policy exists in this area with laws authorizing the municipalities regarding the type of action to be taken. Using these unique data, it is possible to study the rare event of being placed in outside home care. I focus on adult outcomes, e.g. education, labor market status, family relations and crime of all children who were born in Denmark in the period 1981-1986 and who have been placed for the first time in outside home care age 0-6. Linking children to their parents enhances the model by incorporating intergenerational transmission mechanisms. Children placed in outside home care are a highly selected group and therefore it is difficult to find a suitable control group. Propensity score matching is used to overcome the selection bias embedded in the study population when estimating the counterfactual outcomes of placed children had they not been placed in outside home care. My findings show that outside home placements show *negative* associations with children's long-run outcomes of education completion, labor market status, including unemployment, disability pension, social assistance receipt and crime rate. Propensity score matching makes it possibly to approach the true effect of placement a great deal, however propensity score matching has its limitations when it comes to unobserved information which influence the placement decision and outcome but are not included in the model. Examples of unobserved characteristics that could influence the decision of placement are parental drug or alcohol abuse which is not recorded in the registers of Statistics

Denmark. Also a mild psychiatric disorder such as depression which can influence the ability of caring for the child but does not need hospitalization is an unobserved factor. Information on prescription of medicine is not available for the time period of interest. These limitations make it infeasible to conclude whether the effect of the placement on the outcomes are causal or not but placement does not appear to reduce criminal tendencies, heighten education level, enrolment in education or labor market status in any case. In future work, I plan to examine the mechanisms leading to these negative long-run effects as well as identify heterogeneous effects for particular groups of children.

7.1 Further analysis

The results in this paper and previous studies show great importance of family dynamics in the decision making of placements of children in outside home care. To explore this further a subsample of siblings will be analyzed in a fixed effects model. This can help generate information on unobserved family characteristics or dynamics that are not already included in the propensity score estimations. This analysis can be viewed as a supplement to results from the propensity score estimation.

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Table 1. Descriptive statistics of parents of children who have not been placed aged 0-6 and parents of children who have been placed in outside home care aged 0-6. 1980-1985. One-year lagged

	Mother			Father		
	Placed	**Not placed**		**Placed**	**Not placed**	
Enrolled in education	4.8	5.1		2.1	4.2	***
Primary education	85.1	50.9	***	64.3	35.5	***
Secondary education	10.1	27.4	***	29.3	44	***
Post secondary education	4.7	21.6	***	6.4	20.5	***
Employed	34.8	76.2	***	59.3	88.9	***
Unemployed	25.5	14.3	***	23	7.6	***
Disability pension	4.0	0.3	***	3.4	0.2	***
Other[1]	35.8	9.2	***	14.3	3.3	***
Income	48.577	58.480		62.370	666.244	
Record of crime	8.2	0.9	***	13.0	3.9	***
Single	47.8	14.6	***	36.6	11.9	***
Cohabitating	52.2	85.4	***	63.4	88.1	***
Psychiatric diagnosis	0.4	0	***	0.4	0.1	***
No. diagnoses	0.6	0.3		0.1	0.1	
Observations	5.166	306.952		5.166	306.952	

*0.10 **0.05 ***0.01 significance level

[1]Other include individuals who are enrolled in education, different kinds of social benefits or other states outside the labor market. These are not separately computed before the late nineties.

Table 2. Descriptive statistics 20 year-olds who have not been placed aged 0-6 and 20 year-olds who have been placed in outside home care aged 0-6.

	Placed	**Not placed**	
Boy	53.6	51	***
Birth weight	3,212	3,393	
Only child	33.6	30.8	***
Having siblings	66.4	69.2	***
Mother's age at her first birth	25.3	26.6	
Parity	1.9	1.8	
No. of diagnoses	0.6	0.3	
Congenital deformities	4.3	1.4	***
County of Copenhagen	23.3	21.3	***
County of Frederiksborg	6.5	5.6	***
County of Roskilde	4.9	3.9	***
County of Vestsjælland	8.4	5.4	***
County of Storstrøm	6.1	4.3	***
County of Bornholm	0.9	0.8	
County of Fyn	9	8.7	
County of Sønderjylland	3.4	4.6	***
County of Ribe	3.8	4.6	***
County of Vejle	6.1	6.7	*
County of Ringkøbing	4.5	5.4	***
County of Århus	11.8	13.6	***
County of Viborg	3.9	4.8	***
County of Nordjylland	7.3	10.1	***
Observations	5,166	306,952	

*0.10 **0.05 ***0.01 significance level

Table 3. Descriptive statistics 20 year-olds who have not been placed aged 0-6 and 20 year-olds who have been placed in outside home care aged 0-6. (outcome)

	Placed	**Not placed**	
Enrolled in education	30.3	44.3	***
Primary education	96.2	95.8	
Secondary education	3.8	4.1	
Post secondary education	0.0	0.0	
Employed	46.1	75.9	***
Unemployed[1]	5.8	2.3	***
Disability pension	9.3	0.6	***
Social assistance[2]	8.2	1.6	***
Student grant [3] (SU)	8.6	9.6	**
Other outside the labor market[4]	22.0	10.0	***
Income	76,201	76,113	
Single	82.8	84.1	**
Cohabitating	17.2	15.9	**
Teenage mother	0.9	0.3	***
Teen crime	32.8	17.6	***
No. of verdicts	4.2	2.2	
Verdict of violence and sexual offences	28.6	15.0	***
Verdict theft	44.7	30.5	***
Verdict of drunk driving	5.8	14.4	***
Other verdicts	20.9	40.1	***
Unconditional conviction	14.3	5.9	***
Conditional conviction	24.6	13.5	***
Fine	53.1	74.5	***
Other conviction	8.0	6.1	***
Observations	5,166	306,952	

[1]Receiving cash benefits from unemployment insurance funds. This rate is considerable higher than cash benefits received from the municipality. but require a paid membership.
[2]Receiving cash benefits from the municipality. These benefits are heavily restricted.
[3]Every Dane over the age of 18 is entitled to public support for his or her further education - regardless of social standing.
[4]Other include individuals who are on leave incl. maternity leave. sickness benefits. participating in active labor market programs etc

Table 4. Partial effects estimations: First placement outside home aged 0-6 for the birth cohorts 1980-1986

	Estimated marginal effect at the mean	**S.E.**
Male	0.0318**	(0.0128)
Birth weight	-0.0001***	(0.0000)
Congenital deformity	0.2573***	(0.0390)
Only child	0.1375***	(0.0152)
Number of diagnoses	0.1844***	(0.0068)
County of Copenhagen	-0.1605***	(0.0305)
County of Frederiksborg	-0.0652*	(0.0367)
County of Roskilde	-0.0176	(0.0405)
County of Vestsjælland	0.0793**	(0.0323)
County of Storstrøm	0.0722**	(0.0353)
County of Bornholm	0.2148***	(0.0726)
County of Sønderjylland	-0.0225	(0.0396)
County of Ribe	-0.0069	(0.0386)
County of Vejle	0.0023	(0.0336)
County of Ringkøbing	0.0764**	(0.0379)
County of Århus	-0.0640**	(0.0289)
County of Viborg	0.0295	(0.0397)
County of Nordjylland	-0.0172	(0.0320)
Mother unemployed	0.3431***	(0.0194)
Mother disability pension	1.0722***	(0.0576)
Mother other	0.6099***	(0.0191)
Mother enrolled in education	-0.1648***	(0.0316)
Mother primary	0.1244***	(0.0346)
Mother post secondary	-0.2326***	(0.0227)
Mother single	0.3554***	(0.0299)
Mother verdict	0.5689***	(0.0330)
Mother mental disorder	0.7606***	(0.1421)
Mother diagnoses	0.1951***	(0.0077)
Father unemployed	0.3080***	(0.0234)
Father disability pension	0.8070***	(0.0734)
Father other	0.4091***	(0.0318)
Father enrolled in education	-0.3159***	(0.0439)
Father primary	0.2879***	(0.0401)
Father post secondary	0.2250***	(0.0185)
Father single	0.0511	(0.0350)
Father verdict	0.3595***	(0.0244)
Father mental disorder	0.5521***	(0.1377)
Father diagnoses	0.0581***	(0.0178)
Rate of 0-17 year olds in municipality	-0.0397***	(0.0039)
Rate of employed in municipality	0.0333***	(0.0049)
Rate on disability pension in municipality	0.0514***	(0.0133)
Rate of single parents in municipality	0.1715***	(0.0111)
Expenses on public goods in municipality	-0.0155***	(0.0024)
Municipality size	0.0001	(0.0001)
Constant	-3.6661***	(0.2873)
Observations	312118	

Standard errors in parentheses
* p<0.10. ** p<0.05. *** p<0.01

Table 5. Estimated treatment effects

	OLS		OLS with controls		ATT	
Enrolled in education	0.140***	(0.0070)	0.096***	(0.0079)	-0.083***	(.0090)
Primary	0.004	(0.0029)	0.009***	(0.0033)	0.006***	(.0039)
Secondary	-0.004	(0.0029)	-0.009***	(0.0033)	-0.008**	(.0038)
Post secondary	-0.000	(0.0002)	-0.000***	(0.0001)	0.000	(.0000)
Employed	-0.298***	(0.0061)	-0.182***	(0.0086)	-0.168***	(.0096)
Unemployed	0.035***	(0.0022)	0.012***	(0.0039)	0.013***	(.0043)
Disability pension	0.087***	(0.0012)	0.080***	(0.0049)	0.074***	(.0049)
Social assistance	0.066***	(0.0018)	0.044***	(0.0046)	0.037***	(.0050)
Student grant	-0.010**	(0.0042)	0.044***	(0.0046)	-0.017***	(.0056)
Other	0.120***	(0.0043)	0.064***	(0.0070)	0.061***	(.0077)
Single	0.013**	(0.0052)	-0.001	(0.0063)	0.002	(.0073)
Juvenile crime	0.152***	(0.0054)	0.062***	(0.0074)	0.060***	(.0088)
Teenage motherhood	0.007***	(0.0007)	0.004**	(0.0017)	0.003*	(.0018)

Table 6. Balancing properties with respect to explanatory variables of the propensity score. Treatment* and control groups**

	Mean Treated	Mean Control	%bias	% reduct bias	t-test t	p>|t|
Male	.5235	.5182	1.0	79.3	0.43	0.664
Birth weight	3123.2	3112.3	1.5	96.0	0.63	0.527
Congenital deformity	.0382	.0461	-4.7	73.4	-1.62	0.104
Only child	.433	.4246	1.7	69.3	0.66	0.506
No. of diagnoses	.8311	.8383	-0.7	98.6	-0.25	0.799
County of Copenhagen	.2341	.2403	-1.5	69.3	-0.60	0.546
County of Frederiksborg	.0626	.0603	1.0	75.0	0.40	0.690
County of Roskilde	.0516	.0500	0.8	84.1	0.29	0.769
County of Vestsjælland	.0776	.0782	-0.2	98.1	-0.09	0.931
County of Storstrøm	.0568	.0583	-0.7	91.8	-0.27	0.791
County of Bornholm	.0101	.0090	1.3	-17.3	0.49	0.621
County of Fyn	.093	.0920	0.3	68.1	0.11	0.916
County of Sønderjylland	.0345	.0415	-3.6	41.3	-1.52	0.129
County of Ribe	.0388	.0378	0.5	87.6	0.21	0.831
County of Vejle	.0608	.0627	-0.8	68.6	-0.32	0.749
County of Ringkøbing	.0478	.0429	2.3	47.7	0.98	0.326
County of Århus	.1179	.1178	0.0	99.1	0.02	0.984
County of Viborg	.0374	.0349	1.2	73.3	0.55	0.584
County of Nordjylland	.0774	.0746	1.0	90.2	0.44	0.662
Mother's age at her first birth	.8418	.8400	0.6	98.3	0.20	0.839
Mother employed	.0026	.0029	-0.1	98.7	-0.23	0.818
Mother unemployed	.3615	.3658	-0.9	98.7	-0.37	0.711
Mother disability pension	.2610	.2597	0.4	98.3	0.13	0.897
Mother other labor market status	.0414	.0390	1.9	91.3	0.51	0.611
Mother enrolled in education	.3334	.3326	0.2	99.6	0.07	0.943
Mother primary	.0600	.0611	-0.5	63.4	-0.19	0.848
Mother secondary	.0646	.0664	-0.4	96.9	-0.30	0.765
Mother post secondary	.7981	.7285	14.2	66.8	6.82	0.000
Mother single	.0944	.0946	-0.0	99.9	-0.02	0.987
Mother verdict	.0026	.003	-0.1	98.7	-0.23	0.818
Mother mental disorder	.4864	.4884	-0.5	99.2	-0.16	0.870
Mother No. diagnoses	.5110	.5088	0.5	99.2	0.19	0.851
Father employed	.1046	.0995	2.5	93.0	0.70	0.485
Father unemployed	.0049	.0047	0.4	95.2	0.12	0.908
Father disability pension	.6295	.6503	-2.6	94.5	-0.90	0.366
Father other labor market status	.3809	.3741	1.4	96.4	0.59	0.558
Father enrolled in education	.3743	.3794	-1.1	98.4	-0.44	0.663
Father primary	.1359	.1376	-0.6	97.4	-0.21	0.831
Father secondary	.0229	.0212	1.7	89.8	0.48	0.634
Father post secondary	.0860	.0877	-0.8	96.8	-0.25	0.805
Father single	.0264	.0274	-0.6	95.4	-0.25	0.800
Father verdict	.4261	.4242	0.4	99.1	0.16	0.872
Father mental disorder	.3607	.3200	9.0	38.8	3.57	0.000
Father No. diagnoses	.1770	.1821	-1.2	97.0	-0.55	0.585
Rate of 0-17 year olds in municipality	.3809	.3741	1.4	96.4	0.59	0.558
Rate of employed in municipality	.2234	.2328	-2.8	91.3	-0.94	0.349
Rate on disability pension in municipality	.3957	.3931	0.6	99.1	0.22	0.823
Rate of single parents in municipality	.1336	.1373	-1.3	95.9	-0.45	0.653
Expenses on public goods in municipality	.0044	.0046	-0.4	94.2	-0.13	0.899
Municipality size	.1057	.1080	-0.6	94.8	-0.22	0.824

*Treatment= children born 81-86 and placed in outside home care aged 0-6 (more than 6 month in total)
**Control group= all children born 81-86

Figure 1. Histogram of propensity score by both placed children and non-placed children

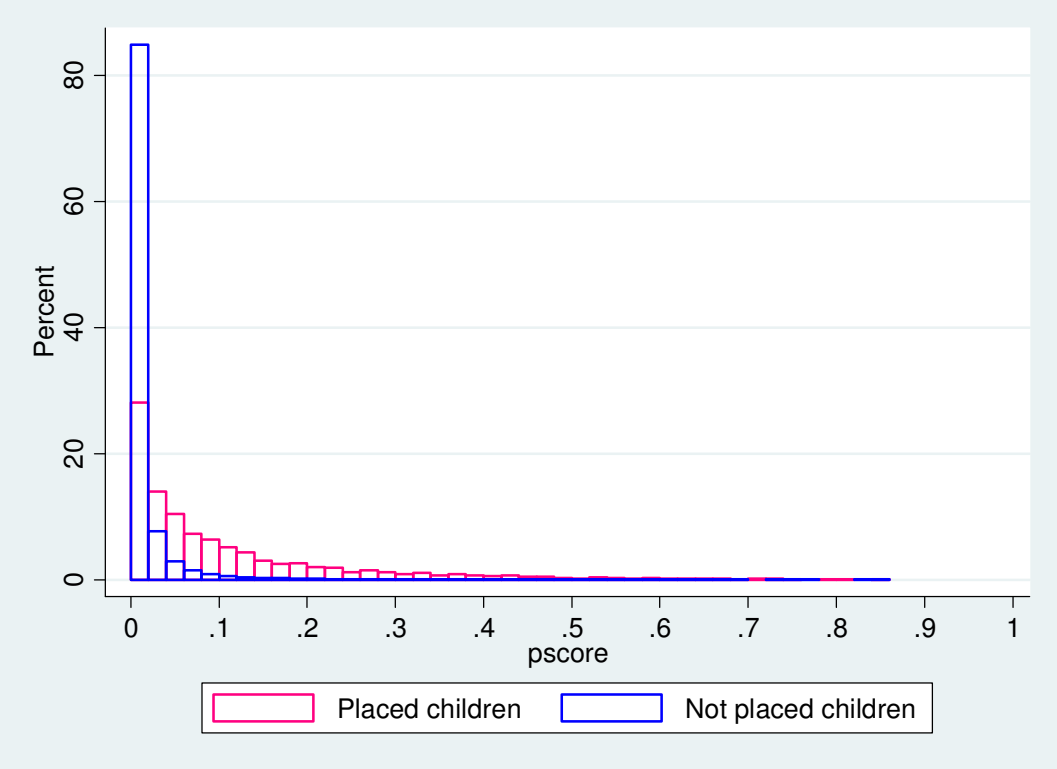
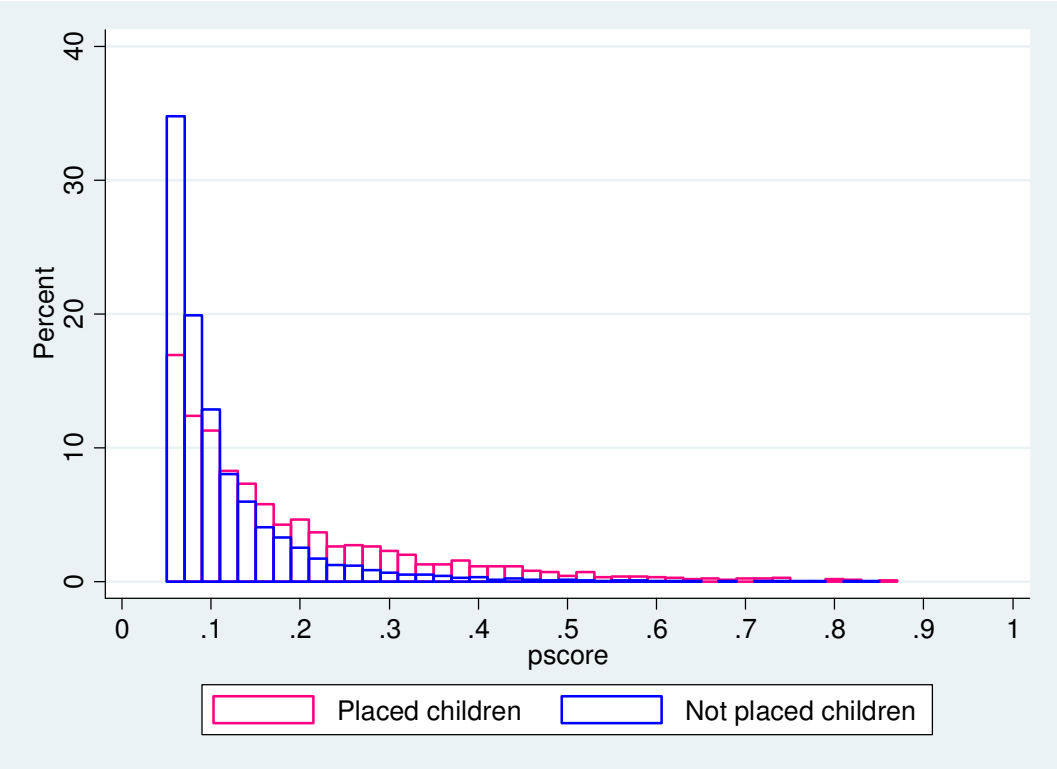


Figure 2. Histogram of propensity >0.05 score by both placed children and non-placed children



Placements of siblings in outside home care: Does age at placement matter?

Signe Frederiksen*

Abstract

In child development stage theory, social, cognitive and language skills develop in children at specific ages. In relation to placements in outside home care, it is relevant to analyze whether placements at particular ages are more stressful for children than at others, and, hence, whether age at placement influences the long-term outcomes for children placed in outside home care.

Using family fixed effects, this paper investigates siblings who are placed in outside home care at the exact same date for the first time, but at different ages. Thus, I analyze employment, education and crime outcomes at age 20 for a child who is placed outside the home at a specific age compared to its younger/older sibling who experiences their first placement at the exact same time but at a different age. The same date of first placement indicates that the placement is not due to the child's own characteristics, e.g. behavior, but is more likely due to circumstances within the family that are difficult to identify otherwise. This set-up makes it possible to study long term outcomes of children who come from the same family environment but who are, due to variation in age, at different stages of development. Using rich Danish register data results show the effect of age at placement on employment, education and crime at age 20.

Keywords: Family, siblings, placement in outside home care, family fixed effects, child development
JEL codes: J08 J12 J13

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*Department of Economics and Business, Aarhus University. Address: Hermodsvej 22, 8230 Aabyhoej, Denmark. E-mail: sifr@asb.dk

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1. INTRODUCTION

Placement of children in outside home care is a major intervention in more than one sense. Naturally, for the child who is removed away from home and from its family environment, it is a notable change, as well as for the family. Furthermore, it is a big decision for the acting authority to intervene and to make the right intervention for the given child. Hence, knowledge of the effects of placements in outside home care is of great importance to ensure the right policy implications. When making the decision to place a child in outside home care, it is important that the caseworker has the best possible evidence foundation. Several studies of children in outside home care have been carried out but only a limited number of them deal with causality issues and are able to inform on whether placements in outside home care affect outcomes such as employment, education and crime. This paper focuses on placements in outside home care at different levels of age, expecting children at certain ages to be more vulnerable than at others, and, therefore, more sensitive to changes in their environment. Using a family fixed effects model, the long-term outcome of siblings placed at the exact same time is analyzed. Thus, families where there is slightly different spacing between siblings are exploited which allows comparing similar families with plausibly exogenous variation in the age at entry into placement.

In a Danish context placement of children in outside home care is carried out by the municipalities. The tax-funded welfare state model which ensures universal education, health care, unemployment benefits, old-age pension, child care etc. also warrants help to vulnerable children. The municipalities are authorized by law to identify and investigate vulnerable children and assess whether or not a placement is required. The municipalities have all responsibility and take all decisions regarding a placement.

The Danish Social Services Act stresses securing of the assistance of children and young people with special needs and ensuring the best possible conditions for their upbringing by establishing a safe, caring and continuous childhood environment with stable adult relations; it mentions opportunities for the child's personal development, development of skills, development of relations, support of the child's health, education and preparation for independent adulthood (Consolidation act on social services §46). Hence, the Danish act on social services rather than simply responding to charges of direct child abuse and neglect is more far-reaching, and can be enforced to ensure that a child or young person has the same development opportunities as their peers despite their individual problems, and, furthermore, emphasizes prevention and early continuous support. The focus on early intervention in Denmark makes it possible for researchers to study the relative effects of placements at early ages compared to later ages.

The paper is structured as follows: Section 2 is an overview of the theoretical framework. Section 3 is a literature review of some relevant studies. Section 4 describes the data. In Section 5 I go through the empirical model. Section 6 shows the results and finally, Section 7 is a discussion of the findings.

2. THEORETICAL FRAMEWORK

The theoretical point of departure of this paper is in developmental psychology and the idea of critical periods of development. In the early and mid-20th century, several seminal theories of children's biological, cognitive, social, emotional, cultural, moral and lingual development were formulated and came to be known as developmental stage theories (Freud, Erikson, Kholberg, Stern and Piaget). These theories argued that development in children's skills is a discontinuous process involving distinct stages which are characterized by qualitative differences in behavior (Hayslip et al., 2006). According to the Swiss developmental psychiatrist Jean Piaget's cognitive stage theory (1952), children can be divided into age categories where they are supposed to develop certain skills. At age 0-1 children develop their sensory-motor skills such as sucking, eye contact, hand-eye coordination and intentional grasping. The child starts understanding the physical world, separation and object permanence – that objects exist even when the child cannot see them. Towards the end of the stage the child starts differentiating between means and goals. Children at ages 2-6 are also called play-age children. They start reacting mentally with respect to objects and develop preoperational skills such as language, drawing, imagination and memory. They are not yet capable of thinking logically and they have trouble taking the viewpoint of others. Age 7-10 is the so-called concrete operational stage where the child starts using logic appropriately. The child is able to classify and sort things into size, color, series etc. The child can take multiple aspects into account and is now able to view things from another's perspective. The last stage is the formal operational stage age 11-14. At this age children move beyond concrete experiences and start thinking in a logical, systematic and abstract way. They can think hypothetically and test solutions systematically.

Most of the great stage theories from the early and mid-20th century have been either further developed or heavily criticized. Today, the field of developmental psychology is characterized by empirical studies which cannot be collected under one great theory, and instead a whole range of different orientations have emerged, applying a relatively loose theoretical framework. However, there is still some following of the discontinuous approach, while others

embrace a continuous approach where children develop gradually and smoothly over a lifespan and yet others have been drawn to theories of children's role within a social and cultural context (Berk 2007). The discussion of continuous vs. discontinuous development is not addressed further in this paper. This paper only refers to the discontinuous perception of child development of the stage theorist as a possible theoretical foundation and attempts to find empirical evidence either supporting or rejecting it. The results of this paper show that even if the theory of stages and discontinuous development has lost its dominant position, there are significant differences in the long-term outcomes of siblings placed at the same time but at different ages indicating that certain ages are more sensitive to major changes in children's environment such as a placement in outside home care than other ones.

3. RELEVANT LITERATURE

Only few econometric studies have been conducted on the topic of children placed outside home, and none, to my knowledge, explore age as a source to whether age at placement matters in terms of long-run outcomes of children. However, a major aspect of the public debate in Denmark concerns effects of early intervention as opposed to later intervention.

A study by Doyle (2007) investigates the long-run outcomes of vulnerable children. He uses the removal tendency of investigators as an instrument to identify causal effects of foster care placement on a range of outcomes for school-age children and youth who are roughly between the ages of 5 and 15 at the time of the abuse investigation. The results should therefore be regarded as the effects of foster care placement on delinquency, teen motherhood, employment and earnings for relatively older children exposed to abuse. He finds that children on the margin of placements tend to have better outcomes when they remained at home, especially for older children, but he urges caution in the interpretation due to large marginal treatment effects. However, the results show higher delinquency rates, teen birth rates and lower earnings for children who have been in foster care (Doyle 2007). In another study Doyle (2008) explores an even longer time span and focuses on adult crime at age 31. He uses the same set-up as in Doyle 2007 and extends with characteristics of children who were on the margin of foster care which provides him with information on the type of cares in which the main results are most likely to apply. Doyle finds that children on the margin of foster care have three times higher rates of arrests and imprisonment than those of children who stayed at home, again Doyle warrants causation in the interpretation due to lack of precision.

In a Danish study by Ejrnæs (2011) the effect of institutional care and care in foster families on education and crime is identified. Using difference-in-difference approach information on siblings who have never experienced child protection issued as controls for their siblings who have experienced child protection, she controls for family specific factors and thus estimates the relative impact. Further, she employs an instrumental variables approach by exploiting municipalities' varying intensities of use of different types of placement. The study finds strong evidence that foster families are better than residential institutions at preventing children from engaging in criminal behavior and for sending them on in the education system. Even though sibling-differenced models can control for shared unobserved family-specific effects that are time-invariant such as common facets of upbringing or genes, they cannot account for individual child-specific characteristics contributing to the fact that one sibling gets placed in outside home care and the other sibling does not. Child-specific reasons are likely to be one of the main reasons for placement when only a single child is removed from the family. This strategy further assumes that the act of placement of a child does not have a direct effect on the development trajectories of other children in the family. We may expect that the reduction in family size increases the level of family resources for the other children in the family and improves their outcomes. On the other hand, removing a child from the home may have a traumatic effect on the other siblings and actually worsen their outcomes. Finally, by definition, the sample consists only of multiple-children families.

Berger & Waldfogel (2004) use both linear probability models and discrete-time event history models to explore the effects of family resources and family structure on (1) the probability that a child is living outside home in a given year, (2) the probability that a child is removed from home in a given year, conditional on the child living at home in the previous year, (3) the probability that a child is removed from home for the first time, (4) the probability that a child is reunified with its biological parent(s) given that the child was living in outside home care in the previous year. The study shows that 1) lower-income, single-mother, and mother-partner families are considerably more likely both to be living out-of-home and to be removed from home. 2) A change in family structure also tends to place a child at higher risk of an out-of-home living arrangement, unless this transition functions to bring a child's father back into the household. 3) No relationship between income and the probability of a family reunification, 4) that single mother and mother-partner families are less likely to reunify, 5) maternal work appears to increase the probability that a child lives at home, and finally 6) welfare benefit levels are negatively related to

out-of-home placements. They conclude that their results provide some indication that policies matter and higher welfare benefits appear to be associated with increases in children remaining at home, particularly as opposed to being placed in a service setting.

In a study from 2008 Kessler et al. use propensity score weighting to estimate long-term mental and physical health of 479 former foster care children who were placed in foster care as adolescents in Oregon and Washington. They find that children from private programs had significantly fewer mental disorders, ulcers, and cardiometabolic disorders, but more respiratory disorders, than did children who have been in the public program (Kessler et al. 2008).

Berger et al. (2009) looks at different methods to adjust for selection bias when estimating impact of placements in outside home care the methods being OLS regressions, residualized change, simple change, difference-in-difference, and fixed effects models. They find that although results from the unmatched OLS and residualized change models suggest that out-of-home placement is associated with increased child behavior problems, estimates from models that more rigorously adjust for selection bias indicated that placement has little effect on children's cognitive skills or behavior problems. In this study, I try to adjust for selection by comparing siblings within families and by exploiting the fact that the spacing between siblings varies across families, thereby generating exogenous variation in the age of placement.

A 2011 report released by The Danish National Centre for Social Research (Fuglsang Olsen, Egelund and Lausten, 2011) measure outcomes at age 24 of three cohorts of placed children, born 1980-1982 and observed in the Danish registers. Propensity score matching is used to construct a comparison sample among unplaced children in the same cohorts, where matching on the basis of parental characteristics of the children. The outcomes considered are education and labor market participation, health (both somatic and psychosomatic) and crime. When testing for heterogeneous effects according to age of placement, there is a slightly higher tendency for children placed at ages 0-5 and those placed >12 to have no education beyond basic compulsory school compared to those placed at ages 6-12 but no effect of age at placement on the other outcomes. As the authors point out, propensity score matching reduces but does not eliminate selection bias.

Finally, in a recent paper Lindquist and Santavirta (2012) explore the separate effects of foster care and residential care on adult crime but in a Swedish setting paying particular attention to the age of placement. The data consist of the Stockholm Birth Cohort Study (SBC), including all individuals born in Stockholm in 1953 who were living in the Stockholm metropolitan area a decade later. They access full case information on each child in the SBC subject to a removal

investigation from the Child Welfare Committee (CWC) files. The treatment group consists of placed children while the comparison group is children at the margin of placement (visited but not placed). Lindquist and Santarvirta vary effects of out-of-home placement on crime by *age group* of initial placement (0-6, 7-12, 13-18), since the actual age of placement is not observed in the data. Their results show that both foster care and residential care have adverse effects of adult criminality of boys compared to non-placement whereas only residential care negatively impacts adult criminality of girls. For both types of care, an informative finding is that the effects on crime are only present for children placed at adolescence (13-18) but not at younger ages.

The literature on the effects of age of placement on long-term outcomes is scant, and has often yielded mixed findings. None of the studies mentioned above have compared siblings placed at the same point in time.

4. DATA

To target the consequences of placements in outside home care, this paper investigates siblings born in the period 1980-86 who experience their first placement at the exact same time. Siblings are defined as children registered with the same (biological) mother but are allowed to have different fathers. To be able to look at long-term outcomes it is necessary to have an extensive time span to explore. Even though the first collection of Danish data on placements in outside home care began in 1977, a more thorough collection, however, was conducted from 1980 and onwards by Statistics Denmark. Further, an extensive registration of the population took place in the early 1980s including registration of education, employment, income, social benefits etc. To carry out the analysis in this paper, a whole range of information has to been merged from different registers into one dataset beginning in 1980 and following individuals continuously up to 2006. Thereby, I have information of every placement taking place and how long each placement lasts. Hence, I can control for number of placements and overall time spent in placement. There are several types of settings where a child can be placed in care. Foster care and residential homes are the most commonly used. Other types of care are boarding schools, continuation schools in lodgings or in socio-educational housing[8]. Most of these target older children and adolescents. In this study type of placement is not considered. All data have been retrieved from Statistics Denmark and processed. I pool children born 1980-1986 and analyze their employment, educational level and crime at age 20. At this age it is reasonable to assume that the children under observation would have finished a

[8] Socio-educational housing is privately placed outside home care slots, which can vary from small professional families to institution-like places.

basic education or are employed. Furthermore, at age 20, cases of juvenile delinquency will have been registered.

Register data only suffer from attrition to a small extent. Due to the way the registration of information is carried out, there is no retrospective information and only natural attrition because of death or migration. All individuals have an identification number which is the key to linking all other information to the individual. Hence, a child is equipped with identification number which can link it to its mother. In this study the mother is the defining key to the family and knowing identification number for both child and mother is therefore central to identifying families and siblings. Thus, when two children are linked to the same mother I identify them as siblings. The child is further equipped with an identification number for the father. In this study information about the father is only used as control variables. Table 1 show that most sibling couples in the sample are registered with the same father and therefore the information will be fixed. But in a few cases sibling couples have different fathers and hence, the paternal information will differ from one sibling the other, which I control for. Observations with missing information on the identity of the mother are excluded from the population.

The population is restricted to include only sibling couples who both reach the age of 20 no later than 2006, where the study period ends. This means that sibling couples in the population can have both older and younger siblings who are not included in the study. Older siblings are not included because they are born before the study period begins and information on these individuals' characteristics are therefore missing, and younger siblings are not included because they will not reach age 20 before the study period ends, and, thus, information of their outcomes will be missing. Table 1 shows the steps in defining the population.

Table 1. Population

	Observations
Population born 1981-1986	366,8778
Children who are siblings	148,632
Children in placement	15,648
Children placed at the exact same time for the first time as their sibling	2,754
- Children with same father as their sibling	1,742
- Children with a different father than their sibling or missing	1,012

When the population is divided into the age-categories given by the stage theory, I get 177 children placed at ages 0-1; 885 children placed at ages 2-6; 547 children placed at ages 7-10; 343 children placed at ages 11-14 and 208 children placed at ages 15-18.

Employment, education and crime are, as aforementioned, all measured at age 20. Data of employment and education is annually reported and teenage crime is date- specific and reported when an individual is registered with a verdict. In the Danish registers employment data cover all states of labor market attachment that are mutually exclusive hence an individual is only registered with their main labor market status at a given point in time of year e.g. employed. Education is measured as having completed a basic education at age 20 and crime is measured as having a verdict at age 20.

5. EMPIRICAL STRATEGY

Children placed in outside home care are a highly selected group. In dealing with effects of placements on adult outcomes it is essential to establish a plausible research design. Using register data makes it possible to control for a wide range of variables e.g. birth weight, parental employment, education, income, social benefits, crime, family situation and illness, but what is not possible to control for using the Danish register data is behavioral problems of the child and dynamics within the family. A family fixed effects model is applied in this chapter to remove bias associated with the omission of unmeasured persistent family characteristics. Further, unobserved personal behavioral characteristics of the child are less of an issue in this set-up given that both siblings are placed in outside home care at the exact same time for the first time, meaning that family characteristics rather than child behavioral characteristics are likely to be the reason for the placement decision. The downside, of course, is that the sample is limited to families with more than one child, siblings spaced less than 6 years apart and that siblings who do not vary in age of placement do not contribute to the variation. The empirical specification analyzing sibling data starts out with modeling age at placement on a given outcome,

$$\text{EMPCHILD}_{ij} = \beta AGEPL_{ij} + \gamma_1 FU_j + \gamma_2 FO_j + \theta X_{ij} + \varepsilon_{ij}$$

where i denotes the individual (sibling) and j denotes the family. EMPCHILD_{ij} is employment of the child at age 20, AGEPL_{ij} is the age at first placement of the child, FU_j is a set of unobserved family characteristics for instance mothers' abilities; FO_j is a set of observed family characteristics which could be mothers' education and X_{ij} is a set of individual characteristics in the family e.g. birth weight or sex of the individual child or fathers' characteristics for those sibling couples with different fathers. If the model is estimated via OLS, the role of unobserved family

characteristics is ignored, and this could bias the effect of age of placement, e.g. if children from families with negative unobserved characteristics are placed out of home at earlier ages.

Now consider a sibling pair (i, k) in family j. Given that the time of placement for both siblings is exactly the same, all family characteristics – both observed and unobserved – are the same and hence differenced out. Further, the individual i can be subtracted from his/her sibling k within family j to get:

$$\mathrm{EMPCHILD}_{ij} - EMPCHILD_{kj} = \beta[AGEPL_{ij} - AGEPL_{kj}] + \theta\left[\mathrm{X}_{ij} - X_{kj}\right] + [\varepsilon_{ij} - \varepsilon_{kj}]$$

To extract even more information, I can estimate separate models for every two consecutive stages of development s, s+1:

$$\left[\mathrm{EMPCHILD}_{ij} - EMPCHILD_{kj}\right]^{s,s+1} = \theta^{s,s+1}\left[\mathrm{X}_{ij} - X_{kj}\right]^{s,s+1} + [\varepsilon_{ij} - \varepsilon_{kj}]^{s,s+1}, \qquad s \in (1,5)$$

Note that the age difference between the siblings consists of both an age effect and a duration effect. Since the focus in this paper is effects of placement on skill formation at age specific development stages what I am interested in knowing in fact is whether it is the result of age specific development stages which influences the child's skill formation and hence the long-term outcomes. However, this will also reflect that one child – the older sibling will have been in a neglecting family environment longer than the younger sibling. In the analysis I include information on the number of siblings. This controls somewhat for the duration of exposure to the family. More fundamentally, however, it may not be optimal to distinguish between age effects and duration effects because age of removal matters precisely for many reasons: exposure to family, potential exposure in out-of-home care and stability of the care career, trauma at the time of removal, and all these reasons contribute to why it may be better to remove children at particular ages.

6. RESULTS

First I estimate a linear probability model without and with controls followed by a family fixed effects model for the different age groups compared to each other. All tables show in columns 1 and 2 marginal effects from OLS (linear probability) models without and with controls and in column 3,

the results from the family fixed effects model reported in marginal effects. In the following only the significant results are commented on.

Table 2 shows the results of the stage-specific age at first placement on a range of outcomes. Thus, the table only includes the group of siblings in stage 0-1 with siblings in stage 2-6. The group of children placed age 0-1 is in this table compared with the group of siblings placed age 2-6. When looking at employment, Table 2 shows us that compared to children placed at ages 2-6, children placed at ages 0-1 are more likely to be employed at age 20. The OLS without controls shows 72 pp higher likelihood of employment than the group of siblings placed at age 2-6. When controls are included the association rises to 123 pp higher likelihood. When using fixed effects the result remains, thus, the association drops to 117 pp higher likelihood. Even though the estimate changes when including controls in the model, none of the control variables turn up as significant for this comparison between these age groups.

Table 3 shows the estimation result for the group of siblings placed age 2-6 that has a sibling placed age 7-11. The group of siblings placed age 2-6 are in the OLS associated with 65 pp higher likelihood of being in employment than the group of siblings placed at age 7-11. However the association disappears when adding control variables and remains at the same level and insignificant for FE. When looking at the control variables birth weight has a positive association at 67 pp for children placed in care at age 2-6 compared to the group of siblings placed age 7-11. Also paternal education is associated with higher likelihood (64 pp) of employment for the children placed age 2-6 compared to children placed age 7-11. Furthermore paternal unemployment has a negative association with employment of the child at age 20. Hence, fathers' unemployment are associated with 153 pp lower likelihood of employment of children placed age 2-6 compared to the group of siblings placed age 7-11.

Table 4 shows results for the group of siblings placed age 7-11 that has a sibling placed age 12-14. The group of siblings placed age 7-11 are in the OLS without controls associated with 83 pp higher likelihood of employment compared to the group of siblings placed age 12-14. This association turns insignificant when adding control variables and remains insignificant for the FE estimation. Of the control variables only number of diagnoses and municipality level variables shows an association. Number of diagnoses is in the OLS with control variables associated with 27 pp lower likelihood of employment for children placed age 7-11 compared to the group of siblings placed age 12-14. This association changes to 29 pp lower likelihood for the FE.

Finally table 5 shows results for the group of siblings placed age 12-14 that has a sibling placed age 15-18. The group of siblings placed age 12-14 are in the OLS without controls not significantly more likely to be employed. The association however turns significant when adding controls. The likelihood of being employed at age 20 is 211 pp higher for children placed age 12-14 compared to the group of siblings placed age 15-18. For the FE this association raises to 233 pp though we have to keep in mind the small number of observations for these age groups. For these age groups the only significant control variable beside the municipality-level control variables is number of placements. Number of placements is negatively associated with employment at age 20 for children placed age 12-14 compared to the group of children placed age 15-18.

Table 6 shows the results for having attained a basic education at age 20. The table does not include control variables even though they are included in the estimations of both OLS and FE models. The only reason for this is to minimize the number of tables. Tables 6 show that for the OLS estimates, children placed age 0-1 have 119 pp lower likelihood of having completed a basic education than the group of siblings placed age 2-6. For the FE the likelihood is 152 pp lower. Further the table shows that for children placed age 2-6 the likelihood is 114 pp higher for the OLS and 120 pp higher for the FE compared to the group of children placed age 7-11. The change in sign for the different age groups indicates that both being placed at age 0-1 and age 7-11 are worse in terms of attaining a basic education compared to their siblings placed at age 2-6.

The last outcome I analyze in the chapter is crime. Table 7 shows the result for having a verdict by the age of 20. As in table 6 no control variables is shown – though included in the model. Table 7 shows the OLS results for children placed age 2-6 which are associated with 136 pp higher likelihood of having a verdict at age 20 than the group of siblings placed at age 7-11. The same likelihood is obtained for the FE.

In the sample used so far only siblings in families with sibling pairs have been included. In cases where three siblings were placed at the same time only the two youngest siblings were kept in the sample – excluding the oldest sibling. As a robustness test all three siblings are included in appendix 1. Table A1 re-estimates Table 2 to include 40 additional observations when third siblings are included. The table show slightly higher associations for OLS with controls and for FE. Thus, children placed age 0-1 have 141-142 pp higher likelihood of being in employment at age 20 than the group of siblings placed at age 2-6. This points in the direction of families with more children placed at the same time having an increased association with employment for children placed age 0-1 compared to siblings placed ages 2-6.

Furthermore in the sample used so far siblings sharing both same mother and father and siblings sharing the same mother but different fathers or with missing father information are pooled together. A robustness test where half-siblings are excluded is shown in table A2. The number of observations drops to 170 and that can influence the result. Both OLS and FE show that children placed age 0-1 is associated with 93 pp higher likelihood of employment at age 20 than siblings placed age 2-6. But neither of the results is significant.

7. DISCUSSION

The analyses in this chapter show the importance of taking into account age at placement when evaluating how children are affected by placement. However the picture indicates diverse age effects on employment, basic education and crime. Hence children placed age 2-6 seem to be associated with a higher likelihood of attaining a basic education at age 20, while on the other hand siblings placed at this age stage are also associated with a higher likelihood of having a verdict at age 20 compared to siblings placed at age 7-11. Furthermore, siblings placed age 0-1 are associated with higher likelihood of employment than their siblings placed at age 2-6. Finally siblings placed age 12-14 are also associated with higher likelihood of employment that their siblings placed at age 15-18.

Thus, no immediate directions can be given on the basis of these analyses other than that age at placement matters in several senses and thus it is important to take the age of the child into account when making placement decisions.

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Table 2. Marginal effects on employment for sibling couple age 0-1 vs. 2-6

	OLS (LP)	**OLS (LP) with controls**	**FE with controls**
Placed age 0-1	0.7253***	1.2277***	1.1754**
	(0.2265)	(0.4197)	(0.4934)
Male		0.1270	0.3257
		(0.2429)	(0.3118)
Birth weight		0.1782	0.1880
		(0.1743)	(0.2187)
Voluntary placement		-0.0736	-0.0767
		(0.2486)	(0.3113)
Age at first placement		0.1553	0.0589
		(0.1361)	(0.1738)
No. of placements		-0.0727	-0.0960
		(0.0598)	(0.0778)
Total days in placements		-0.0058	-0.0071
		(0.0064)	(0.0083)
No. of diagnoses		-0.0600	-0.1044
		(0.1267)	(0.1565)
Congenital deformities		0.1557	0.1740
		(0.8136)	(0.9763)
Father unemployed		0.0439	0.1249
		(0.4092)	(0.4925)
Father disability pension		0.2457	0.6517
		(1.1016)	(1.3102)
Father primary		-0.3891	-0.4673
		(0.2886)	(0.3456)
Father verdict		0.5003	0.5518
		(0.3669)	(0.4439)
Rate of 0-17 year olds in municipality		-0.0378	-0.0302
		(0.0748)	(0.0988)
Rate of employed in municipality		-0.0149	-0.0222
		(0.0741)	(0.0991)
Rate on disability pension in municipality		-0.1668	-0.1994
		(0.2081)	(0.2769)
Rate of single parents in municipality		-0.2604	-0.3118
		(0.2029)	(0.2678)
Expenses on public goods in municipality		-0.0000	0.0064
		(0.0366)	(0.0488)
Municipality size		0.0000	0.0000
		(0.0015)	(0.0021)
Constant	-0.8194***	1.7520	2.1790
	(0.1664)	(4.7530)	(6.2903)
Observations	340	340	340

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 3. Marginal effects on employment for sibling couple age 2-6 vs. 7-11

	OLS (LP)	**OLS (LP) with controls**	**FE with controls**
Placed age 0-1	0.6472**	0.8879	0.8878
	(0.2633)	(0.5552)	(0.5552)
Male		0.3888	0.3888
		(0.2937)	(0.2937)
Birth weight		0.6706**	0.6706**
		(0.3067)	(0.3067)
Voluntary placement		0.1133	0.1133
		(0.3132)	(0.3132)
Age at first placement		-0.0025	-0.0025
		(0.1612)	(0.1612)
No. of placements		-0.0494	-0.0494

		(0.1017)	(0.1017)
Total days in placements		-0.0109	-0.0109
		(0.0138)	(0.0138)
No. of diagnoses		0.1008	0.1008
		(0.1924)	(0.1924)
Congenital deformities		0.6498	0.6496
		(1.3311)	(1.3311)
Father unemployed		-1.5255***	-1.5254***
		(0.5768)	(0.5768)
Father disability pension		-1.3870	-1.3868
		(1.4174)	(1.4174)
Father primary		0.6445*	0.6444*
		(0.3732)	(0.3732)
Father verdict		-0.2590	-0.2590
		(0.5257)	(0.5257)
Rate of 0-17 year olds in municipality		0.1746*	0.1746*
		(0.0975)	(0.0975)
Rate of employed in municipality		-0.1088	-0.1088
		(0.0871)	(0.0871)
Rate on disability pension in municipality		-0.5058*	-0.5058*
		(0.3075)	(0.3075)
Rate of single parents in municipality		0.5082*	0.5081*
		(0.2710)	(0.2710)
Expenses on public goods in municipality		0.0399	0.0399
		(0.0505)	(0.0505)
Municipality size		-0.0013	-0.0013
		(0.0020)	(0.0020)
Constant	-0.4618**	-1.6659	-1.6659
	(0.1882)	(5.6668)	(5.6668)
Observations	238	238	238

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 4. Marginal effects on employment for sibling couple age 7-11 vs. 12-14

	OLS (LP)	**OLS (LP) with controls**	**FE with controls**
Placed age 0-1	0.8338***	0.4729	0.5410
	(0.1855)	(0.3425)	(0.4041)
Male		-0.2093	-0.2375
		(0.1951)	(0.2306)
Birth weight		-0.0510	-0.0959
		(0.1662)	(0.2033)
Voluntary placement		-0.1892	-0.1624
		(0.2013)	(0.2449)
Age at first placement		-0.1381	-0.1755
		(0.0904)	(0.1108)
No. of placements		-0.0891	-0.1055
		(0.0580)	(0.0710)
Total days in placements		-0.0008	-0.0018
		(0.0062)	(0.0076)
No. of diagnoses		-0.2681**	-0.2976**
		(0.1240)	(0.1461)
Congenital deformities		-0.6430	-0.8401
		(0.8404)	(1.0042)
Father unemployed		0.1535	0.2669
		(0.3356)	(0.3943)
Father disability pension		1.5357	1.8059
		(1.3255)	(1.4835)
Father primary		0.0966	0.1257
		(0.2372)	(0.2750)
Father verdict		-0.3649	-0.4963
		(0.3345)	(0.3953)

Rate of 0-17 year olds in municipality		0.0170	0.0123
		(0.0529)	(0.0668)
Rate of employed in municipality		0.1551***	0.1898**
		(0.0588)	(0.0762)
Rate on disability pension in municipality		0.1939	0.2543
		(0.1738)	(0.2216)
Rate of single parents in municipality		-0.1637	-0.1891
		(0.1509)	(0.1907)
Expenses on public goods in municipality		0.0035	-0.0004
		(0.0339)	(0.0431)
Municipality size		0.0020	0.0023
		(0.0016)	(0.0020)
Constant	-0.7780***	-7.9149**	-9.3147**
	(0.1359)	(3.5847)	(4.5694)
Observations	502	501	502

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 5. Marginal effects on employment for sibling couple age 12-14 vs. 15-18

	OLS (LP)	**OLS (LP) with controls**	**FE with controls**
Placed age 0-1	0.4595	2.1058**	2.3307**
	(0.3640)	(0.8487)	(1.0527)
Male		-0.6988	-0.7520
		(0.4328)	(0.4833)
Birth weight		-0.0886	-0.1313
		(0.3157)	(0.3608)
Voluntary placement		-0.0099	-0.0829
		(0.4573)	(0.5299)
Age at first placement		0.5611*	0.6207
		(0.3262)	(0.3808)
No. of placements		-0.4812**	-0.5227**
		(0.1951)	(0.2343)
Total days in placements		-0.0027	-0.0032
		(0.0300)	(0.0332)
No. of diagnoses		-0.0255	-0.0046
		(0.2802)	(0.3102)
Congenital deformities		-1.1798	-1.3477
		(1.3759)	(1.5942)
Father unemployed		-0.3195	-0.1832
		(1.0421)	(1.1636)
Father primary		0.4545	0.5221
		(0.5436)	(0.6026)
Father verdict		0.2186	0.2377
		(0.9685)	(1.0529)
Rate of 0-17 year olds in municipality		0.1247	0.1465
		(0.1707)	(0.1943)
Rate of employed in municipality		-0.3048*	-0.3370
		(0.1845)	(0.2184)
Rate on disability pension in municipality		-1.1644**	-1.2921**
		(0.5192)	(0.6451)
Rate of single parents in municipality		0.0529	0.0754
		(0.3993)	(0.4452)
Expenses on public goods in municipality		-0.0257	-0.0270
		(0.0875)	(0.0981)
Municipality size		0.0026	0.0029
		(0.0039)	(0.0043)
Constant	-0.4595*	11.2593	12.2632
	(0.2607)	(11.4400)	(12.9141)
Observations	124	124	124

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Table 6. Marginal effects on basic education for sibling couples

	OLS (LP)	OLS (LP) with controls	FE with controls
0-1 vs. 2-6	-0.6152***	-1.1948***	-1.5242**
	(0.2286)	(0.4577)	(0.5941)
2-6 vs. 7-11	0.0182	1.1419***	1.1987***
	(0.1906)	(0.3874)	(0.4155)
7-11 vs. 12-14	0.1087	0.2784	0.1829
	(0.2693)	(0.5947)	(0.6781)
12-14 vs. 15-18	0.7306*	1.1480	1.1832
	(0.3879)	(1.0331)	(1.0923)

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 7. Marginal effects on crime for sibling couples

	OLS (LP)	OLS (LP) with controls	FE with controls
0-1 vs. 2-6	1.5129***	0.7053	0.7053
	(0.3029)	(0.4922)	(0.4922)
2-6 vs. 7-11	1.4327***	1.3605***	1.3605***
	(0.2347)	(0.4132)	(0.4132)
7-11 vs. 12-14	0.8809***	0.5418	0.5162
	(0.3134)	(0.6452)	(0.7936)
12-14 vs. 15-18	0.5275	1.2730	1.2730
	(0.5211)	(1.2847)	(1.2847)

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Appendix tables

Table A1. Marginal effects on employment for sibling couple age 0-1 vs. 2-6, including sibling groups with 3 siblings

	OLS (LP)	OLS (LP) with controls	FE with controls
Placed age 0-1	0.8849***	1.4213***	1.4054***
	(0.2165)	(0.4044)	(0.4697)
Male		0.1085	0.2803
		(0.2305)	(0.2912)
Birth weight		0.1955	0.2138
		(0.1667)	(0.2074)
Voluntary placement		-0.0109	-0.0086
		(0.2419)	(0.2975)
Age at first placement		0.1576	0.0652
		(0.1320)	(0.1669)
No. of placements		-0.0468	-0.0660
		(0.0581)	(0.0743)
Total days in placements		-0.0079	-0.0094
		(0.0063)	(0.0080)
No. of diagnoses		-0.0133	-0.0373
		(0.1221)	(0.1476)
Congenital deformities		0.0874	0.1120
		(0.8235)	(0.9748)
Father unemployed		0.0547	0.0326
		(0.3911)	(0.4648)
Father disability pension		0.5610	0.9351
		(1.1241)	(1.3079)
Father primary		-0.5798**	-0.6838**

		(0.2788)	(0.3318)
Father verdict		0.2983	0.3169
		(0.3536)	(0.4213)
Rate of 0-17 year olds in municipality		-0.0136	0.0008
		(0.0736)	(0.0962)
Rate of employed in municipality		-0.0515	-0.0588
		(0.0720)	(0.0947)
Rate on disability pension in municipality		-0.2547	-0.2834
		(0.2064)	(0.2693)
Rate of single parents in municipality		-0.4281**	-0.5013**
		(0.1921)	(0.2527)
Expenses on public goods in municipality		-0.0081	-0.0035
		(0.0352)	(0.0463)
Municipality size		0.0009	0.0012
		(0.0015)	(0.0020)
Constant	-0.9163***	4.0966	4.4404
	(0.1610)	(4.4877)	(5.8609)
Observations	380	380	380

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table A2. Marginal effects on employment for sibling couple age 0-1 vs. 2-6, excluding half-siblings

	OLS (LP)	**OLS (LP) with controls**	**FE with controls**
Placed age 0-1	0.5672*	0.9345	0.9253
	(0.3238)	(0.6178)	(0.6343)
Male		0.2578	0.2645
		(0.3672)	(0.3813)
Birth weight		-0.1829	-0.1843
		(0.3506)	(0.3555)
Voluntary placement		0.2320	0.2324
		(0.4234)	(0.4280)
Age at first placement		0.1169	0.1097
		(0.2228)	(0.2445)
No. of placements		-0.1013	-0.1021
		(0.0992)	(0.1008)
Total days in placements		-0.0038	-0.0039
		(0.0098)	(0.0101)
No. of diagnoses		-0.2938	-0.2954
		(0.2112)	(0.2138)
Congenital deformities		0.6228	0.6159
		(1.0312)	(1.0466)
Father unemployed		0.3782	0.3826
		(0.6018)	(0.6102)
Father disability pension		-1.1573	-1.1491
		(1.4831)	(1.5006)
Father primary		-0.6464	-0.6519
		(0.4700)	(0.4794)
Father verdict		1.4960***	1.5070***
		(0.5585)	(0.5815)
Rate of 0-17 year olds in municipality		0.1358	0.1386
		(0.1066)	(0.1141)
Rate of employed in municipality		-0.0588	-0.0601
		(0.1073)	(0.1101)
Rate on disability pension in municipality		-0.3017	-0.3054
		(0.2948)	(0.3032)
Rate of single parents in municipality		-0.2119	-0.2146
		(0.3115)	(0.3180)
Expenses on public goods in municipality		0.0881*	0.0895
		(0.0525)	(0.0564)
Municipality size		0.0003	0.0003
		(0.0020)	(0.0021)

Constant	-0.8755***	-1.5385	-1.5429
	(0.2380)	(7.2041)	(7.3054)
Observations	170	170	170

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Juvenile delinquency among children in outside home care – does type of care matter?

Nabanita Datta Gupta[#] and Signe Frederiksen*

Abstract:

This paper studies juvenile delinquency at ages 15-20 of children who have experienced placement in outside home care and contributes to the literature in investigating whether the *type* of care (foster homes or residential institutions) matters. Placement of either type removes children from a disrupted home life and reinstates social control. On the other hand, institutional care exposes children to a number of peers from the same kind of disrupted background which may have a reinforcing effect on crime. In contrast to earlier work, we isolate the effect of care type on criminal behavior by identifying children with a simple care history, i.e. who have experienced only one type of care throughout, thereby not confounding the effects of different care types on child outcomes. Next, we exploit municipalities' tendency to use different types of placements to instrument mode of care controlling for other relevant municipal characteristics. Our study brings new evidence on differences in the juvenile delinquency rate, the number of verdicts given as well as the type of verdict and sentence and criminal recidivism between children in foster care and children placed in residential institutions.

Keywords: mode of outside home care, evaluation, juvenile delinquency

JEL Codes: J13, J08

[#,*] Department of Economics and Business, Aarhus University. Address: Hermodsvej 22, 8230 Aabyhoej, Denmark. Corresponding author: Signe Frederiksen, e-mail: sifr@asb.dk

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1. INTRODUCTION

This paper studies juvenile delinquency of children who have experienced placement in outside home care. Using annual Danish register data on the population of placed children, we observe children who have been placed at any age from birth onwards and follow them until age 18 where their eligibility for placement in outside home care ends. Our contribution to the literature is to investigate whether the *mode* of care – foster homes vs. residential institutions – matters for juvenile delinquency at ages 15-20 for children placed out-of-home in the decade of the 1980s. Children placed in outside home care are typically at-risk and therefore exposed to bad influences from parents and/or the neighborhood from the outset. Outside home care can have both alleviating and aggravating effects on risky behavior. On the positive side, by removing children from a disrupted home, placement of either type (foster homes or residential institutions) improves "social bonding", by which is meant strengthening individual and social restraints on behavior (see e.g. the theory by Hirschi, 1969 and recent empirical evidence in Traag et al. 2011). Thus, by reinstating both social control and self-control placement of any type should reduce delinquency, although we would expect that institutions with specially trained staff should perform better along this dimension. On the other hand, there could be negative influences originating from the outside home care itself. Institutional care in particular, exposes children to a number of peers drawn from the same type of disrupted background which may have a reinforcing effect on risky behaviors such as crime. This peer effect is expected to be less pronounced in the case of foster care.[9] Thus, it is an empirical question which type of placement would be better at preventing high-risk behavior among children such as juvenile delinquency.

Placement instability is frequently observed among children placed outside the home and has been associated with poorer outcomes in later life (Newton et al. 2000; Smith et al. 2001). In contrast to earlier work, we isolate the effect of care type on criminal behavior by carefully identifying children with a simple care history, i.e. who only have experienced either foster care or placement in residential institutions but not a mix of care types. Studies that do not take into account the fact that children may have experienced multiple placements and often will have moved from one care type to another may confound the effects of different care types on child outcomes. Furthermore, the studies cited above found that placement instability itself was associated with more externalizing and internalizing problems in children, which could result in a greater crime

[9]Aside from foster homes and residential institutions, children placed outside the home in Denmark may experience other types of care consisting of either socio-educational housing, a room in an apartment or a slot in a post compulsory school educational institution. Socio-educational housing refers to privately placed outside home care slots varying from small professional families to institution-like places.

propensity. Another issue is that particularly children who have been placed at older ages already from the outset may have a criminal record. In order to isolate the effect of care type on crime behavior, we select only those children who enter placement without prior criminal history for the analysis.

After carefully selecting children with simple care histories and no prior criminal record, we use an IV approach by exploiting municipalities' tendencies to use different types of placements (foster care, residential institutions, socio-educational housing and other types of care) to instrument mode of care controlling for other municipality characteristics. The results of this study reveal whether the juvenile delinquency rate between children in foster care and residential institutions differs in terms of the probability of receiving a verdict, the number of verdicts given as well as the type of verdict or sentence and in terms of criminal recidivism. Danish administrative data provide rich background characteristics of the children's parental background including income, education, marital status, labor market status, welfare dependency, objective health measures (including hospitalization for mental diseases) and crime.

The paper is laid out as follows: In the rest of Section 1 we describe the institutional set-up for outside home care for children in Denmark and review the literature on environmental influences on crime behavior. Section 2 describes the data and Section 3 presents the empirical method, discusses identification and describes the data. Section 4 analyzes the findings and Section 5 discusses the interpretation of the results and concludes.

1.1 The Danish set-up

The welfare systems set up to deal with vulnerable children are organized differently across countries. In Denmark, it is the role of the tax-funded welfare state model implemented in the country to ensure universal education, health care, unemployment benefits, old-age pensions, child care etc. Municipalities are authorized by law to identify and investigate vulnerable children and assess whether or not a placement is required. The municipalities have full responsibility in this area and they take all decisions regarding a placement outside home, which can be in foster care, residential institutions, boarding schools, continuation school, in lodgings or in socio-educational housing (see footnote 1). Foster care families are approved by the municipality after an evaluation of the family. To be approved, the family has to participate in courses on foster care. Residential institutions are municipality-owned institutions. Municipalities can create a residential institution on its own or in collaboration with other municipalities for use of placements of children with social

problems or disabilities if they find the need for it. Thus, some residential institutions have a general aim and others have a specific area of expertise e.g. they may target severe social and behavioral problems among adolescents. Further, some residential institutions have educational facilities or even their own schools associated for those children or adolescents who are not able to participate in public schools and others emphasize that children have to be able to participate in public schools. Also some residential institutions have secure slots or specialize as secure residential institutions. Children and adolescents who are placed in secure facilities are placed according to certain paragraphs in the Consolidation act on social services similar to an administrative conviction. These individuals are not included in our sample. Unfortunately there is no national/common registration of all residential institutions informing us about the size, adult to child ratio, specialization etc. Hence, we only know that if a child is placed in a residential institution, but not the circumstances leading to the placement or details on the characteristics of the placement. In 2006 45 pct of all placements were in foster care, 19 pct were in residential homes and 18 pct were in socio-educational housing. Thus, there is considerable variation in the mode of outside home care in the Danish setting unlike in some other settings. In the US, for example, three quarters of placed children are assigned to foster families, 1/3 of which are headed by other family members of these children[10] (Doyle, 2007).

Regarding financing of child protection, all expenses up to a fixed limit are paid by the municipality. The limit set in 2001 is DKK 600,000 (in 2001 prices). Foster families are paid a fee according to the severity of the child's problems. A foster child releases a monthly fee which varies from DKK 3,103 to DKK 93,090 (average is DKK 17,067 or about USD 3,000)[11]. Here, too, the model varies considerably from that of the US, where foster families receive a monthly subsidy of about USD 400 per child in their care. Slots in residential institutions are settled at similar tariffs and are according to special needs etc. According to Statistics Denmark 12,235 children was placed in outside home care at the end of 2006 and the total expenses on placements amounted to DKK 11.3 billion in the same year, thus, a rough mean estimate of cost per placement is DKK 923,580[12]. Disputes or complaints regarding the placement can be directed to the regional state authorities who primarily deal with issues concerning family law. The Danish set-up lends itself to an examination of different types of care environments and how they can influence child outcomes.

[10] Foster families headed by family members of the child only make up 1.8 pct of all placements in Denmark
[11] Local Government in Denmark http://www.kl.dk/Born-og-unge/Afhandling-tegner-billede-af-plejefamilierne-id42208/ (only in Danish)
[12] USD 146,242 at the exchange rate 566.78.

1.2 Environmental influences on criminal behavior

A growing body of literature is finding out that social background and economic conditions only explain a small portion of criminal behavior (Glaeser et al. 1996). Emerging evidence points to the importance of social interactions in crime, particularly for youths. Jacob and Lefgren (AER, 2003) compare crime rates when school is in session to when it is not and find, by exploiting extra time in school during teacher-in-service days, that school attendance causally increases violent crime but reduces property crime. Other studies point at the relevance of older family members and neighborhood effects in crime behavior (Case and Katz, 1991; Ludwig et al. 2001; Kling et al. 2005). Bayer et al. (2008) is one of the few studies which directly analyze the influence that juvenile offenders serving time in the same correctional facility have on each other's criminal behavior. To correct for the non-random assignment to facilities, they estimate crime models including facility and facility-by-prior offense fixed effects, thus, estimating peer effects using within-facility variation over time only. They find strong peer effects for a whole range of specific crimes and also stronger effects in non-residential facilities (youth serving time close to home).

Few studies have explored the effects of outside home care on high-risk behavior. Yet, this is important because while children placed in outside home care are from the outset at-risk and have been exposed to bad influences from parents/neighborhoods, there could be negative reinforcing effects from the mode of care itself. Doyle (2007, 2008) are among the few studies that estimate causal effects of placement in foster care on children's delinquency/criminal activity, teen childbearing, employment and earnings. Doyle uses the tendency of case workers to assign children to foster care as an instrument for placement. He finds children placed in foster care to have 2-3 times greater arrests, conviction and imprisonment rates than children who remained in the home. Doyle cautions that the point estimates are large and somewhat imprecisely estimated, but still that the evidence seems to point to better outcomes for children who were at the margin of placement had they been looked after at home.

More recently, Warburton et al. (2011) use linked administrative data on male youths from British Columbia (BC) and employ two instruments for foster care: a discrete step-up in placement rates following a judicial ruling after a highly publicized case of parental murder of a child in BC and a subsequent step-down again 3 years later; plus, the same caseworker administrative discretion instrument as Doyle. They find different LATE's with respect to crime: the judicial ruling increasing placements leads to an increase in the incarceration rate while the caseworker discretionary instrument leads to decrease in crime incarceration rates. However, they

only look at children 16-18 years of age which may be problematic, since placement in such cases can arise due to the child's own characteristics (behavioral problems, for instance), and also because the children by this age have been exposed to many sources of influences already.

A 2011 report released by The Danish National Centre for Social Research (Fuglsang Olsen, Egelund and Lausten, 2011) measure outcomes at age 24 of three cohorts of placed children, born 1980-1982 and observed in the Danish registers. Propensity score matching is used to construct a comparison sample among unplaced children in the same cohorts. The matching is done on the basis of parental characteristics of the children and the factors included in the matching procedure are single parenthood, no higher education over and above compulsory school, labor market exclusion and marginalization, receipt of welfare benefits, teenage parenthood and psychic illness. The outcomes considered are education and labor market participation, health (both somatic and psychosomatic) and crime. In terms of crime, placed children are found to be 4-6 pct point more likely to have a verdict for violent crime and 8-9 pct point more likely to have a verdict for property crime at age 24 than non-placed children. The findings for convictions, drug related crimes or weapons related crimes are inconclusive because of the generally low frequency of occurrence of these crimes by age 24. No heterogeneous effects are found according to either age of placement or duration of placement. While the authors cannot conclude on the basis of their analysis that the placement itself *causes* increased crime, they conclude that the act of placement does not appear to reduce criminal tendencies in any case. As the authors point out, propensity score matching reduces but does not eliminate selection bias.

Controlling for observed and time-invariant unobserved family characteristics, Vinnerljung (1996) compares crime, mortality, welfare, education and health outcomes of children who were placed for at least 5 years to their siblings, as well as to other children. The study finds that both placed children and their siblings have worse outcomes than the population in general but are not different from each other, suggesting only a minor role for placement in terms of further deteriorating children's development. In another follow-up study of the 1991 birth cohort, Vinnerljung and Sallnäs (2008) break down the 700 children placed in out-of-home care in their teens by reason for placement – behavioral problems or other reason. Children with behavioral problems, especially boys, have substantially worse problems than children placed for other reasons and children in general, including serious involvement in crime.

As far as we are aware, only two other papers try to identify differential effects of the type of out-of-home placement on children's crime behavior later in life. Ejrnæs (2011) is interested in identifying the effect of different types of care on the child's outcomes of education and crime at age 18 or above. Ejrnæs uses a difference-in-difference approach where information on siblings who have not experienced placement is used to identify the treatment effect of being placed, and given placement, the relative effects of different types of care. This identification strategy first of all necessitates limiting the sample to families with more than one child, but more importantly, identifies the effect of placement on child outcome by looking within families where one child was placed outside the home while the other was not. Although doing this rids the estimate of any shared (time-constant) family effect, the sample is narrowed down to only families and children who experienced these rather special circumstances. Furthermore, this strategy does not allow for child-specific reasons for removal from the home that could be correlated with sibling differences in crime outcome other than the measured child-specific factors (gender, birth order and birth weight). Child-specific reasons are likely to be one of the main reasons for removal when only a single child is removed from the family. This strategy further assumes that the act of placement of a child does not have a direct effect on the development trajectories of other children in the family. We may expect that the reduction in family size increases the level of family resources for the other children in the family and improves their outcomes. On the other hand, removing a child from the home may have a traumatic effect on the other siblings and actually worsen their outcomes. Placed siblings may also attain special status for their non-placed siblings and function as a negative role model and/or there could be a spillover of negative peer effects originating from the placed sibling's institution/foster home to the other non-placed siblings.

As a further robustness measure, therefore, Ejrnæs uses an instrumental variables approach by exploiting municipalities' varying intensities of use of different types of placement (foster care and residential institutions) to instrument mode of care but on the same sample of siblings and families as before. Since Ejrnæs compares siblings within the same family, she argues for instrument validity by way of the fact that other characteristics of the municipality are held constant when comparing the differences between siblings residing in the same municipality. The key findings with respect to crime are that boys who are placed are 6 percentage points more likely to likely commit crime than their brothers who are not placed; furthermore, boys placed in institutions are 6 percentage points more likely to commit crime than boys who are placed in foster families but the latter effect is on the margin of significance. Too few girls were convicted for

crimes in her samples, making it impossible to report separate results for girls. Interestingly, a Hausman test shows that once family fixed effects are accounted for, care type is exogenous. The conclusion is that foster families are better at both getting children to enroll in education and at preventing them from engaging in criminal behavior.

A recent paper by Lindquist and Santavirta (2012), explore the separate effects of foster care and residential care on adult crime but in a Swedish setting. The data consist of the Stockholm Birth Cohort Study (SBC), including all individuals born in Stockholm in 1953 who were living in the Stockholm metropolitan area a decade later. They access full case information on each child in the SBC subject to a removal investigation from the Child Welfare Committee (CWC) files and merge to that crime data from the national policy registry. Thus, they have essentially the same information on children and parents as the caseworkers do. Conducting careful analysis, they estimate the average treatment effect on the treated of out-of-home care by using children who were subject to a removal investigation but not placed as a control group, making the CIA assumption that accounting for predetermined variables including family background characteristics, the assignment to 'treatment' (out-of-home placement) is more or less random. The comparison group is children at the margin of placement (visited but not placed). It is possible that the act of visitation not leading to placement could act as a wake-up call to some families to make comprehensive and needed changes leading to better outcomes for their children in the long-run. Using them as a comparison group could potentially make the effects of out-of-home care appear more negative than they are. Another type of selection bias can be present if especially, families wishing to avoid further scrutiny from the public authorities moved out of the Stockholm region when the children were young. 6% of the birth cohort had moved out and were missing from the social registers by 1970. Bias from these potential sources of selectivity is explored in the study.

Lindquist and Santarvirta vary effects of out-of-home placement on crime also by gender and *age group* of initial placement (0-6, 7-12, 13-18), since the actual age of placement is not observed in the data. Their results show that both foster care and residential care have adverse effects of adult criminality of boys compared to non-placement, both at the extensive and intensive margin, whereas only residential care negatively impacts adult criminality of girls. For both types of care, an informative finding is that the effects on crime are only present for children placed at adolescence (13-18) but not at younger ages. Finally, their results also show that the effects seem to be driven by cases where the placement was made due to child behavioral problems and not parental problems. They explore the sensitivity of their estimates to selection on unobservables and

find that the non-zero effects on crime are robust for boys, but not the non-zero effect of residential care on crime for girls.

This carefully crafted paper brings informative results on the outcomes of the children of the 1953 cohort. Children in this cohort who were placed outside of home were placed in Swedish foster care and institutions in the decades of the 50's and 60's. As described in the paper, the institutional setting for placements in Sweden in the period before 1980 (both foster homes and institutions, consisting mainly reform schools) could be characterized by neglect, poor living conditions, corporal punishment, and the absence of rehabilitation or positive measures. Furthermore, forced placements were the norm rather than exception. Recently, the Swedish Parliament passed a law allowing individuals who had suffered abuse in state custody in the period 1920-1980 to sue the government for damages. Starting from the eighties on, a significant pedagogical shift occurred in Scandinavian child care and education with a move towards a more child-centered educational philosophy, influenced among others, by the writings of John Dewey. This means that the placement environment of the 1980's cannot readily be compared to those a few decades earlier, with a greater emphasis in current times on rehabilitation and caring and on parent-institution cooperation, and less on remediation, correction and coercive removals. In Denmark a radical change in the system of placements took place with the 1905 Child law that among others emphasized prevention of placements through schooling, health care and family values and consolidation of achild right[13]. In the time period before World War II, the placement system in Denmark was partly influenced by the expansion of the welfare state and partly by Eugenics, which changed after II world war to a paradigm of *treatment optimism* characterized by a belief that treatment of social problems was possible relying on expert evaluation of the needs of the family. Two opposing trends manifest themselves from the late 1970s and on. First, placement policy was affected by a "home is best" philosophy so that a renewal of the placement case was made every year. However, at the same time, during the late '70s and '80s a heightened focus on the child itself and the rights of the child rooted in the early 20th century child perspective emerged, manifested by a ratification of the UN children convention in 1991 and a strengthening of the legislation in the early '90s (Ebsen & Hald Andersen 2010). Thus, it is interesting to compare the crime outcomes of children who were placed outside of home in the decade of the 1980s to those of Lindquist and Santarvirta.

[13]A right that says the child is an individual on its own, and has the right to a loving and caring upbringing regardless of the circumstances of its birth. If the parents are unable to provide this upbringing, then the state should secure the child this right.

In this paper we focus on children already in placement in Denmark in the period 1980-1986 and followed until ages 15-20[14]. That is, we take Doyle's (2007, 2008) work showing a causal effect of foster care on criminal behavior in the US, corroborated in the Danish setting by Ejrnæs (2011), as the starting point of our analysis. Compared to other regions, Scandinavian child protection tends to be more interventionist in its approach with a belief in the efficacy of early interventions. Furthermore, there is wider use of institutional care than in other countries. Compared to the U.S., Denmark has both a higher rate of child out-of-home placements, between 6-10 per thousand in the 0-17 age group, and a larger share in institutional placement. Thus in 2006, 1 pct of all children were placed, compared to 0.7 pct in the U.S.[15] Given a child is placed, we ask whether the type of placement has a causal effect on juvenile delinquency. The primary reason for not modeling the selection into placement is that we do not observe children at the margin of placement (visited, but not placed). It is possible, however, that the act of visitation not leading to placement could act as a wake-up call to some families to make comprehensive and needed changes leading to better outcomes for their children in the long-run. Using them as a comparison group could potentially make the effects of out-of-home care appear more negative than they are. We do observe the subgroup of children who receive preventive actions at home, however previous research has found significant differences in the characteristics of such children and their families compared to placed children and their families (Egelund and Lausten, 2009).

Similar to Ejrnæs (2011), we exploit the variation across municipalities in the Danish set-up to estimate heterogeneous effects of care type on crime perpetration. However, going further than Ejrnæs and Lindquist and Santarvirta, we address three issues which were not dealt with/partially dealt with in those studies. One is that children placed in out-of-home care experience very different types of care careers in terms of duration and switches. Ejrnæs (2011) first divides up children who have only experienced one type of care into five care types: Institutional care for the disabled/Institutional care/Foster families/Other care types/Preventive Action (intense supervision of the child). Next, among those who experienced multiple types of care, she assumes that those who at age 18 were living in adult institutions for the disabled should be placed in the first group, and among the rest she uses a hierarchical algorithm: that is, those who were never in adult institutions for the disabled but had at any time been in institutional care are assigned to the

[14] As pointed out by Lindquist and Santarvita (2012), most criminals begin a criminal career before the age of 19.
[15] In the US by the end of 2006, 511,000 children were in foster care (U.S. Department of Home and Health Services, see http://www.childwelfare.gov/systemwide/statistics/childwelfare_foster.cfm). For Nordic comparisons, see Torbenfeldt Bengtsson and Böcker Jakobsen, 2009.

institutional care group; those who had never been in institutional care but had at any point been in foster family care are assigned foster families and so on. This means that some children who are identified as belonging to the institutional care group could also have experienced foster family care. Lindquist and Santarvirta's sample of placed children consists of those who in their initial placement were allocated to either foster homes or residential institutions (orphanages or reform schools in that time period). 174 (15 pct) of the 1,166 placed children in their sample experienced both types of placements. These children are included in the main analysis, though not when subdividing according to age group of placement. When estimating treatment effects of type of care in the main analysis, they, too, include children in foster homes (residential institutions) who have been switched to residential institutions (foster homes), i.e. producing attenuation bias in treatment effects. In contrast, we only focus on two types of care in this analysis – foster care and residential institutional care – by identifying and selecting children who have only experienced one of these two types of care throughout their care histories. The majority of children who are placed at early ages are placed in one of these two types of care (64 pct in 2006). We also ensure that the placed children have had similar experiences by controlling for the duration and number of placements. More details on the creation of care histories are provided in Section 2.

Second, children who have been placed at older ages may have a criminal record from the outset. In order to isolate the effect of care type on crime behavior, we select only those children for our analysis who enter placement without prior criminal history. However, even for the sample of children without prior criminal activity, we include a rich set of controls for parental background (including income, education, marital status, labor market status, welfare dependency and objective health measures) as well as registered convictions for parents since the intergenerational transmission of crime behavior is well-established (there are strong influences on children's crime behavior of, in particular paternal criminality, see Rowe and Farrington, 1997). In the Ejrnæs study, previous crime is not explicitly controlled for, the assumption being that siblings would share the same criminal history. In the paper by Linquist and Santarvirta, pretreatment delinquency (ages 7 up to 13) is controlled for, for children placed at ages 13 to 19.

Third, we go a step further and investigate not only effects of care type on the propensity to commit crime (Erjnæs), but also on the intensity and severity of the crime committed (as in Lindquist and Santarvirta). Going further than the two studies mentioned, we bring new evidence on the type of crime and the degree of criminal recidivism. We also conduct separate sub-sample analysis by gender, instead of only looking at boys (Erjnæs) or gender interactions with care

type (Lindquist and Santarvirta). Our results can be used by policy-makers to cleanly identify the effects of care type on multiple dimensions of criminal behavior observed within different sub-populations of placed children.

2. DATA

We use Danish register data from the period 1980-2006. Data of placements in outside home care have been registered since 1977 and include information such as the dates for beginning and end of placement, type of placement etc. A more thorough collection, however, was conducted from 1980 and onwards by Statistics Denmark. Further, an extensive registration of the population took place in the early 1980s including registration of residence, education, employment, income, social benefits, criminal acts, diagnoses etc. To carry out the analysis in this paper, a whole range of information has been merged from different registers into one dataset beginning in 1980 and following individuals continuously up to 2006. The shortcoming of the data is that no information is given for the reason for which the child is placed in outside home care, e.g. if the child was placed because of behavioral problems, social problems or disabilities. Previous studies (by among others), Doyle (2008), Lindquist and Santavirta (2012) and Vinnerljung and Sallnäs (2008) show that the reason for placement (i.e. victim of abuse, neglect, or own behavioral problems) is strongly related to both placement type and to outcomes. We can only indirectly control for reason for placement by making the assumption that young children (0-6 years) are placed for reasons other than their own behavior whereas children older than 6 years are more likely to be placed due to their own behavior.

The number of disabled children in outside home care is estimated to be about 15 pct of all placed children in 2007 by the National Social Appeals Board[16] (*Ankestyrelsen*, 2008). Hence, some disabled children who lived in outside home care are included in the population. Children who at their 18th birthday move to institutions for severely disabled adults are excluded from the sample. Otherwise, it is a difficult task to identify children with disabilities. What we can do, however, is to include diagnoses (ICD8 codes) of the children. We control both for if the child has congenital deformities and the number of diagnoses.

Children born 1980-1986 are included in the sample and followed until age 20. To start with, we observe all placements for all children in the 18 years they are at risk of being placed in outside home care, i.e. 19,572 children. We omit 974 children with a previous criminal history.

[16] Since 2006 information on the background for placement in outside home care is registered. Physical and mental disabilities can be registered as the only reason or as one explanation out of many for the placement. The Local Social Services Authority categorizes the children as either physically or mentally handicapped or as neither when they annually report to the National Social Appeals Board.

This gives us 18,598 children without a prior record who were born 1980-1986 and who have experienced placement in outside home care between ages 0-18. Next, we construct care histories for these children. We divide up the sample as follows: children who have only experienced placement in foster care are assigned to foster care placements (19 pct); children who only have experienced placements in residential institutions are assigned to residential placements (20 pct); and children who have only experienced other types of placements are assigned to other types of care (35 pct) The remaining 26 pct of placements consist of a mix among types of care which we labeled mixed course.

2.2 Measuring crime behavior

In Denmark, national crime statistics on the number of charges, arrests, convictions, sentencing and imprisonments in connection with violations of the Danish Penal Code, the Danish Road Traffic Act or other special laws can be traced all the way back to 1832. From 1979, however, manual coding was replaced by electronic registering of individual-based records of criminal cases with the establishment of the Danish National Police's Central Criminal Register (*Det centrale kriminaleregister*).[17] Information from the Central Criminal Register is merged to our sample of placed children based on the unique individual civil registration number (CPR) that is the key to linking all person-based registers in Denmark. Juvenile delinquency is measured at ages 15-20 since the age of criminal responsibility in our sample period is 15 years.[18] Each case in the criminal registers is identified by a journal number and the above mentioned person identifier (or firm identifier) that is either charged, given a decision, sentenced or imprisoned in the case. The various data elements available for research are, among others, whether the person was charged for a violation, whether a verdict or ruling was arrived at, the type of sentence (suspended or unsuspended imprisonment, fines, warnings, withdrawal of charges or acquittal) and the detailed code or type of offence.[19]

There are alternative ways of defining crime behavior depending on the stage of the criminal prosecution process of the case. The literature has operated with various definitions largely based on self-reported crime. Self-reported crime may tend to be under-reported implying problems of validity and reliability if the under-reporting tends to be systematic. Comparing self-reports to

[17]Note, however, that fines of less than DKK 1,000 are not registered.
[18]The age of criminal responsibility was lowered to 14 on the 1st of July 2010 but raised again to 15 from the 1st of March 2012.
[19]See http://www.dst.dk/en/Statistics/documentation/Declarations/convictions-for-criminal-offences.aspx for details.

official data from the UCR[20] as well as victimization data, one study found lower validity for African-American males (Hindelang et al. 1981) although a later study using data from Philadelphia did not find this to be the case (Farrington et al. 1996). Lochner and Moretti (2003) found fairly similar effects of education on crime, whether measured as arrests, imprisonments or self-reports. The definition used can also depend on the nature of the crime being studied. For sex crimes, reported crimes may be the best definition to apply because charges are only brought in about a quarter of the cases as evidence is difficult to establish (Bhuller et al. 2011). In this study we choose to operate with a stricter definition of crime which is that a ruling or verdict has been given in a criminal case registered to the individual youth. This is because the data at hand do not include information on charges. We do not condition on a guilty sentence however. That is, verdicts could end as either as a conviction or in an acquittal/dismissal.[21] When describing the type of verdict, only the verdict for the most serious offence is selected if there are multiple verdicts associated with an individual.

Note that since we measure crime at ages 15-20, some children are convicted of a crime while they are in placement. This could bias our findings if, for instance, institutions because of greater adult supervision were better informed or had greater incentives to report the crime out of a concern for spillover effects to other children at the institution. Thus, we perform a robustness check in Appendix A3a and A3b where we focus only on crime committed at ages 18 and up when children have left institutional care.

As mentioned earlier, to avoid reverse causality we omit the group of children who have a criminal record prior to placement from the sample. In all, 974 children have received a verdict either before or the same year as placement. Of these, 79 (8 pct) experienced mixed course placement and are thus not included in the sample to begin with. Of the remaining 895 children, 73 (7 pct) are placed in foster homes, 194 (20 pct) in residential institutions and 628 (65 pct) in other care. Since we only include children placed in foster homes or residential institutions in our final sample, presumably the estimates are less affected by any selection bias from omitting children with a prior criminal record, since the children eligible for inclusion among them constitute less than a third of the total group. However, to test if this is the case, we rerun our main model including these 267 eligible children in Appendix A4a and A4b.

[20]US Uniform Crime Reports.
[21]In 2010, only 8 pct of verdicts ended as acquitted or dismissed, source: http://www.dst.dk/pukora/epub/Nyt/2011/NR284.pdf

3. EMPIRICAL METHOD

The starting point of our empirical analysis is a regression model of the effects of the type of outside home care in childhood on crime behavior at ages 15-20 of children without a previous crime record who were placed anytime from birth and up to their 18th birthday:

$$CRIME_i = \tau_0 + \tau_1 RESID\_INSTIT_i + \beta X_i + \mu_i \qquad (1)$$

where *CRIME* is operationalized in different specifications as receiving at least one verdict after being placed (0/1), the number of verdicts, the type of verdict (violence and sexual offences, theft, drunk driving, other convictions), the type of sentence (unsuspended conviction, suspended conviction, fines or other conviction/charges withdrawn/acquitted) and criminal recidivism (receiving the same verdict at least twice). *RESID_INSTIT* takes the value 1 if the child experienced care in a residential institution and 0 for foster home care. *X* is a rich set of child and parent controls and $\mu_i$is the idiosyncratic error term. For ease of interpretation, we estimate either simple linear probability models or OLS wherever relevant. As errors are heteroskedastic in the linear probability model, all standard errors are computed by robust methods.

There are two reasons why OLS may be biased in this case. First of all, care type could be endogenous because social workers presumably try to place children in the type of care they benefit most from. This will bias down the effect of care type on child crime outcome. Second, there may be non-random assignment to 'treatment'. The assignment to foster homes vs. residential institutions or other care types is not likely to be randomly made because past evidence, mainly from the U.S., shows that problem children are more likely to be placed in institutions as opposed to foster homes (see e.g. the review by McDonald et al. 1996). This may not translate over to the Danish setting as we shall see in section 3.2. In any case, simply attributing any difference in crime outcomes across groups of adolescents to their type of placement would lead to omitted variable bias. Covariate adjustment helps to reduce the bias because we employ an exhaustive set of controls, e.g. children's age at first placement, total duration of placement, sex, birth weight, diagnoses, handicaps, and a number of parental characteristics including maternal and paternal age, education, income and labor market status, all measured the year before the child was placed outside home. We measure parental characteristics in the year before placement to ensure that we do not encounter reverse causality – the act of placement affecting parental behavior. We also

include whether either the mother or the father received a verdict in the year before placement.[22] Despite this broad set of controls, children placed in different types of care could vary according to their unobserved characteristics leading again to the endogeneity of care types in the outcome equation. We simply would not know if the heightened criminality of children observed in a particular type of care is due to the form of care or due to the individuals' own unobservable characteristics that are correlated with crime and with the form of care that they are placed in.

If care type is endogenous, estimating equation (1) by OLS will lead to biased and inconsistent parameter estimates because of the potential non-zero covariance between care types and the error term, μ_i. For identification we need a valid instrument for care type that does not appear in the regression for crime. Of course, the ideal experiment would be to take a pool of children and subject them to a lottery which decides which of the two existing forms of care they should be placed in. This single instrument would mimic the lottery assignment and would allow us to measure the true difference in the effects of these two forms of care. In reality, we have not two but three "pure" forms of care and a mixed category that we put aside because we cannot cleanly identify its type. Thus, one instrument would not be enough to identify the effects residential care vs. foster care, since the kids placed in foster care are not placed at random (even if the kids in residential care are). They could have been placed in the "other" category, but are not.[23]

We follow Ejrnæs, 2011 who applies municipal intensities of use of different types of outside home care as instruments for type of care. Figures 1-3 show the frequency distributions of care use for the three types of care analyzed in our study across the 272 municipalities over the time period 1987-2006 but excluding children born 1980-1986 (those in our estimation sample) in the calculation of the shares for the purpose of enhancing exogeneity. We do not use the data from the years prior to 1987 when constructing these intensities. This is because the data is noisy before this period with large swings in particular, in the use of socio-educational housing and boarding schools (see appendix Figure A1). Even excluding the years before 1987, there is considerable variation in the rate of use of different care types across municipalities when it comes to foster care and residential care. In terms of instrument validity, it must be the case that the tendency for

22Intergenerational correlations in crime tend to be high. Using the Stockholm Birth Cohort Hjalmarsson and Lindquist (2012), find that both sons and daughters whose fathers have at least one sentence have more than 2 times higher odds of committing a crime than children of non-criminal fathers, and, furthermore, while 75 pct of this effect can be explained by socioeconomic background, innate ability and household instability, the remaining 25 pct quite possibly reflects a role model effect.

[23]However, as we will show in Section 3.2 (descriptives), children in this "other" category do not resemble children in foster care or residential care in terms of their characteristics. Among other things, they are much older when placed in care (average 14 years, compared to 7 years for foster care and 9 years for residential care), are more likely to be placed voluntarily, and have more educated and wealthier parents, suggesting that this option is used by a slightly different target group.

municipalities to differ in their use of different care types does not correlate with unobserved variation in placed youths' crime behavior. This point is discussed further in Section 3.1.

The bars in each diagram show the frequencies (y-axis) of municipalities' level of intensity in that particular type of care (x-axis). Thus, we see more variation in the use of foster care and residential institutions and less variation of use of other types of care across the 272 municipalities. The mean use of foster care is 27.7 (SD 0.711), mean use of residential care 23.4 (SD 0.572) and mean use of other care is 27.7 (SD 0.711).

Figure 1: Intensity of foster care across 272 municipalities

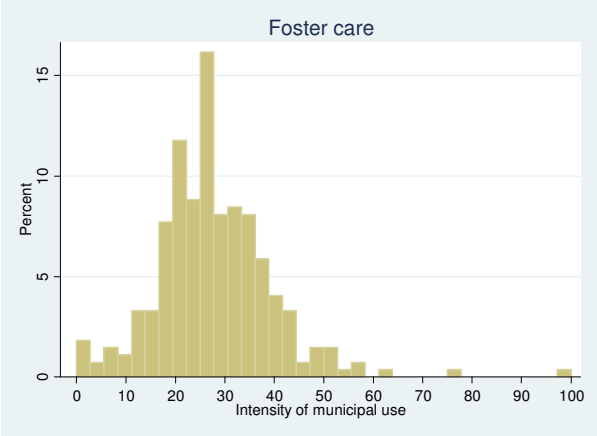


Figure 2: Intensity of residential care across 272 municipalities

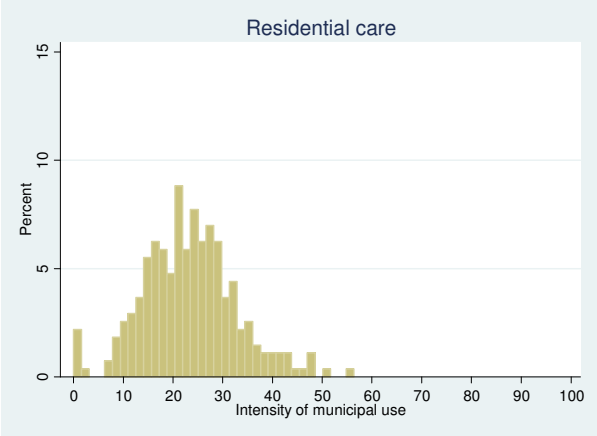
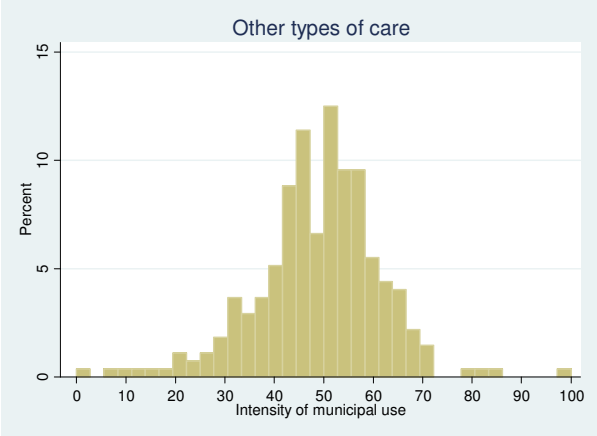


Figure 3: Intensity of other types of care across 272 municipalities



Given a continuous instrument, we apply the 2SLS method and estimate equation (1) with the fitted values from equation (2) below:

$$RESID\_INSTIT_i = \pi_0 + \pi_1 INT\_RESID_j + \gamma X_i + \nu_i \qquad (2)$$

where for individual *i* living in municipality *j*, the π parameters model represents the first-stage effect of the instrument, *INT_RESID*, the use of residential care on placement in a residential institution. Because of a continuous instrument, the results do not lend themselves to a LATE interpretation of effects arising from compliers receiving the treatment due to random assignment[24]. Instead, the 2SLS estimates of the effect of residential care on crime in the second stage can be interpreted as the estimated marginal effect in a structural equation so long as it is identified.

3.1 Sources of variation in care type intensity

What determines municipalities' differing intensities of use of residential care? In Denmark when a child is given for placement, it is the responsibility of the municipalities to decide what type of care would be optimal for the child's future well-being and development according to the varying needs of the children. The identifying assumption is that municipalities' differing intensities of use of different placement types does not at the same time correlate with unmeasured aspects of youth crime behavior. We use two strategies to try to counter this. First, we include in the conditioning set an array of other municipality-level socioeconomic characteristics that could potentially correlate with municipality provision in the child protection area. In previous work, Hald Andersen (2010) looks at municipality-level correlates of placement (though not by type) and finds that municipalities with high expenditures on preventives measures for disadvantaged children and on cultural and sports activities have a lower rate of placements of children in outside home care. Furthermore, she finds that municipalities' expenditures on schools and day care are positively correlated with the placement rate as are the number of pupils in a classroom. Finally, municipalities with a high share of social problems also positively correlate with the placement rate. In this case, we need to control for correlates of the relative use of institutions vs. foster homes. Thus, we control for the average size of the municipality in 1980-2006, the average share of youths 0-17 years in 1980-2006, the average share of employed in 1981-2006, the average share of single parents in 1980-2006, the average share of disability pensioners in 1984-2006 and per capita average public expenditures in 1995-2006. These shares move very little over time hence, averaging over a long period does not present a problem.

[24]An alternative could be to break up the continuous instrument into sets of dummies, in which case the IV would be equivalent to GLS on group means (see Angrist, 2005, and Angrist and Pischke 2009).

Another threat to identification is if municipalities that tend to favor certain types of care do so as a consequence of youth criminal behavior. As mentioned earlier, we have already taken care of this to a certain extent by omitting youths with a prior criminal record from the sample. However, it may be the case that municipalities that use institutions tend to place the most disadvantaged youths who are most likely to be potential criminals in these places. Presumably municipalities are aware of the costs and consequences of putting all the 'bad apples' in a certain type of care and would try to ensure an equitable mix of youth types across care types to be able to continue to attract good care workers to institutions and to minimize negative externalities impacting the local neighborhood. Still, if such a tendency is present, we would expect that children who are placed at an early age (0-6) in a certain type of care would not be affected by any differential placing by municipalities according to behavior. These children were most likely not placed because of their *own* behavior but due to dysfunctional household circumstances. We therefore re-estimate our model on this sub-sample of children as a robustness check in Appendix A2 and A3 to see whether the results are similar to those based on children placed at all ages 0-18. We have also tried estimating the main models with standard errors clustered at the municipality level, but clustering did not change the results (results available on request).

Before turning to the estimations, we try to give some evidence on the validity of our identification strategy of using the municipality intensity of use of residential care as an instrument for placement in residential care. First, we regress municipality level crime for those aged 15-19[25] onto our instrument (Appendix Table A5). This, unfortunately, gives a strong correlation—for every 1 pct increase in the municipality crime rate, the intensity of use of residential care increases by 161pp. However, if we condition on the municipality level controls described above, the correlation between crime at ages 15-19 and the instrument goes to zero, see second column, Table A6. Furthermore, when adding the rest of the control variables in the model in column 3 this result is not changed and the correlation remains insignificant. Thus, at least conditionally, the instrument appears to be valid.

3.2 Descriptive statistics

Tables 1-3 show descriptive statistics of the children and their parents and of the children's crime behavior, all by type of placement. All tables show descriptive statistics for the children who

[25] Throughout the paper we look at crime committed by persons from their 14 birthday and on until the day they turn 21. Unfortunately when looking at the crime rate on the municipality level the data available are pre-categorized including only persons from their 14 birthday and on until the day they turn 20.

experienced other types or a mixed course of placement even though they are not included in the estimation sample. However, children with a record of crime prior to placement have been omitted from the start independent of care type. We focus on the differences between residential care and foster care. From Table 1, we see that children in foster care are significantly younger on average when first placed than children in residential care, 7 years vs. 8.8 years. Furthermore, foster care kids have twice as long a duration of placement on average than kids in residential care, 6 years vs. 3 years. The average number of placements is also significantly greater for children in foster care (1.8) compared to children in residential care (1.5). When looking at whether the placement is voluntary or forced, we see that the level of voluntary placements is also significantly higher for the former, 97 pct, compared to the latter, 95 pct, perhaps because foster care may in some instances be offered by close relatives of the family which may be more acceptable to parents than putting children in institutions. Denmark has a strong tradition for voluntary placements and since 1980 the fraction of forced placements has remained below 10 pct of all placements. This might partly be explained by the fact that forced placements in most cases gives only limited contact between parent and child and partly because of the shift in emphasis from a desire to avoid placements against the parents' wishes in earlier decades to focusing on the child's needs in more recent decades. There is no significant difference in either birth weight, the number of diagnoses, or in the rate of congenital deformities. As mentioned earlier, children who at age 18 were living in adult institutions for the disabled have been omitted from the sample. However, it may be the case that some children with handicaps are still present in the data, hence controlling for diagnoses and handicaps is important. The share of boys is significantly higher in residential institutions relative to foster homes. In terms of the Other care and Mixed course groups, it is clear that these children appear to be older and somewhat different from the first two groups in terms of their characteristics. Hence, our strategy of focusing only on children in foster care vs. children in residential institutions seems, also on these grounds, to be a reasonable one.[26]

In terms of the characteristics of the parents of the children, the information is taken the year before a placement takes place. This is to avoid reverse causality, e.g. if a placement takes place in the beginning of the year and the mother is so affected that she cannot continue in her job

[26]The group of children in 'Other type of care' is fairly heterogeneous and can be broken down into 3 major groups: boarding school/youth hostel/post-compulsory voluntary educational institutions (*efterskole*) (42 pct); placement in own room in a house (30 pct); socio-educational housing (25 pct). The latter group distinguishes itself somewhat from the other two groups, having a longer duration of placement. However, they do not have more placements than the other groups aggregated into 'Other type of care'. They also distinguish themselves by having the highest number of verdicts of any group being analyzed. When analyzing means separately for this group, it appears that in terms of children's own characteristics and parental characteristics they resemble kids in 'Other type of care'. However, in terms of crime behavior, they resemble more the 'Mixed course' children (results available on request). We choose to retain them in the 'Other' group.

and therefore shows up as unemployed in November where labor market status is measured. Unfortunately, we do not have medical information for the whole period. This means that parents' information on mental illness and number of diagnoses is from the year before the child is born. It is strikingly clear from Table 2, that both mothers and fathers of children in foster care have significantly weaker characteristics in terms of education, income, labor market participation (mothers only), unemployment (fathers only), receipt of disability pension, crime and marital status than parents of children in residential care. There is, however, a weak significant effect of a greater extent of mental illness among mothers of children in foster care, but no significant differences in age of first birth or in number of diagnoses of mental illness.[27] Thus, it is not the case that children placed in institutions come from a worse family background as is the case in the U.S. where problem children are more likely to be placed in institutions as opposed to foster homes (see e.g. the review by McDonald et al. 1996); in fact, it is the opposite in the Danish case. There can be several explanations for this. One is that the children in residential institutions are older, indicating that the child is placed due to its own problems which are discovered later in life and so the parents of the child might function normally in terms of education, employment, income etc. Another factor can be that even though the rate of congenital deformities is the same for foster care and residential institutions, the more severe cases might end up in institutions. Cases e.g. caused by genetic defects or complicated births have less to do with the parental socioeconomic background than with a suboptimal prenatal environment.

In the final descriptive table, Table 3, statistics on the outcome measures, crime behavior, by type of placement are shown. We access both *whether* the individual youth has ever received a verdict in the ages of 15-20 (labeled likelihood of crime), the *number* of verdicts received and the *nature* of the verdict which says something about the severity of the crime type. Furthermore, we observe whether the sentence given is an unsuspended sentence, a suspended sentence, a fine, or other type of conviction including acquittal or dismissal of charges. Unsuspended prison terms are the most serious type of sentences that are given, followed by suspended sentences, followed by fines, and lastly, other sentences, resulting in an alternative measure of the severity of the crime committed. In general, crime rates are high among children in out-of-home placement even after omitting children with a record of crime prior to placement from the sample. In comparison to the population at large, among children born 1980-1986 and never placed the crime rate in the age group 15-20 is 12 pct, whereas for children from the same cohorts

[27]Mental illness is defined from the ICD 8 codes 29009-31599 and covers psychoses, mental retardation, neuroses, personality disorders and other non-psychotic mental disorders.

who were placed in residential institutions the crime rate is 32 pct. Children in foster care have a significantly lower rate; about 28 pct of them have received a verdict. Turning to the mean number of verdicts among offenders, this is again significantly lower among foster care children compared to residential care children, 3.7 vs. 4.7. Thefts are the most common types of verdicts in this age group (almost half of all verdicts) followed by violence and sexual offences. In terms of the distribution of crime types across type of care, children who experienced residential care tend to exhibit significantly more serious types of criminal behavior such as violence/sexual offences, whereas children looked after in foster care are more likely to have verdicts for drunk driving and other lighter offences. In terms of sentencing also, it can be seen that children in foster care are more likely than the other groups to be given lesser charges such as fines (though not significant) while children in residential institutions are more likely to receive the stiffest sentences (unsuspended convictions). Finally, we define criminal recidivism as having at least 2 of the same type of verdicts in ages 15-20, where verdicts are classified as either violence/sexual offence, thefts, drunk driving or other. Children in foster care also have a significantly lower rate of recidivism, 16 pct, than children in residential homes who have a recidivism rate of 20 pct.

The differences in observed characteristics show that children looked after in foster care have experienced out-of-home placements from an earlier age and for a longer duration and tend to come from worse family backgrounds than children looked after in residential institutions. Even if we control for the factors above, unobserved differences between the two groups of children that correlate with the use of residential care would bias OLS estimates of the effect of residential care on juvenile crime. If these unobserved differences also favor children in residential care, its effect would be biased downwards. To rid the estimates of this source of bias, the IV method was proposed earlier whereby the municipality intensity of use of residential care is thought of as affecting the individual child's chances of being in residential care, and is conditionally uncorrelated with the outcome, juvenile crime.

4. RESULTS

Table 4 shows the first set of estimation results. Both OLS (linear probability) and IV models of the likelihood of crime (any verdict in ages 15-20) are presented. First of all, from the simple OLS results without controls in column 1 we see that being placed in residential institutions compared to foster homes is associated with a 3.5 percentage point (pp) higher probability of having a verdict and this is highly statistically significant. However, adding our control variables largely accounts

for this effect, and the point estimate diminishes by about a half to 1.7pp and becomes insignificant. However, there is a strong and statistically significant effect of being male, which implies a 30pp higher probability of getting a verdict.

In terms of the other significant controls, the older the child is at first placement, the higher the likelihood of future crime, whereas the longer the child is in placement, the less likely is future crime. Poor health in terms of deformities or diagnoses significantly reduces criminal behavior. This may indicate that some of the children in our sample are disabled and living in special institutions. The mother's age at first birth is negatively related to juvenile crime. Maternal income does not matter and neither does maternal labor market status, however, children of single mothers or mothers with only basic education have a 5pp higher likelihood of having obtained a verdict. If the mother herself has obtained a verdict in the year before child placement, the child is 6pp more likely itself to get a verdict. Father's income, on the other hand, matters for children's crime – the higher the income, the lower the likelihood of the child getting a verdict. The only other strongly significant paternal characteristic associated with juvenile crime is paternal crime, also implying a 6pp higher likelihood for the child of committing crime. Thus, parents' criminal behavior has symmetric effects on child crime in this specification.

To aid in identification, we include a wide set of municipality-level characteristics that are potential correlates of crime, in that they capture the socioeconomic disparities across municipalities such as the size of the municipality, the share of children, the share receiving disability pension, the share of single parents, the share of the employed and the total expenses on public goods in the municipality. Thus, when employing municipalities' relative intensities of use of different types of placements as instruments for type of care, the effect of other municipality characteristics that are correlated with crime and differing provision of care types are controlled for.

The last column of Table 4 shows the 2SLS results with controls. The effect of care type is even smaller (1.4 pp) and statistically insignificant. The effects of the control variables are robust across OLS and IV specifications. The insignificant effect of care type is not due to instrument weakness because our instrument is relevant (F statistic = 134). However, we cannot reject that there is no endogeneity and that OLS is both consistent and efficient as the Wu-Hausman F-test fails to reject OLS. Thus, both OLS and IV conclude that care type is insignificant for juvenile crime, but OLS is to be preferred.

4.1 Heterogeneous effects of gender

Since the previous model showed a substantial effect of gender, in Tables 4a and 4b we subdivide the sample and estimate separate models of the likelihood of crime for boys and girls. It is clear from these tables that the previous insignificant result of care type on crime likelihood was a result of pooling boys and girls together. In Table 4a, we see from the OLS estimates that boys placed in residential care are 3.4pp more likely to commit crime than boys in foster care, and this effect is highly significant. Whereas, girls in residential care are no more likely to commit crime than girls in foster care, and the effect is 0.03pp. The IV estimates, on the other hand, are insignificant for both boys and girls but show the same tendencies i.e. 7pp (boys) and -4pp (girls). In both cases our instruments are valid (F statistics are 71 and 63, respectively, but in neither case can exogeneity be rejected leaving OLS (linear probability) to be the preferred specification here as well.

The signs (and in most cases also the significances) of the background variables are estimated to be much the same as Table 4. However, some point estimates vary by gender. Placement characteristics have a (slightly) stronger effect on girls' crime while the negative effect of diagnoses is statistically significant for boys only. A notable gender difference is that parental characteristics –especially the mother's –have a much stronger effect on girls' crime than on boys' crime. Having a mother with basic education only does not seem to affect boys but implies a 10pp higher likelihood of crime for girls. Girls whose mothers are single display twice as high a probability of crime compared to similar boys – 7pp vs. 3.4pp. Girls with a single father and girls whose father suffers from a mental disorder are more likely to commit crime than equivalent boys. The effect of paternal income is the same across child gender. In terms of parental crime, effects are in fact asymmetric here: a maternal conviction affects boys and girls approximately the same, 7pp for girls and 6pp for boys. However, a paternal conviction has a considerably stronger effect on girls' crime, raising its likelihood by 8pp (significant). For boys, paternal crime has a positive 3pp (and insignificant) effect. This adds new evidence to that of Hjalmarsson and Lindquist (2012) who only consider intergenerational transmission of crime via the father and find that paternal crime yields effects of roughly the same size for boys and girls (see also footnote 14).

To summarize, both OLS estimates show that residential care significantly increases juvenile delinquency for boys but not girls placed in that type of care, and IV estimates, though insignificant, point to a similar tendency.

4.2 Effects on number and type of verdicts

Tables 4 and 4a-b showed the effects of placement on the likelihood of getting a verdict. However, could placement type also affect the *number* of verdicts and the *type* of verdict/sentence? This investigation brings new evidence to the question in relation to Ernjæs (2011) who only looks at the effect of placement type on the likelihood of crime and who also finds a positive (though insignificant) effect on boys' crime of being placed in residential institutions. Lindquist and Santarvirta provide estimates of the effect of care type on both extensive (any crime) and intensive margins (sum of crimes over a time period) and severity of crime (imprisonment and length of prison term). Since few juveniles are imprisoned, our measure of severity is based instead on the nature of the crime committed. We turn to these results in Tables 5a-7b. Given the findings in Tables 4a-4b, we estimate gender separate models in each case. Table 5a shows that boys placed in residential care have significantly greater criminal intensity as measured by number of verdicts. Here too, OLS is preferred to IV despite having a strong instrument (see Hausman test result). Thus, the point estimate from the OLS model with controls show that boys in residential care have 0.11 more verdicts than children in foster care relative to an overall mean number of verdicts for boys of 4.95. The IV estimate is 0.13, though insignificant. The background variables have the same signs and significances as in Table 4a, except that days in placement and paternal crime are now significant and father basic education no longer significant.

In Table 5b similar results for girls are presented. The most striking finding is that while placement in a residential institution does not increase girls' likelihood to commit crime, it has a large impact on the number of verdicts, in fact, even larger than for boys. Girls in residential institutions have 0.49 verdicts more than girls in foster homes, even including zero verdicts. This should be seen relative to the mean of 1.93 verdicts for girls overall. The IV estimate here is somewhat different, negative, reducing number of verdicts by 0.21 but it is insignificant. The same background factors predict girls' crime intensity as girls' crime likelihood, in fact mother on disability pension is now significant and positive, i.e. increasing number of verdicts and father mental disorder is no longer significant. Just as for boys, OLS cannot be rejected so column 2 estimates are the preferred ones. The basic finding is that while placement in residential care does not cause girls to *become* criminal, it increases their criminal intensity.

Tables 6a-b, 7a-b explore the effects of different types of verdict and sentencing. As mentioned earlier, the type of crime/sentence could be an indicator of the severity of the crime. Here, we choose to show multinomial logit models given that all the previous models failed to find

signs of endogeneity. The MNL estimates show a very interesting and consistent picture of more severe adolescent criminality of children who have been placed in residential care. From Table 6a we see that boys in residential care have significantly higher likelihood of verdicts for violence/sexual offences and theft and lower likelihood (though not significant) for less serious offences such as drunk driving and other offences compared to boys in foster care. For girls in residential care too, Table 6b shows a significantly higher tendency to commit violence/sexual offence and a significantly lower tendency for drunk driving and lighter offences and no significant difference in thefts compared to girls in foster care. Again, estimates of the background characteristics of the children, their parents and their municipality show a similar pattern with respect to type of crime as in crime likelihood and crime intensity – i.e. poor health, placement characteristics (age at first placement etc.), maternal age at first birth, maternal single status, maternal low education, maternal crime, paternal income and paternal crime are the important factors associated with juvenile crime behavior. Interestingly, these characteristics have stronger effects on the more serious types of crime-violence/sexual offences and theft.[28]

An alternate measure of crime severity is given by the type of sentence imposed. Tables 7a-b show that residentially placed children, both boys and girls, have a significant higher likelihood of obtaining an unsuspended conviction (the most serious type). In fact, for boys the marginal effects fall monotonically with the severity of the sentence so that they have the highest likelihood of getting a unsuspended sentence, a somewhat lower likelihood of obtaining a suspended conviction, an even lower one of obtaining fines and the lowest likelihood of receiving other convictions including acquittal and dismissals. For girls, the likelihood is highest for the other convictions including acquittal/dismissal although it is not significant, followed by unsuspended sentences, suspended sentences and lastly fines. In fact, residentially placed girls are less likely to be fined, while residentially placed boys are more likely to be fined compared to equivalents in foster care. The source of this gender difference can be explored further in future work, for instance, by looking at the type of verdict for which fines are imposed.

To sum up, the evidence from these tables shows that children in institutions are more likely to commit more serious types of crime compared to children in foster care and at the same

[28]Crimes committed by juveniles under the category Violence/Sexual offences are mainly of the first type, i.e. Violence. The Violence category can be further split up into murder attempts/violence against government authorities/violence against private persons (simple, serious, especially serious)/threats. For this age group, the most frequent registered crime is simple violence against private persons.

time, they also tend to receive stiffer sentences than children from foster homes, although some gender differences exist.[29]

4.3 Effects on criminal recidivism

Once a youth in placement has committed an offence, which type of outside home care is better at rehabilitating and preventing relapses? A meta-analysis of 23 published studies finds that the strongest predictor of criminal recidivism among juveniles is the age of first commitment and contact with the law but also family problems, ineffective use of leisure time, delinquent peers, conduct problems and non-severe pathology (Cottle et al. 2001). Our sample is observed in a very narrow age interval 15-20 and moreover most youths in placement are there because of either family problems or own conduct problems. Our set of controls captures some of these factors. In terms of the remaining factors, it is not clear *a priori* which type of care would be better able at preventing recurrence of crime. A structured institutional environment on the one hand implies less unsupervised leisure time but, on the other hand, possibly more delinquent peers.

In Tables 8a and 8b we explore this question on the subsample of youths who have committed at least one offence and we find that institutions fare worse than foster homes in preventing youth recidivism. Recidivism is defined as having 2 or more of the same type of verdicts in ages 15-20, where verdicts are classified as either violence/sexual offence, thefts, drunk driving or other. We find that the effect of being placed in institutions on criminal recidivism is the same for both boys and girls looked after in institutions and in both cases imply a 8pp higher likelihood of relapse compared to boys and girls in foster homes. The IV estimates are somewhat different, -14pp for boys, and 68pp for girls, but both are very imprecisely estimated. However, here, too, OLS is preferred to IV although the instrument is strong for boys only (F statistic = 27, boys, F statistic = 4.4 girls)[30]. Thus, children placed in residential care are more likely to repeat crimes compared to children placed in foster homes.

[29]Instead of MNL models, we have tried estimating the effect of placement type via separate OLS and IV models where for each verdict/sentence we pooled together sub-samples of offenders of that specific crime with non-offenders. Instruments were valid in all cases, however, exogeneity could not be ruled out at conventional levels of significance in any of the models (results available on request). Hence, in Tables 6-7 we report MNL models without accounting for endogeneity but taking all verdict types into consideration simultaneously, which is the statistically more correct econometric specification.

[30] When analyzing recidivism we first restrict the sample to children with a verdict and then further spilt up by sex. This gives us 521 girls with a verdict. Of those, 165 are registered with the same type of verdict more than once. The F-statistic is low and insignificant suggesting small sample bias.

4.4 Robustness checks

A few concerns remain regarding the robustness of our estimates. First, how robust is the effect of residential institutions compared to foster homes on youth crime if we include other types of placements in the analysis? We argued earlier that we make a cleaner comparison to other studies by focusing only on the effects of residential institutions vs. foster homes. However, Ejrnæs (2011) includes other types of placements and preventive actions in her analysis. The latter is not a type of outside home placement but instead involves intensive supervision of the child. We do not include preventive actions in this paper as the focus is on children in out-of-home placement. Lindquist and Santarvirta (2012) operate with a broader definition of residential care than us, including nurseries, orphanages, mental hospitals, youth homes and reform schools. For ease of comparison to these papers, we go back to the model of the likelihood of committing crime in Appendix Table A1a and A1b except we include children in other placements in their own category. This almost doubles the sample size from 7,375 observations to 13,876 observations. In the IV specification, we instrument Other Care by the municipality intensity of use of other care (see Figure 3).

We find very similar effects to what we found earlier in Tables 4a and 4b: In the OLS specifications with controls, boys placed in residential institutions are 4.3pp (statistically significant) more likely to pick up a verdict than boys placed in foster homes while there is no significant difference in the crime likelihood for girls in either type of placement (our earlier results in Tables 4a and 4b showed a 3.4pp for boys of residential care and an insignificant effect for girls in residential care compared to foster home care). Furthermore, we find that while boys in other types placements do not have a heightened risk of committing crime compared to boys in foster homes, girls in other placements have a 7.7pp higher risk of committing crime compared to girls in foster care. The study by Ejrnæs also on Danish register data presents results only for boys, and her findings show a 6pp (on the margin of significance) higher likelihood of crime for boys in residential care and an insignificant effect for boys in other placements, so the effects found here are in the same order of magnitude but more precisely estimated. The IV estimates are 9.75pp for boys, and 4.7pp for girls but once again, imprecisely estimated. Thus, expanding the sample to include children in other types of placements, does not alter our main findings. Since this group of children is rather different from children placed in foster care and institutional care and, other care, by definition, is a mix of different types, we maintain our strategy of focusing on the former two groups.

Second, we could be concerned that the higher likelihood of crime for children in institutions arises because of systematic differences in (unobserved) child behavior across placement settings. We mentioned earlier that one concern could be that municipalities place the 'worst' children in institutions and that is what is driving the finding of higher crime behavior in such settings. We cannot provide direct evidence to refute this argument since we have no measure of child behavior in the register data. We control for a wide array of parental socioeconomic characteristics and certain child characteristics (birth weight, handicaps) as well as the child's placement history (age at first placement, number of placements, total duration of days in placement) in the analysis. Furthermore, the descriptive statistics showed in fact, that parents of children in foster homes and mixed course had the weakest characteristics of all. Recall also, that we have omitted children with a prior criminal record from the outset. Still, to alleviate the concern that the effect of residential homes on crime behavior is biased upwards due to omitted child behavior, we test whether a subsample of children placed at ages 0-6 in institutions also show higher crime rates at ages 15-20. This group of children is presumably not removed from the home because of own conduct problems/pathology but because of parental problems. If the group of children placed early in institutions also has higher crime behavior than those placed in foster homes, then we may be more confident that what we uncover is a causal effect of institutional care and not merely a difference due to unobserved child behavior.

In Appendix Table A2 we examine the effect on the number of verdicts of the group of boys who were placed at ages 0-6. Despite having a rather small sample (N=198) which make significance hard to establish, we find that the OLS point estimate of residential care on number of verdicts for this group is 0.1033 (0.288), which can be compared to the effect on the number of verdicts of residential care for the full sample of boys placed at ages 0-18 (N=3,844) from Table 5a of 0.1093 (0.0343). Thus, boys in both age groups placed in residential institutions end up with at least 0.10 verdicts more than similar boys in foster care, relative to the mean number of verdicts for all boys age 0-18 of 4.2 and to the mean number of verdicts for boys placed age 0-6 of 1.8, i.e. an even larger effect on crime of being placed in residential care for boys placed at ages 0-6. A similar analysis could not be carried out for girls, unfortunately, due to a prohibitively small sample size.

Another concern we raised earlier is that if crime behavior is measured at ages 15-20, some children are convicted of a crime while they are in placement. This could bias our findings if, for instance, institutions because of greater adult supervision were better informed or had greater incentives to report the crime out of a concern for spillover effects to other children at the

institution. Thus, we perform a robustness check in Appendix A3a and A3b where we focus only on crime committed at ages 18 and up when children have left institutional care. The OLS point estimates show a greater incidence of crime at ages 18-20 for both boys and girls formerly placed in residential care, compared to their counterparts placed in foster care (1.7pp for boys, 5pp for girls). Thus, it is not the case that the greater crime propensity of institutionally placed children is only due to a reporting effect. Note that the sample sizes are smaller here because children who have committed crime at ages 14-17 are by definition left out of the sample.

In the final robustness test, we reintroduce the 267 children with a former criminal record placed in either foster homes or residential institutions into our sample and restimate the model of probability of committing crime on the expanded sample. If omitting these children with a past criminal record had led to any bias, we would expect that including them would inflate the effect of residential care on juvenile crime, as 20% of children with a former record are placed in such institutions as compared to 7% in foster homes. The results are shown in Appendix 4a and 4b and are almost identical to the estimates in Tables 4a and 4b. According to the OLS estimate, boys placed in residential institutions are 3.7pp more likely to commit a crime compared to boys placed in foster care (in Table 4a, the effect was 3.4pp) and girls in residential care are no more likely to commit a crime compared their counterparts in foster care. IV estimates, here too, are imprecisely estimated despite the instrument being strong, and OLS is preferred to IV. Thus, including children with a former criminal record in the sample does not alter the findings.

5. CONCLUSION

This paper studies juvenile delinquency at ages 15-20 of children who have experienced placement in outside home care. Our contribution to the literature is to carefully investigate whether the *type* of care (foster homes or residential institutions) matters for children's criminal behavior as adoloscents for children placed in the decades of the 1980s. In contrast to earlier work, we isolate the effect of care type on criminal behavior by identifying children with a 'simple' care history, i.e. who have experienced only one type of care throughout, thereby not confounding the effects of different care types on child outcomes. Furthermore, we exclude children with a criminal record from the sample and focus solely on the crime debut of children who came into placement without a prior verdict. We exploit municipalities' tendency to use different types of placements to instrument mode of care controlling for other relevant municipal characteristics. Our study brings new evidence on differences in the juvenile delinquency rate, the number of verdicts given, the type of verdict, the

type of sentence and the extent of criminal recidivism between children in foster care and children placed in residential institutions.

Our study shows that relative to boys placed in foster homes boys placed in residential institutions are 3.4pp more likely to commit crime, have 0.11 more verdicts, are more likely to have verdicts for violence/sexual offences and theft and less likely to have verdicts for drunk driving and other offences, are more likely to get unsuspended sentences and fines and are 8pp more likely to engage in criminal recidivism. Our study also finds that while girls placed in residential institutions are no more likely to commit crime than girls in foster homes, they have 0.44 more verdicts, are more likely to have verdicts for violence/sexual offences, less likely to have verdicts for drunk driving and other offences, are more likely to have unsuspended sentences and less likely to get fined and are also 8pp more likely to engage in criminal recidivism. Taken together, these results suggest that both boys and girls placed in residential institutions show substantially greater criminal activity across various measures of crime than their counterparts placed in foster homes. These findings arise in spite of the fact that parents of such children appear stronger in terms of income, education, labor market participation, mental health and criminal activity compared to parents of children in foster homes.

These results are robust to incorporating other placement types and children with a prior criminal record into the analysis. Furthermore, similar estimates also obtain for boys placed in institutions at much earlier ages suggesting that the observed criminal activity is not a consequence of child conduct problems or pathology. Such problems normally manifest themselves at later ages and are a common reason for child removal from the home for older children. We also find effects of prior placement in residential institutions on crime behavior even after leaving the institutions, implying that it is not merely the increased supervision and monitoring leading to greater reporting of criminal activity of children in such settings. The findings instead suggest instead a real effect of being placed in an institutional setting that makes children more criminally active.

Our results compare rather well to the two existing studies investigating the effect of care type on crime behavior. Ejrnæs (2001) also uses Danish register data and a sibling design and reports results for boys only. She finds that boys in institutional care are 6pp point more likely to engage in criminal activities compared to boys who have been cared for in foster families. Lindquist and Santarvirta (2012) follow children investigated by the Child Welfare Committee in the Stockholm Birth Cohort and compare crime behavior in adulthood of children who were removed to children who were investigated but not removed. The children analyzed experienced out-of-home

placement in the 1950s and 1960s in a period where, especially, institutions (mainly orphanages and reform schools) were notorious for neglect, corporal punishment and the absence of rehabilitative measures. Surprisingly, their results are similar to ours: boys (girls) placed in institutions have a 3 (1.5) times higher excess probability of committing a crime over boys (girls) placed in foster care relative to boys (girls) investigated but not placed. Furthermore, these results are driven by children placed in the age group 13-18.

Clearly, the nature of institutions for children has evolved greatly in recent decades a significant pedagogical shift towards a more child-centered educational philosophy. Institutions these days are staffed with specially trained care workers and offer a structured and supervised environment that in theory should reinstate social control and self-control of children exposed to disturbed home circumstances. Our findings nonetheless show an excess criminality of children in institutions, which is an issue of serious concern. This seems to suggest that one of the mechanisms of the heightened criminal tendencies of children placed in these settings may not be as much what institutions *do*, as much as the institutional *structure* itself, which by clustering together many children with similar backgrounds may engender a strong peer effect in crime. Peer effects in crime of the same magnitude may not arise in foster family care. In future work we plan to investigate whether the mechanism explaining greater criminal behavior of children placed in institutions is their exposure to delinquent peers.

Finally, we attempted to conduct a careful and clean comparison by narrowly focusing on children who have experienced only one of two types of care throughout – foster homes and residential institutions. We did this in order to avoid confounding the effects of different care types arising from placed children being moved between care types during their care careers. We also omitted children with a former criminal record from the main specifications in order to isolate the effect of the type of care on crime from that of the children's prior criminal tendencies. These restrictions meant that we only exploited 38% of the sample of placed children. In additional tests we examined the robustness of our results to including some of these previously omitted groups and found that they held up. However, we retained the restricted sample in order to be able to generate cleaner results that are more useful for policy purposes. It also bears repeating that we did not model the selection into placement due to the lack of a suitable comparison group. Our results thus apply only to the population of children already in placement.

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Table 1. Descriptive statistics of children in different types of placements

	Foster care	Residential Institution		Other type of care	Mixed course
Mean age at first placement	7.0	8.8	***	13.9	7.0
Mean total days in placements	2,193	1,072	***	1,187	3,147
Mean birth weight (in gms)	3,195	3,184		3,267	3,163
Mean no. of placements	1.8	1.5	***	1.5	4.2
Voluntary placement	97.0	95.0	***	99.0	94.1
Mean no. diagnoses	0.7	0.7		0.5	0.7
Congenital deformities	3.7	3.7		2.0	2.7
Male	51.0	53.2	**	51.5	54.9
Obs.	3595	3781		6501	4720

*Significantly different from Foster care at 10% level; **Significantly different from Foster care at 5% level;
***Significantly different from Foster care at 1% level.

Table 2. Descriptive statistics of parents with children in different types of placements

	Foster Care	Residential Institution		Other type of care	Mixed Course
Mother's mean age at her first birth [a]	25.5	25.6		25.1	24.9
Mother mean wage income [ac]	40,756	67,343	***	84,666	36,098
Mother mean no. of diagnoses [a]	1.5	1.4		1.4	1.5
Mother basic education	62.8	55.5	***	53.3	64.3
Mother secondary education	11.3	16.4	***	18.5	10.7
Mother post-secondary education	5.4	8.4	***	7.4	4.6
Mother employed	28.9	40.4	***	41.2	25.6
Mother unemployed	12.8	13.3		10.4	13.9
Mother disability pension	8.0	3.8	***	5.2	6.8
Mother outside labor market[b]	33.4	27.6	***	24.8	38.7
Mother conviction	6.0	4.2	***	3.0	7.4
Mother single	48.5	38.1	***	37.3	51.3
Mother cohabiting	34.6	47.0	***	44.5	33.7
Mother mental illness	0.3	0.1	*	0.1	0.4
Father mean wage income [a]	104,233	129,921	***	152,483	91,834
Father mean no. of diagnoses [ac]	1.3	1.2		1.2	1.3
Father basic education	33.0	33.9		34.3	35.7
Father secondary education	19.7	24.0	***	25.0	17.8
Father post-secondary education	4.9	8.1	***	5.5	3.3
Father employed	39.4	48.6	***	47.7	34.0
Father unemployed	9.1	10.5	*	6.9	11.4
Father disability pension	4.4	2.8	***	3.6	4.5
Father outside labor market [b]	8.6	7.8		9.7	10.7
Father conviction	11.6	9.3	***	8.2	12.6
Father single	31.1	25.0	***	27.3	29.7
Father cohabiting	30.3	44.7	***	40.6	30.8
Father mental illness	0.2	0.2		0.3	0.4
Obs.	3595	3781		6501	4720

[a]Calculated on the basis of a reduced no. of observations due to missing values. If in some cases, shares do not sum to 100, this is due to observations with missing values. For example, 23.5 pct have missing values on maternal education.
[b]Outside the labor market includes individuals who are on leave incl. maternity leave, receiving educational benefit, different kinds of social benefits and other states outside the labor market. These were not separately registered before the late nineties.
[c]Mothers' and fathers' annual wage income in DKK. Wage income is only available for individuals who at some point during the year have a wage income and does not include individuals receiving public benefits. The amount is stated in real Danish kroner from the year before a placement.
*Significantly different from Foster care at 10% level; **Significantly different from Foster care at 5% level;
***Significantly different from Foster care at 1% level.

Table 3. Crime by types of placements (outcomes)

	Foster Care	Residential institution		Other type of care	Mixed Course
Mean no. of verdicts (offenders only)	3.7	4.7	***	4.7	5.2
Any verdict (likelihood of crime)	28.3	31.9	***	34.4	44.6
Verdict of violence and sexual offences[a]	7.5	11.3	***	11.7	17.9
Verdict of theft	13.0	15.4	***	16.1	21.1
Verdict of drunk driving	2.5	1.5	***	2.0	1.6
Verdict of other types of crime	5.3	3.7	***	4.3	4.0
Unsuspended conviction[a]	3.9	5.6	***	6.8	10.8

Suspended conviction	6.5	8.6	***	9.2	13.1
Fine	16.2	15.3		15.8	18.1
Other conviction	1.6	2.3	**	2.3	2.6
Criminal recidivism (>=2 same verdicts)	15.8	20.3	***	21.9	30.0
Obs.	3595	3781		6501	4720

*Significantly different from Foster care at 10% level; **Significantly different from Foster care at 5% level; ***Significantly different from Foster care at 1% level.

Table 4. Effects of placement type on likelihood of crime

	OLS	OLS with Controls	2SLS with Controls
Residential care	0.0352***	0.0165	0.0140
	(0.0107)	(0.0111)	(0.0820)
Male		0.3024***	0.3025***
		(0.0099)	(0.0105)
Birth weight		0.0121**	0.0120*
		(0.0061)	(0.0062)
Voluntary placement		0.0016	0.0012
		(0.0250)	(0.0276)
Age at first placement		0.0056***	0.0056***
		(0.0010)	(0.0012)
No. of placements		0.0065	0.0064
		(0.0051)	(0.0057)
Total days in placements		-0.0015***	-0.0015**
		(0.0003)	(0.0006)
No. of diagnoses		-0.0096*	-0.0095*
		(0.0052)	(0.0053)
Congenital deformities		-0.0724***	-0.0723***
		(0.0252)	(0.0251)
Mother's age at her first birth		-0.0033***	-0.0033***
		(0.0007)	(0.0007)
Mother income		0.0000	0.0000
		(0.0001)	(0.0001)
Mother employed		-0.0158	-0.0157
		(0.0164)	(0.0166)
Mother disability pension		0.0148	0.0149
		(0.0164)	(0.0168)
Mother basic education		0.0531***	0.0531***
		(0.0162)	(0.0162)
Mother single		0.0517***	0.0516***
		(0.0128)	(0.0135)
Mother conviction		0.0640***	0.0640***
		(0.0245)	(0.0245)
Mother mental disorder		0.1103	0.1100
		(0.1418)	(0.1416)
Father income		-0.0002***	-0.0002***
		(0.0001)	(0.0001)
Father employed		-0.0027	-0.0026
		(0.0187)	(0.0190)
Father disability pension		0.0375*	0.0377*
		(0.0211)	(0.0220)
Father basic education		-0.0224	-0.0225
		(0.0173)	(0.0176)
Father single		0.0146	0.0144
		(0.0143)	(0.0156)
Father conviction		0.0598***	0.0597***
		(0.0178)	(0.0178)
Father mental disorder		0.0200	0.0201
		(0.1066)	(0.1064)
Rate of 0-17 year olds in municipality		-0.0042	-0.0042
		(0.0030)	(0.0031)
Rate of employed in municipality		0.0051	0.0051
		(0.0032)	(0.0032)
Rate on disability pension in municipality		0.0143	0.0143
		(0.0096)	(0.0096)
Rate of single parents in municipality		-0.0139*	-0.0138*
		(0.0080)	(0.0083)
Expenses on public goods in municipality		0.0055***	0.0055***
		(0.0017)	(0.0017)
Municipality size		-0.0002***	-0.0002***
		(0.0001)	(0.0001)

Constant	0.2835***	-0.2385	-0.2366
	(0.0077)	(0.1900)	(0.1991)
Observations	7375	7375	7375

Standard errors in parentheses.* p<0.10, ** p<0.05, *** p<0.01

F-test	133.58	[0.000]
Shea's partial R-squared	0.176	
Endogeneity test (Wu-Hasuman F-test version)	0.001	[0.975]

Table 4a. Effects of placement type on likelihood of crime, boys

	OLS	**OLS with controls**	**2SLS with controls**
Residential care	0.0383***	0.0339**	0.0744
	(0.0119)	(0.0132)	(0.0898)
Birth weight		0.0051	0.0055
		(0.0063)	(0.0063)
Voluntary placement		0.0149	0.0187
		(0.0289)	(0.0307)
Age at first placement		0.0050***	0.0047***
		(0.0012)	(0.0013)
No. of placements		0.0157**	0.0173**
		(0.0063)	(0.0072)
Total days in placements		-0.0006*	-0.0004
		(0.0004)	(0.0007)
No. of diagnoses		-0.0141**	-0.0140**
		(0.0063)	(0.0063)
Congenital deformities		-0.0395	-0.0441
		(0.0261)	(0.0282)
Mother's age at her first birth		-0.0016*	-0.0015*
		(0.0008)	(0.0008)
Mother income		0.0001	0.0001
		(0.0001)	(0.0001)
Mother employed		-0.0269	-0.0287
		(0.0198)	(0.0200)
Mother disability pension		-0.0118	-0.0129
		(0.0197)	(0.0196)
Mother basic education		0.0122	0.0116
		(0.0193)	(0.0192)
Mother single		0.0342**	0.0361**
		(0.0155)	(0.0161)
Mother conviction		0.0603*	0.0602*
		(0.0319)	(0.0319)
Mother mental disorder		0.3237	0.3349*
		(0.1998)	(0.2020)
Father income		-0.0002***	-0.0002***
		(0.0001)	(0.0001)
Father employed		0.0018	-0.0010
		(0.0221)	(0.0228)
Father disability pension		0.0201	0.0150
		(0.0256)	(0.0277)
Father basic education		-0.0333*	-0.0323
		(0.0201)	(0.0202)
Father single		-0.0155	-0.0124
		(0.0172)	(0.0183)
Father conviction		0.0331	0.0334
		(0.0220)	(0.0219)
Father mental disorder		-0.1843***	-0.1814***
		(0.0258)	(0.0307)
Rate of 0-17 year olds in municipality		-0.0046	-0.0041
		(0.0035)	(0.0036)
Rate of employed in municipality		0.0057	0.0057
		(0.0037)	(0.0037)
Rate on disability pension in municipality		0.0011	0.0019
		(0.0114)	(0.0115)
Rate of single parents in municipality		-0.0013	-0.0025
		(0.0092)	(0.0097)
Expenses on public goods in municipality		0.0027	0.0026
		(0.0019)	(0.0019)
Municipality size		-0.0002*	-0.0002*
		(0.0001)	(0.0001)
Constant	0.1283***	-0.1661	-0.2045

	(0.0084)	(0.2241)	(0.2381)
Observations	3531	3531	3531

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

F-test	70.70	[0.000]
Shea's partial R-squared	0.019	
Endogeneity test (Wu-Hasuman F-test version)	0.207	[0.649]

Table 4b. Effects of placement type on the likelihood of crime, girls

	OLS	**OLS with controls**	**2SLS with Controls**
Residential care	0.0199	0.0032	-0.0398
	(0.0160)	(0.0174)	(0.1364)
Birth weight		0.0193*	0.0186*
		(0.0099)	(0.0101)
Voluntary placement		-0.0075	-0.0158
		(0.0415)	(0.0492)
Age at first placement		0.0062***	0.0065***
		(0.0017)	(0.0020)
No. of placements		-0.0012	-0.0024
		(0.0076)	(0.0084)
Total days in placements		-0.0021***	-0.0024**
		(0.0005)	(0.0010)
No. of diagnoses		-0.0067	-0.0058
		(0.0076)	(0.0081)
Congenital deformities		-0.0881**	-0.0900**
		(0.0379)	(0.0380)
Mother's age at her first birth		-0.0048***	-0.0048***
		(0.0011)	(0.0011)
Mother income		-0.0000	-0.0000
		(0.0002)	(0.0002)
Mother employed		-0.0059	-0.0047
		(0.0255)	(0.0256)
Mother disability pension		0.0384	0.0413
		(0.0253)	(0.0268)
Mother basic education		0.0966***	0.0971***
		(0.0260)	(0.0259)
Mother single		0.0680***	0.0652***
		(0.0198)	(0.0215)
Mother conviction		0.0676*	0.0666*
		(0.0363)	(0.0363)
Mother mental disorder		-0.0770	-0.0749
		(0.1770)	(0.1799)
Father income		-0.0002**	-0.0002*
		(0.0001)	(0.0001)
Father employed		-0.0122	-0.0114
		(0.0302)	(0.0302)
Father disability pension		0.0530	0.0548
		(0.0331)	(0.0335)
Father basic education		-0.0190	-0.0218
		(0.0278)	(0.0290)
Father single		0.0390*	0.0354
		(0.0224)	(0.0249)
Father conviction		0.0808***	0.0790***
		(0.0273)	(0.0278)
Father mental disorder		0.3515**	0.3588**
		(0.1617)	(0.1646)
Rate of 0-17 year olds in municipality		-0.0040	-0.0044
		(0.0047)	(0.0048)
Rate of employed in municipality		0.0058	0.0060
		(0.0050)	(0.0050)
Rate on disability pension in municipality		0.0285*	0.0280*
		(0.0149)	(0.0150)
Rate of single parents in municipality		-0.0264**	-0.0252*
		(0.0128)	(0.0134)
Expenses on public goods in municipality		0.0084***	0.0085***
		(0.0027)	(0.0027)
Municipality size		-0.0003**	-0.0003**
		(0.0001)	(0.0001)
Constant	0.4326***	-0.0846	-0.0576
	(0.0116)	(0.3014)	(0.3124)

Observations	3844	3844	3844

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

F-test	62.90	[0.000]
Shea's partial R-squared	0.016	
Endogeneity test (Wu-Hasuman F-test version)	0.100	[0.751]

Table 5a. Effects of placement type on the number of verdicts, boys

	OLS	**OLS with controls**	**2SLS with Controls**
Residential care	0.1186***	0.1093***	0.1255
	(0.0318)	(0.0343)	(0.2054)
Birth weight		0.0215	0.0216
		(0.0155)	(0.0155)
Voluntary placement		-0.0809	-0.0794
		(0.1190)	(0.1237)
Age at first placement		0.0134***	0.0133***
		(0.0032)	(0.0038)
No. of placements		0.0636***	0.0642***
		(0.0165)	(0.0181)
Total days in placements		-0.0023***	-0.0021
		(0.0008)	(0.0016)
No. of diagnoses		-0.0355***	-0.0354***
		(0.0133)	(0.0133)
Congenital deformities		-0.0726	-0.0744
		(0.0442)	(0.0510)
Mother's age at her first birth		-0.0041**	-0.0041**
		(0.0019)	(0.0019)
Mother income		-0.0004	-0.0004
		(0.0003)	(0.0003)
Mother employed		-0.0227	-0.0234
		(0.0501)	(0.0496)
Mother disability pension		-0.0432	-0.0436
		(0.0501)	(0.0497)
Mother basic education		0.0251	0.0248
		(0.0562)	(0.0557)
Mother single		0.0710*	0.0717*
		(0.0397)	(0.0410)
Mother conviction		0.1827*	0.1826*
		(0.1039)	(0.1035)
Mother mental disorder		0.6455	0.6499
		(0.4741)	(0.4750)
Father income		-0.0004**	-0.0004**
		(0.0002)	(0.0002)
Father employed		-0.0058	-0.0069
		(0.0488)	(0.0509)
Father disability pension		0.0817	0.0797
		(0.0698)	(0.0753)
Father basic education		-0.0155	-0.0151
		(0.0552)	(0.0545)
Father single		-0.0349	-0.0337
		(0.0445)	(0.0460)
Father conviction		0.1570**	0.1571**
		(0.0693)	(0.0690)
Father mental disorder		-0.3698***	-0.3686***
		(0.0779)	(0.0805)
Rate of 0-17 year olds in municipality		-0.0089	-0.0087
		(0.0085)	(0.0088)
Rate of employed in municipality		0.0055	0.0055
		(0.0097)	(0.0097)
Rate on disability pension in municipality		-0.0175	-0.0172
		(0.0322)	(0.0323)
Rate of single parents in municipality		-0.0009	-0.0014
		(0.0234)	(0.0236)
Expenses on public goods in municipality		0.0061	0.0061
		(0.0048)	(0.0048)
Municipality size		-0.0003	-0.0003
		(0.0002)	(0.0002)
Constant	0.2260***	0.0021	-0.0132
	(0.0225)	(0.6361)	(0.6695)
Observations	3531	3531	3531

Standard errors in parentheses.* p<0.10, ** p<0.05, *** p<0.01

F-test	70.70	[0.000]
Shea's partial R-squared	0.193	
Endogeneity test (Wu-Hasuman F-test version)	0.006	[0.937]

Table 5b. Effects of placement type on the number of verdicts, girls

	OLS	**OLS with controls**	**2SLS with Controls**
Residential care	0.6808***	0.4939***	-0.2100
	(0.1403)	(0.1483)	(1.1621)
Birth weight		0.1470*	0.1356
		(0.0793)	(0.0831)
Voluntary placement		-0.3493	-0.4862
		(0.4514)	(0.5029)
Age at first placement		0.0902***	0.0959***
		(0.0149)	(0.0176)
No. of placements		0.1924**	0.1734*
		(0.0803)	(0.0918)
Total days in placements		-0.0066*	-0.0114
		(0.0034)	(0.0087)
No. of diagnoses		-0.0901	-0.0749
		(0.0585)	(0.0640)
Congenital deformities		-0.8752***	-0.9065***
		(0.1791)	(0.1844)
Mother's age at her first birth		-0.0283***	-0.0277***
		(0.0089)	(0.0089)
Mother income		-0.0009	-0.0006
		(0.0016)	(0.0018)
Mother employed		0.1132	0.1329
		(0.2186)	(0.2137)
Mother disability pension		0.3768*	0.4236*
		(0.2262)	(0.2347)
Mother basic education		0.6710***	0.6794***
		(0.2403)	(0.2403)
Mother single		0.4620***	0.4170**
		(0.1665)	(0.1862)
Mother conviction		0.4866	0.4707
		(0.3604)	(0.3587)
Mother mental disorder		-0.0854	-0.0510
		(0.8383)	(0.8917)
Father income		-0.0024***	-0.0023***
		(0.0009)	(0.0009)
Father employed		0.0400	0.0531
		(0.2813)	(0.2856)
Father disability pension		0.1042	0.1328
		(0.3088)	(0.3159)
Father basic education		-0.2557	-0.3010
		(0.2581)	(0.2638)
Father single		0.1249	0.0668
		(0.1874)	(0.2166)
Father conviction		0.8882***	0.8583***
		(0.2773)	(0.2884)
Father mental disorder		0.1031	0.2222
		(0.5802)	(0.6063)
Rate of 0-17 year olds in municipality		-0.0563	-0.0628
		(0.0445)	(0.0454)
Rate of employed in municipality		0.0600	0.0639
		(0.0406)	(0.0419)
Rate on disability pension in municipality		0.1087	0.1005
		(0.1321)	(0.1312)
Rate of single parents in municipality		0.0506	0.0704
		(0.1136)	(0.1194)
Expenses on public goods in municipality		0.0782***	0.0793***
		(0.0244)	(0.0245)
Municipality size		-0.0023**	-0.0021*
		(0.0010)	(0.0011)
Constant	1.8314***	-37.566	-3.3142
	(0.1015)	-27.389	(2.7490)
Observations	3844	3844	3844

Standard errors in parentheses.* p<0.10, ** p<0.05, *** p<0.01

F-test	62.90	[0.000]
Shea's partial R-squared	0.016	
Endogeneity test (Wu-Hasuman F-test version)	0.339	[0.528]

Table 6a. Effects of placement type on type of verdicts, MNL model, marginal effects, boys

	Violence and sexual offences	**Theft**	**Drunk driving**	**Other verdicts**
Residential care	0.8311***	0.2322*	-0.1671	-0.0160
	(0.2682)	(0.1302)	(1.0128)	(0.2218)
Birth weight	0.1916	0.0108	0.1912	0.0107
	(0.1323)	(0.0767)	(0.4445)	(0.1402)
Voluntary placement	0.2512	0.1390	14.4951	-0.0563
	(0.6092)	(0.2957)	(2236.9689)	(0.4755)
Age at first placement	0.0758***	0.0428***	-0.0849	0.0138
	(0.0229)	(0.0117)	(0.0930)	(0.0203)
No. of placements	0.3414***	0.1373**	-0.3822	-0.0581
	(0.1051)	(0.0610)	(0.5895)	(0.1184)
Total days in placements	-0.0173*	-0.0084*	-0.0198	0.0041
	(0.0101)	(0.0043)	(0.0313)	(0.0062)
No. of diagnoses	-0.1327	-0.0819	-0.1115	-0.3046**
	(0.1527)	(0.0718)	(0.5418)	(0.1412)
Congenital deformities	-0.5804	-0.4946	-13.7163	-0.7202
	(1.0448)	(0.4825)	(3206.1371)	(1.0381)
Mother's age at her first birth	-0.0101	-0.0111	0.0551	-0.0248*
	(0.0172)	(0.0086)	(0.0648)	(0.0141)
Mother income	-0.0014	0.0007	-0.0036	0.0018
	(0.0024)	(0.0012)	(0.0154)	(0.0019)
Mother employed	-0.3073	-0.2744	0.7256	-0.0877
	(0.3956)	(0.1989)	(1.6854)	(0.3327)
Mother disability pension	-0.4642	-0.1382	1.2503	0.0843
	(0.4272)	(0.1966)	(1.2131)	(0.3264)
Mother basic education	0.1877	-0.0923	1.1199	0.5931*
	(0.3535)	(0.1860)	(1.3306)	(0.3056)
Mother single	0.6537**	0.1132	0.7774	0.5039**
	(0.2892)	(0.1471)	(1.1286)	(0.2507)
Mother conviction	0.0061	0.5291**	1.5543	0.2408
	(0.5416)	(0.2294)	(1.3328)	(0.4440)
Mother mental disorder	-18.5051	2.4059***	-16.5928	-19.3559
	(41944.0946)	(0.7904)	(73801.0193)	(45439.9838)
Father income	-0.0021	-0.0033***	-0.0461	-0.0002
	(0.0017)	(0.0009)	(0.0337)	(0.0013)
Father employed	0.1967	0.0769	-11.4314	0.0774
	(0.4346)	(0.2152)	(823.3919)	(0.3823)
Father disability pension	-0.0943	0.1496	2.6460	0.2858
	(0.4945)	(0.2209)	(1.6345)	(0.4114)
Father basic education	-0.2622	-0.3064	0.7197	-0.1572
	(0.3928)	(0.1939)	(1.4891)	(0.3526)
Father single	-0.2926	0.0056	-1.2175	-0.3574
	(0.3251)	(0.1652)	(1.6126)	(0.2854)
Father conviction	0.2199	0.1796	0.2208	0.4433
	(0.3726)	(0.1853)	(1.4662)	(0.3096)
Father mental disorder	-17.0349	-16.9573	-14.2498	-17.0995
	(8952.4331)	(4719.7667)	(22486.8663)	(8682.1063)
Rate of 0-17 year olds in municipality	-0.0828	0.0001	-0.0931	-0.0790
	(0.0649)	(0.0353)	(0.3350)	(0.0554)
Rate of employed in municipality	-0.0228	0.0407	-0.2540	0.1183**
	(0.0743)	(0.0379)	(0.3135)	(0.0595)
Rate on disability pension in municipality	-0.2588	0.0413	0.6160	0.1321
	(0.2198)	(0.1161)	(0.7960)	(0.1804)
Rate of single parents in municipality	0.1296	0.0294	1.0534	-0.2343
	(0.1897)	(0.0945)	(1.3339)	(0.1624)
Expenses on public goods in municipality	-0.0023	0.0239	-0.5406	0.0420
	(0.0373)	(0.0196)	(0.3714)	(0.0343)
Municipality size	-0.0022	-0.0004	-0.0045	-0.0031**
	(0.0015)	(0.0008)	(0.0103)	(0.0014)
Constant	-1.4883	-5.6097**	4.3706	-8.4348**
	(4.3172)	(2.3178)	(2237.0612)	(3.7114)
Observations	3531	3531	3531	3531

Standard errors in parentheses.* p<0.10, ** p<0.05, *** p<0.01

Table 6b. Effects of placement type on type of verdicts, MNL model, marginal effects, girls

	Violence and sexual offences	Theft	Drunk driving	Other verdicts
Residential care	0.3194***	0.0699	-0.4137**	-0.6201***
	(0.1058)	(0.0977)	(0.1938)	(0.1594)
Birth weight	0.1314**	0.0773	-0.1393	0.0980
	(0.0610)	(0.0573)	(0.1206)	(0.0872)
Voluntary placement	-0.0973	0.0792	0.0558	-0.2519
	(0.2395)	(0.2366)	(0.4803)	(0.3518)
Age at first placement	0.0516***	0.0188**	0.0232	-0.0172
	(0.0101)	(0.0095)	(0.0191)	(0.0157)
No. of placements	0.0584	-0.0095	-0.1768	-0.1064
	(0.0470)	(0.0461)	(0.1110)	(0.0788)
Total days in placements	-0.0059*	-0.0105***	-0.0067	-0.0128***
	(0.0030)	(0.0028)	(0.0054)	(0.0044)
No. of diagnoses	-0.0933*	0.0125	-0.0631	-0.0008
	(0.0499)	(0.0433)	(0.0950)	(0.0711)
Congenital deformities	-0.6188*	-0.5216**	-0.1843	-0.0040
	(0.3221)	(0.2650)	(0.4926)	(0.3596)
Mother's age at her first birth	-0.0281***	-0.0196***	-0.0118	-0.0076
	(0.0066)	(0.0061)	(0.0123)	(0.0097)
Mother income	-0.0002	0.0008	-0.0031	-0.0004
	(0.0010)	(0.0010)	(0.0021)	(0.0016)
Mother employed	-0.0662	-0.1439	0.2414	0.1675
	(0.1574)	(0.1466)	(0.2836)	(0.2259)
Mother disability pension	0.2098	0.1191	0.3879	-0.1000
	(0.1450)	(0.1376)	(0.2540)	(0.2431)
Mother basic education	0.4655***	0.3530**	0.5632**	0.2700
	(0.1495)	(0.1417)	(0.2854)	(0.2330)
Mother single	0.2807**	0.2098*	0.7299***	0.2797
	(0.1167)	(0.1100)	(0.2210)	(0.1794)
Mother conviction	0.2891	0.3968**	-0.1419	0.0082
	(0.2086)	(0.1932)	(0.4412)	(0.3367)
Mother mental disorder	0.8176	-12.5633	-12.4651	-12.8255
	(0.8730)	(485.2313)	(976.9336)	(809.9337)
Father income	-0.0009	-0.0014**	-0.0007	0.0001
	(0.0007)	(0.0007)	(0.0013)	(0.0011)
Father employed	0.1189	0.0383	-0.4212	-0.5482**
	(0.1791)	(0.1679)	(0.3355)	(0.2729)
Father disability pension	0.2890	0.2878	0.2541	-0.2041
	(0.1949)	(0.1803)	(0.3299)	(0.2942)
Father basic education	0.1310	-0.0318	-0.7716**	-0.3552
	(0.1629)	(0.1539)	(0.3125)	(0.2493)
Father single	0.1804	0.2708**	-0.0983	0.0239
	(0.1297)	(0.1221)	(0.2387)	(0.2029)
Father conviction	0.6714***	0.1779	-0.2280	0.2753
	(0.1489)	(0.1516)	(0.3170)	(0.2360)
Father mental disorder	1.2922	2.3201**	-12.2056	-12.1361
	(1.4411)	(1.1748)	(1613.7232)	(1427.3838)
Rate of 0-17 year olds in municipality	-0.0213	-0.0169	-0.0497	0.0033
	(0.0274)	(0.0260)	(0.0522)	(0.0431)
Rate of employed in municipality	-0.0052	0.0375	-0.0005	0.0733
	(0.0304)	(0.0282)	(0.0537)	(0.0454)
Rate on disability pension in municipality	0.0270	0.1932**	0.0457	0.2126
	(0.0892)	(0.0833)	(0.1560)	(0.1355)
Rate of single parents in municipality	-0.0549	-0.0899	-0.2331	-0.1624
	(0.0772)	(0.0723)	(0.1532)	(0.1171)
Expenses on public goods in municipality	0.0381**	0.0399***	-0.0069	0.0281
	(0.0162)	(0.0154)	(0.0336)	(0.0254)
Municipality size	-0.0015**	-0.0014**	-0.0026*	0.0004
	(0.0007)	(0.0006)	(0.0015)	(0.0011)
Constant	-2.2852	-4.6539***	0.6194	-6.6007**
	(1.8558)	(1.7495)	(3.3398)	(2.8133)
Observations	3844	3844	3844	3844

Standard errors in parentheses.* p<0.10, ** p<0.05, *** p<0.01

Table 7a. Effects of placement type on type of sentence, MNL model, marginal effects, boys

	Unsuspended conviction	Suspended conviction	Fine	Other conviction

Residential care	1.0044*	0.3086	0.2592**	0.0013
	(0.5909)	(0.2228)	(0.1293)	(0.2805)
Birth weight	-0.1790	0.1860*	0.0184	-0.0377
	(0.3576)	(0.1095)	(0.0773)	(0.1804)
Voluntary placement	0.1433	-0.0767	0.2352	-0.0543
	(1.0853)	(0.4790)	(0.3030)	(0.6105)
Age at first placement	0.0681	0.0848***	0.0188	0.0788***
	(0.0492)	(0.0206)	(0.0116)	(0.0256)
No. of placements	0.4382**	0.1918**	0.1002	0.0593
	(0.2226)	(0.0938)	(0.0615)	(0.1543)
Total days in placements	-0.0119	0.0023	-0.0067	-0.0185*
	(0.0207)	(0.0070)	(0.0041)	(0.0111)
No. of diagnoses	-0.5017	-0.0772	-0.1134	-0.2941
	(0.4089)	(0.1221)	(0.0725)	(0.1861)
Congenital deformities	-12.5298	-0.1763	-0.7239	-0.0598
	(891.8023)	(0.7631)	(0.5303)	(1.0558)
Mother's age at her first birth	0.0091	-0.0306**	-0.0104	-0.0028
	(0.0400)	(0.0148)	(0.0084)	(0.0190)
Mother income	-0.0005	-0.0031	0.0016	0.0018
	(0.0059)	(0.0021)	(0.0011)	(0.0024)
Mother employed	-1.3291	0.3432	-0.2469	-0.8300*
	(0.9904)	(0.3266)	(0.1975)	(0.4537)
Mother disability pension	-0.1400	0.0297	-0.0443	-0.6340
	(0.6926)	(0.3420)	(0.1938)	(0.4593)
Mother basic education	-0.5222	0.4434	0.0754	-0.2348
	(0.8679)	(0.2968)	(0.1822)	(0.4405)
Mother single	0.5104	0.2631	0.1196	0.9592***
	(0.5787)	(0.2513)	(0.1474)	(0.3105)
Mother conviction	0.9630	-0.0847	0.6224***	-0.1455
	(0.8074)	(0.4831)	(0.2262)	(0.6123)
Mother mental disorder	-14.0431	2.6963**	1.8085**	-13.8768
	(8890.2116)	(1.1787)	(0.8949)	(5626.2019)
Father income	-0.0038	-0.0032**	-0.0018**	-0.0033*
	(0.0035)	(0.0015)	(0.0009)	(0.0018)
Father employed	1.2973	0.2489	-0.0660	0.1007
	(0.9544)	(0.3620)	(0.2219)	(0.4467)
Father disability pension	1.0901	0.2891	0.1254	-0.1941
	(0.9717)	(0.3675)	(0.2277)	(0.5190)
Father basic education	-0.5164	-0.4203	-0.0738	-0.8861**
	(0.8971)	(0.3366)	(0.1946)	(0.4290)
Father single	-1.0357	0.1713	-0.0115	-0.8284**
	(0.6729)	(0.2746)	(0.1683)	(0.3502)
Father conviction	-0.2068	0.1984	0.2431	0.4026
	(0.8062)	(0.3074)	(0.1872)	(0.3759)
Father mental disorder	-14.0025	-14.2998	-14.1901	-14.3994
	(4663.4424)	(1804.0623)	(1236.4637)	(2378.4185)
Rate of 0-17 year olds in municipality	-0.0747	-0.1045*	-0.0160	-0.0110
	(0.1461)	(0.0581)	(0.0338)	(0.0793)
Rate of employed in municipality	-0.1043	0.0086	0.0605*	0.0818
	(0.1572)	(0.0664)	(0.0363)	(0.0826)
Rate on disability pension in municipality	0.0315	-0.1610	0.0452	0.1624
	(0.4661)	(0.1959)	(0.1109)	(0.2578)
Rate of single parents in municipality	-0.0086	0.2552	-0.1097	0.1489
	(0.4161)	(0.1687)	(0.0937)	(0.2068)
Expenses on public goods in municipality	0.0286	-0.0158	0.0347*	0.0025
	(0.0808)	(0.0321)	(0.0199)	(0.0422)
Municipality size	-0.0050	-0.0007	-0.0016**	0.0009
	(0.0034)	(0.0013)	(0.0008)	(0.0018)
Constant	-0.2410	-2.0204	-6.1716***	-8.9819*
	(9.8392)	(3.8614)	(2.2426)	(5.0333)
Observations	3531	3531	3531	3531

Standard errors in parentheses.* p<0.10, ** p<0.05, *** p<0.01

Table 7b. Effects of placement type on type of sentence, MNL model, marginal effects, girls

	Unsuspended conviction	**Suspended conviction**	**Fine**	**Other conviction**
Residential care	0.2640*	0.1923	-0.1967**	0.3958
	(0.1350)	(0.1183)	(0.0919)	(0.2633)
Birth weight	0.1424*	0.0826	0.0784	-0.1157
	(0.0772)	(0.0697)	(0.0536)	(0.1523)
Voluntary placement	-0.2387	0.0444	0.0963	-0.6792

	(0.2906)	(0.2802)	(0.2296)	(0.4559)
Age at first placement	0.0705***	0.0349***	0.0066	0.0099
	(0.0130)	(0.0114)	(0.0090)	(0.0243)
No. of placements	0.0961*	0.0493	-0.0864*	-0.0549
	(0.0579)	(0.0527)	(0.0464)	(0.1251)
Total days in placements	-0.0056	-0.0081**	-0.0111***	-0.0026
	(0.0040)	(0.0034)	(0.0026)	(0.0070)
No. of diagnoses	-0.0595	-0.0489	-0.0357	0.1564
	(0.0634)	(0.0543)	(0.0425)	(0.0970)
Congenital deformities	-1.1274**	-0.5566	-0.2858	0.0507
	(0.5266)	(0.3495)	(0.2316)	(0.5047)
Mother's age at her first birth	-0.0298***	-0.0163**	-0.0191***	-0.0138
	(0.0085)	(0.0075)	(0.0058)	(0.0155)
Mother income	-0.0014	0.0014	-0.0005	0.0019
	(0.0013)	(0.0011)	(0.0009)	(0.0025)
Mother employed	0.0946	-0.2380	0.0234	-0.1176
	(0.1989)	(0.1800)	(0.1356)	(0.4071)
Mother disability pension	0.2901	0.1581	0.0708	0.4294
	(0.1810)	(0.1624)	(0.1326)	(0.3591)
Mother basic education	0.4031**	0.4380***	0.3716***	0.4893
	(0.1933)	(0.1688)	(0.1349)	(0.3493)
Mother single	0.3505**	0.3175**	0.3077***	-0.3201
	(0.1480)	(0.1315)	(0.1044)	(0.3000)
Mother conviction	0.1872	0.1260	0.3712**	0.2681
	(0.2615)	(0.2446)	(0.1849)	(0.5411)
Mother mental disorder	-13.8884	1.0569	-14.1751	-13.9943
	(1508.6780)	(0.8758)	(974.5901)	(2918.6752)
Father income	-0.0012	-0.0007	-0.0012*	0.0003
	(0.0009)	(0.0008)	(0.0006)	(0.0017)
Father employed	-0.2662	0.1327	-0.0031	-0.5594
	(0.2201)	(0.2031)	(0.1606)	(0.4520)
Father disability pension	0.0080	0.5823***	0.1662	-0.2763
	(0.2354)	(0.2094)	(0.1764)	(0.4940)
Father basic education	-0.3043	0.2278	-0.1441	-0.1749
	(0.2026)	(0.1826)	(0.1481)	(0.4044)
Father single	0.2624	0.2757*	0.0883	0.0434
	(0.1616)	(0.1448)	(0.1170)	(0.3453)
Father conviction	0.5808***	0.5759***	0.1233	0.1328
	(0.1838)	(0.1672)	(0.1459)	(0.4289)
Father mental disorder	1.8834	-13.3996	2.0591*	-12.5737
	(1.4576)	(1808.5025)	(1.1750)	(3737.5509)
Rate of 0-17 year olds in municipality	-0.0178	-0.0392	0.0091	-0.1955***
	(0.0362)	(0.0305)	(0.0245)	(0.0728)
Rate of employed in municipality	-0.0180	0.0200	0.0371	0.0711
	(0.0393)	(0.0343)	(0.0263)	(0.0755)
Rate on disability pension in municipality	0.0701	0.0515	0.1589**	0.3834*
	(0.1155)	(0.1004)	(0.0782)	(0.2115)
Rate of single parents in municipality	-0.0529	-0.0445	-0.1560**	-0.0392
	(0.1000)	(0.0877)	(0.0679)	(0.2068)
Expenses on public goods in municipality	0.0320	0.0415**	0.0383***	-0.0425
	(0.0208)	(0.0182)	(0.0148)	(0.0414)
Municipality size	-0.0009	-0.0017**	-0.0011*	-0.0014
	(0.0009)	(0.0007)	(0.0006)	(0.0016)
Constant	-2.1221	-3.9028*	-4.1896**	-1.5299
	(2.4121)	(2.0950)	(1.6352)	(4.4522)
Observations	3844	3844	3844	3844

Standard errors in parentheses.* p<0.10, ** p<0.05, *** p<0.01

Table 8a. Effects of placement type on criminal recidivism, boys

	OLS	**OLS with controls**	**2SLS with Controls**
Residential care	0.1032***	0.0835***	-0.1433
	(0.0237)	(0.0267)	(0.2141)
Birth weight		-0.0019	-0.0075
		(0.0165)	(0.0177)
Voluntary placement		0.1273**	0.0770
		(0.0643)	(0.0803)
Age at first placement		0.0060**	0.0081**
		(0.0026)	(0.0033)
No. of placements		0.0118	0.0056
		(0.0127)	(0.0142)

Total days in placements		-0.0001	-0.0017
		(0.0008)	(0.0017)
No. of diagnoses		-0.0056	-0.0047
		(0.0122)	(0.0122)
Congenital deformities		-0.2960***	-0.3169***
		(0.0695)	(0.0735)
Mother's age at her first birth		0.0002	-0.0001
		(0.0016)	(0.0017)
Mother income		-0.0003	-0.0002
		(0.0003)	(0.0003)
Mother employed		0.0492	0.0605
		(0.0387)	(0.0409)
Mother disability pension		0.0212	0.0442
		(0.0365)	(0.0428)
Mother basic education		0.0085	0.0172
		(0.0380)	(0.0393)
Mother single		0.0322	0.0213
		(0.0292)	(0.0314)
Mother conviction		0.0185	0.0141
		(0.0502)	(0.0500)
Mother mental disorder		0.3658***	0.4606***
		(0.0698)	(0.1137)
Father income		-0.0000	-0.0001
		(0.0002)	(0.0002)
Father employed		-0.0021	0.0060
		(0.0445)	(0.0458)
Father disability pension		-0.0034	0.0116
		(0.0452)	(0.0483)
Father basic education		0.0398	0.0216
		(0.0395)	(0.0438)
Father single		0.0353	0.0155
		(0.0321)	(0.0380)
Father conviction		0.0850**	0.0688*
		(0.0359)	(0.0400)
Rate of 0-17 year olds in municipality		0.0029	-0.0017
		(0.0068)	(0.0082)
Rate of employed in municipality		0.0055	0.0072
		(0.0074)	(0.0077)
Rate on disability pension in municipality		0.0107	0.0088
		(0.0220)	(0.0223)
Rate of single parents in municipality		0.0340*	0.0425**
		(0.0193)	(0.0208)
Expenses on public goods in municipality		0.0066	0.0074*
		(0.0041)	(0.0043)
Municipality size		-0.0001	-0.0001
		(0.0002)	(0.0002)
Constant	0.5513***	-0.4182	-0.2422
	(0.0173)	(0.4755)	(0.5132)
Observations	1698	1698	1698

Standard errors in parentheses.* p<0.10, ** p<0.05, *** p<0.01

F-test	27.06	[0.000]
Shea's partial R-squared	0.163	
Endogeneity test (Wu-Hasuman F-test version)	0.195	[0.274]

Table 8b. Effects of placement type on criminal recidivism, girls

	OLS	**OLS with controls**	**2SLS with Controls**
Residential care	0.0983**	0.0845*	0.6779
	(0.0410)	(0.0444)	(0.5198)
Birth weight		0.0592*	0.0482
		(0.0346)	(0.0377)
Voluntary placement		-0.0613	-0.0480
		(0.1134)	(0.1331)
Age at first placement		0.0049	-0.0061
		(0.0044)	(0.0110)
No. of placements		0.0483**	0.0802**
		(0.0242)	(0.0380)
Total days in placements		-0.0021	0.0004
		(0.0014)	(0.0027)
No. of diagnoses		0.0007	0.0018

		(0.0232)	(0.0266)
Congenital deformities		-0.3015***	-0.2533
		(0.0891)	(0.1643)
Mother's age at her first birth		-0.0036	-0.0035
		(0.0031)	(0.0035)
Mother income		-0.0009**	-0.0006
		(0.0004)	(0.0005)
Mother employed		0.1244*	0.0386
		(0.0661)	(0.1004)
Mother disability pension		0.0270	-0.0065
		(0.0738)	(0.0907)
Mother basic education		-0.0059	-0.0244
		(0.0650)	(0.0760)
Mother single		-0.0610	-0.0605
		(0.0511)	(0.0572)
Mother conviction		0.1307	0.1730*
		(0.0833)	(0.1005)
Mother mental disorder		0.1085	0.3611
		(0.3177)	(0.3547)
Father income		-0.0002	-0.0003
		(0.0002)	(0.0003)
Father employed		-0.0610	-0.0554
		(0.0714)	(0.0874)
Father disability pension		0.0093	-0.0184
		(0.0859)	(0.1037)
Father basic education		0.0516	0.0691
		(0.0718)	(0.0848)
Father single		0.0371	0.0672
		(0.0594)	(0.0738)
Father conviction		0.0239	-0.0045
		(0.0633)	(0.0780)
Rate of 0-17 year olds in municipality		0.0043	0.0146
		(0.0123)	(0.0168)
Rate of employed in municipality		-0.0122	-0.0111
		(0.0135)	(0.0151)
Rate on disability pension in municipality		-0.0397	-0.0004
		(0.0407)	(0.0577)
Rate of single parents in municipality		0.0051	0.0122
		(0.0345)	(0.0388)
Expenses on public goods in municipality		0.0028	0.0009
		(0.0071)	(0.0082)
Municipality size		0.0001	0.0000
		(0.0003)	(0.0004)
Constant	0.2611***	0.7400	0.0323
	(0.0308)	(0.8196)	-11.297
Observations	521	521	521

Standard errors in parentheses.* p<0.10, ** p<0.05, *** p<0.01

F-test	4.40	[0.031]
Shea's partial R-squared	0.011	
Endogeneity test (Wu-Hasuman F-test version)	1.936	[0.164]

Appendix Tables

Table A1a. Effects of placement type on crime including other types of care, boys

	OLS	OLS with controls	2SLS with controls
Residential care	0.0383***	0.0423***	0.0975
	(0.0121)	(0.0128)	(0.0965)
Other types of care	0.0298***	0.0179	-0.0269
	(0.0107)	(0.0125)	(0.1116)
Birth weight		0.0127**	0.0132**
		(0.0057)	(0.0058)
Voluntary placement		0.0185	0.0314
		(0.0257)	(0.0304)
Age at first placement		0.0032***	0.0066
		(0.0010)	(0.0051)
No. of placements		0.0191***	0.0237***
		(0.0055)	(0.0076)
Total days in placements		-0.0006*	-0.0002

		(0.0003)	(0.0006)
No. of diagnoses		-0.0112**	-0.0115**
		(0.0051)	(0.0052)
Congenital deformities		-0.0426*	-0.0509**
		(0.0230)	(0.0251)
Mother's age at her first birth		-0.0020***	-0.0021***
		(0.0007)	(0.0007)
Mother income		-0.0000	-0.0000
		(0.0001)	(0.0001)
Mother employed		-0.0131	-0.0130
		(0.0149)	(0.0152)
Mother disability pension		-0.0050	-0.0047
		(0.0155)	(0.0158)
Mother basic education		-0.0042	-0.0065
		(0.0145)	(0.0148)
Mother single		0.0210*	0.0230**
		(0.0109)	(0.0114)
Mother conviction		0.0644**	0.0631**
		(0.0258)	(0.0261)
Mother mental disorder		0.2134	0.2289
		(0.1694)	(0.1707)
Father income		-0.0002***	-0.0002***
		(0.0000)	(0.0000)
Father employed		0.0136	0.0126
		(0.0164)	(0.0167)
Father disability pension		0.0186	0.0138
		(0.0202)	(0.0213)
Father basic education		0.0083	0.0096
		(0.0156)	(0.0158)
Father single		0.0180	0.0205
		(0.0122)	(0.0130)
Father conviction		0.0427**	0.0434**
		(0.0168)	(0.0169)
Father mental disorder		-0.0621	-0.0536
		(0.0790)	(0.0826)
Rate of 0-17 year olds in municipality		-0.0003	0.0001
		(0.0026)	(0.0027)
Rate of employed in municipality		0.0049*	0.0044
		(0.0028)	(0.0029)
Rate on disability pension in municipality		0.0096	0.0093
		(0.0084)	(0.0085)
Rate of single parents in municipality		0.0038	0.0026
		(0.0069)	(0.0072)
Expenses on public goods in municipality		0.0010	0.0008
		(0.0015)	(0.0015)
Municipality size		-0.0000	-0.0000
		(0.0001)	(0.0001)
Constant	0.1283***	-0.2751	-0.2970
	(0.0086)	(0.1703)	(0.1851)
Observations	6686	6686	6686

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

	Residential care		Other types	
F-test	52.76	[0.000]	40.25	[0.000]
Shea's partial R-squared	0.017		0.014	
Endogeneity test (Wu-Hasuman F-test version)	0.789	[0.674]	0.789	[0.674]

Table A1b. Effects of care type on crime including other types of care, girls

	OLS	**OLS with controls**	**2SLS with controls**
Residential care	0.0199	0.0118	0.0478
	(0.0161)	(0.0169)	(0.1258)
Other types of care	0.0874***	0.0768***	0.1204
	(0.0145)	(0.0172)	(0.1258)
Birth weight		0.0174**	0.0178**
		(0.0079)	(0.0080)
Voluntary placement		0.0021	0.0055
		(0.0381)	(0.0442)
Age at first placement		0.0011	-0.0002
		(0.0015)	(0.0057)
No. of placements		0.0122*	0.0122
		(0.0070)	(0.0083)

Total days in placements		-0.0026***	-0.0024***
		(0.0004)	(0.0008)
No. of diagnoses		-0.0084	-0.0088
		(0.0062)	(0.0065)
Congenital deformities		-0.0929***	-0.0912***
		(0.0312)	(0.0316)
Mother's age at her first birth		-0.0048***	-0.0048***
		(0.0009)	(0.0010)
Mother income		-0.0001	-0.0001
		(0.0001)	(0.0001)
Mother employed		0.0112	0.0110
		(0.0195)	(0.0202)
Mother disability pension		0.0282	0.0269
		(0.0193)	(0.0204)
Mother basic education		0.0572***	0.0575***
		(0.0193)	(0.0196)
Mother single		0.0623***	0.0640***
		(0.0143)	(0.0150)
Mother conviction		0.0698**	0.0712**
		(0.0295)	(0.0297)
Mother mental disorder		-0.0229	-0.0243
		(0.1490)	(0.1474)
Father income		-0.0002***	-0.0002***
		(0.0001)	(0.0001)
Father employed		-0.0102	-0.0104
		(0.0219)	(0.0219)
Father disability pension		0.0131	0.0115
		(0.0252)	(0.0255)
Father basic education		-0.0175	-0.0155
		(0.0204)	(0.0213)
Father single		0.0283*	0.0301*
		(0.0161)	(0.0173)
Father conviction		0.0772***	0.0782***
		(0.0210)	(0.0212)
Father mental disorder		0.0507	0.0402
		(0.1268)	(0.1315)
Rate of 0-17 year olds in municipality		-0.0005	-0.0005
		(0.0035)	(0.0037)
Rate of employed in municipality		0.0017	0.0018
		(0.0037)	(0.0038)
Rate on disability pension in municipality		0.0110	0.0117
		(0.0111)	(0.0113)
Rate of single parents in municipality		-0.0151	-0.0156
		(0.0095)	(0.0096)
Expenses on public goods in municipality		0.0065***	0.0065***
		(0.0020)	(0.0021)
Municipality size		-0.0002***	-0.0003***
		(0.0001)	(0.0001)
Constant	0.4326***	0.1935	0.1616
	(0.0116)	(0.2272)	(0.2430)
Observations	7190	7190	7190

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

	Residential care		Other types	
F-test	62.37	[0.000]	64.84	[0.000]
Shea's partial R-squared	0.018		0.018	
Endogeneity test (Wu-Hasuman F-test version)	0.139	[0.933]	0.139	[0.933]

Table A2. Effects of placement type on number of verdicts for boys placed at ages 0-6

	OLS	**OLS with controls**	**2SLS with controls**
Residential care	0.2167	0.1033	1.2790
	(0.2338)	(0.2884)	(1.9013)
Birth weight		-0.0655	-0.2007
		(0.2072)	(0.3190)
Voluntary placement		0.7544*	0.7042
		(0.4401)	(0.5060)
Age at first placement		-0.0325	0.0300
		(0.0985)	(0.1219)
No. of placements		0.2017*	0.2762
		(0.1216)	(0.1743)

Total days in placements		-0.0127**	-0.0068
		(0.0051)	(0.0096)
No. of diagnoses		-0.0836	-0.1041
		(0.1025)	(0.1108)
Congenital deformities		-0.0859	-0.0748
		(0.5227)	(0.6480)
Mother's age at her first birth		-0.0065	-0.0033
		(0.0162)	(0.0177)
Mother income		-0.0027	0.0012
		(0.0053)	(0.0082)
Mother employed		0.3313	0.1161
		(0.3869)	(0.5115)
Mother disability pension		0.2361	0.1129
		(0.3257)	(0.3807)
Mother basic education		0.5974	0.6496
		(0.3876)	(0.4106)
Mother single		0.5560*	0.6321*
		(0.2867)	(0.3365)
Mother conviction		0.2607	0.3757
		(0.4476)	(0.4841)
Mother mental disorder		1.4779**	2.1644
		(0.6707)	(1.3407)
Father income		-0.0023	-0.0036
		(0.0029)	(0.0035)
Father employed		0.1501	0.2715
		(0.4050)	(0.4703)
Father disability pension		0.5266	0.4296
		(0.5934)	(0.6178)
Father basic education		-0.2266	-0.1569
		(0.3949)	(0.4355)
Father single		-0.3692	-0.3659
		(0.3548)	(0.3808)
Father conviction		0.6749*	0.7101*
		(0.3877)	(0.4018)
Rate of 0-17 year olds in municipality		-0.0350	-0.0073
		(0.0532)	(0.0674)
Rate of employed in municipality		-0.0539	-0.0517
		(0.0617)	(0.0618)
Rate on disability pension in municipality		-0.2020	-0.1491
		(0.1746)	(0.1877)
Rate of single parents in municipality		0.0175	0.1216
		(0.1886)	(0.2900)
Expenses on public goods in municipality		0.0012	-0.0024
		(0.0407)	(0.0431)
Municipality size		0.0008	0.0006
		(0.0017)	(0.0017)
Constant	1.7833***	5.2592	3.5059
	(0.1467)	(4.4410)	(4.5880)
Observations	198	198	198

F-test	2.01	[0.158]
Shea's partial R-squared	0.01	
Endogeneity test (Wu-Hasuman F-test version)	0.535	[0.464]

Table A3a. Effects of placement type on likelihood of first verdict age 18-20, boys

	OLS	**OLS with Controls**	**2SLS with Controls**
Residential care	0.0233***	0.0176*	-0.0337
	(0.0090)	(0.0098)	(0.0641)
Birth weight		0.0007	0.0001
		(0.0044)	(0.0045)
Voluntary placement		-0.0226	-0.0270
		(0.0251)	(0.0260)
Age at first placement		0.0026***	0.0029***
		(0.0009)	(0.0010)
No. of placements		0.0173***	0.0153***
		(0.0051)	(0.0055)
Total days in placements		-0.0010***	-0.0014***
		(0.0002)	(0.0005)
No. of diagnoses		-0.0048	-0.0048
		(0.0048)	(0.0048)

Congenital deformities		-0.0108	-0.0052
		(0.0183)	(0.0193)
Mother's age at her first birth		-0.0010*	-0.0010*
		(0.0006)	(0.0006)
Mother income		0.0000	0.0000
		(0.0001)	(0.0001)
Mother employed		-0.0199	-0.0177
		(0.0148)	(0.0147)
Mother disability pension		-0.0067	-0.0051
		(0.0152)	(0.0152)
Mother basic education		-0.0037	-0.0028
		(0.0153)	(0.0153)
Mother single		0.0184	0.0158
		(0.0119)	(0.0124)
Mother conviction		0.0414	0.0429
		(0.0265)	(0.0266)
Mother mental disorder		0.3768*	0.3631*
		(0.1951)	(0.1925)
Father income		-0.0001**	-0.0001**
		(0.0001)	(0.0001)
Father employed		-0.0059	-0.0019
		(0.0167)	(0.0173)
Father disability pension		0.0133	0.0205
		(0.0203)	(0.0221)
Father basic education		-0.0115	-0.0127
		(0.0155)	(0.0157)
Father single		-0.0056	-0.0098
		(0.0129)	(0.0141)
Father conviction		0.0089	0.0083
		(0.0166)	(0.0167)
Father mental disorder		-0.0883***	-0.0917***
		(0.0147)	(0.0135)
Rate of 0-17 year olds in municipality		-0.0004	-0.0010
		(0.0028)	(0.0028)
Rate of employed in municipality		-0.0007	-0.0009
		(0.0028)	(0.0028)
Rate on disability pension in municipality		-0.0127	-0.0137
		(0.0087)	(0.0088)
Rate of single parents in municipality		0.0020	0.0038
		(0.0067)	(0.0069)
Expenses on public goods in municipality		0.0019	0.0020
		(0.0014)	(0.0014)
Municipality size		-0.0001	-0.0000
		(0.0001)	(0.0001)
Constant	0.0583***	0.1242	0.1755
	(0.0063)	(0.1753)	(0.1854)
Observations	3236	3236	3236

Standard errors in parentheses.* p<0.10, ** p<0.05, *** p<0.01

F-test	62.00	[0.000]
Shea's partial R-squared	0.018	
Endogeneity test (Wu-Hasuman F-test version)	0.631	[0.427]

Table A3b. Effects of placement type on likelihood of first verdict age 18-20, girls

	OLS	**OLS with Controls**	**2SLS with Controls**
Residential care	0.0639***	0.0499***	-0.0602
	(0.0165)	(0.0179)	(0.1265)
Birth weight		0.0223**	0.0207**
		(0.0098)	(0.0099)
Voluntary placement		0.0009	-0.0173
		(0.0444)	(0.0489)
Age at first placement		0.0047***	0.0057***
		(0.0018)	(0.0020)
No. of placements		0.0040	0.0010
		(0.0075)	(0.0083)
Total days in placements		-0.0018***	-0.0026***
		(0.0005)	(0.0010)
No. of diagnoses		-0.0089	-0.0064
		(0.0077)	(0.0082)
Congenital deformities		-0.1269***	-0.1273***

		(0.0301)	(0.0304)
Mother's age at her first birth		-0.0037***	-0.0037***
		(0.0011)	(0.0011)
Mother income		-0.0002	-0.0002
		(0.0002)	(0.0002)
Mother employed		0.0112	0.0121
		(0.0260)	(0.0260)
Mother disability pension		0.0241	0.0274
		(0.0266)	(0.0269)
Mother basic education		0.0645**	0.0642**
		(0.0270)	(0.0270)
Mother single		0.0509**	0.0446**
		(0.0207)	(0.0217)
Mother conviction		0.0699*	0.0657
		(0.0403)	(0.0403)
Mother mental disorder		-0.0398	-0.0436
		(0.1671)	(0.1739)
Father income		-0.0001	-0.0001
		(0.0001)	(0.0001)
Father employed		-0.0228	-0.0214
		(0.0313)	(0.0314)
Father disability pension		0.0333	0.0355
		(0.0368)	(0.0370)
Father basic education		-0.0194	-0.0258
		(0.0297)	(0.0302)
Father single		0.0347	0.0251
		(0.0237)	(0.0261)
Father conviction		0.0804***	0.0770**
		(0.0303)	(0.0305)
Father mental disorder		0.3645*	0.3645*
		(0.2203)	(0.2170)
Rate of 0-17 year olds in municipality		-0.0075	-0.0081*
		(0.0049)	(0.0049)
Rate of employed in municipality		0.0037	0.0044
		(0.0052)	(0.0053)
Rate on disability pension in municipality		0.0092	0.0085
		(0.0158)	(0.0157)
Rate of single parents in municipality		-0.0134	-0.0108
		(0.0131)	(0.0134)
Expenses on public goods in municipality		0.0068**	0.0069**
		(0.0028)	(0.0028)
Municipality size		-0.0003**	-0.0002
		(0.0001)	(0.0001)
Constant	0.2480***	0.0040	0.0570
	(0.0121)	(0.3081)	(0.3149)
Observations	2983	2983	2983

Standard errors in parentheses.* p<0.10, ** p<0.05, *** p<0.01

F-test	58.47	[0.000]
Shea's partial R-squared	0.019	
Endogeneity test (Wu-Hasuman F-test version)	0.779	[0.378]

Table A4a. Effects of placement type on the likelihood of crime including those entering placement with a criminal record, boys

	OLS	**OLS with controls**	**2SLS with Controls**
Residential care	0.0566***	0.0337***	0.0729
	(0.0123)	(0.0130)	(0.0873)
Birth weight		0.0051	0.0055
		(0.0061)	(0.0062)
Voluntary placement		0.0146	0.0180
		(0.0285)	(0.0301)
Crime before placement		0.8084***	0.8039***
		(0.0130)	(0.0166)
Age at first placement		0.0050***	0.0047***
		(0.0011)	(0.0013)
No. of placements		0.0156**	0.0171**
		(0.0063)	(0.0071)
Total days in placements		-0.0006*	-0.0004
		(0.0004)	(0.0007)
No. of diagnoses		-0.0141**	-0.0139**

		(0.0063)	(0.0062)
Congenital deformities		-0.0399	-0.0444
		(0.0261)	(0.0281)
Mother's age at her first birth		-0.0015*	-0.0015*
		(0.0008)	(0.0008)
Mother income		0.0001	0.0001
		(0.0001)	(0.0001)
Mother employed		-0.0267	-0.0286
		(0.0195)	(0.0197)
Mother disability pension		-0.0120	-0.0127
		(0.0195)	(0.0194)
Mother basic education		0.0119	0.0116
		(0.0189)	(0.0188)
Mother single		0.0336**	0.0357**
		(0.0152)	(0.0159)
Mother conviction		0.0606*	0.0605*
		(0.0319)	(0.0319)
Mother mental disorder		0.3237	0.3346*
		(0.1996)	(0.2016)
Father income		-0.0002***	-0.0002***
		(0.0001)	(0.0001)
Father employed		0.0024	-0.0000
		(0.0217)	(0.0222)
Father disability pension		0.0205	0.0158
		(0.0253)	(0.0271)
Father basic education		-0.0322	-0.0314
		(0.0196)	(0.0196)
Father single		-0.0151	-0.0123
		(0.0168)	(0.0178)
Father conviction		0.0333	0.0337
		(0.0215)	(0.0215)
Father mental disorder		-0.1836***	-0.1809***
		(0.0254)	(0.0302)
Rate of 0-17 year olds in municipality		-0.0044	-0.0039
		(0.0034)	(0.0035)
Rate of employed in municipality		0.0055	0.0055
		(0.0037)	(0.0037)
Rate on disability pension in municipality		0.0008	0.0016
		(0.0112)	(0.0113)
Rate of single parents in municipality		-0.0011	-0.0024
		(0.0091)	(0.0095)
Expenses on public goods in municipality		0.0026	0.0026
		(0.0019)	(0.0019)
Municipality size		-0.0002*	-0.0002*
		(0.0001)	(0.0001)
Constant	0.1352***	-0.1576	-0.1942
	(0.0088)	(0.2209)	(0.2338)
Observations	3600	3600	3600
Standard errors in parentheses			
* p<0.10, ** p<0.05, *** p<0.01			
F-test		73.76	[0.000]
Shea's partial R-squared		0.020	
Endogeneity test (Wu-Hasuman F-test version)		0.205	[0.601]

Table A4b. Effects of placement type on the likelihood of crime including those entering placement with a criminal record, girls

	OLS	**OLS with controls**	**2SLS with Controls**
Residential care	0.0376**	0.0017	-0.0450
	(0.0157)	(0.0167)	(0.1345)
Birth weight		0.0190**	0.0183*
		(0.0096)	(0.0098)
Voluntary placement		-0.0092	-0.0182
		(0.0409)	(0.0483)
Crime before placement		0.4955***	0.4944***
		(0.0179)	(0.0181)
Age at first placement		0.0061***	0.0065***
		(0.0017)	(0.0020)
No. of placements		-0.0010	-0.0023
		(0.0075)	(0.0083)
Total days in placements		-0.0021***	-0.0024**

		(0.0005)	(0.0010)
No. of diagnoses		-0.0063	-0.0054
		(0.0074)	(0.0079)
Congenital deformities		-0.0856**	-0.0879**
		(0.0364)	(0.0367)
Mother's age at her first birth		-0.0046***	-0.0046***
		(0.0011)	(0.0011)
Mother income		-0.0000	0.0000
		(0.0001)	(0.0002)
Mother employed		-0.0055	-0.0045
		(0.0242)	(0.0242)
Mother disability pension		0.0386	0.0417
		(0.0247)	(0.0262)
Mother basic education		0.0940***	0.0948***
		(0.0249)	(0.0249)
Mother single		0.0658***	0.0630***
		(0.0185)	(0.0201)
Mother conviction		0.0679*	0.0671*
		(0.0351)	(0.0350)
Mother mental disorder		-0.0775	-0.0753
		(0.1768)	(0.1799)
Father income		-0.0002*	-0.0002*
		(0.0001)	(0.0001)
Father employed		-0.0135	-0.0122
		(0.0281)	(0.0283)
Father disability pension		0.0511	0.0532*
		(0.0315)	(0.0320)
Father basic education		-0.0169	-0.0200
		(0.0260)	(0.0273)
Father single		0.0388*	0.0347
		(0.0209)	(0.0239)
Father conviction		0.0791***	0.0770***
		(0.0264)	(0.0269)
Father mental disorder		0.2920**	0.2992**
		(0.1455)	(0.1480)
Rate of 0-17 year olds in municipality		-0.0039	-0.0044
		(0.0044)	(0.0046)
Rate of employed in municipality		0.0055	0.0058
		(0.0047)	(0.0047)
Rate on disability pension in municipality		0.0277*	0.0270*
		(0.0142)	(0.0143)
Rate of single parents in municipality		-0.0247**	-0.0232*
		(0.0123)	(0.0130)
Expenses on public goods in municipality		0.0079***	0.0080***
		(0.0026)	(0.0026)
Municipality size		-0.0003**	-0.0003**
		(0.0001)	(0.0001)
Constant	0.4503***	-0.0571	-0.0268
	(0.0115)	(0.2852)	(0.2971)
Observations	4042	4042	4042
Standard errors in parentheses			
* p<0.10, ** p<0.05, *** p<0.01			
F-test		62.02	[0.000]
Shea's partial R-squared		0.015	
Endogeneity test (Wu-Hasuman F-test version)		0.121	[0.728]

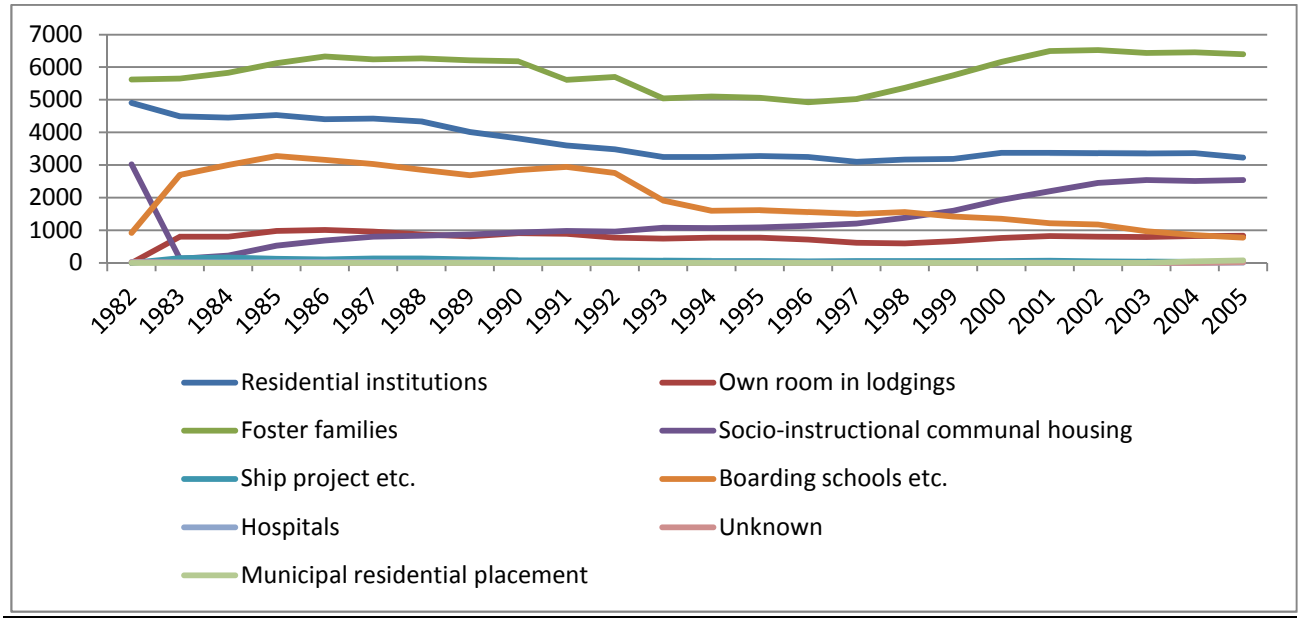
Table A5. Effects of municipality level of crime for those aged 15-19 on municipality intensity of residential care

	OLS	**OLS with controls**	**OLS with controls**
Municipality level of crime for those aged 15-19	160.8863***	3.6419	2.3692
	(4.1106)	(6.7868)	(6.7838)
Rate of 0-17 year olds in municipality		-0.3842***	-0.3837***
		(0.0497)	(0.0497)
Rate of employed in municipality		0.1948***	0.1907***
		(0.0541)	(0.0542)
Rate on disability pension in municipality		-0.4665***	-0.4456***
		(0.1481)	(0.1490)
Rate of single parents in municipality		1.0246***	1.0398***
		(0.1245)	(0.1263)
Expenses on public goods in municipality		0.0400	0.0379
		(0.0256)	(0.0258)

Municipality size		0.0201***	0.0202***
		(0.0009)	(0.0009)
Male			0.1607
			(0.1481)
Birth weight			0.0857
			(0.0925)
Voluntary placement			-0.0696
			(0.3454)
Age at first placement			-0.0044
			(0.0147)
No. of placements			-0.1489**
			(0.0755)
Total days in placements			-0.0080*
			(0.0047)
No. of diagnoses			0.1343*
			(0.0729)
Congenital deformities			0.3271
			(0.4445)
Mother's age at her first birth			-0.0021
			(0.0102)
Mother income			0.0034**
			(0.0015)
Mother employed			-0.4164*
			(0.2409)
Mother disability pension			-0.0510
			(0.2319)
Mother basic education			0.0656
			(0.2346)
Mother single			-0.2071
			(0.1871)
Mother conviction			0.0297
			(0.3256)
Mother mental disorder			0.1723
			(1.1973)
Father income			0.0020*
			(0.0011)
Father employed			-0.2460
			(0.2855)
Father disability pension			-0.0237
			(0.3017)
Father basic education			-0.3961
			(0.2596)
Father single			-0.3858*
			(0.2095)
Father conviction			0.2874
			(0.2506)
Father mental disorder			-0.9643
			(1.4846)
Constant	15.1179***	20.2434***	20.7731***
	(0.3099)	(2.9587)	(3.0169)
Observations	7375	7375	7375

Standard errors in parentheses * p<0.10, ** p<0.05, *** p<0.01

Appendix Figure A1. Trends over time of children in different types of placements, 1982-2005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Residential institutions
Own room in lodgings
Foster families
Socio-instructional communal housing
Ship project etc.
Boarding schools etc.
Hospitals
Unknown
Municipal residential placement

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